

**ADAPTING URBAN AGRICULTURE FOR SUSTAINABLE FOOD
SECURITY IN CASE OF ARADA SUB-CITY ADDIS ABABA, ETHIOPIA**



Nejat Shemsu Bushra

A Thesis Submitted to

The department of Architecture and Urban Planning and Design

School of Civil Engineering and Architecture

Presented in Partial Fulfilment of the Requirement for the Degree of Master's in Urban
Planning and Design

Office of Graduate Studies
Adama Science and Technology University

August, 2021

Adama, Ethiopia

**ADAPTING URBAN AGRICULTURE FOR SUSTAINABLE FOOD
SECURITY IN CASE OF ARADA SUB-CITY ADDIS ABABA, ETHIOPIA**

Nejat Shemsu Bushra

Advisor: Professor Samson Kassahun

A Thesis Submitted to

The department of Architecture and Urban Planning and Design

School of Civil Engineering and Architecture

Presented in Partial Fulfilment of the Requirement for the Degree of Master's in Urban
Planning and Design

Office of Graduate Studies

Adama Science and Technology University

August, 2021

Adama, Ethiopia

APPROVAL OF BOARD OF EXAMINERS

I, the advisor of the thesis entitled “**Adapting urban agriculture for sustainable food security in case of Arada sub-city Addis Ababa, Ethiopia**” and developed by **Nejat Shemsu** hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

| | | |
|---------------|-----------|-------|
| _____ | _____ | _____ |
| Major Advisor | Signature | Date |

We, the undersigned, members of the Board of Examiners of the thesis by **Nejat Shemsu** have read and evaluated the thesis entitled “**Adapting urban agriculture for sustainable food security in case of Arada sub-city Addis Ababa, Ethiopia**” and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Urban Planning and Design.

| | | |
|-------------|-----------|-------|
| _____ | _____ | _____ |
| Chairperson | Signature | Date |

| | | |
|-------------------|-----------|-------|
| _____ | _____ | _____ |
| Internal Examiner | Signature | Date |

| | | |
|------------------|-----------|-------|
| _____ | _____ | _____ |
| Eternal Examiner | Signature | Date |

Finally, approval and acceptance of the thesis is contingent upon submission of its final copy to the Office of Postgraduate Studies (OPGS) through the Department Graduate Council (DGC) and School Graduate Committee (SGC).

| | | |
|-----------------|-----------|-------|
| _____ | _____ | _____ |
| Department Head | Signature | Date |

| | | |
|-------------|-----------|-------|
| _____ | _____ | _____ |
| School Dean | Signature | Date |

| | | |
|--------------------------------------|-----------|-------|
| _____ | _____ | _____ |
| Office of Postgraduate Studies, Dean | Signature | Date |

DECLARATION

I hereby declare that this Master Thesis entitled “**Adapting urban agriculture for sustainable food security in case of Arada sub-city Addis Ababa, Ethiopia** ” is my original work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

| | | |
|---------------------|-----------|------|
| Name of the student | Signature | Date |
|---------------------|-----------|------|

RECOMMENDATION

I, the advisor of this thesis, hereby certify that I/we have read the revised version of the thesis entitled “**Adapting urban agriculture for sustainable food security in case of Arada sub-city Addis Ababa, Ethiopia**” prepared under my/our guidance by Nejat Shemsu submitted in partial fulfillment of the requirements for the degree of Master’s of Science in Urban Planning and Design. Therefore, I recommend the submission of a revised version of the thesis to the department following the applicable procedures.

Major Advisor

Signature

Date

ACKNOWLEDGMENT

First of all, thanks be to Allah, the Lord of the Worlds, for His infinite goodness and mercy Thank you so much for making me go all the way without giving up

And to my beloved parents who have given me this inexhaustible supply of love and care since my childhood May Allah give you long and healthy life under his protection for the rest of your life

I also would like to express our gratitude to Adama science and technology University for giving me the opportunity to learn this scholarship and thinking to make me deeper in knowledge so that i have a better idea for the future of the country and serve the community.

Next, I would like to express my sincere gratitude to professor Samson for helping me get this Research done by sharing scholarly opinions and constructive ideas.

Many thanks to my friends (Nabiha, Asiya, Kalkidan, Danny, Sami, ...) who have always been by my side, pointing out ways, giving morale and encouragement, helping, expressing your best wishes.

Finally, a big thank you to the district administrations (Ababaw, Mercy, Juliette, Lydia, Jerusalem ...) who took me every day without hesitation in the houses of the urban farmers.

LIST OF FIGURES

| | |
|--|----|
| Figure 1.1 Map of Arada sub-city..... | 6 |
| Figure 3. 1 Methodological design | 24 |
| Figure 4. 1 Place urban farmer’s work | 28 |
| Figure 4. 2 Overall vegetable production | 29 |
| Figure 4. 3 Farmers who produce vegetable and fruit overall..... | 30 |
| Figure 4. 4 Types of vegetables produced in Arada sub-city | 31 |
| Figure 4. 5 Location of vegetable producers | 34 |
| Figure 4. 6 Number of farmers/ number of animals they have..... | 35 |
| Figure 4. 7 Types of livestock | 36 |
| Figure 4. 8 Livestock production..... | 37 |
| Figure 4. 9 Location of livestock producers | 38 |
| Figure 4. 10 places where UA take place | 42 |
| Figure 4. 11 Some Vertical farming ideas | 63 |

LIST OF TABLES

| | |
|--|-------------------------------------|
| Table 2. 1 Development stage of UA | 9 |
| Table 2.2 Dimensions of sustainability of urban agriculture..... | 15 |
| Table 2.3 Existing Land use for UPA in Addis Ababa..... | 16 |
| Table 4. 1Demographic Data of urban farmers | 25 |
| Table 4. 2 Description about urban farmers | 27 |
| Table 4. 3 production and Harvesting | 33 |
| Table 4. 4 Economical aspect of UA for Vegetable and fruit producers..... | 43 |
| Table 4. 5 Economical aspect of UA for livestock producer..... | 45 |
| Table 4. 6 Livestock outputs with their price | Error! Bookmark not defined. |
| Table 4. 7Environmental aspect of UA | 48 |
| Table 4. 8 Social aspect of UA | 49 |
| Table 4. 9 Household family size | 51 |
| Table 4. 10 Output from vegetable/ household and individual | 52 |
| Table 4. 11: Major traditional food kinds in the study area and their average dietary energy composition | 54 |
| Table 4. 12 Total quantity of vegetable obtained and the dietary energy equivalent by types of vegetable | 54 |
| Table 4. 13 challenge and constraint of Urban farmers..... | 56 |
| Table 4. 14 availability accessibility usability of land for urban farmers | 57 |
| Table 4. 15urban planning and urban agriculture..... | 59 |

LIST OF ACRONYMS

UA= Urban Agriculture

FAO= Food and Agriculture Organization of The United Nation

RUAF= Resource Center of Urban Agriculture and Forestry

Mo FED = Ministry of Finance and Economic Development

UNDP= United Nations Development Program

UNCHS= United Nations Commission on Human Settlement

WHO =World Health Organization

USDA= United States Department of Agriculture

CGIAR=Consortium of International Agriculture Centers.

Table of Contents

| | |
|--|-----|
| APPROVAL OF BOARD OF EXAMINERS | i |
| DECLARATION | ii |
| RECOMMENDATION | iii |
| ACKNOWLEDGMENT | iv |
| LIST OF FIGURES..... | v |
| LIST OF TABLES | vi |
| LIST OF ACRONYMS..... | vii |
| ABSTRACT | xi |
| CHAPTER ONE | 1 |
| 1. INTRODUCTION..... | 1 |
| 1.1. Motivation of study | 2 |
| 1.2. Background of study | 2 |
| 1.3. Problem statement..... | 3 |
| 1.4. Research objective..... | 4 |
| 1.5. Research question..... | 4 |
| 1.6. Significance of the study | 4 |
| 1.7. Scope of the study | 5 |
| 1.8. Description of the study area..... | 5 |
| 1.9. Limitation of the study | 6 |
| 1.10. Organization of the thesis..... | 6 |
| CHAPTER TWO..... | 8 |
| 2. LITERATURE REVIEW | 8 |
| 2.1. History of urban agriculture | 8 |
| 2.1.1. Urban agriculture in ancient world..... | 8 |
| 2.1.2. Urban agriculture in modern world | 8 |
| 2.2. Urban agriculture definition | 9 |
| 2.3. Benefits of urban agriculture | 10 |
| 2.3.1 Food security | 10 |
| 2.3.2. Health benefits..... | 11 |
| 2.3.3. Economic benefits | 11 |

| | |
|---|----|
| 2.3.4. Environment benefits | 11 |
| 2.4. Food security and urban agriculture | 11 |
| 2.4.1. Food insecurity measurement..... | 12 |
| 2.4.2. Household income and expenditure surveys | 12 |
| 2.5. Urban agriculture and land use..... | 13 |
| 2.5.1. Availability of land..... | 13 |
| 2.5.2. Accessibility of land..... | 13 |
| 2.5.3. Usability of land | 14 |
| Contextual review | 15 |
| 2.6. Addis Ababa and urban agriculture..... | 15 |
| Empherical review..... | 16 |
| 2.7. Urban agriculture in African countries..... | 17 |
| 2.7.1. Uganda Kampala | 17 |
| 2.7.2. Nigeria Ibadan | 18 |
| 2.8. Summery and gaps of literature review..... | 19 |
| CHAPTER THREE..... | 20 |
| 3. METHODOLOGY | 20 |
| 3.1. Introduction | 20 |
| 3.2. Sampling technique | 20 |
| 3.3. Sample size..... | 20 |
| 3.4. Sources of data | 21 |
| 3.5. Data collection techniques | 21 |
| 3.5.1. Qualitative data collection techniques..... | 21 |
| 3.5.2 Quantitative data collection techniques..... | 22 |
| 3.6. Data analysis techniques | 22 |
| 3.6.1. Qualitative data collection analysis..... | 22 |
| 3.6.2. Quantitative data analysis techniques..... | 23 |
| 3.7. Household Food Balance Model | 23 |
| 3.8. Methodological design | 24 |
| CHAPTER FOUR | 25 |
| 4. RESULT AND DISCUSSION..... | 25 |
| 4.1. Demographic characteristics of urban farmers..... | 25 |
| 4.2. Description about urban farmers | 27 |
| 4.3. Vegetable and fruits production | 28 |
| 4.3.1. Current situation of urban agriculture in terms of vegetables and fruits | 28 |

| | | |
|--|---|----|
| 4.3.2. | Production and harvesting of vegetables and fruits..... | 33 |
| 4.4. | Livestock production..... | 34 |
| 4.4.1. | Current situation of urban agriculture in terms of animal breeding | 34 |
| 4.4.2. | Livestock products | 36 |
| 4.5. | Discussion | 38 |
| 4.6. | Economical aspect of urban farming..... | 43 |
| 4.6.1. | Economic benefits of Vegetable and crop production..... | 43 |
| 4.6.2. | Economic Benefits of livestock production | 45 |
| 4.7. | Environmental aspect of urban agriculture..... | 48 |
| 4.8. | Social aspect of urban agriculture | 49 |
| 4.9. | Discussion | 50 |
| 4.10. | Role of urban agriculture in food security attainment in Arada sub city | 51 |
| 4.11. | Discussion | 55 |
| 4.12. | Urban planning an urban agriculture..... | 56 |
| 4.12.1. | Challenge and constraint of urban farmers..... | 56 |
| 4.12.2. | Availability, accessibility, usability of urban agricultural land..... | 57 |
| 4.12.3. | Urban planners and urban agriculture | 59 |
| 4.12. | Discussion | 62 |
| CHAPTER FIVE..... | | 63 |
| 5. CONCLUSION AND RECOMMENDATION | | 64 |
| 5.1. | Conclusion..... | 64 |
| 5.2. | Recommendation..... | 65 |
| REFERENCES..... | | 66 |
| APPENDIX I..... | | 69 |
| APPENDIX II | | 74 |

ABSTRACT

This research is conducted with the main objective of examining the existing condition of urban agriculture activities including its economic, social, and environmental benefits, role urban agriculture has to attain food security for urban agriculture beneficiaries in Arada Sub-city of Addis Ababa. Therefore, necessary data are generated from both primary and secondary sources, primary data were collected from field observation sample household survey informant interview while secondary data were obtained from urban agriculture concerned offices (Arada sub-city urban agriculture office, woredas, Arada sub-city planning office). These data were analyzed by both qualitative and quantitative techniques. The qualitative data analysis techniques include content and narrative analysis methods using a different kind of assistance software. Descriptive analysis method and household food balance model were used as quantitative data analysis techniques to look into the household per capital dietary energy contribution of urban agriculture in Arada sub-city. Also challenges and constraints urban farmers face regarding urban agriculture in terms of land availability, accessibility, and usability of land discussed with opinions and plans of urban planners and UA experts have been analyzed. The findings of this study confirm a significant role of adapting urban agriculture in attaining urban household food security through studying overall urban farmers' identity, economical social, and environmental benefits side by side. Over 65 % percent of the surveyed sample households were obtaining 38% of dietary energy requirement only from their urban farmlands. Additionally, the paper tries to find out urban farmers challenge in terms of land, finance, knowledge etc. with urban agriculture expert and planners' opinions and plans for future. Based on the findings of the study, important urban agriculture development schemes in terms of policy, land, finance have been recommended.

Key words: Urban Agriculture, vegetable, livestock, food security, urban planning

CHAPTER ONE

1. INTRODUCTION

The world urban population is continuously growing day to day. Recent data shows that it increases from 751 million to 4.2 billion within just 68 years (1950-2018) (United Nations, 2019). According to (knoema, 2020) In 2020, urban population for Ethiopia was 21.7 %. Over the last 50 years, urban population of Ethiopia grew substantially from 8.8 to 21.7 % rising at an increasing annual rate that reached a maximum of 2.44% in 2008 and then decreased to 2.21% in 2020. This indicates that Ethiopia also shows rapid urbanization from last 50 years. Thus, Addis Ababa capital city of Ethiopia and a diplomatic center of Africa holds 25% of urban population with number of 3,000,000 people in 2007 according to (MWUD, 2007) and other study of United Nations Habitat states it Hosts 30 percent of the urban population of Ethiopia therefore currently thought to be more than 4 million also the study estimates that this number will continue to rise, reaching 12 million in 2024 (UN-HABITAT, 2008).

Therefore, it indicates that if the rate of population increases anyone can predict what will happen next. For instance, congestion and overcrowding will take place all over the city which in turn makes the atmosphere hotter than other days, a greater consumption of food and goods, scarce of land, pollution, more energy usage, and people are forced to pay high costs to live in cities. Therefore, this rapid urbanization leads to urban Poverty and the question of food security (Palanivel, 2017).

While urban poverty and food security are taking place here in Addis Ababa urban agriculture is the unrecognized or neglected sector for the city in relation to urban planning and design for it has a direct relation to land and its purposes. Although there are some works and activities that are starting now a day's urban agriculture is still an untouched field and can be done more than this. Since it can boost the productivity of food security, generation of income for everyone who participates to it, access to fresh and micro nutrient-rich foods, energy generation from the waste disposals, brings climate change for good through planting agricultural trees both inland and buildings (vertical farming) which in turn refreshes the environment.

1.1. Motivation of study

The motivation of study to conduct this research is an observation of urban residents suffer from inflation of goods due to covid 19 and chaos that happened in last 3 years in the country until now which directly contribute to economic failure and food insecurity, second most important is to get Master's degree.

1.2. Background of study

Ensuring food security and appropriate nutrition of the urban population, in particular of the poorest households, has become a tremendous challenge in many cities in developing countries. Cities are therefore among the principal territories for intervention and planning of strategies that aim to eradicate hunger and poverty and improve livelihoods (René van Veenhuizen, 2007)

The majority of the inhabitant of Addis Ababa constitute poor and live in an inadequate standard of living about 70% of the dwellers are living in the slum (MoFED2006), which clearly state that their life not suitable even exposed to Poverty and food security. In developing countries, the force of development in urban agriculture has also come from food-related problems, mainly: the lack of guaranteed food security and the need for large-scale food production. It is said that urban agriculture could help to improve both food intake and food quality (RUAF, 2015).

UPA is a productive and income-generating farming system that should be seen as an integral part of the urban system, providing food and jobs, contributing to the urban ecology, and competing for natural resources with other urban functions. UPA can also contribute to urban sanitation by recycling solid and liquid wastes. Effective participation and capacity building of UPA actors is essential to poverty alleviation and food security in cities, as well as sustainable urban development (Hoornweg, 2008)

Urban Agriculture is contributing to several policy goals (De Haas and Gura, 1996, Mougeot, 2000): Commercial urban agriculture makes a significant contribution to employment, income generation, and poverty alleviation, and contributes to the aggregate supply of the city as well as balanced diets. Backyard production reduces food expenditures and improves household diets. Moreover, during periods of economic or political crisis, urban agriculture proved to be an important survival strategy in many countries. Taking the current urbanization rates into account, it is no surprise that Urban

Agriculture received during the last years increasing attention by major donors and is now included in programs of FAO, UNDP, UNCHS, WHO, USDA and the CGIAR system as well as many other international organizations.

Land use issues, specifically availability of land, access to land and usability of land, are of particular concern to urban farmers. These issues are imposed or perpetuated by the urban planning policy context through a lack of formal recognition of urban agriculture in planning policy, through a lack of awareness about the socio-economic and environmental role of urban agriculture in cities, through a lack of clear government responsibility for the various aspects of urban agriculture, through resistant attitudes or cultural norms held by players in the land use planning process, and through a lack of resources, technical and financial support for urban farmers from the government. (Gutman & Pablo, 1987)

1.3. Problem statement

Attaining food security in the capital of Ethiopia is becoming hard to achieve from time to time due to different reasons which are affecting everyone directly or indirectly. Since the country gets its food raw products by importing from other countries and this cannot serve all the peoples of the nation so it needs a tangible solution to overcome this and create sustainable food security by creating a community that is fully dependent on products that are easily available near their territory.

While watching the data even experiencing in our day-to-day life people continuously move to the more urbanized areas for the better opportunities of life especially the developing countries can be a good example for this and Addis Ababa is one of the victims of this problem which urbanization brings. As a result of this the resident of the city are facing the various problems of crowdedness, pollution, inflation so as a capital city it losing the quality one city should have. There is also scarcity in food supply due to different reasons like seasonal production of the products, security reasons in other areas which supply food materials to the city and also lack of practice of fulfilling their needs by themselves using mechanisms which can be adapted to city life.

The traditional way of life of the community is also another problem that is becoming one of the main reasons to not attain food security in the city. Most of the people living in the city try to get their food raw products from stores and markets nearby and also the time-to-time increase of the cities size is another thing which needs integration to the people living around the city side and creates a city which is independent on its food supply.

