



**St. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**A SOCIO-ECONOMIC IMPACT OF URBAN AGRICULTURE
THE CASE OF ADDIS ABABA**

**BY
HENOK TAYE TAFESE
ID: MAE/010/2004**

**JULY, 2014
ADDIS ABABA, ETHIOPIA**

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A THESIS SUBMITTED TO ST .MARY'S UNIVERSITY, SCHOOL OF
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**ST.MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
INSTITUTES OF AGRICULTURE AND DEVELOPMENT STUDIES**

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APPROVED BY BOARD OF EXAMINERS

As member of the Board of Examiners of the M.Sc. Thesis Open Defense, We certify that we have read and evaluated the Thesis prepared by Henok Taye. We recommended that the Thesis be accepted since it fulfills the Thesis requirements for the Degree of Master of science in Agricultural Economics.

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DEDICATION

I dedicate this Thesis manuscript to my beloved family, especially my Sister Tigist Taye, Ayalew Getachew and my deepest friend Alemayehu Dekeba. They all have played a major role in nursing, educating and bringing me to this success.

ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a University advisor.

Advisor

Signature

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. Dagnew Eshete. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Name

Signature

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ABSTRACT

In Ethiopia, urban agriculture is omnipresent as before. Very recently there has been a sizable expansion of it both in outskirts of the cities and in the backyards and vacant space of urban dwellers. Understanding the impact that urban agriculture plays in the socio-economic contribution to the urban dwellers helps to realize its relevance in urban poverty alleviation. Thus, the purpose of this research is to find out the socio-economic characteristics of urban farmers, and its impact on household, level food security and income; and to provide empirical evidences on socio-economic challenges related to the urban farming in Ethiopian cities, taking Addis Ababa as a case study. The study were adopted a cross-sectional survey method that combines both qualitative and quantitative research method and used a mix of probability sampling. In order to test the economic impact of UA on households welfare (income and food security), the study applied probit model followed by PSM. The findings revealed that urban farmers differ in their social backgrounds such as age, occupation, and marital status, sex of the household head, level of education, farm size, and own housing, which might have also implication on their Livelihood strategies. The majorities of farmers have low formal education and consider urban farming as their major occupations. Participation of the youth is relatively low in the sector, leaving it for adults over 45 years old and women who also support large families. Participations of women and uneducated people in the sector are also widely observed. Insufficient earnings from non-farm sector and food insecurity were major reasons for adapting urban agriculture as survival strategy in the city, that is, to fulfill daily food and other essentials. Many urban farmers (51%) engaged in Cow's milk and poultry production while 24% are involved in vegetable crop production. Urban farming in Addis Ababa and other Ethiopian cities has a significant influence on the household level food security and income as compared to other livelihood options, where over 70% of the households' income and food expenditure is derived from urban farming. However, UA has constrained with limited access to land; limited farm extension services; lack of veterinary services; lack of access to farm credit; shortage of improved seed and animal breeds; lack of production technologies; limited access and high cost of fertilizers and quality animal feeds; coordination gap among government bodies for the sector are considered among the major factors that constrained urban agricultural development in the urban areas in Ethiopia.

Key words: Socio-Economic, urban agriculture, livelihood, welfare, farm income.

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LIST OF ABBREVIATIONS AND ACRONYMS

AA	Addis Ababa
AATIDB	Addis Ababa Trade Industry and Development Bureau
ATT	Average Treatment of the Treated
BMI	Body Mass Index
CSA	Central Statistical Agency (Ethiopia)
DA	Development Agent
DID	Difference in Difference Method
EHNRI	Ethiopian Health and Nutrition Research Institute
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDP	Growth Domestic Product
GTP	Growth and Transformation plan
HHs	Households
IE	Impact Evaluation
IFPRI	International Food Policy Research Institute.
IVREG	Instrumental Variable Regression
IV	Instrumental Variable
MoFED	Ministry of Finance and Economic Development
MoWUD	Ministry of Work and Urban Development
NGO	Non-Governmental Organization
OLS	Ordinary Least Squares
ORAAMP	Office for the Revision of Addis Ababa Master Plan
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PSMT	Propensity Score Matching Techniques
RCT	Randomized Control Technique
RD	Variant Regression Discontinuity Method
SDPRP	Sustainable development poverty reduction program
UA	Urban Agriculture
UNDP	United Nations Development program
UN	United Nations
USD	United States Dollar

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

With a population of more than 85 Million, and per capita GDP of less than 392 USD, Ethiopia is one of the poorest countries in the world (World Bank 2010). Agriculture is a key sector for the economy with 41% of GDP contribution. Therefore, in the past two decades, the government of Ethiopia has given huge emphasis in implementing the agricultural development and poverty reduction strategies. The poverty reduction strategy paper namely SDPRP, PASDEP, and currently the GTP show this reality. Because of these efforts the government Ethiopia has registered impressive economic growth in the past decade. However, the growth registered mostly has been dependent on the agricultural sector which is the center of the economy. The growth of the agricultural sector has not been increasing unabated in the recent past. For example, with regard to the share of GDP, the contribution of Agriculture was 41%, industry 13.4% and the service sector 45.6% (MoFED report 2010/11).

Recent empirical evidences indicate that due to high inflation, unemployment, and food insecurity, urban population have been resorting to various means as coping mechanism (Alem & Kohlin, 2013). Urban Agriculture (UA) has been one of the means for coping up with huge price increase, lower wage and food insecurity experienced in the country. Since Urban agriculture (UA) has become “*an old wine in a new bottle*”, gaining prominence especially in developing economies because it has been known to be a viable poverty intervention strategy for the urban poor and socio-economically disadvantaged groups. Various qualitative and anecdotal evidences (Mkwambisi et al., 2011) suggests that urban agriculture has a positive impact on improving malnutrition, increasing food security level of households, increasing income as well as providing very rich micronutrients for household consumption. However, there is little attention given among government stakeholders (like policy makers, City Administration, governmental agencies, NGOs and others) towards urban agriculture. UNDP mentioned that, about 800 million urban residents were engaged in urban agricultural production for subsistence and commercial purpose in the mid 1990s (Bryld, 2003). Since then the number of urban farmers has been increasing.

Moreover, many authors (RUAF, 2007) also noted about the expansion of UA and its wide spread existence in many cities of the world. For instance, according to the UNDP, 80% of families in Libreville (Gabon), 68% of urban dwellers in six Tanzanian cities, 45% in Lusaka (Zambia), 37% in Maputo (Mozambique), 36% in Ouagadougou (Burkina Faso), and 35% in Yaounde (Cameroon) are involved in UA. The involvement of so many people in UA indicates its centrality in informal sector activities. There seems to be no signs in Sub-Saharan Africa today that the number of people involved in farming activities as a primary or as a secondary source of income will significantly decline in the near future Hubert debon (2010). As to the government of Ethiopia, focusing on urban re-development and resettling, and with the current land tenure policy, there seems to be less attention given to expand and support the UA practices; and yet, little has been researched to justify the socio-economic relevance of UA in cities.

Evidences indicate that, there will be high rate of urbanization in Africa and Asian countries in the coming twenty years (Garrett J. and Mougeut 2000). Many of the countries, which have recorded urban growth, are least developed nations. These countries are not capable enough to provide sufficient food demanded by expanding urban population via rural based supply. This leads to increased food insecurity and prevalence of poverty in the urban areas. For instance, MoFED (2006) reported that urban population of Ethiopia will increase in two folds by 2020; and urban poverty is currently becoming a growing concern, especially in large cities of the country. Thus, cities may need to consider agricultural production in urban areas or urban fringe to reduce the food insecurity and prevalence of poverty.