1.4. Research objective

The general objective of this study is to examine the existing condition of urban agriculture activities, what role does it have to attain food security for urban agriculture beneficiaries in Arada Sub-city of Addis Ababa.

Specific objective

1. To assess the existing situation of urban agriculture in Arada sub-city.
2. To identify the economic, social, environmental impact of urban agriculture.
3. To examine if urban farmers have attained food security from this agriculture
4. To assess relation between urban planning and urban agriculture.

1.5. Research question

2. What is the existing situation of urban farmers who are conducting with urban agriculture?
3. What positive impact does urban agriculture have in terms of economic, social, environmental for urban farmers?
4. How does this urban agriculture attain its food security?
5. What relation does urban planning and urban agriculture have?

1.6. Significance of the study

Once this study is executed and finalized the outcome have significance some of them are described below.

1. In the absence of much research on this field, it fills the gap and serves as a resource for government bodies to plan, especially those involved in this field.
2. It attracts people who do not benefit from this sector and those who are interested in working in the sector by showing how much people who are engaged with urban agriculture are self-sufficient in food and other economic benefits.
3. It examines the food security of people who produce a variety of foods at home and benefit themselves and their families and neighbors.
4. It emphasizes that urban agriculture is a key option for current urban growth and also for future food-related problems in a cit

1.7. Scope of the study

Thematic scope

The study was conducted in the Arada sub-city of Addis Ababa focus on urban agriculture and how it can facilitate sustainable food security for those who live in a city. It studied urban farmers in the sub-city and explored many things about them. These include the type of agriculture the farmers are engaged in, the quantity of their production, the working environment, the economic, social, and environmental benefits, the shortcomings and obstacles they face, their food security, and the government's plans for the future.

Spatial scope

The spatial scope of the study area is Arada sub-city with a size of 950 hectares of land having a total population of more than 210,000 that is subdivided into 10 woredas.

1.8. Description of the study area

Arada mentions as its name with the name of Addis Ababa regarding the historical foundation. The reign of Emperor Minilik II in 1886 and emperors Taitu Betul decide this place to be the seat of their government. Most of their government structures, residences, and other social economic, and political infrastructure were established mostly in Arada sub-city (Addis Ababa city administration, 2015)

Arada is one of the 10 sub-cities in Addis Ababa city administration. It covers an area of 950 hectares with a total population of more than 210,000 and an average density is 223 people/ hectare. It's situated in the central part of Addis Ababa, bounded from south by Kirkos and lideta, from west by Addis ketema, from east by Yeka and from north by Gulele sub cities. This sub city divided by 10 woredas, 31 sub woredas, 100 Sefers, and 316 Blocks.

According to (Addis Ababa city administration, 2015) There are a lot of historical institutions, building monuments such as the palace, parlama worship places established in this sub city.in general Arada is one of the ancient parts of Addis Ababa and also one of the areas where the early history of the city is most apparent.

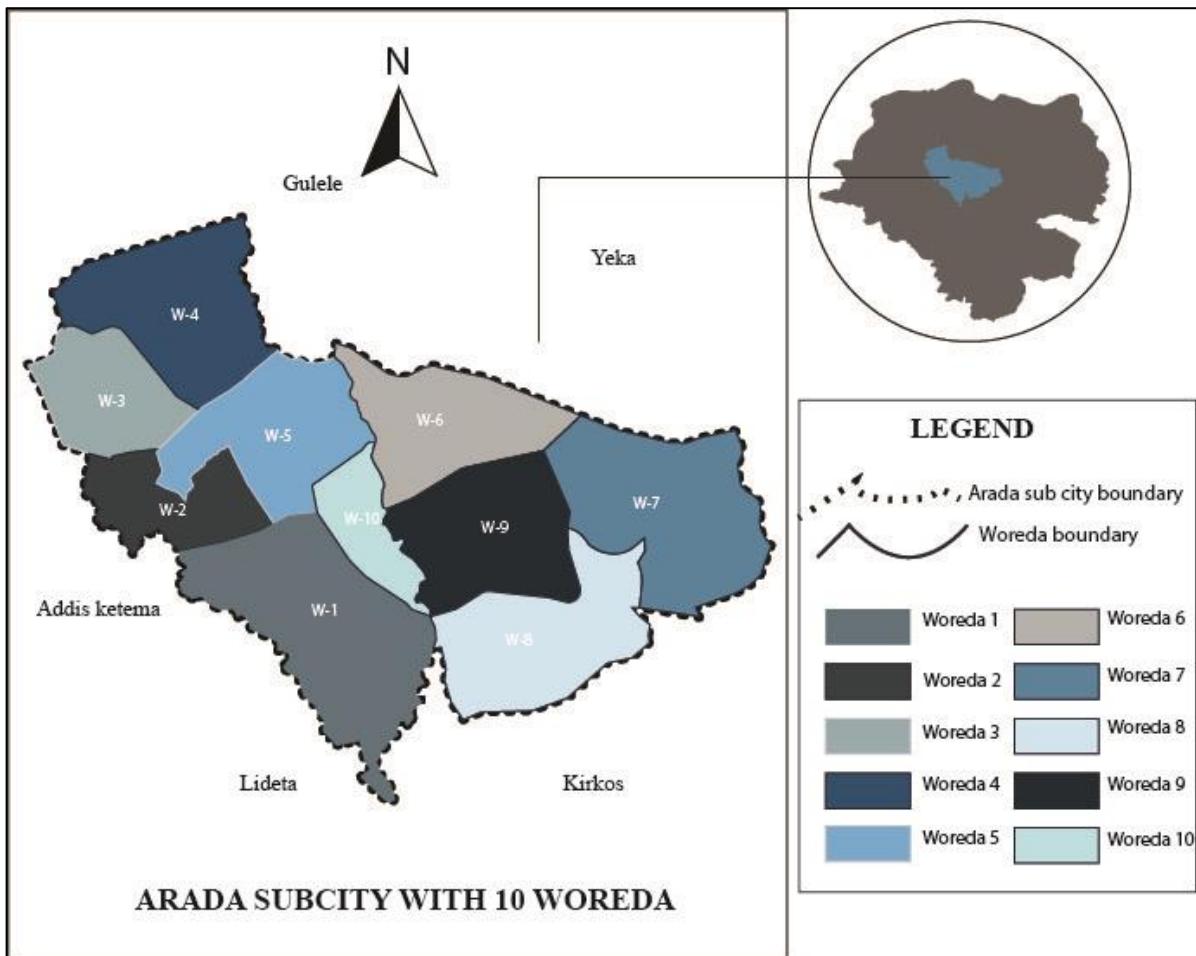


Figure 1. 1 Map of Arada sub-city

1.9. Limitation of the study

One of the things that can be taken as a limit is not knowing the places directly where these urban farmers are located. It was important to go and talk to the staff of this sector who work in the duty district. Then, waiting for the day when they will be out in the field is another thing that kills available time. After all, only 6 or 7 people can go in a day so this limitation As a result, it wastes a lot of time and to conduct only to certain urban farmers.

1.10. Organization of the thesis

The thesis is categorized into five chapters. Each chapter systematically and effectively examines the content and data of the study accordingly.

Chapter One: This chapter introduce the general topic of the thesis which are research problems, objectives, questions, significance, scope, and research design in detail.

Chapter Two: chapter two is mainly focus on literature reviews that discuss about what urban agriculture is, benefits of urban agriculture, food security and how it can be measured.

Chapter Three: Research Methodology is a chapter that discusses the methodology of the research. The chapter explains the methods used for the study and the process of data collection and analysis in detail.

Chapter Four: Result and Discussion is a chapter that discusses the results of qualitative and quantitative data findings.

Chapter Five: Conclusion and recommendation is the concluding part of the thesis.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. History of urban agriculture

2.1.1. Urban agriculture in ancient world

In our modern world, urban agriculture is considered to be a recent phenomenon; nevertheless, it has existed for as long as humans have lived in cities. Agricultural activities have a long history and are related to people's abilities not only to harvest food available in nature, but also to purposefully cultivate and grow it, both plants and livestock. Archaeological evidence suggests that people in different parts of the world (primarily Asia and Africa) started to learn agricultural skills between 10 and 5 thousand years ago. (Mannion, 1999). In 3500 BCE Mesopotamia, 2500 BCE Ancient Egypt 1100 CE Aztec Farming were some of ancient civilization that practice urban agriculture where farmers set aside small plots of land for farming within the city's walls. (The green conspiracy, 2018).

People have been growing food in urban areas since the first cities for two reasons:

- 1) most of the original cities were formed and developed around cultivated agricultural lands,
- 2) people transferred their agricultural knowledge to nascent cities to feed themselves, their families, and the urban community. (Steel, 2013).

2.1.2. Urban agriculture in modern world

From the 1880s to the early 1900s, allotment gardens were a common way for European cities such as London, Paris, and Stockholm to assist the urban poor in becoming self-sufficient. Poor families were given land to garden in peri-urban areas, or land immediately surrounding a settlement. (AURORA UNIVERSITY, 2019). Following a long period of industrialization, London became one of them by granting allotments. In addition, public parks were established in the 1920s to provide sufficient quantities of land within the city for citizens to use, typically for a small fee. Furthermore, in the 1800s, Germany began gardening with the aim of preserving green spaces within cities for children to play in nature. During World Wars I and II, this trend became more focused on increasing edible gardens in urbanized areas. (The green conspiracy, 2018).

Table 2. 1 Development stage of UA

| Development stage of urban agriculture | Influencing factors | Period |
|--|--|---|
| Urban agriculture- <i>the basic principle for urban planning</i> | -formation of cities -the need for territorial autonomy -population growth | 3,5 thous y. BC-17 th century |
| <i>Changing functions</i> of urban agriculture | -industrialization -the economic stratification of society -economic migration to cities | 18 th -19 th century |
| | -period in time of world wars -economic and social depression -Insufficiency of resources | First half of 20 th century |
| The <i>renaissance</i> of urban agriculture | -the concept of sustainable development -science and research activities -technological development -changing the values of society | Second half of 20 th century-now |

source: The concept of urban agriculture by Madara dobele and Andra zvirbule

2.2. Urban agriculture definition

Many authors defined urban agriculture some of them are described below.

- “An industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows and 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.” (Mouget, 2000).
- “The growing of plants and the raising of animals for food and other uses within and around cities and towns, and related activities such as the production and delivery of inputs, and the processing and marketing of products. Urban agriculture is located within or on the fringe of a city and comprises a variety of production systems, ranging from subsistence production and processing at household level to fully commercialized agriculture.” (Veenhuizen, 2006).
- “Urban Agriculture (UA) and peri-urban agriculture can be defined as the growing, processing, and distribution of food and other products through plant cultivation and seldom raising livestock in and around cities for feeding local populations.” (GSDR, 2015)

Urban agriculture includes:

1. Crop production, animal raising as well as fish-farming in and around cities.
2. Food production as well as non-food production (flowers, trees, pot plants for example).
3. Processing and marketing of food and non-food products produced in and around the urban area.
4. Uses compost and (treated or untreated) urban wastewater as resources.
5. May take place on open land areas in the city as well in backyards or on rooftops.

Rural and urban agriculture have much in common. They are however also characterized by some important differences. These are related to:

- a. The role of agriculture in local livelihoods
- b. The social context in which agriculture takes place
- c. The political and institutional context
- d. The access to land use of productive resources
- e. The farming types found in the area and the processes of agricultural innovation
- f. The demand for non-agricultural services.

2.3. Benefits of urban agriculture

2.3.1 Food security

Food security is one of the major advantages of urban agriculture, especially for poor developing countries. (Kutiwa, 2010) argue that urban agriculture is one way to break the cycle of food insecurity and poverty in a cash-strapped world, and they create a conceptual model to address three aspects of food security. Households that participate in urban agriculture will produce their own food and consume it immediately. The money saved from food supplements allows households to have access to a diverse diet. Food utilization is a term that refers to nutritional protection in terms of food quality. Furthermore, the main products in the urban and periphery are fresh and perishable products such as vegetables, fruits, eggs, and milk, which are a supplement to but not a replacement for rural agriculture. (Mougeot, 2001).

2.3.2. Health benefits

Gardening and food processing are also healthy forms of exercise. However, health practitioners and others often underestimate the exercise-related health benefits. Gardeners and farmers seldom classify their efforts as "exercise." The "exercise" can vary from fine motor participation when cutting flowers to aerobic gross motor activities like turning compost piles (Brown & Jameton, 2000). Gardeners report that "activity" in the garden boosts their self-esteem, pride, trust, personal satisfaction, and effectiveness. (Hanna & Oh, 2000) Working with plants and being outside improves people's mental health, outlook, and personal wellbeing (Brown, VM et al. 2004).

2.3.3. Economic benefits

Producers fulfil their own basic needs or sell the goods on markets by growing food in their own backyards or farmland, or both. As a result, "fungible" and "real" income is provided (Brown, Bellows, & Smit, 2004). To begin, when a household produces food for its own consumption, the savings on food can be thought of as fungible income. The majority of the experiences, which come from African countries, indicate that the saved money or income will otherwise be spent on basic necessities or invested in household resources. As a result, urban agriculture plays an important role in poverty alleviation. Second, if there are more goods than the household requires, they prefer to sell the excesses on the market, resulting in an additional source of household income. As a result, urban agriculture not only increases food security but also reduces food waste (Guo & Liangyan, 2012).

2.3.4. Environment benefits

Improved Soil Quality, Reduced Stormwater Runoff, Improved Air Quality, Reduced Urban Heat Island Impact, Increased Biodiversity, Reduced Carbon Emissions, Waste Reduction are some of the environmental benefits of urban agriculture (Heather, 2012).

2.4. Food security and urban agriculture

Food security is a broad and nebulous term that encompasses issues concerning the existence, efficiency, accessibility, triggers, and coping strategies of food shortages. (Clay, 2001). The term food security emerged only in the mid-1970s, during discussions of international food issues during a period of global food crises. Since then, there has been a significant shift in the understanding and concept of food security. The initial focus of

attention was mainly on food supply issues, specifically ensuring the availability and price stability of essential food items at the international and national levels. (Mulugeta, 2010).

The FAO definition of food insecurity is: “A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life.” This definition of food security has been further elaborated in the (WorldBank, Poverty and Hunger, 1986) study on Poverty and Hunger as "entry of all people at all times to enough food for an active, safe life." In its Plan of Action, the 1996 World Food Summit adopted a more nuanced definition: ‘Food security at the individual, household, national, regional, and global levels [is achieved] when all people have physical and economic access to adequate, secure, and nutritious food to meet their dietary needs and food preferences for an active and healthy life at all times.’ (WorldBank, 1996)

Non-availability of food, lack of access, improper consumption, and uncertainty over a specific time span are all factors that can contribute to a situation of food insecurity. One of the goals of the 1996 World Food Summit was to combat food insecurity.

2.4.1. Food insecurity measurement

According to (Pérez-Escamilla & Segall-Corrêa, 2008) There are five commonly used methods that can be used to assess food security i) the Food and Agriculture Organization (FAO) method for estimating calories available per capital at the national level; ii) household income and expenditure surveys; iii) individual's dietary intake; iv) anthropometry; and v) experience-based food insecurity measurement scales.

2.4.2. Household income and expenditure surveys

This method is based on interviewing respondents in their households. Respondents provide information on the amount of money that they spend on food and other necessities. Different time reference periods have been used including the week(s) or month(s) preceding the survey. The following inputs are needed to be able to take full advantage of this method:

- i) quantity of food bought (or expenditures) and costs associated with different foods consumed within and outside the house;
- ii) foods received by any household member as either a gift or as payment for work, goods or services;

iii) foods grown for consumption by household members. This method estimates calories consumed on average per household member per day, making it essential to have access to culturally appropriate and valid food composition tables.

2.5. Urban agriculture and urban land use

land is an important resource for urban agriculture. Urban farming requires some land space, irrespective of whether the farming system is soil-based or not. Therefore, land is and will remain a resource of particular concern to urban farmers. But land, or rather the adequate use of the land, is of increasing concern also to planners and municipal policymakers who have to consider the various demands on the land and its functions in and around the city (RUAF o. , 2003).

Urban agriculture has always been part of urban settlements. In the past and even today many urban inhabitants turn to it as part of their livelihood strategy. Although the quantity of food produced by city farming does not match up to that outside the city, its impact is quite considerable. Yet, national and municipal policy do not acknowledge this important role, but consider urban agriculture as something of the past, and one that does not have a place in modern urban design. This poses several key challenges for urban farming: urban land is either not available or not accessible; and when available, it is most often not suitable (RUAF o. , 2003).

2.5.1. Availability of land

Availability of land refers to the existence of land that can be utilized for urban agriculture, in the short-, medium- or long-term. In areas of rapid urbanization, undeveloped land for agricultural use may not be available or may be difficult to identify (Quon, 1999). Urbanization may displace farming activity (by replacing farming with more economically lucrative land uses), or prevent new farming from starting (by erecting buildings and structures that effectively preclude farming). Agriculture usually cannot provide the economic returns of industry or housing, and urban development pressures may compel or even force land holders to sell their urban plots (Aziz & Sartaj, 1997).

2.5.2. Accessibility of land

Accessibility of land refers to the opportunity for actual use of available land by needy households or groups, taking into account administrative procedures and conflict resolution mechanisms. Some authors assert that land availability is less a problem than access to

land, where access means “capable of being reached” by farmers. Access to land is one of the most, if not the most, significant constraint to urban farmers (Maxwell, Daniel , & Armar-Klimesu, 1998). Access to land must be distinguished from availability of land; land may be available or present in a city but not accessible to farmers because of political or social constraints to its use or redistribution (Helmore, Kristin , & Annu Ratta, 1995).

2.5.3. Usability of land

of the land for urban agriculture is a function of topography, soil texture and fertility, moisture and other environmental qualities. The inherent qualities of a plot of land, and the facilities and services available to it, determine whether parcels of land that are otherwise both available and accessible can be used for farming. A plot’s biophysical characteristics (soil, hydrology or microclimate), or physical dimensions (size, shape, location) may make it unfit for agriculture. (RUAF o. , 2003).

2.5.4. Sustainability of UA

Gerstl (2001) highlighted two major threats for the sustainability of urban off-plot farming (not on own plots): first, the fact that UA is usually part of the informal sector, i.e. without formal recognition or legislation; and second, that most of the land or field is not owned by producers. This lack of secure tenure and access to suitable land is a major issue in the sustainability of UPA. Yi-Zhang and Zhanen (2000) state that in addition to land shortage, labor shortage can also limit the sustainability of UA. The production costs in the Shanghai area are on average 15 percent higher than in rural vegetable-producing areas. This could make UPA unsustainable unless other functions of UPA are appreciated.

(Obuobie et al. (2006) and Drechsel et al. (2006) point out that for 20 years on some sites in Accra, urban farmers have been cultivating several harvests per year on the poorest soils and without any fallow period, applying high amounts of organic inputs. This may be considered a sustainable and highly productive land use system in an environment that normally only supports shifting cultivation.

According to de (Zeeuw, 2005), the main factors constraining sustainable development of UA are, inappropriate urban policies and regulations, limited access to productive resources and insecure land tenure, lack of support services and appropriate technologies and lack of organization among urban farmers.

Table 2.2 Dimensions of sustainability of urban agriculture

| Dimensions of sustainability of urban agriculture | | | |
|---|---|--|---|
| | Environmental | Economic | Social |
| Synergy | Plant nutrients in urban waste and sewage; urban greening and micro-climate; landscape and biodiversity management; | Food production; access to inputs and markets; amenities employment and income generation. | Human needs for food and green (recreational) space; poverty reduction; community building; |
| Conflict | Urban pollutants affecting agricultural soils and irrigation water; agro-chemicals affecting urban environment. | Competition with other urban land uses; vandalism and theft. | Negative perceptions of UPA; UPA not yet adapted to urban demand, e.g. for recreation. |

Source: Based on Van der Berg, 2002.

Contextual review

2.6. Addis Ababa and urban agriculture

According to the majority of UA practitioners in Addis Ababa and the surrounding small towns are low-income earners who use UA to supplement their income and gain nutritional and socioeconomic benefits. UA in and around the city entails raising livestock, primarily dairy cows, sheep, and chickens; egg production; and rain-fed and irrigated crop cultivation, primarily vegetables but also cereals and pulses, on homesteads, river banks, school compounds, and other open fields (Messay , 2013).

UA has played an important role in the socioeconomic development, food security, and livelihoods of the residents of Addis Ababa and the surrounding towns, according to key informant interviews, document reviews, and observations conducted for this study. The importance of urban farm products in the food supply cannot be overstated. According to a CSA report from 2007, UA provides 30 percent of vegetables, 60 to 70 percent of milk, and 40 to 60 percent of eggs consumed in Addis Ababa. Each year, Addis Ababa produces approximately 62 tons of honey. Despite its enormous contribution in many areas, UA's contribution to total employment is quite low (estimated to be only 3 percent in Addis Ababa). In this regard, (Gebremichael, Gebremichael, & Worku, 2014) found that more than half of Addis Ababa's household heads work in the service sector, and nearly 40% work in the manufacturing, repairing, and construction sectors, with the role of UA being minor.

Over 70% of total income of the urban farming community in the city is derived from crop and livestock production, with crop cultivation contributing to 30%, while livestock (mainly dairy production) accounts for 40%. Livestock production refers to dairy farming, cattle fattening, sheep and goat rearing, and poultry farming. The share of none-farm income for these communities at 30% is relatively low. According to estimates by the Addis Ababa Bureau of Finance and Economic Development, the contribution of urban agriculture to the GDP was 0.3% in 2013. The attention given to urban agriculture has increased in recent years associated with the MSE development strategies promoted by the City Government. During 2009 and 2010, 461 MSEs were engaged in urban agriculture, employing around 4,870 youth and women. The Addis Ababa City Development Plan (2002-2012) had indicated that the livelihoods of 51,000 families in Addis Ababa were associated with farming. It argued that urban and periurban agriculture (UPA) should be encouraged, especially in the south-eastern part of Addis Ababa. It proposed horticulture development along riverbanks and livestock production on the peripheries. Overall, 13.82% of the city's land area (7,175 ha) was delineated as agricultural land. However, other than this reference, UPA was not featured in the planning tools for regulating the actual implementation of the plan (i.e., Strategic Development Framework, Strategic Development Action Plans; and Local Development Plans).

Table 2.3 Existing Land use for UPA in Addis Ababa

| Akaki-Kaliti | Arada | Gullele | Yeka | Kirkos | Addis Ketema | Kolfe-Keranio | Lideta | Bole | Nefas Silk-Lafto | Total |
|--------------|-------|---------|-------|--------|--------------|---------------|--------|---------|------------------|---------|
| 4,328.4 | - | - | 923.0 | 0.4 | - | 369.6 | - | 1,186.0 | 365.8 | 7,172.2 |

Goals of UA in Addis Ababa structure plan

- Cover at least 50% of the demand for high value agricultural products (vegetables, milk, poultry meat and egg) in Addis Ababa with food to be produced within the city;
- Increase farmers' annual income from urban agriculture from \$ 294 to \$ 882. (Note: urban farmers get 70% of their annual income from agriculture and the remaining 30% from off-farm income sources);
- Create additional employment opportunity for 500,000 residents of the city;

- Reduce natural resource degradation and environmental pollution caused by UPA by 80%; and

- Double the supply of raw materials for agro-industries (milk, poultry products, vegetables, fruits, hides and skin, etc.).

Empirical review

2.7. Urban agriculture in African countries

Globally, urban agriculture tends to be much more important in developed countries. The United Nations Development Program reports that cities generate 15% of the world's food, though reliable measurements of the precise nature of its benefits are difficult to identify. (Hamilton 2013; Smit et al. 1996), Moreover, the scale of urban agriculture, as well as its opportunities and challenges, differs across regions or countries in the Global South. Since much of the food produced in small urban plots is eaten at home or sold or exchanged in informal markets, the economics of urban agriculture in the developing world are difficult to quantify. The scale of production and consumption appears to be significant, and urban agriculture is one of the main mechanisms by which the world is fed (Mok . 2014). Since Sub-Saharan Africa is the world's poorest and most food-insecure country, understanding the position of urban agriculture is critical. Urban agriculture has the potential to increase nutrition access for the urban poor, especially through horticultural crops rich in essential minerals such as zinc and iron, as well as vitamins such as vitamin A, which are often deficient in African diets. African indigenous greens such as amaranths (*Amaranthus* spp.), nightshades (*Solanum* spp.), and spider plant (*Cleome gynandra*), seeds of which are readily available at local markets and are easily grown in a relatively small space, play an important role in this regard” (Croft. 2014).

2.7.1. Uganda Kampala

In the city of Kampala most commonly grown crops are banana, cassava, maize, beans, vegetables for instance leafy greens, cabbage, tomatoes, onions, bitter Tomatoes, etc. spices, sweet potatoes, potato, cocoyam, sugarcane, mushrooms and fruit like jack fruit, avocado, pawpaw, mango, etc. (Development Consultants International Ltd., 1997). Urban livestock is also an important economic activity in Kampala and one that has increased substantially in the past decade. one of them is Poultry rearing which is the most existing livestock activity in Kampala, associated with cattle, pigs, goats, sheep and rabbits, in that order (Katongole, 2011).

Most of urban agriculture activities are undertaken by women in the city of Kampala and they are involved with vegetable, poultry and pig production (Nabulo , Nasinyama , Lee-Smith . , & Cole, 2004) and the men are engaged with cattle and pig keeping and marketing or trade activities (Maxwell,1998).

mostly Urban and peri-urban agriculture in Kampala is practiced in different locations which include home compounds, along roadsides, in undeveloped plots, in wetlands/swamps, under power lines, on waste dumpsites, and on other public and private land. In the beginning of 1990s, Kampala residents engaged in UPA is estimated about 25-36 % (Azuba, 2002) ten years later this number increased to 49 per cent (David , Lee-Smith , Kyaligonza , & Mangeni, 2010).

This includes that about 20-25 % are dwellers of urban city centers and the rest of 50% are living on peri urban areas. According to (Semwanga, 2005)report urban households engaged in UPA about 53 per cent farm to supplement their income and nearly 89 per cent of them produce food for household provisioning. urban agriculture also has a significant benefit in case of nutrition According to studies by (Maxwell, Urban Food Security in Sub-Saharan Africa, 1999),Children under age of five in Kampala which are in the family of low-income farmers were found to be better in nutrition than child whose families are non-farming household.

2.7.2. Nigeria Ibadan

Urban and peri-urban agriculture is serves as a significant source of nutrient-rich foods to the city, therefore it's an important activity in Ibadan, and a source of livelihoods for farmers and those involved along the value chain. According to (Gbadegesin, 1991)(food crops sold in city markets about 23–25 per cent of were produced within the metropolis of Ibadan. In the 11 LGAs of Ibadan agricultural survey was undertaken therefore 796 farms, over 90 per cent of which were in peri-urban zones are identified. These farms fall into five main categories Mono-cropping, Mixed-cropping, Mixed Farming (crop and livestock) which livestock farming and aquaculture are dominant, with more than 67 per cent of all farms falling into these categories.

In core urban areas are the most grown crops are leafy vegetables including amaranth and corchorus, fruit such as plantain/banana, arable crops including maize, citrus fruit and pineapple, cassava and yam, and tomatoes (Gbadegesin, 1991). In the middle of urban dwellers, the majority of farmers about 63 per cent involve in urban agriculture for purpose

of food self-provisioning and as a means towards household food security, and the rest of farmers about 34 per cent farm for commercial purposes. Its only three per cent farm just because they have no other means of a livelihood (Yusuf, Adesanoye , & Awotide, 2008)). The farmers use mostly private plots, land in and around residential areas, vacant plots on government and institutional land and land along rivers and roadsides (IMUI/RUAF, 2007).and they sold it in Ibadan and nearby towns and cities. Ibadan urban farmers in livestock production involves cattle, sheep, goats, pigs and rabbits, poultry keeping and aquaculture also pig farming which is a male-dominated enterprise are practiced in the city (Oni, O.A, & Yusuf, 1999)

The type of Farmers in urban and peri-urban locations of Ibadan differ in terms of their socio-economic and demographic characteristics. For instance, more than 90 per cent of commercial vegetable farmers belong to the low-income group, while the other farmers like livestock keepers, including poultry and fish farmers, from middle and high-income groups are mostly well educated. the majority of farmers are women, those women have the ability to integrate small-scale production with other household duties (Kintomo, Ogunkeyedeand, & Ogungbaigbe, 1997).

2.8. Summery and gaps of literature review

Urban agriculture is a viable solution for the coming years and a solution that can greatly benefit the people of the city, especially those who may be affected by poverty it can help all of the world urban community not only by covering their food needs but also by improving their economy, improving their environment, maintaining their health, and strengthening their relationship with others furthermore role of urban agriculture in attaining food security can be measured through different types of method internationally among them household food balance model is better. Urban planning and urban agriculture also have a direct linkage due to usage of land.

The above literature generally tries to show about urban agriculture from ancient to now and its benefits but many literatures doesn't show how UA attain food security in detail quantitatively on their papers so this makes it hard to find even one paper that discuss the contribution of UA on food security.

CHAPTER THREE

3. METHODOLOGY

3.1. Introduction

This chapter describe the material, methods used to collect the data required what type of data collection system used, sampling size and techniques for the target population. In addition to this this chapter provide type of techniques and methods to analyze data for the accomplishment of objectives and to answer research questions raised from objectives also output for the thesis.

3.2. Sampling technique

non probability sampling methods used to generate primary data for this research.

Table 3. 1 Sample technique

| Judgemental sampling | Snowball sampling |
|--|--|
| <ul style="list-style-type: none">• 5 sample woredas were purposefully chosen from various parts of arada subcity, especially those where the researcher believes there are more urban farming households. This was done on purpose to ensure that the sample woredas adequately represented the study district, Arada subcity. It also helps to see the varied importance of urban agriculture from every corner of the subcity | <ul style="list-style-type: none">• Another method the researcher used to select the sample of urban farmers household is snowball. The reason for using this technique is that its hard to access those household users directly in the sub-city So, there has to be someone (snowballs)who can lead where they lives and apply urban agriculture. therefore woreda officials who work on urban agriculture helps to show the way to urban farmers. |

3.3. Sample size

Initially, it was difficult to reach the target population. Accordingly, it was easy to identify the urban farmers involved in both the animal and the horticultural sector with the cooperation of both Arada sub city head office of urban agriculture and all five woredas official who are appointed for the purpose of urban agriculture works.

Generally, there are 7084 urban farmers who are engaged with vegetables and fruits. and 2437 engaged with animals (livestock, chicken, bees). from this defined numbers of urban farmers researcher draw the sample size from target population.

Using online sampling size calculator, sample size for urban farmers engaged with vegetables and fruits (with confidence level 90% margin of error 10%) it gives 102 sample population size. And for farmers engaged with animals (confidence level 90% margin of error 8%) it gives 67 sample size population. Therefore totally 169 population size are conducted for this research that have willing to answer the questions.

3.4. Sources of data

The information for this analysis was gathered from both primary and secondary sources. The majority of the primary data was gathered through

- Household surveys
- Field observations
- Informant interviews

Structured questionnaires were filled out by sample household heads. Interviews and focus group discussions were also conducted to validate the data collected from the questionnaire-based survey. This study relied heavily on information given by woreda officials, household heads, and agricultural development offices.

Secondary data was obtained from

- Published and Unpublished literatures
- Arada sub city head office
- Woreda 1, woreda 4, woreda 7, woreda 8, woreda 10 urban agriculture office were among secondary data sources.

3.5. Data collection techniques

The study had conducted both qualitative and quantitative data.

3.5.1. Qualitative data collection techniques

- Includes observations, interviews, photographs

Table 3. 2 Qualitative data collection technique

| Observations | Interviews | Photographs |
|---|--|--|
| <ul style="list-style-type: none"> To find out the current situation of the urban farmers, to study their agricultural methods they use to grow those vegetations , to understand what places do they prefer to use to do this work, to personally evaluate look at what they are producing how much they produce. | <ul style="list-style-type: none"> This was undertaken for urban farmers in addition to questionaris given to them also for woreda and subcity ffficials. Both structured and unstructured intreviws were given to them. | <ul style="list-style-type: none"> photographes were taken to show the current urban agriculture activity graphycally. it shows the size, type of farm, variety of vegitables and animals etc. |

3.5.2 Quantitative data collection techniques

To investigate the asked numerical data, the quantitative technique was employed. Quantitative data was collected through;

Table 3. 3 Quantitative data collection technique

| Surveys |
|---|
| <ul style="list-style-type: none"> List of closed or multiple choice questions that is distributed to a sample of urban farmers in person and over the phone |

3.6. Data analysis techniques

3.6.1. Qualitative data collection analysis

Qualitative data that are made up of words, observations, images are analyzed through different types of methods.

| | |
|-------------------------|--|
| Content analysis | This method depends on the research questions. Content analysis is usually used to analyze responses from interviewees. |
|-------------------------|--|

Table 3. 4 Qualitative data collection analysis

| | |
|---------------------------|--|
| Narrative analysis | It is used to analyze content interviews of respondents, observations from the field, or surveys focuses on using the stories and experiences shared by people to answer the research questions. |
|---------------------------|--|

3.6.2. Quantitative data analysis techniques

Descriptive and inferential methods are conducted to analyze quantitative data.

Table 3. 5Quantitative data collection analysis

| | |
|--------------------|---|
| Descriptive | <ul style="list-style-type: none"> • Mean • Percentage • Range is used to analyze quantitative data for the research. |
|--------------------|---|

3.7. Household Food Balance Model

The contribution of urban farming to household dietary calorie supply was calculated using simple arithmetic formulas. The amount of food produced was calculated and converted into dietary calorie equivalents using the food composition table from the Ethiopian Health and Nutrition Research Institute (EHNRI). To investigate the contribution of urban agriculture to the dietary calorie supply of the households in the study area, the calculated calorie was compared to the national average daily caloric requirement for a moderately active adult (2100 kcal).

Household Food Balance Model

$$NGA = (GP + GB + FA + GG) - (HL+ GU + GS +GV)$$

Where, NGA= Net grain available/year/household

GP= Total grain produced/year/household GS=Amount of grain sold/year/household

GB= Total grain bought/year/household GV =Grain given to others within a year

GG= Total grain obtained through gift or remittance/year/household

HL= Post harvest losses/year

GU=Quantity of grain reserved for seed/year/household

This modified form of a simple arithmetic equation termed as **Household Food Balance Model**, originally adapted by (Degefa, 1996) from FAO Regional Food Balance Model.

3.8. Methodological design

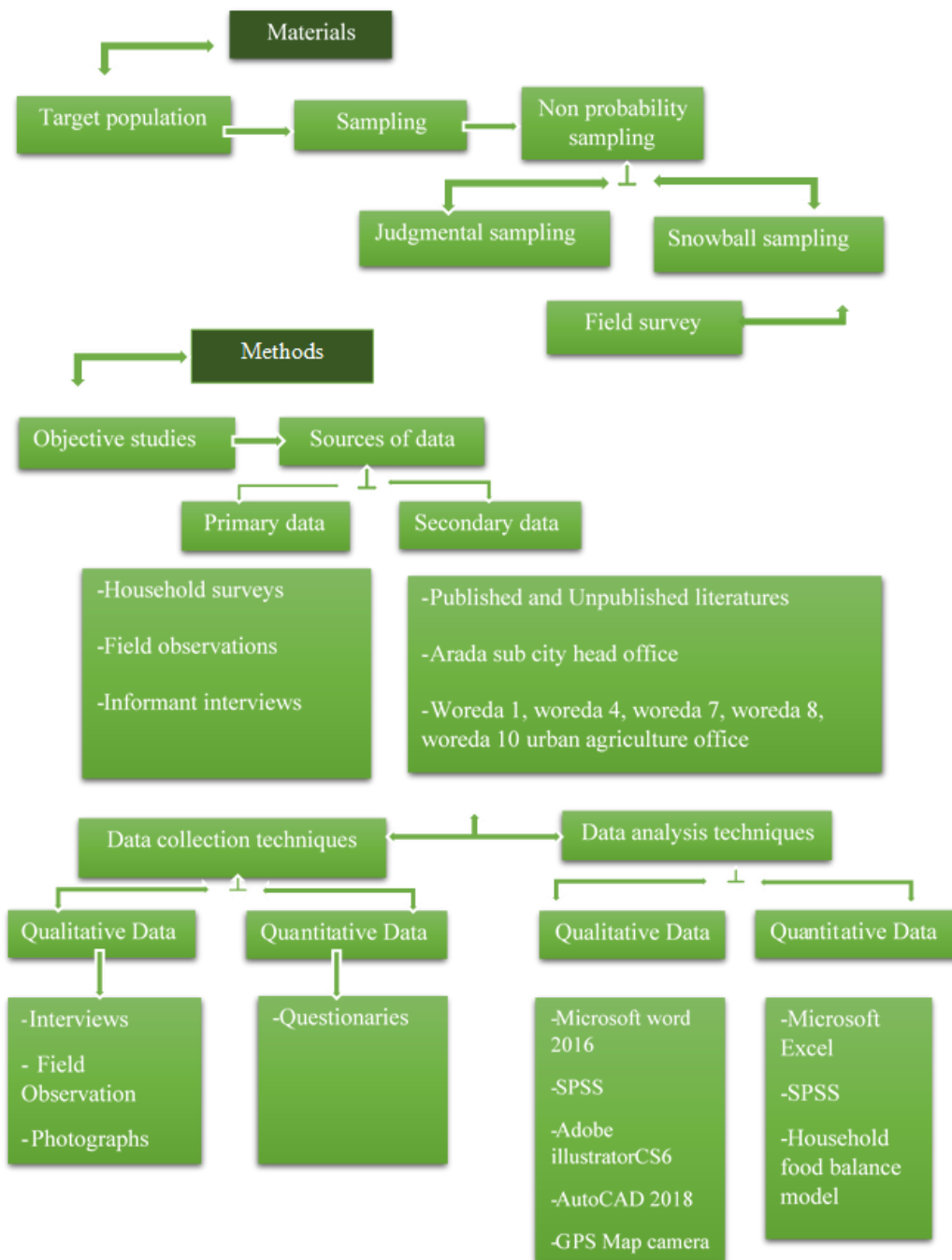


Figure 3. 1 Methodological design

The table 4.1 shows the place from where urban farmers of vegetable producers come from, out of 102 respondents 55(53.9%) are from Addis Ababa and the rest of 47(46.1%) are from countryside (Arba minch, wolega, welo, Gondar...). And those who are engaged with animal breeding also came from different corner of the country therefore, 62.7 % of farmers are from Addis Ababa and 37.3 % of them are from countryside.