Anecdotal evidences also suggest that UA is expanding in scope and level of production in Ethiopia. Therefore, it is highly important to understand the socio-economic impact of UA at the household level for evidence based policy making and city redevelopment planning. Thus, the motive behind carrying out this research is to improve the understanding that urban agriculture contributes to the socio-economic development of urban farming households in particular and to the livelihood of urban society in general.

However, some scholars disagree with the contribution of urban agriculture to the urban development and portray such practices as damaging to public health and unfitting to the implementation of urban development policies. On the contrary, others argue that if appropriately planned and integrated into urban design, urban agriculture can contribute to the

wellbeing of citizens (Deelstra and Girardet, 2004). It can be used (Thomas P.Z. Mpofo, 2013, van Veenhuizen, 2006) as a strategy to address the increasing urban unemployment, poverty, hunger and other socio-economic benefits for the urban poor in general and the disadvantaged groups in particular. However, urban agriculture is still faced with growing threats from city planners and policy makers partly due to the absence of evidence about its benefit for the welfare of the producers.

Some observational and qualitative evidences show that urban agricultural practices are omnipresent in Ethiopian major cities, particularly in the pri-urban of the cities. Though there is less interest to support urban agricultural practices in medium scale mainly at city centers, the government still promotes and supports urban farmers in the pri-urban of the cities to reduce unemployment and improve the livelihood of the urban farming households. This study was motivated by the huge expansion of urban agriculture in Ethiopia; particularly in Addis Ababa city and thereof promotion and support by governmental and non-governmental organizations. During the research period, around 8177 urban households were participating in urban agriculture (AATIDB, survey 2012/13, unpublished).

1.2.Statement of the Problem

Urban agriculture is widely practiced as an informal economic sector across many African cities (Bryceson and Potts 2005). Even though it is a viable activity to complement food supplies from rural areas to towns, and is a means of income and food expenditure for many urban dwellers, particularly for the poor, its contribution has been underestimated (Mougeut 2000). UA producers are also often discouraged and ignored by the society and in policy reforms (Mougeut 2000). As Deelstra and Girardet (2004) put it, “*planners tend to think that urban food growing is messy business and have little understanding of peoples’ need to grow food in cities*”.

With the fast growing population in the cities, inflation and unemployment, the problem of food insecurity is a grave concern. According to Alem & Kohlin, (2013) the coping mechanisms include cutting back on consumption, working longer hours, engaging in less incentive and high energy consuming works as well as producing commercial crops and keeping livestock within their vacant space. Extensive review on the impact of inflation on households welfare has been done by Alem & Söderbom (2011). As MoFED (2006) reported, urban poverty is currently becoming a growing concern, especially in large towns of Ethiopia.

Thus, towns may need to consider agricultural production in their respective urban areas or urban fringes to improve the income and the food security level of households (ibid).

The potentials of urban agriculture in Ethiopia, especially in the big cities such as Bahirdar, Mekele, Hawassa, Jimma, Adama etc are not to be doubted. In case of Addis Ababa, the City Government has recognized urban agriculture as one of the important tools to end poverty (Thomas P.Z. Mpofu, 2013). UA has being carried out in most sub-cities of Addis Ababa; but, it is not known why those urban dwellers of the sub-cities chose to engage in such a venture, and what constraints they are facing. Various qualitative evidences (Mkwambisi et al, 2011) suggest that urban agriculture has a positive impact on improving malnutrition, increasing food security level of households, increasing income as well as providing very rich micronutrients for household consumption (ibid). Though there are various directives on urban agriculture to be implemented at the cities level, there have not been any pragmatic rules guiding UA in Addis Ababa and other towns in Ethiopia. This partly has been due to lack of evidences about the socio-economic role and impact of UA towards increasing the welfare of producer households in the cities.

Mohamed (2002) studied “*urban agriculture initiatives in Addis Ababa on selected vegetable producing cooperatives*”, and Tewdros (2007) also studied the “*livelihood dependence on urban agriculture in Addis Ababa*”. Both researchers have given a baseline for new research work. However, there is no still an in-depth empirical study that characterizes the socio-economic nature of urban agriculture in Addis Ababa and other towns of the country; and its impact on households’ welfare except the anecdotal evidences trying to highlight; the role and impact of urban agriculture is absent. Hence, using a onetime data set, this study aims to unravel the nature, the socio-economic impact, challenges; and opportunities of urban agriculture.

1.3. Significance of the Study

In line with the problems indicated above, studying the socio-economic contribution of urban agriculture to urban farmers at large would be timely and necessary. The research outputs would improve our knowledge about the role urban agriculture plays in improving the welfare/ livelihood of the urban people; and the study will add information to the limited research done so far on the role and impact of urban agriculture in the Ethiopia.

Data generated may help policy makers, researchers and extension workers in policy design, development of improved technologies and enable the public to recognize the sector's role in the city's economic development and provide priorities to the sector. The study will bring new insight into the most debatable role of urban agriculture (i.e, its impact on household welfare, like food security and income). This will help researchers and NGOs to further analyze their intervention based on what works and what does not work in the urban settings.

1.4.Objectives of the Study

The main objective of the study is to assess the contribution of urban agriculture (UA) to the socio-economic development, household level income and food security (measured by food expenditure) of urban dwellers in Ethiopia taking Addis Ababa as a case study. The study has the following specific objectives: To analyze the socio-economic characteristics of UA in Addis Ababa; to identify the impact of UA on HHs income and food security level, measured by food expenditure; and to identify the challenges and opportunities of UA in Addis Ababa.

1.4.1. Research Questions

Given the objectives, the following questions were addressed in the research:

1. What are the socio-economic characteristics of UA in Addis Ababa?
2. What is the impact of UA on income and food security of urban households in Addis Ababa?
3. What are the opportunities and major constraints of UA in Addis Ababa?

1.4.2. Hypothesis

1. Urban farming contributes the major source of livelihood for households; and
2. Household involvement in urban agriculture improves the food security status of the household.

1.5.Scope and Limitation of the Study

The scope of the study was limited to the farming activities practiced at urban level (i.e., vegetable crop production, milk and/or poultry production; and mixed farming that are in high demand and have a comparative advantage over rural area production). On top of this the study focused on understanding the contribution of urban agriculture on households' welfare (income and food security), taking Addis Ababa as a case study. Moreover, the food security is

measured in terms of household level food expenditure. It does not use other methods of measuring food security due to limitation in finance and time.

One of the limitations to this study was the absence of counterfactual data on the control group. An artificial control group has created using statistical techniques like PSM. This is to reduce the problem of self-selection through using instrumental variables, retired and households who own house. Apart from this, the study had adopted robust econometric techniques to control unobservable and observable differences between participants and non-participants. The second limitation of the study was the use of food (cereal and other) expenditure data as a proxy for food security level. This method was used since other methods like observations; BMI (Body mass index) methods are beyond the scope of the study in terms of cost and implementation. The third limitation was the use of small sample size (n=140) that may not be representative of urban Ethiopia but this is pretty good to provide insights about the UA in Urban Ethiopia.

1.6.Organization of the Report

Chapter one discuss the introduction part, including the background of the study, statement of the problem, the significance, scope and objectives of the study. Chapter two presents the Review of Literature while chapter three discuss the Research Methodology applied. Chapter four presents the finding of the study and discussion; while chapter five discuss the conclusion and policy suggestion hared the study findings.