This urban agriculture work is conducted by different types of age group as the table illustrate 46% of from 21-30 years old, 31-40 constitute 28.4% of total the rest of 25.5 % are from 41-50 age groups from vegetable producers and for farmers with animal breeding age group also include both youths and elders from 21-60 years old. Therefore, 4 (6 %) respondents are from 21-30 age groups, 47 (70.1 %) of them are from 31-40, 8(11.9 %) of them are from 41-50 the rest of 8(11.9 %) respondents are from 51-60 years old.

African countries like Uganda Most of urban agriculture activities are undertaken by women in the city of Kampala and they are involved with vegetable, poultry and pig production (Nabulo and Katongole., 2011) and the men are engaged with cattle and pig keeping and marketing or trade activities (Maxwell 1998). in study area both male and female participate in vegetable production thus in Arada sub city 38.2 % are males and 61.1 % of them are females out of 102 participants. For animal breeders goes the same thing which is proportional in numbers of male and female urban farmers, both genders involve in this activity. So, 41.8 % of males are engaged with animal breeding the rest of 58.2 % are female farmers.

The table below also illustrate marital status of vegetable producers found in Arada sub city which shows that 64.7% (66) urban farmers are married and 29(28.4 %) are singles, 4.9% are widows and 2% are divorced. Marital status of urban farmers of animals is dominated by married household with little numbers of singles, widows and divorced house heads. Therefore, 83.6 % of them are married, 9 % of them singles, 6% divorced finally 1.5% of widow are available out of overall respondents.

Educational level of urban farmers varies from one to another. table shows different type of levels among them. Which is 5.9% of farmers do not attend school and the rest of them goes to school, 38.2% primary school, 38.2 % secondary school and finally 17.6 % attend college/university. And farmers with animal breeding 34.3 % of them do not

attend school,49.3% attended primary school, 10.4%attend secondary school the rest of 6.0% finished their class at university/college.

Table 4.1 illustrate family size of each household who produce fruits and vegetables by percent thus 55.9% of respondents have 1-4 family size and those households from 5-8 of family size holds of 39.2% of overall respondents finally 4.9% of respondents have 9-11 families at their homes. Table 4.1 also Illustrate family size of those of livestock producers 34.3% of household have a family size of 1-4, 52.2% are of them have 5-8 of families and 9.0% of farmers have between 8 to 11 families the rest of 4.5% respondents have more than 11 family size.

4.2. Description about urban farmers

According to some studies there are different types of urban farmers based on purpose they apply by production According to (Lee-Smith, 2008) there are four types of farmers commercial farmers, food self-sufficiency farmers, food security farmers and survival farmers. Thus, there are also different types of farmers available in Arada sub city and its described as follows by percent.

Table 4. 2 Description about urban farmers

| | Types of farmers | | | | | Duration of time | | | | | |
|-------|--|------------|------------------------|-----------------|------------------------|--------------------------------|------|-------|-----------------|------|-------|
| | Vegetables and fruit producers | | | Animal breeders | | Vegetables and fruit producers | | | Animal breeders | | |
| | household | commercial | Household & commercial | commercial | Household & commercial | 0-5 | 6-10 | 11-20 | 0-5 | 6-10 | 11-20 |
| | 50 | 14 | 38 | 42 | 25 | 79 | 13 | 10 | 42 | 22 | 3 |
| | 49.0 | 13.7 | 37.3 | 62.6 | 37.3 | 77.5 | 12.7 | 9.8 | 53.7 | 32.8 | 4.5 |
| Total | Frequency (Vegetables and fruit producers -102 & Animal breeders-67) | | | | | | | | | | |
| | Percent-100.0% | | | | | | | | | | |

Urban farmers of Vegetables and fruit producers in Arada sub city take this activity for different purposes household consumption, commercial and both household and commercial as table 4.2 shows from those 49% uses it for household consumption, 13.7 % uses only for commercial, 37.3 % uses for both household and commercial. Table. illustrate percent of what kind of farmers are there in animal producers There are two

type of producers which are commercial and both commercial and household. Therefore, 62% of them uses it for commercial purpose and the rest of 37.3 percent uses it for both household and commercial purpose.

Figure 4.1 illustrate where urban farmers work this agricultural activity. Among 102 respondents 45.1 % of them work on their home garden, the other 17.6 % share community garden. A community garden “is a shared, semipublic space where people in the surrounding neighborhood share the work and harvest of maintaining a garden space for growing fruits, vegetables, flowers or even livestock” (Community Gardens: Definition, 2017). also, there are schools where urban agriculture is preforming (such as Minilik Preparatory School, Kelemework Preparatory School, Arbegnoch Primary School) which is 4.9 %, finally 32.4 % are work on a place government provided for free.

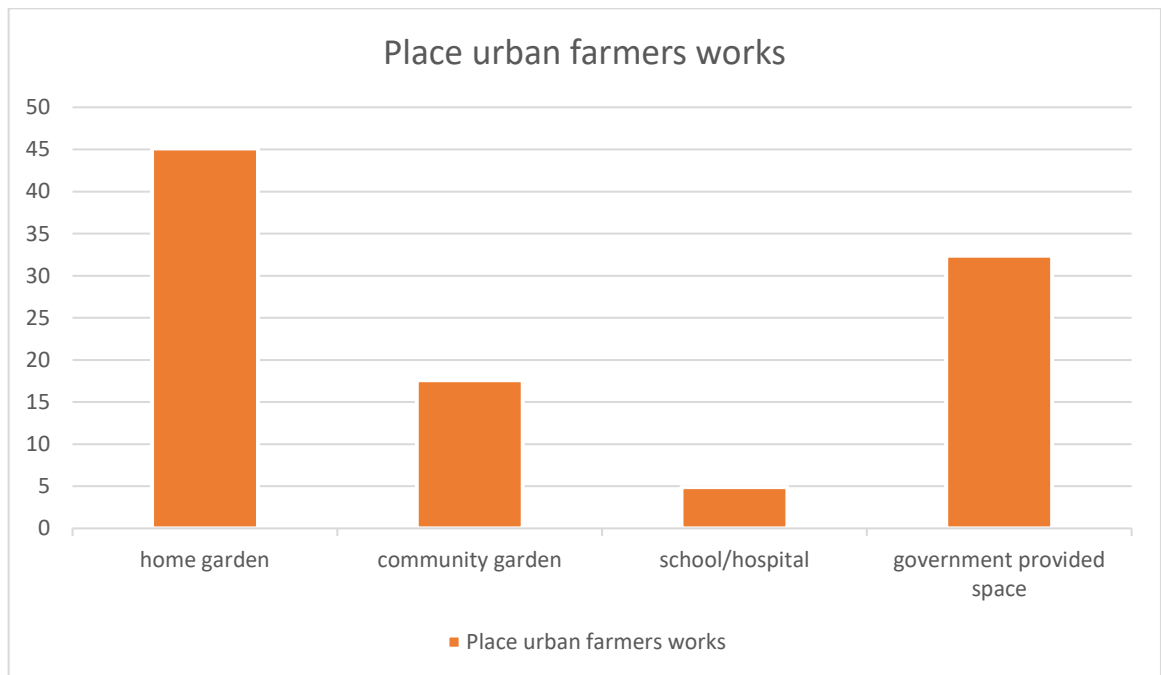


Figure 4. 1 Place urban farmer’s work

4.3. Vegetable and fruits production

4.3.1. Current situation of urban agriculture in terms of vegetables and fruits

Arada sub city urban farmers produce different types of vegetables and fruits with in the land they have among them spinach and Swiss chard are among frequently produced vegetables.

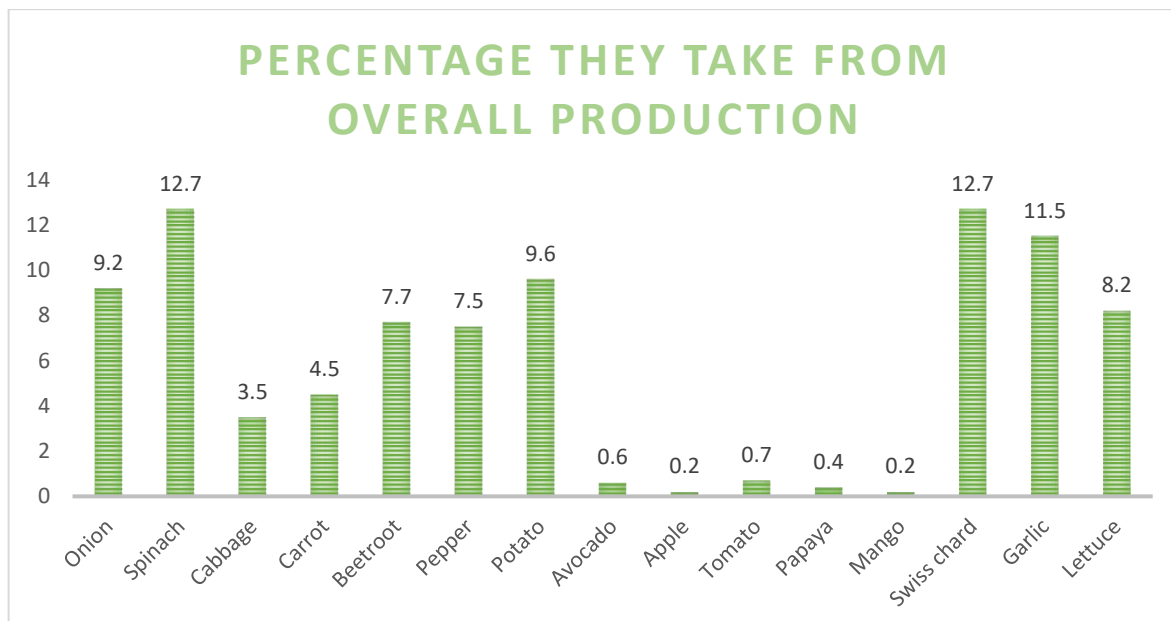


Figure 4. 2 Overall vegetable production

The figure 4.2 illustrate type of fruits and vegetable produced in Arada sub city farmers. From vegetable spinach and Swiss chard are the most common production among farmers but additionally they produce onions, cabbage, carrot, beetroot, pepper, potato, tomato, garlic and lettuce. From overall production onion take 9.2%, spinach 12.7 %, cabbage 3.5%, carrot 4.5%, beetroot 7.7%, pepper 7.5 %, potato 9.6 %, tomato 0.7 %, Swiss chard 12.7%, garlic 11.5 %, lettuce 8.2% of general vegetable production. Fruits also produced in some part of households. among them avocado, papaya, apple and mango can be mentioned but in small number. Thus avocado 0.60 %, apple 0.2 %, mango 0.2 %, papaya 0.4 % of overall production in the sub city. The main reason for the small number of fruits is that the producers do not choose it because they do not have enough space and it takes a long time to grow. In this regard, stakeholders need to consider ways to increase productivity and improve land use.

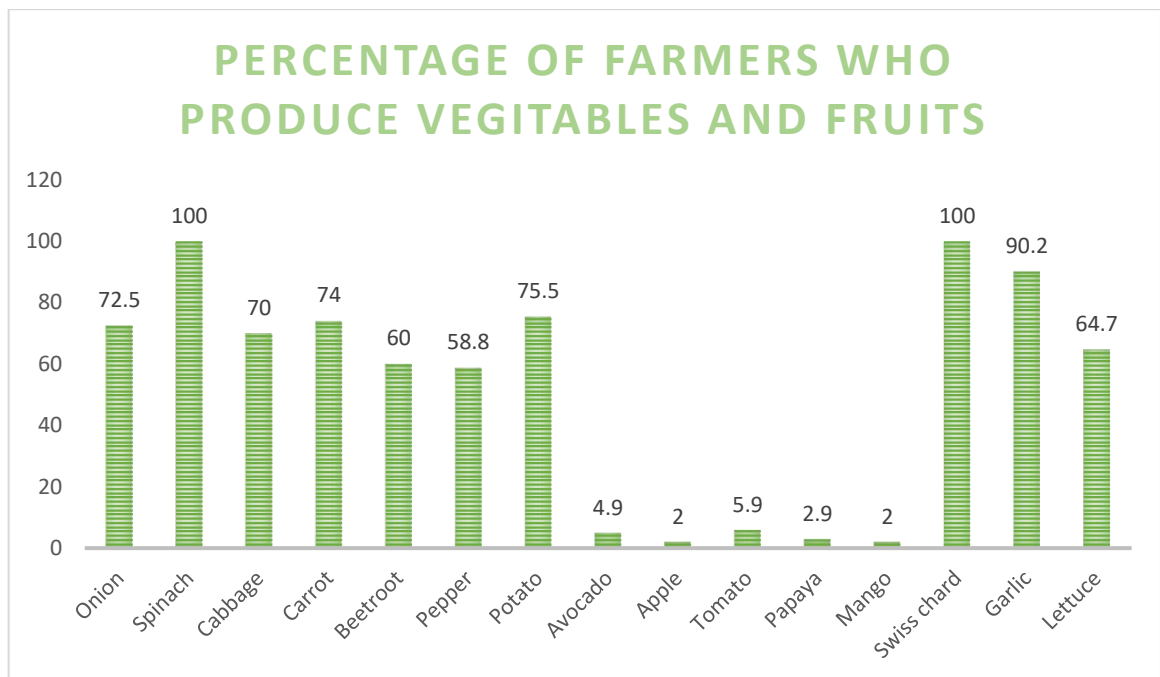
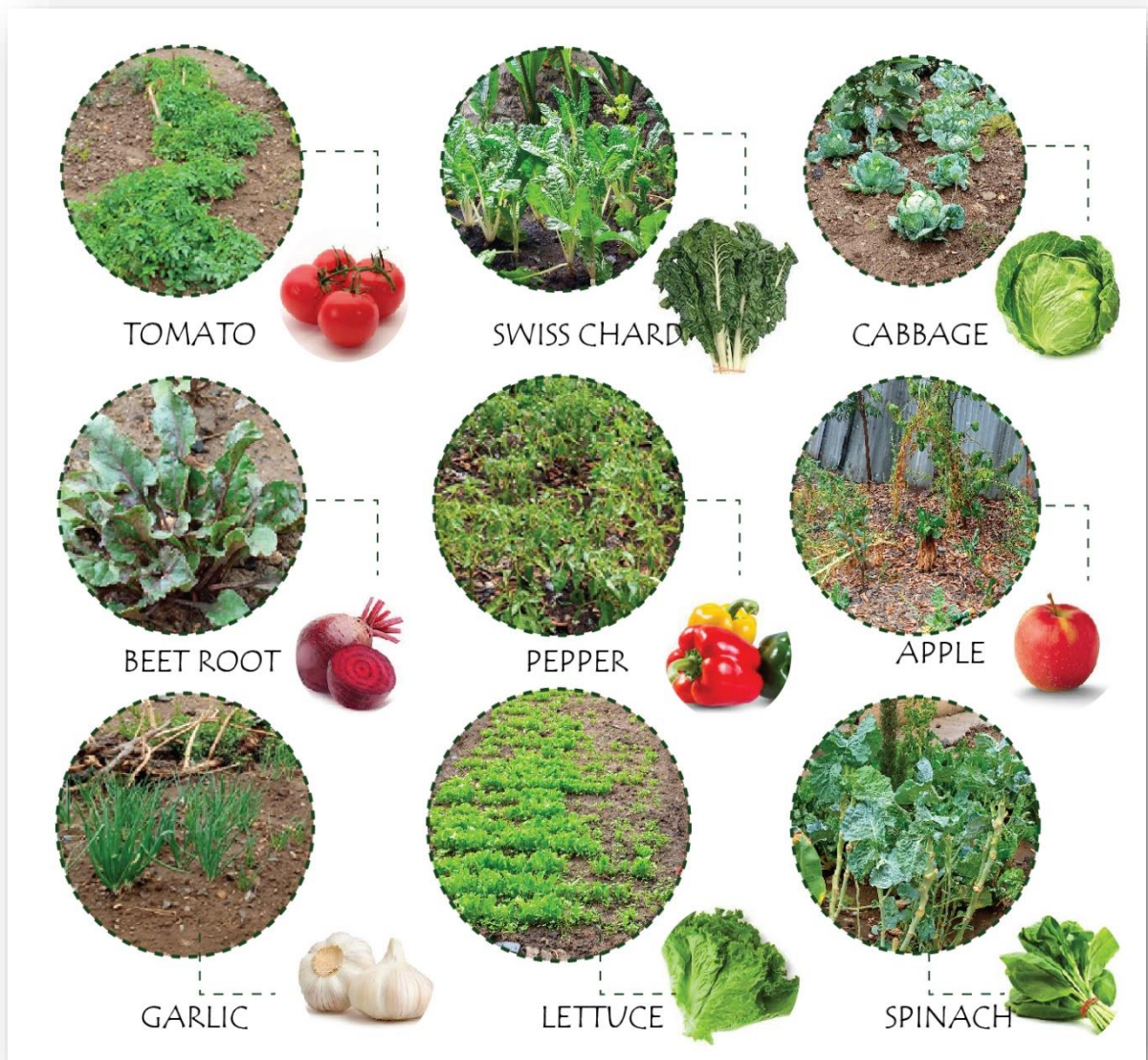


Figure 4. 3 Farmers who produce vegetable and fruit overall

Urban farmers who produce vegetables and fruits usually have more than one type of vegetables, for instance one can have onion, spinach, and cabbage at one time as long as he has budget to buy seeds and enough land to produce. Therefore figure 4.3, most of requested farmers have multiple answers for “what do produce on your farm?”. Thus 72.5 % of farmers produce onions, 100% of them produce spinach, 70% of cabbage, 74 % of them produce carrot, 60 % of them produce beetroot, 58.8 % of them produce pepper, 75.5 % of them produce potato, 4.9% of them produce avocado, 2% of them produce apple, 5.9% of them produce tomato, 2.9 % of them produce papaya, 2% of them produce mango, 100 % of farmers produce Swiss chard, 90.2 of them produce garlic and finally 64.7 of them produce lettuce. It should be noted, however, this does not mean that these farmers produce all kinds of crops at once. Some of the farmers cultivate in a small plot of land with different kind of vegetables, while others plant a variety of vegetables when they have finished harvesting by alternating their type as the farmers said during to informant interview.

TYPES OF VEGETABLES AND FRUITS PRODUCE IN ARADA SUBCITY



Source: Researcher survey data

Figure 4. 4 Types of vegetables produced in Arada sub-city



Figure 4.5 sketches of urban agriculture
source: springer links

4.3.2. Production and harvesting of vegetables and fruits

Table 4. 3 production and Harvesting

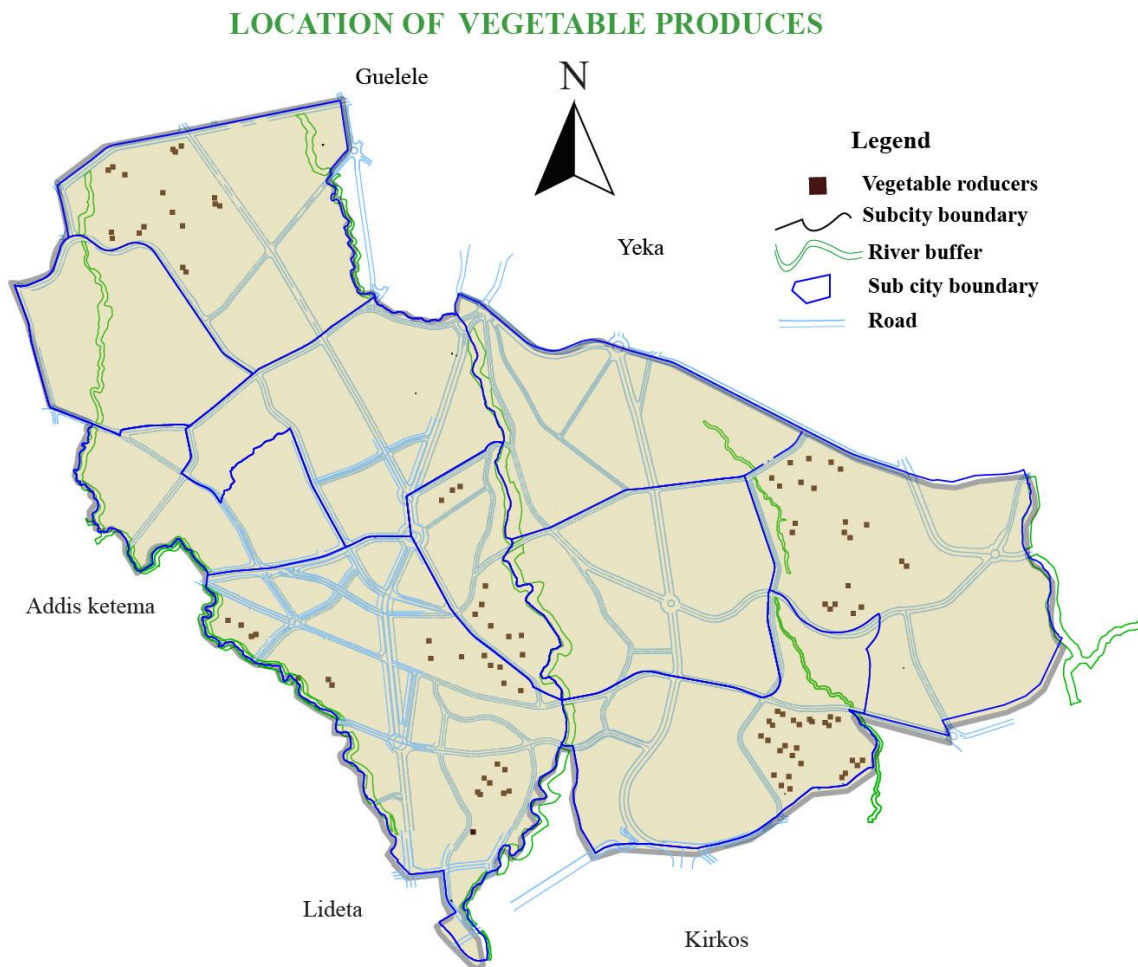
| No | Variables | | frequency | percentage |
|-------|---|-------------|-----------|------------|
| 1 | Area urban farming cover/ household, school | 0-10 sqm | 28 | 27.5 |
| | | 10-100sqm | 65 | 63.7 |
| | | 100-1000sqm | 9 | 8.8 |
| Total | | | 102 | 100% |
| 2 | Production/ month in kilogram | 10-50kg | 67 | 65.7 |
| | | 50-100kg | 30 | 29.4 |
| | | >100kg | 5 | 4.9 |
| Total | | | 102 | 100% |
| 3 | Harvest time/ half year | (4-6) * | 21 | 20 |
| | | (7-10) * | 24 | 23.5 |
| | | (>10) * | 57 | 55.9 |
| Total | | | 102 | 100% |

Urban farming cover usually large area of land because of usage of horizontal land rather than vertical. This table illustrate the land urban farmers used. among them 27.5% have under 10-meter square of land, 63.7% respondents have between 10–100-meter square of land, the rest of 8.8% have above 100 square meters.

This table 4.3 illustrate how much production they get from urban agriculture. Among them 65.7% get between 10-50 kilo of vegetable per month, and 29.4% gain between 50–100-kilogram vegetable per month the rest of them have above 100-kilogram vegetable which constitutes 4.9% of total farmers.

According to informant interview Urban farmers prefer plants which are fast-growing and harvested vegetables usually for household consumption but some urban farmers would like to seed crops if they have large piece of land. But the above table illustrate how frequent they harvest vegetables. Among them 20.6% collect more than 4 times in half year, 23.5 % collect in between 7-10 times, 55.9% collect more than 10 times in half year.

Almost 100% of urban farmers prefer summer (“keremt”) season for their farm because there is no need of using domestic water also 100 % of respondents uses horizontal method to grow their vegetables.



source: Researcher survey data

Figure 4. 5 Location of vegetable producers

4.4. Livestock production

4.4.1. Current situation of urban agriculture in terms of animal breeding

In Arada sub city there are also urban farmers who are engaged with animals. The most common type of breeding is cow, poultry keeping, bee keeping, and sheep/goats. Percentage of farmers and number of animal farmers breed an average is described below.

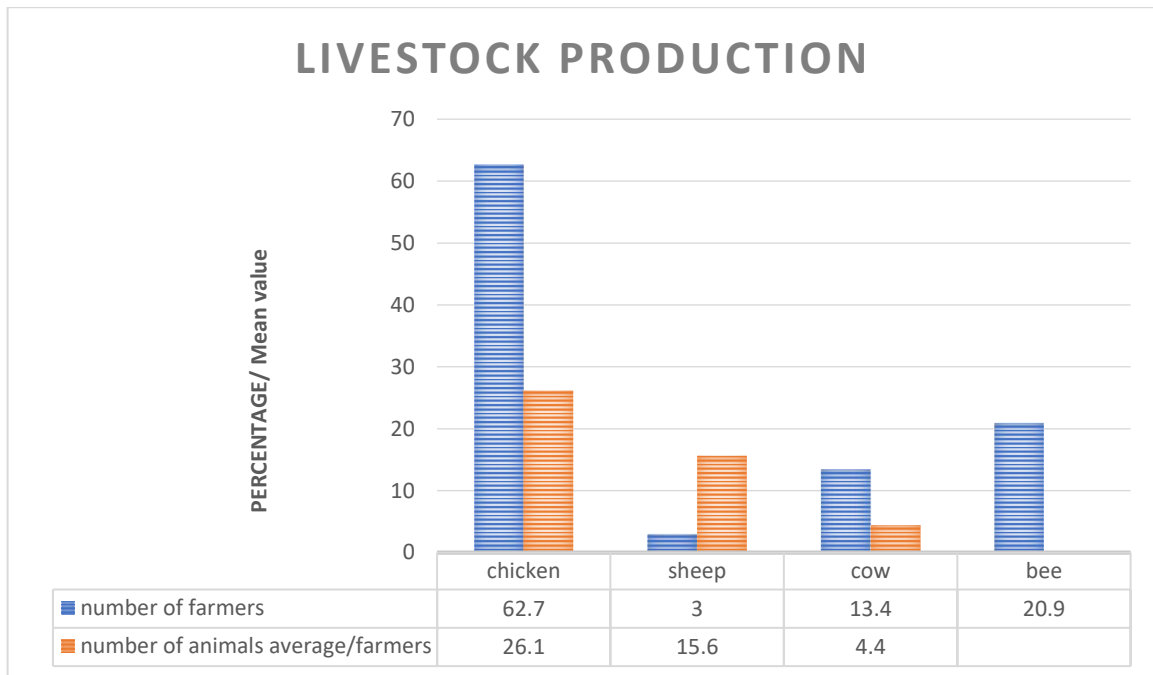


Figure 4. 6 Number of farmers/ number of animals they have

Figure 4.6 demonstrate number of farmers found in Arada sub city in percentage. according to the data chicken breeders are huge in numbers due to the fact that they don't occupy large area of land to breed. Thus, there are 62.7 % of farmers with poultry keeping, 3% of respondents involved with sheep/, 13% of farmers engaged with cattle/cow, and 20 % of users are into bee keeping. Poultry keepers have average of 26.1 chickens per farmer average of 15.6 number of sheep per farmer; an average of 4.4 of cows per farmer, number of bees cannot be counted but there is an average of three or four beehive per urban farmer household.

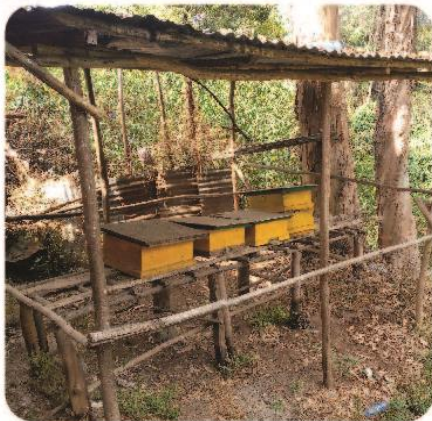
TYPES ANIMALS BREED IN ARADA SUBCITY URBAN FARME



SHEEP/ GOAT



LIVESTOCK



BEE KEEPING



CHICKEN

source: Researcher survey data

Figure 4. 7 Types of livestock

4.4.2. Livestock products

Urban farmers of animals can get different types of products among them eggs, dairy products, honey and meat are some of them. Arada sub city urban farmers also users of those benefits. They either offer it to the nearest market or use it for home consumption.

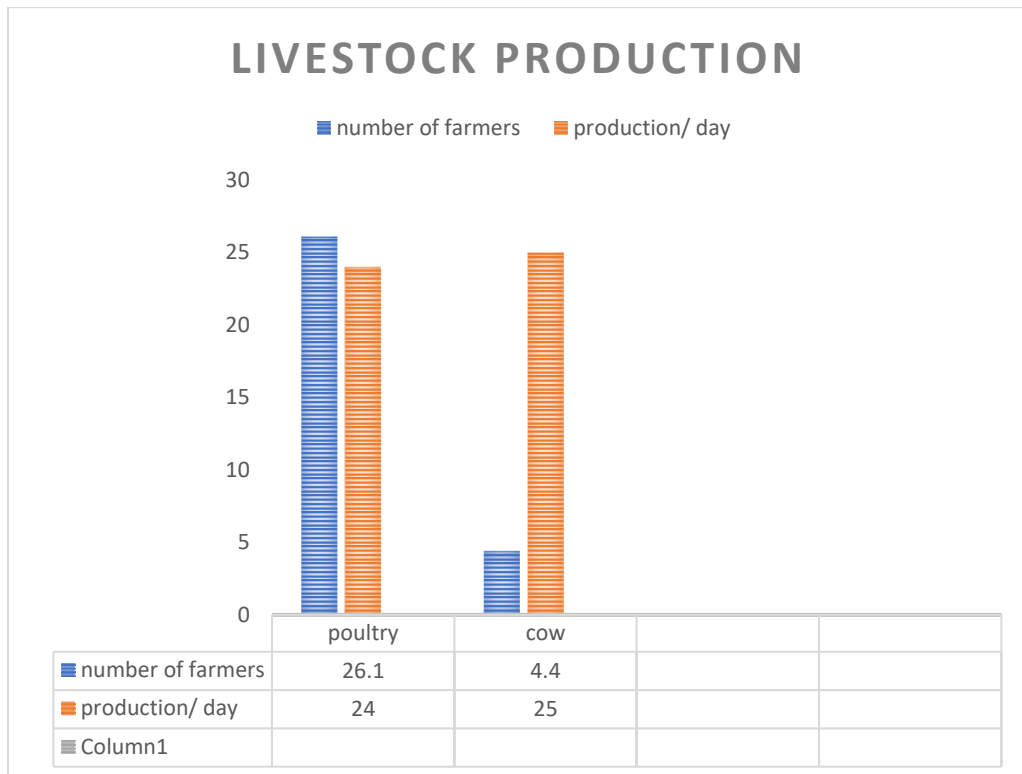
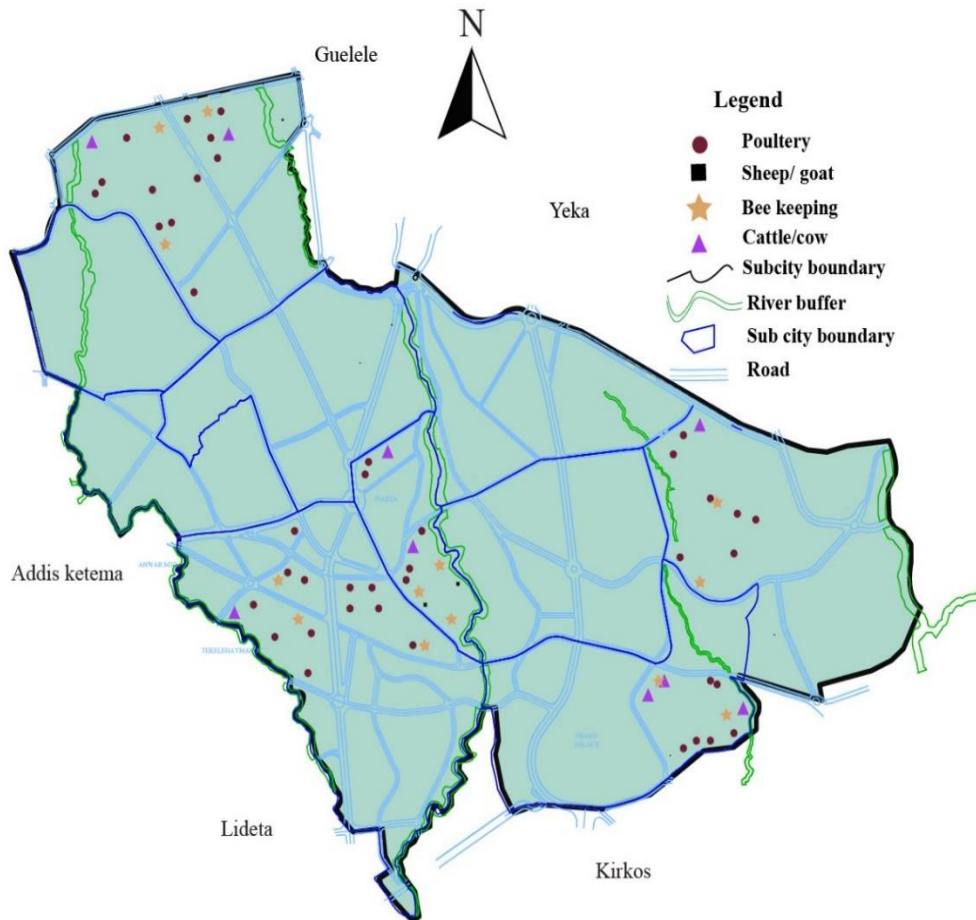


Figure 4. 8 Livestock production

Figure 4.8 illustrates how much production those animal gives in a period of time, thus an average number of 26.1 chickens produce 24 eggs/day if the owner treats them well but if not, this number will decrease down to 15 or 16 eggs as the farmers said. Livestock also give different types of production like it can be sold as it is also can give dairy products (milk, cheese, butter...). Therefore, this dairy cow can produce an average of 25 liters per day from average of 4.4 cows. In addition to this, 64% of them take less than 10 square meter of land and the rest of 3% more than 10-meter square space used to breed their animals

LOCATION OF LIVESTOCK PRODUCES



Source: Researcher survey data

Figure 4. 9 Location of livestock producers

4.5. Discussion

Objective 1: -To assess the existing situation of urban agriculture in Arada sub-city

Demographic

The finding of this objective suggests different type of demographic characteristic of urban farmers in the study area, from their place of birth to family size of household in addition to that it describe what kind of farmers they are in terms of usage of production their year of experience, vegetable and livestock type. This helps to understand the exact identity of those urban farmers engaged with both vegetable and animal breeding.

According to survey Urban farmers usually came from rural area with agricultural background and knowledge and its easier for them to seed, take care of both vegetables and animals than the one whose are from Addis Ababa. Also, they are interested and passionate about what they are working with.

In addition to this, the composition of different age groups demonstrate that urban agriculture is an activity that can be practiced from young to old. But more of the youth group are close to urban farming due to the strength and energy they have during this young age.

According to some key informant interviews Most women urban farmers from study area said that they are housewives taking care of their children at home and doing all the housework, at the same time they take care of their farm when they get extra time from their busy day. while there are men who took this urban farming as business and work full time on their farm also some of men engaged with it on their weekend and after they came from their regular (day to day) job.

Furthermore, according to interviews given to users in the sub city, those urban farmers who are singles are mostly youths also working together in one to five organization from the land provided from government. additionally, some of single respondents take this farming as a fulltime work. While married couples are work on their compound and community garden near them.

The impact of their education on urban agriculture is significant. For instance, most high school graduates and college graduates do not devote their full time to urban agriculture also have other regular work. but at the same time those educated ones follow modified methods of farming and breeding methods better than those with low level of education which makes big difference to the profit they gain from UA.