CHAPTER TWO

RVIEW OF LITREATURE

2.1. Urban agriculture: Concepts and Definitions

Urban agriculture is a recent phenomenon as compared to rural farming. As cited in Thomas P. Z. Mpfu (2013), food production in urban settlements of ancient civilization has always been part and parcel of the urban economy. Different authors like Maugeot (2000) described urban agriculture in various ways on the basis of location or time of agricultural activities.

Deelstra and Girardet (2004) put urban agriculture broadly as any agricultural production which includes horticulture, forestry, fishery, poultry and livestock mainly in public open spaces within or fringe of cities. Renevan (2006) concludes that *“urban agriculture is an industry located within or on the fringe of a town, which grows or raises, processes and distributes a diversity of food and nonfood products, using largely human and material resources, products and services found in and around that urban area”*.

According to Thomas P. Z. Mpfu (2013) one of the economic significance of urban agriculture is its capacity to create income, food supply, employment opportunity and environmental management. Low and middle-income farmers practice urban agriculture mainly to survive and achieve a combination of nutritional and socio-economic benefits, mainly to provide supplementary food and /or income.

As women are still disadvantaged in the formal sector in several societies, they tend to dominate certain components of urban agriculture. Hovorka *et al* (2009) reported that women were the majority among the urban farmers worldwide. This is because urban food production offers opportunities to be integrated into other household activities where women uphold the responsibility for household food security, while men dominate the commercial urban food production (FAO, 2002). It is estimated that about 800 million people worldwide engage in urban agriculture, and it is thought that globally, urban agriculture produces 15% of all food consumed in urban areas (UN-Habitat, 2001); and this figure is likely to double within the next twenty years. For instance, in Russia, 72% of households are urban farmers; 80% in Berlin; 68% in Tanzania; while in China, 14 largest cities produce 85% or more of vegetables (UN Habitat, 2001). Apart from this, increases in urban agriculture have also been recorded in African cities, such as: Bissau (Guinea Bissau), Dakar (Senegal), Kumasi (Ghana), Lome

(Togo), Nairobi (Kenya); and Dar-es-Salamm (Tanzania) [Food and Agricultural Organization (FAO), 2004]. Thus, urban agriculture is, in most cases, a response by the urban poor to inadequate, unreliable and irregular access to food and lack of purchasing power (Hovorka *et al*, 2009).

Most cities, particularly in developing countries, are unable to generate sufficient income and employment for their rapidly growing population. This translates directly into lack of food and malnutrition. Around 53% of Ethiopians are undernourished (Headey D. and Ecker, 2013). In six East and Southern African countries, the number of people obtaining part of their food from urban agriculture is expected to rise from about 25 million to 40 million by 2020 (Renevan, 2006).

Ethiopia has registered a growth rate of 11% with significant improvements in various sectors including service, agriculture and even the industry (MoFED F. report 2010/11). With a fast growing population, a decrease in land holding size per household, increase of unemployment, persistent food insecurity as well as environmental and social challenges, it will be a huge challenge to the government to maintain the growth rate and achieve its ambitious Growth and Transformation Plan (GTP). This GTP plan assumes of making Ethiopia a middle income country by 2025. Among the top priorities of the GTP plan to ensure food security through building a strong agricultural sector is the one; which is not only expected to feed the nation, but also support the growth of the industry.

According to Yonas Alem (2011), the growth of the Ethiopian economy brought huge inflation in food and non-food goods, particularly in food commodities. The government had also taken some measures in 2008 by lifting certain taxes from food commodities (especially oil), as well as measures to curb the excess supply of money. These fiscal and monetary measures might take time to reduce prices and lead to improved food security of the urban dwellers especially the poor. This had a very negative welfare impact on the urban than rural households; while the rural households are supported by various safety net programs. Combined with huge unemployment, high cost of living, growing population, urban people have developed various mechanisms to cope with the changes. One of the coping mechanisms adopted by the urban dwellers has been to engage with urban farming.

Various studies such as RUFA (2007), FAO (2002), and UN-Habita (2013) have documented the contributions of urban agriculture to the socio-economic wellbeing of the producers, the community as well as to the ecosystem of the urban areas. However, the findings of such studies are still debatable and their applications defer from country to country. For example, in one province in Nigeria, households were able to generate around 74% of their agricultural income through urban farming (Salau and Attah 2012). Most of the urban populations in Ethiopia are dependent on rural farmers in fulfilling their basic food needs; while the poor, elderly and disadvantaged urban dwellers are engaged on urban agriculture to supplement their food demand; and generate their side line income (Tewodros, 2007).

2.2. Empirical Evidence

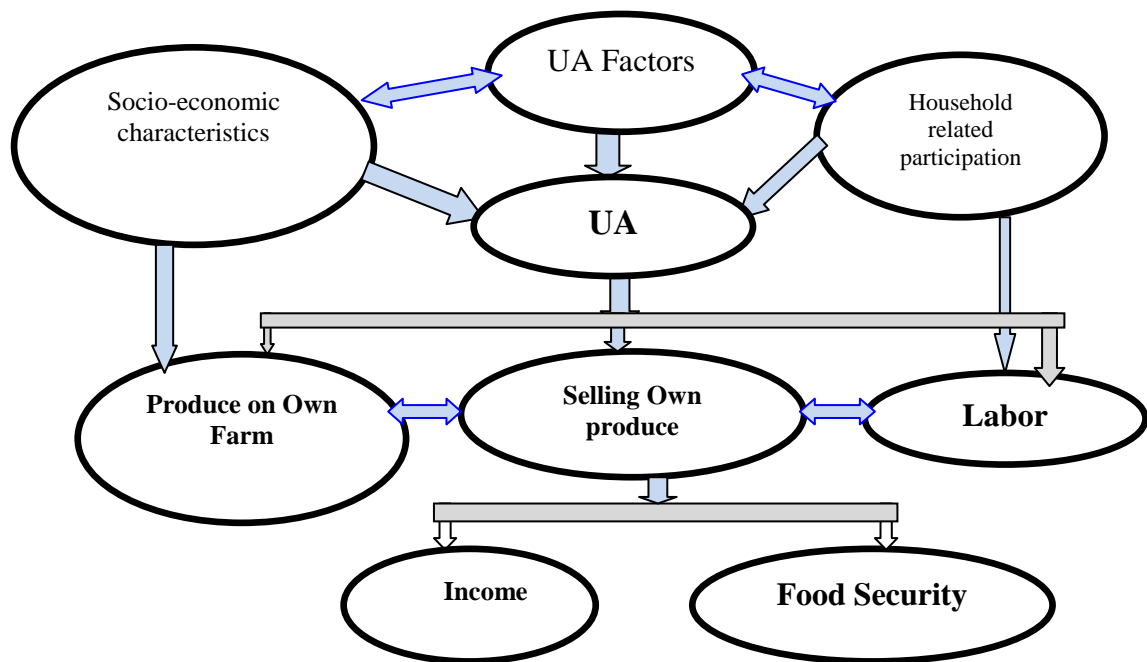
The high growth of urban areas and urban population is a worldwide phenomenon. Prain (2006) indicated that half of the world population is already living in urban centers and additional 1.5 billion people will be living in the cities by 2020. In Africa, by 2030 about 50% or more of population is expected to live in cities (Parrot, 2010). According to the Ministry of Works and Urban Development, Ethiopia has a high rate of urbanization, averaging about 4.3% per annum (MoWUD, 2006). About 30% of this population is concentrated in the capital city, Addis-Ababa.

Bryceson (2005) argued that urban agriculture in Africa evolved as a response to scant sources of urban economic sustenance (i.e, insufficient supply of staple food to cities) coupled with declining purchasing power of city dwellers. Currently, millions of urban dwellers are reinforced to restore farming in urban areas throughout many African cities either to supplement their household income or they cannot afford to meet their daily food needs (Bryceson and Potts 2005). The population's engagement in urban agriculture (UA) in Africa increased from 10 to 25% in the beginning of 1980s to 70% in 1990s; and the rapid urbanization has a great impact on food demand (Bryld, 2003).

2.3. Conceptual Frame Work

On the following framework (figure.1), it is tried to portray the general concepts of the study. Specifically, it indicates the direct or indirect relationship and/or effect of urban farming practice on specified impact indicator variables (level of household income and food security, measured by households' food expenditure).

Figure 1: Conceptual Frameworks



Source: J.int.Dev.23, 181-203 (2011), with researchers' adjustment from the real world view.

2.4. Potentials and Constraints of Urban Agriculture

Since urban agriculture is practiced mainly within boundaries of cities, it has unique features with distinct potentials and constraints. Long-term benefits of cities from urban agriculture imply the contributions of the sector to sustainability of cities (Nugent, 1999). Nugent 1999 reported that studying urban agriculture from three dimensions: social, economic and ecological, is helpful to realize the net benefit; hence, it's sustainable contribution to the selected cities.

2.4.1. Potentials of Urban Agriculture

Urban agriculture is mainly practiced in the outskirts and vacant spaces of the city, and along rivers sides and urban fringes where land is not suitable for building construction. As Bryld (2003) puts it "urban agriculture brings with it great potentials for enhancing the situation of the urban citizens, especially those with the lowest incomes who are dependent on the access to locally grown food".

a. Food Security

Acceleration of urbanization in developing countries has been accompanied by increased demand for food consumption. This can be seen in Ethiopia (Dereje, A. Margaret P. and

Wubetu B, 2007). Yet, the number of poor urban households has also significantly been rising along with urbanization, so do many households who cannot afford to buy enough food for their own consumption (Bryceson and Potts 2005). According to Thomas P. Z. M pofu (2013) report, “*given the right support, urban farmers could supply more than 42% of the vegetable demand in Addis-Ababa*”.

Most of urban farming is practiced by the urban poor who consume most of the production and supply, the surplus to market (Bryld 2003, Mireri et al. 2006). The major expense for most of the urban poor is purchasing of food; thus, they will be left with nothing for health, education and other necessities. They also hardly consume varieties of food. Thus, it is not surprising that urban farming contributes to improving livelihoods for the urban poor. RUAF’s (2007) report emphasized the role of urban agriculture as ensuring food security and healthy nutrition. This report further indicated that food production in the city is in many cases a response of the urban poor to inadequate, unreliable and irregular access to food, and the lack of purchasing power.

b. Economic Potential

Urban farming can also be a good source of income for the urban poor, if it is especially practiced as a formal sector. However, Bryld (2003) doubted whether it has a significant contribution to macro economies of cities although he stated that urban farming has an economic relevance because it is helping urban farmers, especially the poor, to use their non-farm income for other purposes instead of purchasing food (i.e., it improves the welfare of urban farming households).

RUAF (2007) reported that the poor households in developing countries spend 50 to 70% of their income to purchase foods; hence, the foundation appreciated the benefits of self-growing crops and/or participating in other forms of urban agriculture by the urban poor. The report also confirmed that “in Addis Ababa, above-normal profits are earned by even the smallest-scale backyard producers with very low capital” (RUAF 2007). This finding also agrees with RUAF’s report.

c. Social Advantage

Actors in urban agriculture came from various groups of urban society. They can be the poor or the rich, women or men, natives or migrants, and so on. The participation of mostly women and other vulnerable households in the sector draws attention, and implies the role of the sector

in poverty alleviation and integrating urban societies (RUAF 2007). Thomas P. Z Mpofu (2013) reported that “urban farming helps vulnerable groups to reduce their dependency on other people and strengthens social integration of the farmers by organizing them into cooperatives and also providing them an opportunity to earn additional income”.

d. Environmental Advantages

In most cases, urban agriculture is practiced in marginal spaces in cities and outskirts where lands are not suitable for other use. It, therefore, creates beautiful scenarios and landscapes, and improves microclimate, and nutrient recycling (Bryld 2003). The study established that, due to the favorable climatic conditions of Addis-Ababa and other Ethiopian cities (Bahirdar, Jimma, Mekele, Adama etc,) areas used for urban agriculture were green throughout the year. This contributed towards the creation of a micro-climate in some parts of the cities, as well as improves the city’s aesthetic value. Ever greenness also helped to clean the air by reducing dust and protecting the soil from erosion. Some respondents in the study area added that urban agriculture had protected their areas from being used as sites for the unhygienic dumping of wastes.

2.4.2. Constraints of Urban Agriculture

Despite the advantages of urban agriculture mentioned above, it has some limitations worth noticing. In many Ethiopian cities, it is being practiced as an informal sector and has little support from regional and federal ruling body (Bryceson 2005, Bryld 2003). There are a number of challenges that were facing the urban farmers in different Ethiopian cities. These were classified into three broad categories, namely: institutional, financial and capacity related challenges; the finding will be discussed under result chapter.

a. Space for Cultivation and Livestock keeping

Agriculture requires land; but, the first institutional challenge was lack of land tenure rights (Thomas P. Z. Mpofu 2013). This was regarded by many urban farmers as mostly restrictive to the growth and development of urban agriculture in Ethiopia in general and in Addis Ababa in particular. The existing unclear legal set up caused a sense of insecurity among most farmers, thus negatively affecting their commitment to invest in the development of the land whose ownership was uncertain. As a result, farmers lived in constant fear of being evicted from “their” land due to lack of tenure security. For example, about 51% of the members of the

Makanisa Furi Saris and about 82% of the members of the Akaki kaliti Cooperative expressed fear of eviction from ‘their’ agricultural land (Thomas P. Z. Mpofu 2013).

Similarly, (Dereje, A. Margaret P. and Wubetu B, 2007) reported that, in Mekelle, ‘owned’ land is actually land owned by the state, for which farmers have a certificate entitling them to use it during their lifetime. More recently, Tigray Regional State has given property right licenses to farmers, but still there is no right to sale or land transfers to a third party (meaning a non-family member). Thus lack of government recognition is the biggest institutional challenge facing urban farming households. As Bryld (2003) said it, “*besides feeding the poor in the cities, there is an urgent need for providing shelter for the homeless*”. Knowing that growing food in cities requires land, it may not be prioritized in urban land uses since the demand for urban spaces to build houses is by far higher than using spaces for agricultural activities. Argenti (2000) further emphasized that “...agricultural productive lands are likely to be lost in this competition.”

b. Lack of Access to Resources

According to Drescher *et al.* (1999), the most critical institutional constraints to urban agriculture include lack of access to farming land as well as to farming inputs such as seeds, fertilizer, pesticides, and implements. Urban food markets are often designed, to import food from rural areas, while the input producing businesses are also oriented towards serving rural agriculture. Thus, both the input and output market systems and infrastructure often favor rural agriculture (UNDP, 2010). This is largely because the market structures tend to be composed of large wholesalers who purchase directly from rural areas or from intermediary wholesale markets at the edge of the city. Thus, generally, smaller urban farming households do not yet fit well into these structures.

c. Extension Contact/Service

One of the critical challenges facing most urban farmers was their limited skills in modern agriculture. This was attributed to lack of training and/or technical support to help them improve their skills and knowledge, and increase their productivity. According to Thomas P. Z. Mpofu (2013), in Addis Ababa about 44% of the farmers did not get any kind of technical advice from the agricultural extension workers. On its part, the Addis-Ababa Urban Agriculture Department admitted that they did not have enough experts to provide the required and continuous support to the urban farmers.

d. Health Problems

Urban agriculture can be a health hazard. It may use resources of cities such as water and urban wastes for production. Use of wastewater/polluted rivers and untreated compost may contaminate.