Finally, the size of the urban farmers in study area households affected their production and consumption. For example, a house with a large family cannot be the same size as a house with a small family. but This does not mean that these producers will have insecurity of food due to the size of their family. This is because there are not many people who use this household on a regular basis, but it does help people with large families to decrease money purchase on food and for small size family it helps them to sell it and earn money in addition to home consumption

Similar research findings also show “Farmers in urban and peri-urban locations of Ibadan differ in terms of their socio-economic and demographic characteristics. Although more than 90 per cent of commercial vegetable farmers belong to the low-income group, this is not the case with other categories, particularly livestock keepers, including poultry and fish farmers, who are mostly well educated and from middle and high-income groups. The majority of vegetable garden owners in the city of Ibadan are part-time farmers between the ages of 20-50 years. Most have some level of formal education, the majority of which are women, who are able to integrate small-scale production with other household duties” (Kintomo 1997; Odebode, 2006; Olajide-Taiwo et al., 2010)

Description of farmers

There is a wide range of differences between the vegetable and animal producers in terms of how they use their production either commercial or home consumption. Vegetable producers mostly used it for domestic consumption, as mentioned above, while animal producers use it for commercial purposes. This is because production of animals is not as palatable as the salad or pickle at any time, and most of the product is cannot be consumed at home once because there would be surplus of production also what’s more beneficial for them is to sell the product they gain from animals.

Urban agriculture is not a new concept for many of us it’s been widely experienced for many years. And in this Arada sub city there are peoples with many years of experience and vice versa the table below illustrate how many years they have been engaged with urban agriculture. According to the data obtained from the interview. Most of the users under the age of five started with the initiative of the former mayor Engineer Takele Umma of the city and were already interested. In addition to that most of them started this agricultural work due to the global pandemic of covid 19 while staying at home for the purpose of protection from the virus said during key informant interview.

Vegetable and crop production

Within urban core of Arada sub city, the majority of farmers (86%) engage in urban agriculture for food self-sufficiency and household food security also commercial, while 14% farm for commercial purposes only. Leafy vegetables such as spinach and Swiss chard are the most widely produced vegetables among them, fruit such as mango, papaya, avocado are the main food crops grown in the sub city.

Private plots, land in and around residential areas, vacant plots on government and institutional land, and land along rivers and roadsides are all examples of land accessible for agricultural activities within the urban area. Vacant plots in major facilities such as research and educational institutions, hospitals, military and police barracks, and airports provide farmers with the most crop farming space. Food production in backyards and other smaller plots is important as well, with 40% of crop farmers using their backyards and 2% using boxes or pots.





source: Researcher survey data

Figure 4. 10 places where UA take place

Condominium sites

Open spaces provided in condominiums sites are creating favorable conditions for urban agriculture. Observing few numbers of sites some condominium dwellers divide up large tracts of land and produce their own production, while others work with their neighbors having good vibes, and others by taking advantage of the space behind or in front of their homes they also have urban farm. However, it is often observed that the users of this space are dwellers who lives ground floor. But in other sub-cities condominium sites, in addition to vacant land available for all of residents they are also using to create a variety of space-saving methods on their balconies to produce agricultural products. People in Arada sub city condominium sites even anyone who have passion to do this work should also realize that it is possible to create better productivity by taking this practice for them.

As most of us know, living in a condominium is making many of us to be introvert/private. This can make people feel lonely and less social. But the social cohesion created by this

urban agriculture cohesive behavior should not be taken lightly. Because when people work on common ground, there is interaction and they communicate each other which in turn create social bond. Even if some of dweller does not involve in such kind of activity, it can be seen that the person who produced it is helping people who are not able to do so, and as a result, the bond between the two is greatly increased. This help many of the community to avoid depression like feelings.

Livestock producers

Although its usually hard to have livestock in urban core of the city there are still farmers who manage to work in this field (UA). Therefore, there are also few animal breeders in the study area. Poultry rearing takes large percent from other type of animal farming due to its easiness and space consumption relatively to stock raising.

Most of farmers uses their animal production for commercial purposes (eggs, milk, butter and cheese) are major output from the animals and they sell to nearest market in neighborhood. Sheep(goat) breeders do not get production from them rather they sell them in the market after treating and feeding them well especially during annual holidays so the probability of using them for home consumption is low. Bee’s keepers also have to wait for the whole year to get honey at least two or three times. These two types of urban farmers may not get expected benefits if the number of sheep and number of hives are large in numbers.

Two out of four breeders have different type of space use. they are those who produce honey and raise chickens. This is because it is possible to breed these animals in a small area. But farmers who raise cattle and sheep often use the usual method, which is to prepare a room for them and take care of animals inside the prepared room. This takes up more space than the others.

4.6. Economical aspect of urban farming

4.6.1. Economic benefits of Vegetable and crop production

Urban farming helps most of users from the vegetables they sell in near their neighborhood. This section shows economical aspects of urban agriculture for households.

Table 4. 4 Economical aspect of UA for Vegetable and fruit producers

| No | Variables | | frequency | Percentage |
|----|-----------|--|-----------|------------|
|----|-----------|--|-----------|------------|

| | | | | |
|-------|---|---------------|-----|------|
| 1 | Urban Farmers who sell their production | Yes | 52 | 51.0 |
| | | No | 50 | 49.0 |
| Total | | | 102 | 100% |
| 2 | Money earned/month | 100-300 ETB | 35 | 34.3 |
| | | 400-700 ETB | 13 | 12.7 |
| | | >1000 ETB | 4 | 3.9 |
| | | Don't sell | 50 | 49.0 |
| Total | | | 102 | 100% |
| 3 | Job opportunity they created | Yes | 4 | 4.0 |
| | | No | 98 | 96.0 |
| Total | | | 102 | 100% |
| 4 | expenditure on food before this farming/month | 100-500 ETB | 12 | 11.8 |
| | | 600-1000 ETB | 76 | 74.5 |
| | | 1000-2000 ETB | 14 | 13.7 |
| Total | | | | |

Table 4.4 illustrate that 49 % of urban farmers do not sell their production rather used it for home consumption. thus 51% of them sell it in nearby markets. 100% of the response was yes if there is a market near their farm, most of them sell it for shopkeepers while others customers come to their farm land and buy it themselves. From urban farmers who sells their production 34.4 of them gets 100-300 ETB per month, and 12.7 % earn in between 400-700 ETB per month, the rest of 3.9% of farmers earn more than 1000 birr per month in addition Urban farmers created only 3.9 percent of job opportunity for others, the rest of 98 respondents don't create any job opportunity.

Table ... also illustrate how much expenditure they put for food consumption before having this urban farming. Therefore, 11.8% spent 100-500 ETB for food at home, 74.5 % spent about 600-1000 ETB, 13.7 % above 1000 ETB for home food consumption only.

100% farmers agree that they don't get any financial support from government only thing they get is supervision from professional from woreda officials.

4.6.2. Economic Benefits of livestock production

Table 4. 5 Economical aspect of UA for livestock producer

| No | Variables | | Frequency | Percentage |
|-------|---|-----------|-----------|------------|
| 1 | Urban Farmers who sell their production | Yes | 67 | 100 |
| | | No | 0 | 0.0 |
| Total | | | 67 | 100% |
| 2 | Money earned/month | 400-700 | 5 | 7.5 |
| | | 800-1000 | 46 | 68.7 |
| | | >1000 | 16 | 23.9 |
| Total | | | 67 | 100% |
| 3 | Job opportunity they created | Yes | 5 | 92.5 |
| | | No | 62 | 7.5 |
| Total | | | 67 | 100% |
| | expenditure on food before this farming/month | 600-1000 | 6 | 8.9 |
| | | 1000-2000 | 61 | 91.0 |
| Total | | | 67 | 100% |

Table 4.5 illustrate that 100 % of urban farmers (those who engaged in animal breeding) sell their production also used it for home consumption. thus 67 respondents sell it in nearby markets. 100% of the response was yes if there is a market near their farm, most of them sell it for shopkeepers. From animal breeding who sells their production 7.5% of them gets 400-700 ETB per month, and 68.7 % earn in between 800-1000 ETB per month, the rest of 23.9% of farmers earn more than 1000 birr per month in addition. Urban farmers created 7.5 percent of job opportunity for others, the rest of 92.5 % of them don't create any job opportunity.

Table ... also illustrate how much expenditure they put for food consumption before having this ur an farming. Therefore, 8.9% spent 600-1000 ETB for food at home, 91.0 % spent about 1000-2000 ETB. 100% farmers agree that they don't get any financial support from government only thing they get is supervision from professional from woreda officials.

Table 4. 6 Livestock outputs with their price

| Output | No of owners | Number of animals they breed | Output/household/day | Unit price ETB | Income/day/ETB |
|--------|--------------|------------------------------|----------------------|----------------|---------------------------|
| Eggs | 22 | 20 | 16 | 8.00 | 128.00 |
| | 10 | 30 | 25 | | 200.00 |
| | 4 | 25 | 20 | | 160.00 |
| | 3 | 100 | 93 | | 744 |
| | 3 | 10 | 7 | | 56 |
| total | 42 | 185 | | | 1288 Average= 257.6 |
| Milk | 2 | 5 | 25ltr | 40.00 | 1000.00 |
| | 2 | 4 | 20ltr | | 800.00 |
| | 3 | 6 | 30ltr | | 1200.00 |
| | 2 | 2 | 10ltr | | 400.00 |
| total | 9 | 17 | | | 3400 Average=850.0 |
| Cheese | 2 | 5 | 5kg/week | 120.00 | 600.00 |
| | 2 | 4 | 4kg/week | | 480.00 |
| | 3 | 6 | 6kg/week | | 720.00 |
| | 2 | 2 | 2kg/week | | 240.00 |
| total | 9 | 17 | | | 2040 Average=510.00 |
| Butter | 2 | 5 | 2kg/week | 400.00 | 800.00 |
| | 2 | 4 | 1.5kg/week | | 600.00 |
| | 3 | 6 | 2.5kg/week | | 1000.00 |
| | 2 | 2 | ½kg/week | | 200.00 |
| total | 9 | 17 | | | 2600.00 Average=650.00 |

Table 4.6 shows how urban farmers engaged with animal breeding mostly use their product for commercial purposes. Thus, they gain egg, milk, cheese and butter from the animals. therefore, there are 22 owners have 20 chickens and they get an average of 16 eggs per day per household; 10 owners have 30 chickens and they get 25 eggs perday;4 owners have 25 chickens and they get 20 eggs per day; 3 owners have 100 and above chickens and they get 93 eggs per day; 3owners have 10 chickens and get an average of 7 eggs per day. nowadays one egg costs 8.00 ETB and these owners get 128.00 ETB,200.00ETB,160.00ETB,744.00ETB AND 56.00ETB Per day.

Those who have milk cows also get a benefit from them. Therefore, there are 2 owners who have 5 cows and they give an average of 25litres of milk per day; 2 owners have 4 cows they give an average 20 liters of milk per day; 3 owners have 6 cows they get 30 liters of milk per day; 2 owners have 2 cows they get 10 liters of milk per day. Currently 1 liters of milk is being sold 40.00 ETB then these farmers get 1000.00 ETB, 800.00 ETB, 1200.00 ETB and 400.00 ETB per day from the product.

In addition to milk production, they also produce cheese and butter but since it takes time, they collect from every week. there are 2 owners who have 5 cows and they give an average of 5 kg of cheese per week; 2 owners have 4 cows they give an average 4 kg of cheese per week; 3 owners have 6 cows they get 6 kg of cheese per week; 2 owners have 2 cows they get 2kg of per week. Currently 1kg of cheese is being sold 120.00 ETB then these farmers get 600.00 ETB, 480.00 ETB, 720.00 ETB and 240.00 ETB per day from the product.

Finally, producers have to work hard to get butter production. Thus, from those two cow owners 2 kg of butter can be collected from every week; 4 cows give 1.5 kg of butter/ week; 6 cows give 2.5kg of butter / week; 2 cows give 1.5 kg of butter/ week. Each kilogram costs 400.00 ETB so that 800.00ETB, 600.00ETB,1000.00ETB and 200ETB per week is earned from livestock.

4.7. Environmental aspect of urban agriculture

Table 4. 6Environmental aspect of UA

| No | Variables | | frequency | percentage |
|--------------------------------|----------------------|------------|-----------|------------|
| Vegetables and crop production | | | | |
| 1 | Recycling by product | Yes | 20 | 19.6 |
| | | no | 82 | 80.4 |
| Total | | | 102 | 100% |
| 2 | Waste disposal | On street | - | - |
| | | Collectors | 82 | 80.4 |
| | | decompose | 20 | 19.6 |
| Total | | | 102 | 100% |
| Animal breeding | | | | |
| 3 | Recycling by product | Yes | 1 | 1.5 |
| | | no | 66 | 98.5 |
| Total | | | 67 | 100% |
| 4 | Waste disposal | On street | 1 | 1.5 |
| | | Collectors | 65 | 97.0 |
| | | decompose | 1 | 1.5 |
| Total | | | 67 | 100% |

The table 4.7 illustrate how they handle waste product of vegetables and as a table shows 80.4 % gives it to home-to-home collectors and the rest of 19.6 % decompose byproducts to recycle it and 100% of urban farmers used domestic water until summer comes. And animal breeders only one respondent decompose waste product of animals the rest of 66 respondents answer was no “I don’t recycle”. While their disposal method is 1 respondent throw them on street, 65 respondents give it to waste collectors and 1 person decompose the waste.

4.8. Social aspect of urban agriculture

Table 4. 7 Social aspect of UA

| No | Variables | | frequency | percentage |
|--------------------------------|--|----------|-----------|------------|
| Vegetables and crop production | | | | |
| 1 | This activity created a social cohesion with your neighbors, family, friend? | Yes | 75 | 73.5 |
| | | - | 27 | 26.5 |
| Total | | | 102 | 100% |
| 2 | Co- workers | Neighbor | 18 | 17.6 |
| | | Family | 26 | 25.5 |
| | | Friend | 31 | 30.4 |
| | | Alone | 27 | 26.5 |
| Total | | | 102 | 100% |
| Animal breeding | | | | |
| 3 | This activity created a social cohesion with your neighbors, family, friend? | Yes | 60 | 89.5 |
| | | - | 7 | 10.5 |
| Total | | | 67 | 100% |
| 4 | Co- workers | Neighbor | 7 | 10.4 |
| | | Family | 54 | 80.6 |
| | | Alone | 6 | 9.0 |
| Total | | | 67 | 100% |

Table 4.8 illustrate these urban farmers (vegetable and crop production) work with thus 73 % of them do not work by themselves. 17.6% work with their neighbors, 25.5 % works with their family, 30.4 works with their friends the rest of 26.5 % work alone. (livestock

producers) 10.4% work with their neighbors, 80.6 % works with their family, 9.0% work alone.

Therefore, urban agriculture created a social linkage among friends, families, neighbors as table 4.8 illustrate out of 102 respondents' people who work together say yes for the question rest of 27 works alone.

4.9. Discussion

Objective 2: - Economic, social and environmental aspect of urban agriculture in case of Arada sub city

UA can contribute to savings at the household level e.g. (Egziabher 1994) observed that “ in Addis Ababa, self-grown vegetables allowed cooperative households to save 10-20% of their household income) or even provide or add to income if excess crops are sold.” Similarly, Urban agriculture in study area benefits economically both vegetable and animal breeders by supporting them from the money they earned from selling and saving up their expenses from buying those goods (vegetables, dairy products, eggs). Farmers who produce livestock gain more benefits than fruit and vegetable growers (in terms of earning money). Almost everyone tends to market more than domestic consumption. But that doesn't mean they don't use it at home. they said during key informant interview that they would take eggs, milk and honey whenever they wanted for home consumption. These farmers sell these products, not at a market for agricultural products, but by going to the nearest grocery store. However, this does not apply to all, for example, when holydays come those urban farmers goes to place provided intended for marketing then they offer their sheep/ goat and cattle. Dairy product producers make money by handing it over to other merchants who come to their homes (wholesalers).

There are some urban farmers who do this work on a regular basis and earn a lot of money, some of whom earn a small income. Farmers who sell chicken eggs get eggs every day so they can raise money every day and Dairy product producers also sell the product from the moment the cow starts milking and sell it for a number of days. But in order to earn a living, they need constant fodder and care. Otherwise, the loss may be greater than the profit.

According to the survey 75 % of animal urban farmers say this urban agriculture will support their home economy by reducing the amount of money they spend to buy these

(egg, dairy products) for domestic use and by selling them therefore by reducing their domestic consumption for other expenditures.

Environmental impact of urban agriculture can be seen with one own eye who is visiting agricultural land of any farmer from making beautiful neighborhood to reducing environmental hazard like soil degradation usage of wastes as a fertilizer. “The environmental benefits of UA are frequently mentioned in the same sentence as the potential environmental hazards (e.g., soil degradation, siltation of water courses), and many authors are quick to point out that these risks must be recognized and regulated, using standards established by organizations such as the Food and Agriculture Organization (FAO) or the World Health Organization (WHO) also a community may become more beautiful or visually pleasant when derelict urban spaces are cultivated” (Smith & Jack, 1996)

In same way UA farmers of Arada sub city have a big contribution to making a place visually pleasant and giving beautiful garden kind of feelings for the community they are living in. about 20 % of farmers recycle wastes as a fertilizer then keep the environment clean while those who don’t recycle said that they have lack of awareness and shortage of time as an excuse of not recycling. Furthermore 100% of UA farmers uses domestic water for their vegetables and waste water for crop irrigation.

The social linkage/ bond UA created is so magnificent in the study area the reason for that is many of them work with their neighbors in a common parcel of land with family helping each other and friends from different villages coming together just to take care of those vegetables that makes them meet and talk often which in turn increase the bond they have before. Not only this after harvesting those vegetables most of them share it with needy ones even for someone who maybe stranger for them so that it starts a new relationship between them.

4.10. Role of urban agriculture in food security attainment in Arada sub city

Family size of the Sample Small-holding Urban Farmers

Table 4. 8 Household family size

| | | |
|--|---------------------------------------|--|
| | Number of individuals in a house hold | |
|--|---------------------------------------|--|

| | Female | Male | Total |
|-----------|--------|------|-------|
| Woreda 1 | 2.8 | 2.4 | 5.2 |
| Woreda 4 | 2.6 | 2.3 | 4.9 |
| Woreda 7 | 3.1 | 2.5 | 5.6 |
| Woreda 8 | 2.9 | 2.1 | 5.0 |
| Woreda 10 | 2.7 | 2.4 | 5.1 |
| Average | 2.8 | 2.3 | 5.16 |

In order to compute the attainment of food security in the sub city according to household food balance model and dietary calorie per household and per individual family size of one's household should have known. Thus, family size of each woredas is described in above table 4.9 as woreda 1 with 5.2, woreda 4 with 4.9, woreda 7 with 5.6, woreda 8 with 5.0, woreda 10 with 5.1 family size and total average of 5.16 of the whole woredas.

Table 4. 9 Output from vegetable/ household and individual

| | Output per year per household (in quintals) | | | | | | Average |
|-------------|---|----------|----------|----------|-----------|------|---------|
| | Woreda 1 | Woreda 4 | Woreda 7 | Woreda 8 | Woreda 10 | | |
| Onion | 3.7 | 2.4 | 1.6 | 1.7 | 0.9 | 2.06 | |
| Spinach | 4.5 | 4.2 | 5.1 | 5.3 | 4.2 | 4.6 | |
| Cabbage | 2.2 | 1.9 | 2.3 | 0.8 | 1.4 | 1.72 | |
| Carrot | 1.5 | 0.8 | 0.7 | 0.9 | 0.8 | 0.94 | |
| Beetroot | 0.7 | 1.7 | 0.8 | 1.0 | 0.9 | 1.02 | |
| Pepper | 1.0 | 0.9 | 2.1 | 1.9 | 0.7 | 1.32 | |
| Potato | 3.7 | 2.6 | 4.1 | 3.9 | 1.9 | 3.24 | |
| Swiss chard | 4.9 | 4.5 | 4.6 | 4.3 | 5.1 | 4.68 | |
| lettuce | 1.9 | 2.7 | 2.6 | 1.0 | 1.8 | 2 | |

| Average | 2.67 | 2.41 | 2.65 | 2.31 | 1.96 | 2.4 |
|--|-------------|-------------|-------------|-------------|--------------|-------------|
| Output per year per person (in quintals) | | | | | | Average |
| | Woreda 1 | Woreda 4 | Woreda 7 | Woreda 8 | Woreda 10 | |
| Onion | 0.71 | 0.48 | 0.28 | 0.34 | 0.17 | 1.84 |
| Spinach | 0.86 | 0.85 | 0.91 | 1.06 | 0.82 | 3.84 |
| Cabbage | 0.42 | 0.38 | 0.41 | 0.16 | 0.27 | 1.42 |
| Carrot | 0.2 | 0.16 | 0.12 | 0.18 | 0.15 | 0.69 |
| Beetroot | 0.17 | 0.34 | 0.14 | 0.2 | 0.17 | 0.88 |
| Pepper | 0.19 | 0.18 | 0.38 | 0.38 | 0.13 | 1.12 |
| Potato | 0.71 | 0.53 | 0.73 | 0.78 | 0.37 | 2.82 |
| Swiss chard | 0.94 | 0.91 | 0.82 | 0.86 | 1 | 3.73 |
| lettuce | 0.37 | 0.55 | 0.46 | 0.2 | 0.35 | 1.65 |
| Average | 0.5 | 0.48 | 0.47 | 0.46 | 0.38 | 0.45 |

Table 4.10 Illustrate amount of Output per year per household (in quintals) and of Output per year per person (in quintals). each woredas vegetable producers' output is computed Accordingly Onion production 2.06 quintals, spinach 4.6 quintals, cabbage 1.72 quintals, carrot, 0.94 quintals, beetroot, 1.02 quintals, pepper 1.32 quintals, potato 3.24 quintals, Swiss chard 4.68 quintals, lettuce 2 quintals per year per household in average from each woredas on the other hand woreda 1 household produce 2.67 quintal vegetable, woreda 4 produce 2.41quintal, woreda 7 produce 2.65 quintal, woreda 8 produce 2.31 quintal, woreda 10 produce 1.96 quintal of vegetable in a year. The number of vegetables produced per year in each woredas are close to each other due to the similarities of land size, preference urban farmers choose to grow, duration of time vegetables take to grow etc.

The same thing goes to individual with in a household, the number is computed as Output per year per household (in quintals) divided in to family size of each woredas. Therefore, now it's easier to get the actual contribution of urban agriculture for household individual through calculating dietary calorie per day.

Table 4. 10: Major traditional food kinds in the study area and their average dietary energy composition

| Major Sources of Food | Products (Major traditional foods in the area) | Average Dietary Energy (kcal/ 100 gram) |
|-----------------------|--|---|
| Onion | Qey shenkurt T'ibs (be qibat) | 376 kcal |
| Spinach | Gomen T'ibs | 116 kcal |
| Cabbage | Tiql gomen T'ibs | 428 kcal |
| Carrot | Carrot | 27.8 kcal |
| Beetroot | Qey sir tibs. Qey sir wot | 486 kcal |
| Green pepper | Qariya | 46.5 kcal |
| Potato | Dinich T'ibs, Dinich wot | 168 kcal |
| Swiss chard | KostaT'ibs | 186 kcal |
| Lettuce | Selata (with carrot, onion, potato) | 45 kcal |

source: computed based on EHNRI's food composition table and survey data

Table 4.11 Illustrate Major traditional food kinds in the study area and their average dietary energy composition based on EHNRI's food composition table and survey data.

Table 4. 11 source 1 Total quantity of vegetable obtained and the dietary energy equivalent by types of vegetable

| Types of food grains | Production (kg/capita /day) | Conversion Scale (kcal/100 gram) | Dietary Energy Equivalent (kcal/capit a/day) | Contribution to daily per capita calorie requirement (per cent) |
|----------------------|-----------------------------|----------------------------------|--|---|
| Onion | 0.5 | 92.6 kcal | 46.3 | 5.74 |
| Spinach | 1.05 | 116 kcal | 121.8 | 15.11 |
| Cabbage | 0.38 | 428 kcal | 162.64 | 20.18 |
| Carrot | 0.18 | 27.8 kcal | 5.0 | 0.62 |
| Beetroot | 0.24 | 486 kcal | 116.64 | 14.39 |

| | | | | |
|--------------|------|-----------|--------|-------|
| Green pepper | 0.3 | 46.5 kcal | 13.95 | 1.73 |
| Potato | 0.77 | 168 kcal | 129.36 | 16.08 |
| Swiss chard | 1.02 | 186 kcal | 189.72 | 23.54 |
| Lettuce | 0.45 | 45 kcal | 20.25 | 2.51 |
| Total | | | 805.66 | 100 |

Table 4.12 shows analysis of the contribution of urban farming to food security, has been done based on the nationally recommended minimum requirement of 2100 kcal/day for a moderately active adult.

According to the table vegetable producers gain total of 806.66 kcal / day without additional supplement food like (Injera, Bread) which accounts from the total 2100kcal/day 38 % percent of their dietary calorie is come from vegetables they produce in their gardens::

4.11. Discussion

Objective 3: - To examine if urban farmers have attained food security from this agriculture

The contribution of UA in attainment of food security in a study area is not unrecognized also there is no data concerning about it. But it seems like the contribution of the sector is now cannot be neglected as it used to be because of rapid urban population growth and inflation of food prices in all over Ethiopia urban centers therefore adapting UA may become so essential since the role of urban agriculture in the town appears to be greater than ever before and will continue to grow in the coming decades.

The small-scale farmers in the sub city produce, vegetables like spinach, Swiss chard, tomato, onion, potato, carrot, green-pepper and beetroot as well as livestock products like dairy and dairy outputs and poultry to supplement their household financial needs, they sell some of their vegetable and animal outputs to the market. The outputs of the households are either sold by their own family members or sold to formal/ nearest shop owners in the neighborhood.

As the result describe on table 4.10 urban agriculture producers obtained 2.4 quintals of food vegetables per household per year or 0.45 quintals per person per year. next, the average calorie value per 100 grams of each type of food grain was computed based on the

kind of food that the community consumes often then the entire vegetable quantity/household/year was converted into dietary calorie equivalent using EHNRI food composition table.

it was found that urban farmers secured 38 % percent of their dietary calorie which is 806.66kcal/day is come from vegetables by urban farming on the average (the minimum dietary requirement for adults is 2100kcal). similarly, “the sample small-scale urban farmers in Adama secured, on average, more than the minimum dietary requirement (100.72per cent) only from cereal production in 2008/9 crop year” (Mulugeta M. , 2010)

4.12. Urban planning an urban agriculture

4.12.1. Challenge and constraint of urban farmers

urban farmers face different types of challenge everyday table 4.13 describe some of their problem as follow

Table 4. 12 challenge and constraint of Urban farmers

| | | | frequency | percent |
|---|---|------------------------------------|-----------|---------|
| 1 | planning preparation discussion | Yes | 0 | 0 |
| | | No | 169 | 100 |
| 2 | any kind of support from concerned group | Yes | 67 | 39.6 |
| | | No | 102 | 71 |
| 3 | kind of support (Animal breeders) | Technical | 0 | 0 |
| | | Material | 67 | 100 |
| | | Labor | 0 | 0 |
| | | Knowledge | 0. | 0 |
| | | Financial | 0 | 0 |
| | | Other | 0 | 0 |
| 4 | major problem regarding urban agriculture | awareness and adequate information | 169 | 100 |
| | | lack of finance | | |
| | | lack of material | | |
| | | lack of land | | |
| | | lack of technical support | | |

| | | | | |
|-------|--|--|-----|-----|
| | | Other | | |
| 5 | Important thing in sub-city level to improve food production | enough open and vertical spaces | 169 | 100 |
| | | Raw materials to work on urban-agriculture | | |
| | | Practical trainings by the local authorities | | |
| | | Other | | |
| Total | Frequency 169 Percentage 100 | | | |

Table 4.13 illustrate challenge and constraints of urban farmers. Among conducted 169onsite survey all respondents (vegetables producers and animal breeders) gives their answers.100% of them has never invited to planning or policy preparation discussion and 67% of animal producers get material support from government body the rest of 102 vegetable producers do not get any kind of support from anybody. Also 169 of them mention lack of finance(fund), lack of material support, lack or shortage of land availability, lack of technical support even lack of adequate information and awareness as a major problem regarding urban agriculture.

4.12.2. Availability, accessibility, usability of urban agricultural land

Table 4. 13 availability accessibility usability of land for urban farmers

| | | | frequency | percentage |
|----|--|----------------------------|-----------|------------|
| 1. | proximity of land | Within 5-10 meters rad. | 107 | 63.3 |
| | | Within 10-50 meters | 29 | 17.1 |
| | | Within 100-200 meters | 33 | 19.5 |
| | | >200 meter | 0 | 0 |
| 2. | size of your land | small | 137 | 81.06 |
| | | medium | 22 | 13.01 |
| | | large | 10 | 5.9 |
| | | extra large | 0 | 0 |
| 3 | challenge do you face in terms of its size | Less production | 137 | 100 |
| | | Less variety of vegetables | | |

| | | | | |
|----|--|--|-----|------|
| | | other | 0 | 0 |
| 4 | Ownership of land | private | 27 | 16 |
| | | municipal | 109 | 64.4 |
| | | institution | 33 | 19.5 |
| | | other | | |
| 5 | issues related to the land you have | land is needed for development | 0 | 0 |
| | | Conflict with neighbors | | |
| | | Because am a woman | | |
| | | other | | |
| 6 | soil type of the urban agriculture areas | The soil type is not suitable for urban agriculture | 0 | 0 |
| | | The soil type is suitable for urban agriculture | 102 | 100 |
| | | The soil type is changing due to waste disposed in urban agriculture areas | 0 | 0 |
| | | other | 0 | 0 |
| 7. | How does accessibility of water for urban agriculture areas labeled? | Accessible in neighborhood level | 148 | 87.5 |
| | | Accessible in immediate working area | 21 | 12.4 |
| | | Transported from other areas | 0 | 0 |
| | | other | 0 | 0 |
| 8 | Effect of climate | The production is not affected through the years | 169 | 100 |
| | | The natural damage created by flood, land slide and soil erosion is affecting the production | 0 | 0 |
| | | other | 0 | 0 |
| 9 | availability of water | Water is available everyday | 118 | 69.8 |
| | | Water only comes 3 or 4 times a week | 51 | 30.1 |
| | | I usually use waste water | 0 | 0 |
| | | other | 0 | 0 |

Table 4.14 Illustrate questions and answers related to land availability, accessibility and usability. Among 169 respondents 63.3 % of them can access working area (UA land) within 5–10-meter radius, 17.1% can access their land in 10–50-meter radius, the rest of 19.5 farmers have to go 100-200 meters to their working area. In addition to that 81.06 %

of respondents has small size of land (these farmers said due to the size of land they have there have to be less production and do not have a chance to produce variety of vegetable like others), 13.01% has medium size of land, 5.9 has larger size relatively from other farmers.

The survey also assesses accessibility of land in terms of ownership of land therefore 16% of them have private land, 64.4 municipal (kebele) and 19.5 use land owned by institution (schools, health care...), and 100% of them respond that they didn't have issues related to land like conflict with neighbors, discrimination because of gender or warning from government to take land for development.

Usability of land analyzed as follows related to soil type, availability of water and climate. Thus 102 respondents who produce vegetables said soil type is suitable for urban agriculture in addition to this 87.5 % of respondents can access water on a neighborhood level while 12.4 % of them can access water in intermediate working area of UA, no one said they transported from other area to uses it for farming. among those farmers 69.8% of them get available water everyday while 30% of them get water 2 or 3 times a week finally due to a suitable climate of Addis Ababa 100% of residents say their production is not affected through a year.

4.12.3. Urban planners and urban agriculture

Table 4. 14urban planning and urban agriculture

| | | | Ans. |
|----|--|-------------------------------|------|
| 1. | policy regarding urban agriculture | Yes | ✓ |
| | | No | |
| 2. | If yes what are the focus areas | Bring economic benefits | ✓ |
| | | Encourage food sustainability | ✓ |
| | | Environmental | ✓ |
| | | Other | |
| 3. | land use plan developed integrates urban agriculture | Yes | ✓ |
| | | No | |
| 4. | If yes what portion of the land use is considered for urban agriculture? | 0-5% of a neighborhood | ✓ |
| | | 6-10% of a neighborhood | |
| | | >10% of a neighborhood | |
| | | Other | |
| 5 | organization support urban agriculture | Yes | ✓ |

| | | | |
|----|--|--|---|
| | | No | |
| 6. | what kind of support | Technical | |
| | | Material | ✓ |
| | | Labor | |
| | | Knowledge | ✓ |
| | | Financial | |
| | | Other | |
| 7. | factors which can increase the number of households or institutions practice urban-agriculture | Planning considerations | ✓ |
| | | Educational reinforcement | ✓ |
| | | Policy changes | ✓ |
| | | Other | |
| 8. | land-use of the sub-city for urban agriculture | A- Suitable | |
| | | No enough considerations established for urban agriculture | ✓ |
| | | The land-use considers built areas only | |
| | | Other | |
| 9. | urban areas and urban-agriculture | They are not good for each other in any means | |
| | | Urban-agriculture is against the aesthetics of the city | |
| | | If they are cooperated together, they can form a sub-city which is self-sufficient | ✓ |
| | | Other | |

Urban agriculture experts & urban planners were also asked a few questions about how they have been dealing with these UA & their opinions about it among 12 respondents their answer was close to each other. Therefore, as table 4.15 shows their answer for if there is a policy on regards Urban agriculture their answer was yes in order to bring economy benefits encourage food sustainability & environmental sustainability. New structural plan is prepared for Arada Sub City in that plan urban holds 0-5% of the structural plan.

Urban officers said that they give knowledge & material support sometimes and also that gives create a good relationship with urban farmers moreover this expert select planning consideration educational enforcement policy change as a factor which can increase the no of have hold institution for more urban work also mention that consideration for urban in land use plan is not enough finally 100% of them agree urban do not affects urban beauty

4.12. Discussion

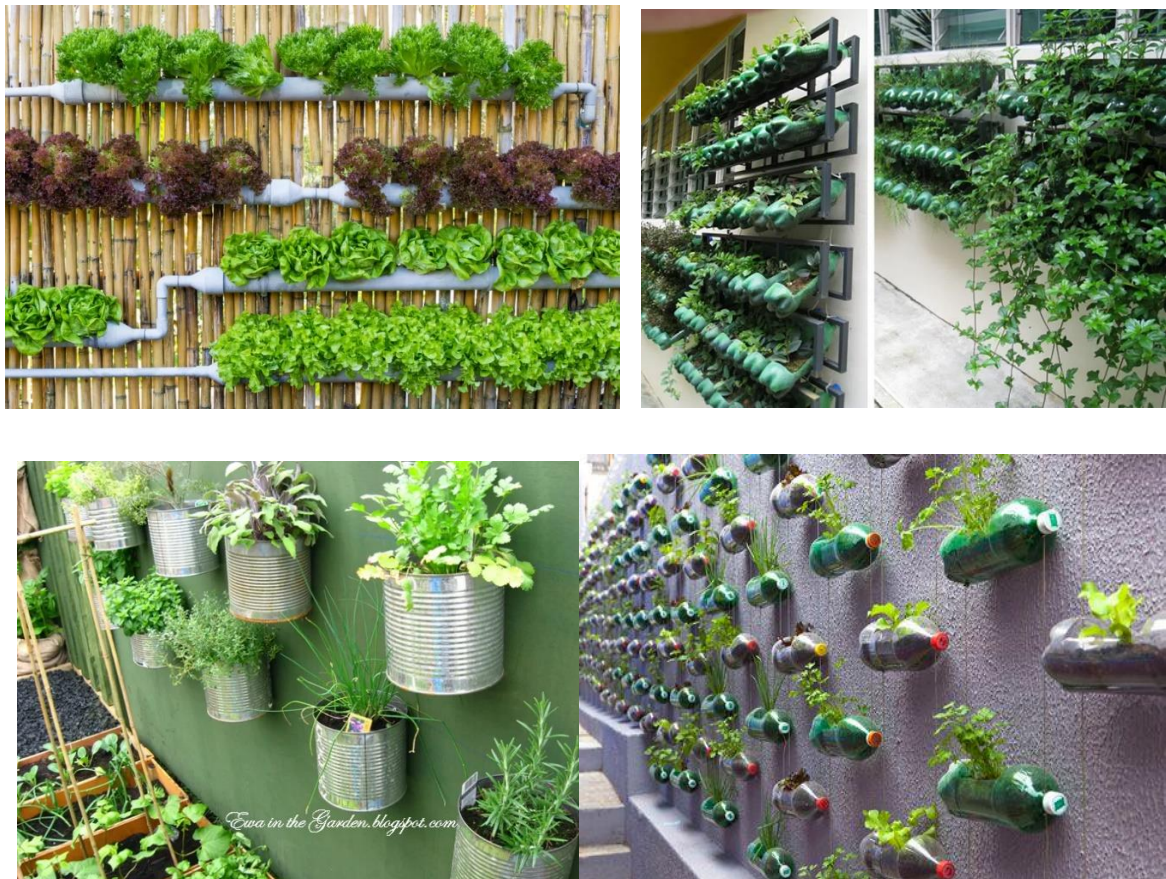
Objective 4: - To assess the government plan toward urban agriculture in order to expand the field in different parts of sub-cities specifically Arada sub-city.