Crops and livestock production may become health hazards to human beings. There are a number of cases when urban farming brought health problems (UNDP 1996). Besides these, the major constraints of urban farming in Addis Ababa and other Ethiopian cities include lack of policy issues about urban agriculture which resulted in less attention to the sector, limited working capital for farming and over-use of resources (ORAAMP 2000).

CHAPTER THREE

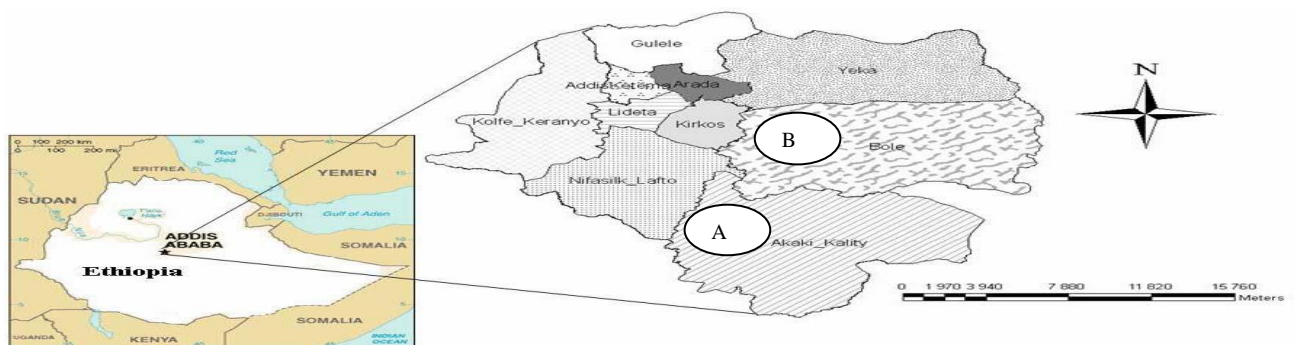
RESEARCH METHODOLOY

3.1. Description of the Case Study Area: Addis Ababa City

The case study area Addis Ababa (see Figure 2) is the economic and political capital of Ethiopia, lies at an altitude of 2408 meters above sea level, located at $9^{\circ}1'48''N$ latitude and $38^{\circ}44'24''E$ longitude CSA (2005). Its average daily temperature is $16^{\circ}C$, means annual precipitation is about 1180 mms and has unimodal rainfall regime starting from June to September. The dry season occurs from January to May. During the dry season, many urban dwellers engage in urban farming. The city has shown extensive physical growth since the past 10 to 20 years. In 1984, the area of the city was only 224 square-kilometers; and by 2009, its total area was estimated to be 530.14 square kilometers (ORAAMP 1999).

The City Administration is made up of urban and peri-urban areas; and it is divided into ten (10) sub-cities, namely; Addis Ketema, Akaki-kality, Arada, Bole, Gulele, Kirkos, Kolfe-Keranio, Lideta, Nifasilk-Lafto, and Yeka sub-cities (see Figure 2). Seven of the sub-cities except Arada, Addis Ketema and Kirkos sub-cities have urban agriculture offices under their sub-city capacity building program offices. The population of Addis Ababa in 2011 was 3,040,740 of which 1,448,904 were males and 1,591,836 females (CSA, 2012).

Figure 2: Map of Addis Ababa City, Ethiopia



Source: Addis Ababa city Council, 2006.

Over 97.7% of the population lives in the City; while the remaining live in the peri-urban fringes and most of which growing various horticultural crops and livestock keeping for the city's consumption.

3.2.Data Type and Sources

The study used both primary and secondary data collection methods. Using structured interview schedule, selected sample households were interviewed in their premises about their socio-economic characteristics, type of UA adapted and asset ownership, household's food expenditure, their attitude towards urban agriculture, challenges, and opportunities they face. In addition, sample key informants and groups were selected for undertaking Focus Group Discussion (FGD) about urban agricultural practice in the area, the challenges and opportunities in production, marketing as well as access to credit facilities.

Addis Ababa was selected for three main reasons. Firstly, it is the largest city in Ethiopia harboring more than 30% of its population as urban farmers; thus, it was assumed that it holds many of the urban farmers and represents in their socio-economic circumstance. Secondly, cognizant that few research are done so far on the same issue, the study is expected to improve knowledge about the role that urban agriculture plays in the study area and in the country at large.

3.3.Sampling Methods

The relevant population from which the sample derived was the population of urban farmers in Addis Ababa rather than the urban population as a whole. The study had used a mixture of probability sampling technique (multi-stage random sampling method) and non-probability sampling technique (purposive selection of areas). Due to limitation in resource and time, the sample size considered was limited. Nevertheless, the findings of the study would be quite adequate enough to give insights about the socio-economic characteristics of urban agriculture in Ethiopian cities.

3.4.Sample and Sampling Techniques

The sampling frame included study sites and sample respondents (urban farming participants and non-participants). The target population for this study is all urban farming households and neighboring non- urban farmers in the case study area; while the actual study is carried out in two sample sub-cities in Addis Ababa city. A multi stage sampling technique was used for the study. The first stage involved purposive selection of two sample sub-cities (Akaki kality and Bole) from the seven sub-cities where urban agriculture is practiced in various scales. These

sample sub-cities were selected based on the size of land used, production and number of households involved in urban agriculture.

In the second stage, one sample district was randomly selected from each of the selected sample sub-cities. At the third stage, using the list from urban agricultural offices about each district, sample households were randomly selected proportionally to the size of the urban farming household's population in each district. In general, with the limitation of resource and time faced, 140 randomly and equivalently selected households were considered for this study. Because of self-selection problem, the sample control group farmers were selected from the same agro-ecological and socio-cultural condition of the treatment group. The detailed sample selection is indicated in Table 1 below.

Table 1: Sample Size, Taken Proportional to UA Participating and Non-Participating Households

S.No	Treatment/Control	Sub-cities	Total number of Urban Households	Sampled Households
1.	Treatment (Participants)	Akaki kaliti	102	43
		Bole	78	27
2.	Control(Non-Participants)	Akaki kaliti	201,114	24
		Bole	342,918	46
Total				140

Source: Total Number of Households CSA 2012, and sample HHs extraction by the researcher.

3.5. Data Collection

Selected sample households were interviewed to collect both quantitative and qualitative information. In this study, quantitative data were collected for measuring the role and impact of urban agriculture on households' income (also called on-farm income) and level of food security. A self-administered structured questionnaire was used for the study (see Appendix VIII A). Discussions with sample key informants and focus groups were also held using pre-designed checklist (see Appendix VIII B and C). Secondary data sources were used to supplement the data gathered from the interview of sample household, key informants and focus group discussion.

3.5.1. Primary Data

Individual sample households were interviewed in their premises using a structured questionnaire (see Appendix VIII A). The questionnaire covered different topics to capture relevant information about the socio-economic characteristics of the respondents. Monthly earnings from off-farm income sources were also recorded because they were important to predict the overall household income and urban farmers' socio-economic status. All monetary values were taken from the reports of annual incomes for 2012/13 production year.

The interview schedule was prepared in English and later translated in to Amharic, the local language. The interview schedule was pre-tested using ten non-selected sample household farmers; and corrections were made to improve the relevance of the questions for the study area. In order to undertake the survey, two enumerators with a background of urban agriculture, were selected and trained before administering the survey. The average time for undertaking one sample interview was 25 minutes.

Sample key informants including development agent (DA) from each sample districts and Addis Ababa urban agricultural officers were interviewed on the extent of urban farming in their sub-cities, locations of urban farming, types of common crop and livestock adapted in the sub-cities, common uses of crop and livestock products, and proportion of households involved in urban farming in the sub-cities. Similarly, sample focus group discussions were also undertaken about urban farming practices in the study area, opportunities and challenges facing urban farmers in terms of production, marketing as well as financing.

3.5.2. Secondary Data

Published and unpublished reports from relevant governmental offices, NGOs and international research organizations involved on urban agriculture were major sources for collecting secondary data. The city Administration directives and strategies towards urban agriculture were reviewed from Addis Ababa urban agriculture office, and different findings including journals and articles were reviewed from FAO [Food and Agriculture Organization], Ethiopia Institute of Agriculture Research and IFPRI (International food policy research institute).

3.6. Methods of Data Analysis

The objective of this analysis is to estimate the average treatment effect on the treated group that is, the effect of participating in urban agriculture on household level income and food

security (measured by food expenditure). In doing this STATA version 12 was used to analyze the data. Descriptive statistical techniques are used to understand the socio-economic characteristics of urban farmers. These include mean, standard deviation as well as percentiles. Moreover, the econometric analysis is adapted to test the economic impact of urban agriculture on households' welfare (income and food security).

Since, the study is ex-post evaluation, it was difficult to use the golden standard impact evaluation methods like Randomized Control Trial (RCT) technique or the variant regression discontinuity (RD) or even Difference in Difference (DID). Rather, Propensity Score Matching Technique (PSM) and Instrumental Variable Method are used.

The biggest problem in impact evaluation is the missing data problem (i.e., absence of the counterfactual). We cannot observe the same person in two different states at the same time. Ravallion (2001) and Godrland *et al.*, (2004) concluded that there is empirical problem when there is typical absence of data concerning the counterfactual: how would the performance of urban farmers have been; if these farmers had not joined the urban farming? The main challenge is to identify the counterfactual (i.e, identifying suitable comparison group of non-participants whose outcomes provide unbiased estimate of the outcome that participants had from urban agriculture). As a result of non-random selection of urban households into urban agriculture and self-selection problem, simple comparison of participants and non-participants would give biased estimate. This is Ordinary Least Square estimation which is quite naive because it assumes both groups do not differ systematically.

Using OLS method would bring a bias into our analysis as there is a counterfactual problem. We cannot compare two groups when they are systematically different from each other. In this study, propensity score matching technique is adopted to develop the counterfactual group (the control group). Since matching improves the performance of the estimator by imposing the common support condition. This method uses statistical technique to create an artificial control group by identifying for every treated observation as an untreated observation that has the most similar (observable) characteristics. The estimator is also cross-sectional estimator since the data is a onetime data. The research has adopted two steps to undertake the analysis.

The first step is using probit model, in estimating the propensity score. The participation decision in UA is regressed on variables that simultaneously determine participation in UA as

well as impact indicators (income and food security, measured by food expenditure). Probit method is used because the dependent variable is dummy. Both participants and non-participants will have a propensity score,

$$\hat{P}(X|T = 1) = \hat{P}(X)$$

Using the propensity of participation, only those close to the propensity score are matched and a common support will be created for analyzing the impact. This reduced the bias that would have been created in comparing incomparable groups. The main drawback of matching technique is that it imposes restrictive assumptions on the process by which urban households select into urban agriculture that may not be true always. In particular, participating in urban agriculture is usually assumed to be random conditional on observed variables (as cited on the World Bank, Handbook on Impact evaluation, 2010).

The second stage is using participants in the common support (see figure 3), the study estimates the impact of participating in urban agriculture on household food expenditure and household income. The analysis used two of the PSM techniques (i.e., Kernel and Nearest-Neighborhood Matching Technique). The following equation is for estimating the Average Treatment Effect on the treated (ATT). Let Probability denote $\Pr(X)$ (note: \Pr is not the same as P ; instead it is the probability that $P=1$). A typical cross-sectional matching estimator for the ATT takes the form:

$$\widehat{ATT}_M = \frac{1}{n_1} \sum_{i \in I_1 \cap S_P} (Y_{1i} - \widehat{E}(Y_{0i}|P = 1, P_{ri}))$$

$$\text{Where } \widehat{E}(Y_{0i}|P = 1, P_{ri}) = \sum_{j \in I_0} W_{ij} Y_{0j}$$

In the above equation, I_1 indicates participants in urban agriculture; I_0 indicates non-participants in urban agriculture; S_P is the region of common support; n_1 is the number of households in the set $I_1 \cap S_P$; and W_{ij} are weights for every individual in the comparison group according to the distance between these individuals' propensity scores and those of their matches in the treatment group. It is quite a trade-off decision in the matching algorithm. A trade-off between the estimator's ability to deal with bias and reducing variance. For example, using Neighborhood method reduces the variance; but, is likely to increase bias as it is started to compare units that are less similar.

PSM technique has limitation of its own. This limitation emanates from the strong assumption one has to hold to reduce the bias. The first problem is the effect of time variant factor. The second problem is self-selection. Due to some unobservable features, farmers might self-select

themselves into urban farming. Hence, comparing both groups would create a bias. In this study, additional method (Instrumental Variable regression method is used to control any self-selection effect). Retired civil servant has used as instrumental variable for the endogenous variable creating a bias in the model. The instrumental variable technique is robust to the correlation between the program variable and one of both error terms after conditioning on X_1 or X_0 .

The traditional model for the instrumental variable technique is as follows; $Y_i = \delta P_i + X_i\beta + \varepsilon_i$. In the above equation, Y_i is participation in urban agriculture; P_i is the impact indicators (i.e, household income and household food consumption expenditure); X_i is a vector of covariates; and ε_i is a regression error with mean zero and $Cov(X_i, \varepsilon_i) = 0$.

In order to estimate the impact, two-stage least squares (2SLS) methods are used. In the first stage, participation in urban agriculture regressed on all the other variables in the outcome equation plus the instrument retired civil servant. The equation is noted below:

$$P_i = a_0 + a_1Z_i + a_2x_i + v$$

Predicted values have obtained from the first stage of probit estimation. In the second stage, the impact indicators regressed on the predicted values and other independent variables using equation described below:

$$Y_i = \alpha + \delta\hat{P}_i + X_i\beta + \varepsilon_i$$

So, in the above model, $\hat{\delta}$ is the IV estimate of participating in urban agriculture. Using OLS, PSM and IV, methods it is assumed that the trust impact of participating in urban agriculture on household income and food security level will be estimated.

CHAPTER FOUR

RESULT AND DISCUSSION

Results that are found to draw out more relevant information on the socio-economic contribution of urban agriculture are presented and discussed in this chapter. The chapter addresses mainly two critical dimensions of urban dwellers, namely: income and contribution to food security, taking Addis Ababa as a case study. Moreover, constraints that were found to influence the farming activities and opportunities are also discussed.

4.1.Descriptive Analysis

4.1.1. Socio-economic characteristics of the Respondents

The socio-economic characteristics of the households engaged in urban farming and non-urban farming are shown in Table 2 and 3.

Table 2 below presents the socio-economic differences between urban farming and non-farming households with common variables.

Table 2: Sample Response of Participant and Non-Participant HHs with Common Variables.