The finding of this objective suggest challenge & constraints Urban farmers have in terms of land issue from governmental body. all of Urban farmers were asked about their opinion about these constraints with an option offered to them to choose. almost all respondents have a complaint with issue related to support the only thing they get from government body is follow up by Urban experts and livestock producers once in a while get fodder, but most of the day they buy it by their own money. technical, material, financial kind of support is what they need the most for more profitable work they said. Respondent also say since the lack of land is not a problem that's can be solved quickly, they prefer officials & planners to think about vertical agriculture system and raw materials to be accommodate for them with practical training & awareness this helps most importantly Farmers with small parcel of land who has a passion & interest to work but could not work because they did not get/have the opportunity to do their best since it's affected production level for them. Similar research by (Quon S. 1999) also shows "The second most frequently selected option was the lack of credit or financing opportunities for farmers, which 9 of 25 respondents selected as a key constraint. Lack of programs and technical support services received 8 votes, and a lack of acknowledgement of UA in planning policy received 7 votes. Five selected a lack of information and education among practitioners as a key constraint."

even though they have challenge facing every day they still have less problem with availability, acceptability & usability of land. more than 75% of them have homework - distance short, do not have issues with neighbors or discriminated because of their gender & government officials about land oppositely according to (Quon S. 1999) "When asked how these constraints might affect women and men differently, most declared no difference between men and women farmers. However, it was observed that women tend to have a more difficult time than men in securing loans and credit". even they have suitable soil available water & good climates which is good for both country economy & themselves.

Government officials like UA experts and urban planners also gives their opinions regarding urban agriculture and planning, since UA is directly connected to land usage of

a city it has linkage with urban planning, according to results many farmers faces lack of land to produce which directly target planners as they deal with allocating land for some specific purpose and prepare plans but unfortunately the new structural plan of Arada sub city allocate small percent of land for UA therefore this has to be revised and modify for more beginners of UA.



source: Off grid world

Figure 4. 12 Some Vertical farming ideas

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The series of discussions have shown that urban agriculture is a super intensive farming practice within the urban areas for different kind of purposes with proper description of urban farmers with in Arada sub city both vegetable producers and livestock producers Its described from the discussion that urban agriculture is one of the crucial sectors in urban poverty alleviation and food security attainment especially for developing countries like Ethiopia. Similarly, the study has shown that urban agriculture in the town of Adama is found to have great importance in urban poverty alleviation, food security attainment, being self-sufficiency economically, urban greening, increasing social bond between neighbors, families and friends. About 65 percent of the small-scale vegetable producers have been found to attain the 38% dietary calorie from minimum nationally set dietary energy requirement, 2100kcal/person/day, from their urban agricultural activities alone. Even most of them have been found supplying their agricultural related products to local consumers and vendors especially those who are engaged with livestock production.

The re utilization of waste for soil fertilization, regarding waste disposal in order to keep environment clean, usage of waste water to reduce usage of domestic water should be highlighted by giving them awareness to all the farmers

The contribution of urban agriculture to good communication and relationship with others should not be underestimated. since n this day and age, it is a great achievement for city dwellers to see people open their doors and be self-sufficient, to listen to people discuss their problems, and to help those in need with their products.

unlike other urban town there is better consideration concerning urban agriculture in terms of offices and plans but still there is a shortage of documented files, support and follow ups future plans. Furthermore, Urban farmers are complaining about lack of technical, financial, land and awareness support, even they didn't a right to have a participation in planning preparation when they are stake holders of UA.

Finally, as study results describe urban agriculture could play its significance role in creating a more food secure, environmentally friendly, green, attractive and livable village

of Arada sub city The sector needs to be well organized interconnected with other professions(fields) and the urban farm households should be provided with appropriate technical support, training, modern farm inputs like vertical farming, financial and material support and extension work for more benefit.

5.2. Recommendation

Current situation of urban agriculture its aspects on economic, social and environment; role of urban agriculture in attaining food security finally challenges and constraint urban farmers face with regard to urban land, finance, awareness was discussed under result and discussion chapter the following is recommendation for stakeholders of Urban agriculture.

- ❖ Planner and policy makers should develop policy and regulation that benefit UA initials of land use activity, urban planner as a big influencer on land they should plan and adopt a good and suitable land use patterns for the success of this activity.
- ❖ Prepare a discussion with urban farmers while making policies or plans and make them participate and hear them out about the idea about the new plan/ policy being made.
- ❖ Government and financial institution have to offer some kind of land credits, reward who are engaged with urban agriculture to support them in terms economy.
- ❖ Enterprises Interested in developing and expanding UA should be supported if they come up with brilliant idea of using small space for UA especially with an aid of technological inventions.
- ❖ Experts should give awareness about waste recycle /fertilizer making/ environment protection, using of domestic products like (used water plastics, PVC, sacks, used tires ...) and also vertical farming methods.

REFERENCES

- Abnet Gezahegn, D. B. (2017). *CITY PROFILE ADDIS ABABA*. ADDS ABABA: Erasmus+ program of the European Union.
- Addis Ababa city administration. (2015). *Arada sub-city Atlas*. Addis Ababa.
- AURORA UNIVERSITY. (2019, 10 14). Retrieved from History of urban agriculture: <https://online.aurora.edu/history-of-urban-agriculture/>
- Aziz, & Sartaj. (1997). "How is Rapid Urbanization Affecting Food Production and Agricultural Research?" *ISNAR Symposium, Selected Regional Issues for Agriculture and Agricultural Research*.
- Azuba, M. (2002). *An overview of urban agriculture in Kampala City*.
- Brown, K., & Jameton, A. (2000). Public Health Implications of Urban Agriculture.
- Brown, K., Bellows, A., & Smit, J. (2004). Health benefit of urban agriculture.
- Clay, T. (2001). *Household food insecurity with hunger is associated with women's food intakes, health and household circumstances*.
- Community Gardens: Definition, B. R. (2017, July 28). Retrieved from Study.com: <https://study.com/academy/lesson/community-gardens-definition-benefits-rules-best-practices.html>
- David , S., Lee-Smith , D., Kyaligonza , J., & Mangeni, W. (2010). *Changing Trends in Urban Agriculture in Kampala*.
- Degefa, T. (1996). *Household Seasonal Food Insecurity: Social Science Research Report Series*.
- foundation, R. (2015). *urban agriculture in attaining food security*.
- Gbadegesin. (1991). *Farming in the urban environment of a developing nation: A case study from .*
- Gebremichael, D., Gebremichael, A., & Worku, A. (2014). *Building Urban Resilience: Assessing Urban and Peri-UA in Addis Ababa, Ethiopia*. Nairobi, Kenya.: United Nations Environment Programme (UNEP).
- GSDR. (2015). *Brief urban agriculture*.
- Guo, & Liangyan. (2012). Study on the role of urban and peri-urban agriculture: a case of zhengzhou, china.
- Gutman, & Pablo. (1987). Urban Agriculture: The Potential and Limitations of an Urban Self-Reliance Strategy. *Food and Nutrition*, 37-42.
- Hanna, A., & Oh, P. (2000). Rethinking Urban Poverty: A Look at Community Gardens. *A Look at Community Gardens*.

- Heather, k. (2012). *The Environmental Benefits of Urban Agriculture on Unused, Impermeable and Semi-Permeable Spaces in Major Cities With a Focus on Philadelphia, PA.*
- Helmore, Kristin , & Annu Ratta. (1995). The Surprising Yields of Urban Agriculture.
- Hoornweg, M.-F. (2008). *Urban agriculture for food security in low income countries.*
- IMUI/RUAF. (2007). *Urban and peri-urban agriculture in Ibadan: characteristics, challenges and.*
- Katongole, C. (2011). *Developing rations for meat goats based on some urban market crop wastes.*
- Kintomo, A., Ogunkeyedeand, O., & Ogungbaigbe. (1997). Peri urban dry season vegetable . *Tropicultura.*
- knoema. (2020). Retrieved from Ethiopia - Urban population as a share of total population: <https://knoema.com/atlas/Ethiopia/Urban-population>
- Kutiwa. (2010). The Role of Urban Agriculture in Alleviating poverty.
- l., H. K. (2012). *The Environmental Benefits of Urban Agriculture on Unused, Impermeable and Semi-Permeable Spaces in Major Cities With a Focus on Philadelphia, PA.*
- Lee-Smith, D. (2008). *Urban food production in Kampala: community perceptions of health impactsand how to manage them.*
- Ltd, D. C. (1997). *District state of environmental report: Kampala District.*
- Mannion. (1999). domestication and the origions of agriculture. *progress in physical geography, 37-56.*
- Maxwell. (1999). *Urban Food Security in Sub-Saharan Africa.*
- Maxwell, & Daniel , G. (1999). Urban Food Security in Sub-Saharan Africa. In: For hunger-proof cities:. *sustainable urban food systems.*
- Maxwell, Daniel , & Armar-Klemesu, M. (1998). *Urban Agriculture: Introduction and Review of Literature.*
- Messay , M. (2013). The Need for Policy Framework for Urban/Peri-Urban. *A Reflection.*
- Mougeot. (2001). *Urban Agriculture: A Tool for Creating Economic Development andHealthy Communities.*
- Mouget. (2000). *Urban Agriculture: Definition, presence, potential and risks.Growing Cities, Growing Food: Urban Agriculture on the policy agenda.*
- Mulugeta, M. (2010). *Food Security Attainment Role of Urban Agriculture: A Case Study from Adama City.*
- Mulugeta, M. (2010). *Food security attainment role of urban agriculture: case of Adama city.*

- Nabulo , G., Nasinyama , G., Lee-Smith . , D., & Cole. (2004). *Gender analysis of urban agriculture in kampala , Uganda. Urban Agriculture Magazine.*
- Pérez-Escamilla, R., & Segall-Corrêa, A. (2008). *Food insecurity measurement and indicators.*
- Quon, S. (1999). *Planning for Urban Agriculture:.* International Development.
- Oni, O.A, & Yusuf. (1999). "The Effects of Farmers' Socioeconomic Characteristics on Livestock Production in Ibadan Metropolis". *Sustainability of the Nigerian Livestock Industry in 2000 A.D. Proceedings of 4th Annual Conference of Animal Science Association of Nigeria. .*
- Palanivel, T. (2017). *Rapid urbanisation: opportunities and challenges to improve the well-being of societies.* UNITED NATIONS DEVELOPMENT PROGRAMME.
- RUAF, f. (2015). *urban agriculture ti attain food security.*
- RUAF, o. (2003). *Availability, Access and Usability of Land for Urban Agriculture.*
- Semwanga. (2005). *Urban Agriculture in Uganda: A rapid appraisal of the characterization,opportunities and challenges that would influence policy formulation.*
- Smith, & Jack. (1996). *Urban Agriculture, Progress and Prospect.*
- Steel, C. (2013). *Hungry City: How Food Shapes Our Lives.* UK : vintage books.
- The green conspiracy.* (2018, 9 13). Retrieved from <https://thegreenconspiracy.com/history-urban-gardening/>
- UN-HABITAT. (2008). *ETHIOPIA:addis ababa urban profile.* nairobi: United Nations Human Settlements Programme (UN-HABITAT).
- United Nations, D. o. (2019). *World Urbanization prospects The 2018 Revision (ST/ESA/SER.A/420).* New York: United Nations.
- Veenhuizen, R. v. (2006). *cities farming for the future : urban agriculture for green and productive cities.* RAUF foundation, IIRR AND IDRC.
- World Population Review.* (2017-2021). Retrieved from <https://worldpopulationreview.com/world-cities/addis-ababa-population>
- WorldBank. (1986). *Poverty and Hunger. Issues and Options for Food Security.*
- WorldBank. (1986). *Poverty and Hunger : Issues and Options for Food Security.* USA.
- WorldBank. (1996). *Annual report.* Washington DC.
- Yusuf, S., Adesanoye , & Awotide. (2008). Assessment of poverty among urban farmersin Ibadan Metropolis, Nigeria. *Journal of Human Ecology.*

FOR ARADA SUCITY RESIDENTS WHO ARE INVOLVED IN URBAN AGRICULTURE PART 1

| Pre request for urban farmers | | |
|--------------------------------------|---|---|
| | What kind of urban farmer are you? | A. Household consumption B. commercial C. Survival D. Recreational purpose |
| | From your past experience when do you think this farming was useful | A. Always B. During lockdown C. Inflation time D. When Chaos happened in the country E. Other |
| | How long have you been in this urban farming activity? 0-5 | A. 0-5 B. 5-10 C. 10-20 D. More than 20 |

| Existing situation in terms of vegetables, fruits and crops | | |
|--|---|---|
| 1 | What are the types of vegetables do you produce in your yard? | A. Tomato F Papaya B. Potato G Mango C. Onion H Avocado D. Cabbage I Orange E. Carrot J Other |
| 2 | Where do you grow your food? | A. Home garden B. Roof top C. Community garden D. Window sill E. School/ hospital F. In my own compound G. In a place gov't prepared for us |
| 3 | How much hectare does this agriculture cover? | A. 0-10 B. 10-100 C. 100-1000 D. More than 1000 |

| | | |
|---|--|---|
| 4 | How much production does it gives you at one time? | Per kilo gram A. 1-10 B. 10-50 C. 50-100 D. More than 100 |
| 5 | How often do you harvest the product? | Per year A. 1 B. 2 C. 3 D. more than 3 |
| 6 | Which season produces the best product for you? | A. Winter B. spring C. Summer D. autumn E. All of them |
| 7 | What are the things that are considered as a problem/ scarcity to grow this plant? | A. Space B. Support from government C. Water D. Fertilizer E. other |
| 8 | What kind of method do you use? | A. Horizontal land B. Vertically |

| Existing situation in terms of livestock, fish, Bee | | |
|--|--|--|
| 1 | What are the types of animal do you breed? | A. Chicken B. Goat/sheep C. Cow D. Bee 1. other |
| 2 | How many are they? | A. 1-10 B. 10-50 C. 50-100 D. 100-200 E. More than 200 |
| 3 | What do you get from them | A. Egg B. Dairy products C. Meat D. Honey E. other |
| 4 | How much production do you get from them? | Per liter (for dairy products) |
| 5 | How often do you collect from the animals? | |

| | | |
|---|---|--|
| 6 | How much hectare do you use for this urban farming? | A. 0-10 B. 10-100 C. 100-1000 D. More than 1000 |
| 7 | What are the things that are considered as a problem/ scarcity while doing this work? | A. Space B. Support from government C. Water D. Animal feed E. other |
| 8 | Do you use any different other method to breed the animals? (interms of space) | |

| Economic situation of urban agriculture | | |
|--|---|--|
| 1 | Do you sell the products you get from this farming? | A. Yes B. No |
| 2 | Is there a market near you to sell your products? | A. Yes B. No |
| 3 | How far is it? | |
| 4 | How much money do you sell from what you sell? | Per month |
| 5 | Do the money you earn from selling benefits you financially? | A. Definitely it supports me enough B. Just a little |
| 6 | Does this farming created a job opportunities for others? | A. Yes B. no |
| 7 | If yes for how many persons? | |
| 8 | How much is your expenditure on food before this farming? (home consumption) | Per month A. 500-1000 B. 1000-2000 C. 2000-3000 1. More than that |
| 9 | Do you think this urban agriculture saves your money that you spend for food? (if you used it for home consumption only)? | A. Yes totally B. A little bit C. Not at all |
| 10 | do you get any kind of support from government/ sponsors? | A. Yes, I get B. No, I don't |

| | | |
|----|---------------------------------------|--|
| 11 | If yes what kind of support and when? | |
|----|---------------------------------------|--|

| Environmental factor of urban agriculture in a sub city | | |
|--|--|---|
| 1 | Where do you dispose the waste? | A. Landfill B. On streets C. Give to collectors D. other |
| 2 | Do you recycle the byproducts again? | A. Yes B. No |
| 3 | What kind of water do you use for this agriculture? | A. Rain water B. Domestic water |
| 4 | What precaution do you take to ensure that there is no contagious disease in the area? | |
| 5 | How beautiful is your environment do you think it is? | |

| Social effects of urban agriculture | | |
|--|---|---|
| 1 | Do you work this urban agriculture alone or with other people? Like? | A. Neighbors, B. Family, C. Friend D. No, I am alone |
| 2 | Do you think this activity created a social cohesion with your neighbors, family, friend? | A. Yes B. No |
| 3 | What do you feel about this relation? | |
| | | |

APPENDIX II

Dear Respondents,

The questionnaire is prepared to conduct study on ‘**Adapting Urban Agriculture for Sustainable Food**

Security, the case of Arada Sub-city’ for the partial fulfillment of MSc degree in Urban Planning and Design that is given by Adama Science and Technology University. So, you are selected to give your answer and opinion for the questions.

Please, note that the information you provided is only used for the academic purpose and confidential. Besides, no reference will be made to you in particular. Therefore, feel free to respond to the questions to the best of your knowledge so as to realize the objective of this study.

Thank you in advance for your cooperation

3. Date _____

4. Name of interviewer _____

3. Name of Respondent (optional)

4. Place (where they are from)

12. Age?

A. 15-20 B. 21-30 C. 31-40 D. 41-50 E. 51-60 F. 61 and above

13. Gender

A. Male

B. Female

14. Kebele/sub-city

15. Marital status
Divorced

A. Married

B. Single

C. Widowed

D.

16. Did you attend formal school

A. Yes

B. No

17. Educational level

A. University College

B. Secondary

C. Primary

D. Never attended School

18. What do you do?
Nothing

A. Government worker

B. Private

C. NGO

D. Student E.

F. Other (specify)_____

**FOR GOVERNMENT OFFICE AND THOSE WHO ARE CONCERNED WITH
URBAN AGRICULTURE**

| | | | answer |
|----|---|---|--------|
| 1. | Is there a policy regarding urban agriculture which is adopted by your organization? | Yes | |
| | | No | |
| 2. | If yes what are the focus areas of the policy? | Bring economic benefits | |
| | | Encourage food sustainability | |
| | | other | |
| 3. | Do the land use plan developed integrates urban agriculture? | Yes | |
| | | No | |
| 4. | If yes what portion of the land use is considered for urban agriculture? | 0-5% of a neighborhood | |
| | | 6-10% of a neighborhood | |
| | | >10% of a neighborhood | |
| | | other | |
| 5 | Does your organization support urban agriculture? | Yes | |
| | | No | |
| 6. | If yes, what kind of support does it gives? | Technical | |
| | | Material | |
| | | Labor | |
| | | Knowledge | |
| | | Financial | |
| 7. | What are the factors which can increase the number of households or institutions practice urban-agriculture | Planning considerations | |
| | | Educational reinforcement | |
| | | Policy changes | |
| | | other | |
| 8. | How do you assess the land-use of the sub-city for urbanagriculture | A- Suitable | |
| | | No considerations established for urban agriculture | |
| | | The land-use considers built areas only | |
| | | other | |
| 9. | How do you relate urban areas and urban-agriculture? | They are not good for each other in any means | |

| | | | |
|--|--|--|--|
| | | Urban-agriculture is against the aesthetics of the city | |
| | | If they are cooperated together, they can form a sub-city which is self-sufficient | |
| | | other | |