Common Variables	UA participation =yes /The Treatment		UA participation =No /Control Group	
	Mean	Std. Dev.	Mean	Std. Dev.
Age of the household head	53	11.36	51	14.08
HH head level of education (%)				
No formal education	0.2	0.40	0.07	0.26
Primary education (1-6)	0.23	0.42	0.09	0.28
Junior Level (7-8)	0.17	0.38	0.06	0.23
Secondary education (9-10)	0.19	0.39	0.19	0.39
Preparatory (11-12)	0.03	0.17	0.10	0.30
Tertiary Level	0.18	0.39	0.50	0.50
Gender/Sex of the HH Head (%)				
Male	0.76	0.43	0.93	0.26
Female	0.24		0.07	
Married households	0.80	0.40	0.94	0.23
Civil Servant	0.09	0.28	0.39	0.49
Retired	0.07	0.26	0.16	0.37

Common Variables	UA participation =yes /The Treatment		UA participation =No /Control Group	
	Mean	Std. Dev.	Mean	Std. Dev.
Farmers Membership	0.77	0.42	0.26	0.44
Household size	4.77	1.54	4.74	1.09
Own house	0.79	0.41	0.47	0.50
Private rented house	0.10	0.30	0.19	0.39
Kebele rented house	0.11	0.32	0.34	0.49
Access to Farm credit	0.34	0.49	0.09	0.28
Log food expenditure	6.31	0.50	6.19	0.45
Log income	9.58	0.54	8.42	0.76

Source: Field survey, 2013

- i. *Age of household head:* The mean age of the sample treatments group/participants were 53 years; whereas, the control group/non-participants were 51 years (see Table 2). Most (60.7%), of the participant respondents were within the age of 46 to 78 years followed by those within the range of 26 to 45 years (39.28%). This suggests that urban farmers in Addis Ababa city government are mostly elderly people. This finding agrees with the study results of Mohammed (2002) and ENDA-Ethiopia (2002) which stated that UA is the leading occupation of women, elderly and disadvantaged urban dwellers.
- ii. *Educational level:* The results in Table 2 reveal that, many (79%) of the urban farming household heads had below secondary school education. That is, those with informal education are 20%; those with primary and junior secondary cycle education are 40%; those with secondary school education covered 19%; and those with preparatory and tertiary education level are 21% of the household heads. While (41%) of the control group household heads are below secondary education level. This suggests that most of the illiterates (no formal education) households are participating on urban farming. Agbamu (2006) stated that, formal education has always been known to positively influence the adoption of improved technology among farmers; otherwise they will focus towards traditional informal economic sector.
- iii. *Gender:* The results in Table 2 show that majority (76%) of the urban farming respondents were male headed while 24% were female headed households. Whereas most (93%) of the non-urban farming households are male headed and only 7% are female headed households. This suggests that women have a great interest to engage in this a venture as compared to males. This finding agrees with the findings of Hovorka *et al* (2009) who reported that

women are the majority among the urban farmers worldwide, 80% -Uganda and 56% Kenya.

- iv. *Marital status:* Majority (80%) of the sample respondents are married and the remaining samples reported as they are single, separated and widowed (see Table 2). This finding suggests that most of the urban farmers in the study area are married. And, each household have 5 members on average. Their participation in urban farming is to ensure food security for their families.
- v. *Major occupation:* The study results show that the majority (39%) of the non- urban farming participant respondents are civil servants and 16% of them are retired, whereas only 9% of the urban farming households are civil servant and 7% of them are retired farming households; considered urban agriculture as their major occupation (see Table 2). This suggests that urban farming has been one of the major occupations for retired households. The results in Table 3 below show that the majority (70%) of the respondents are self-employed on their own farm; 1.43% are employed on other private farms; and 1.28% working employed on other none farm activities. This finding differs from the findings of Foeken and Mwangi (2000) report that, most of the farming activities in the urban areas were carried out on part time basis by people engaged in other occupations.
- vi. *Membership of farmers' organization:* Majority (77.14%) of the urban farming respondents belongs to kebele membership, cooperative group, *edir/equb* and agricultural associations; while 22.86% do not belong to any farmer's membership (see Table 2). The result suggests that, in the case study area there is a high participation of the respondents in social groups; this may creates advantage to them because they would enjoy and share any of the benefits of cooperative. This finding agrees with the findings of Agbamu (2006) argues that the greater the participation of a farmer in social organization, the more interaction with other farmers and hence the earlier his adoption of innovations and experience sharing among farmers.
- vii. *Access to farm credit:* Majority (65.72%) of the sample urban farming household respondents had no access to farm credit, while 34.28% had access to farm credit services. some 91.43% of the non-urban farming participant households had no access to farm credit services; while 8.57% had access to the same services facilities (see Table 2). This suggests

that, most urban farming and non-farming sample households in the study area do not have access to farm credit services. This finding is in line with the findings of Hovorka *et al* (2009) who reported that urban farmers in Ghana did not have access to formal credit schemes due to their limited land space for cultivation.

- viii. *Housing*: sample households response shows that, the majority (79%) of the urban farming households and 47% of the non-farming households were live in their own house (see Table 2). On the other hand, 10% of the farming household participants and 19% from the non farming household participants are living private rented houses; while 11% of the farming household participants and 34% from the non farming household participants live in rented house from different kebele Administration. This suggests that, urban households having their own house; may have more access to participate in urban farming to subsidize their income and food security.
- ix. *Annual income level of households*: it was found that there is a huge gap in annual income between urban farming participants and non-farming participant households. The analysis of information in Table 2 shows that the mean annual income of the urban farming household participants was 16,519.8 ETB (equivalent to 855.5 USD). Whereas, those of non-farming household participants was 5,969.98 ETB (equivalent to 309.33 USD). This shows that urban household farmers were found to be high income earners and the finding confirms that there is significant income difference between the urban farming and non-farming household participants. This high income status of urban farming participants might increase their ability to procure capital intensive technologies as income level has a positive relationship to technology adoption (Agbamu, 2006).
- x. *Per capita food expenditure*: The results in Table 2 show that the per-capita food expenditure of urban farming households was 397.59 ETB. Whereas, per capita food expenditure of non-farming urban household participants was 314.80ETB or equivalent to 16.06 USD. This suggests that the urban farming households' consumption exceeded by 20.82% when compared to the non-farming household participants. The household size in both cases was not significantly different. This high income status of urban farming household participants might increase their ability to purchase and consume more and diversified food. The high income status of the same urban farming household participants is also representing to have access to food from their own farms with only at production cost.

xi. Farm size of the households: The mean farm size of the urban farming household respondents was 0.70 ha (see Table 3). This suggests that the majority of the urban farming household participants with less than one hectare of land. To elaborate this further 84.28% of the urban farming households own between 0.25 ha to 1 ha of farm land; while others 15.71% own between 1ha to 1.5 ha farm land. This means that most of the urban farmers have been on subsistence level. This might be connected to the difficulty in acquiring land for farming purposes in the city; and sample interviewees did report that they all face land constraints. Moreover, at different regional cities of the country the same problem is reported; for instance Dereje, A. Margaret P. and Wubetu B, (2007) reported that; individual plots were generally small. The largest farms in Mekele town, located in Aynalem averaged 0.5 ha, whereas in Industry, in the heart of town, plots, unsurprisingly, did not even average 0.1 ha). In a similar context, studies have shown that most urban farmers in Nigeria operated on small scale (Aniedu, 2006).

Moreover, most of the vegetable growers around Akaki Kality were complaining about losing their vegetable farm for the other business. In addition the expansion of the city is also constraining UA by affecting long-term land development and expansion of farm lands. Focus groups also pointed out that the bureaucracy in getting license for dairy and poultry production added with lack of entrepreneurial skills hindered involvement of smallholder farmers to engage on these businesses.

xii. Government Agricultural Extension services: The majority (64.28%) of the sample respondents had no on field governmental extension service throughout the year; while the other 35.72% had at least twice extension service in a year. This suggests that, there is a limited extension service provision for urban farmers in the case study area (see Table 3). (Okolo.D, 2006) found that exposition of the farmers to government extension services and their access to general agricultural information increases the probability to adopt a new technology. It is, generally, believed that the presence of enabling and efficient extension services at the local level have a direct effect on the innovativeness of farmers. This, undoubtedly, plays a significant role in improving the level of households' income and food security.

Table 3: Specific Characteristics of Sample Household Participants.

Variable	Mean	Std. Dev.
Self employed	0.70	0.46
Employed on other farm	0.01	0.12
Working Non-farm activities	0.13	0.34
Farm size of the HHs	0.71	1.08
Extension contact	0.64	0.48
Farming experience	16.79	11.66
HHs attitude towards UA	4.23	0.52
Type of urban agriculture Adopted		
Vegetables production	0.24	0.43
Livestock keeping	0.51	0.50
Mixed farming	0.24	0.43

Source: Field survey, 2013

- xiii. *Farming experiences:* Table 3 above shows that the mean farming experience of the sample respondents is 16.78 years. Despite the majority (45.71%) have urban farming experience between 1 to 15 years, other 44.28% have between 16 to 30 years of experience; while the remaining 8.75% have between 31 to 46 years of experience. This suggests that most of the sample respondents are well experienced in urban farming; and are expected to have acquired relevant skills for effective operations. However, it may not be possible to generalize experienced farmers are effective without proper farm extension support services and technology transfer for effective farming practices. Analysis results in Table 3 show that the average urban households' attitude towards urban farming is scaled as important (4.23). This was measured based on important benefits derived from urban farming and ranked from 5 to 1 (See Table 11).

4.1.2. Types of Urban Agricultural Production Practices

The types of agricultural activities practiced in Addis Ababa (case study area) can be divided into three main categories: namely vegetable crop production, livestock rearing, and mixed farming. In the present context, mixed farming includes both crop and livestock production. Finding results in Table 3 above reveal that the majority (51.43%) of the sample respondents has been practicing Cow's milk and poultry production, 24.29% of the respondents are vegetable crop growers; while those practicing mixed farming accounted for 24.28%. This

suggests that even though urban farming has been providing a variety of farm products for the urban farmers and consumers, livestock production practices appears to have overtaken the share because of its comparatively small size of land requirements. According to Van Veenhuizen and Danso (2007), urban farmers undertake the production of profitable products that are in high demand, such as green leafy vegetables, eggs, milk, mushrooms, medicinal herbs, flowers and ornamental plants. Because of this, urban farmers have a comparative advantage over rural farmers/producers.

a. Vegetable Productions

According to the respondents report and researchers' observation, a diversity of vegetable crops are grown across the surveyed sub-cities in Addis Ababa; either for home consumption or for sale or for both.

Table 4: Vegetable Production, Consumption by HHs, Qty Sold and Total Value.

Vegetable Types	Vegetable production	Home Consumption	Quantity Sold	Total Value
	Mean	Mean	Mean	Mean
Cabbage (Kg)	5,980.65	42.00	5,861.29	13,536.85
Leafy vegetable (Kuntal)	21.21	1.30	18.54	2,512.88
Onion (Kg)	930.00	51.67	1,054.00	5,748.00
Tomato (Kg)	3,150.00	25.00	3,125.00	34,235.00
Potato (Kg)	2,976.25	47.10	3,035.00	7,828.92
Carrot (Kg)	871.00	11.13	887.67	3,667.50
Beet root (Kg)	2,658.55	39.67	2,732.71	6,539.35
Paper (Kg)	40.00	29.50	21.00	462.00
Total	2,638.34	30.60	2,705.81	7,716.87

Source: Field survey, 2013

Table 4 reveals that the majority (90%) of the households' annual and/or seasonal vegetable produce is used for sale as compared to what is consumed at home. From the total vegetable crop types produced, cabbage and potato take the lion's share for urban farmers' income source. On the other hand, pepper and leafy vegetables are consumed more than what is to be sold by the households. Almost all the sample vegetable growers reported that, they cultivate

vegetables mainly for selling in local markets. Producers use money for purchasing their food stuffs and for covering other household expenses. Though vegetable production is widely practiced by different households in the research area; and its return is fast and profitable as compared to livestock production, it has currently, become vulnerable due to large scale urban expansion and shortage of land. Vegetable production needs less initial capital investment and larger production land as compared to livestock production. On the other hand, Even though livestock production needs higher initial capital investment; facing the growing shortage of land, in the future, urban farming households may be forced to shift to livestock production giving less focus on vegetable production. But, the present situation of UA in sampled areas, however, shows that, about 90% of urban farmers are highly dependent on UA in terms of occupation, sources of income and food expenditure (see Appendix III-VI).

b. Cow's Milk and Poultry Production

Among total randomly sampled households in the case study area (A.A), some 51% are (Cow's milk and poultry) producers in both sample sub-cities (Akaki kality and Bole). The research work focused on cow's milk and poultry production is due to livestock production is the common urban agricultural business in urban Ethiopia (see Table 5).

Table 5: Total Productions, Consumption at Home, Quantity Sold and Total Value.

Animal products	Animal origin	HHs Home	Quantity	Total
	production	consumption	Sold	Value
	Mean	Mean	Mean	Mean
Milk (Lit)	609.16	34.77	582.94	6,447.08
Butter (Kg)	1.33	0.50	0.75	82.50
Cottage cheese (Kg)	0.75	0.00	0.75	25.00
Sure milk (Lit)	19.50	19.50	0.00	0.00
Three month chicken (number)	103.40	0.00	87.50	8,662.50
Meat chicken (number)	98.00	4.57	515.71	5,770.71
Egg (number)	715.50	28.82	368.78	8,447.25
45 day chicken (number)	23.67	1.50	22.67	1,260.00
Cow dung (kuntal)	19.79	3.48	32.43	247.91
Total	304.44	17.97	297.27	3,928.57

Source: Field survey, 2013

Findings of the study (see Table 5) above, show those households' average milk production per season was 609.16 liters and consumption 34.77liters. On the other hand, the average quantity sold per same season was 582.94liters, generating 6,447.08 ETB. Study results show that, from the total cottage cheese produced per the same season, urban households had sold almost 100% of the produce. This is inversely related to sure milk production, consumption, quantity sold and total value. As compared to cow's milk, poultry production, consumption and quantity sold had taken over the lion's share of households' income. Especially, a three months chicken and egg are fully produced for commercial purposes; and sample respondents reported that, they were generating high households' income.

c. Mixed Farming

Urban farmers who are practicing mixed farming were found to be most common in all of the survey areas, of Addis Ababa. Assessment results show that over 24.29 % of the households in sample areas are involved in mixed farming (crop and livestock production together) (for detail see Appendix II). Use of the produces sample mixed farmers is similar to the practices of both crop and livestock producers. Hence, in a similar manner urban mixed farmers consume and sell their vegetable and livestock produce.

4.1.3. Asset Ownership of the Urban Farmers

The study results (see Appendix I) show that, among the urban farming households, about 20% of them have oxen; 35% have cow's milk; 16.4% have equine; 12.14% have sheep and goats; 10.7% have chicken; 13.57% own water pump for irrigation use; 38.57% have different types of farm equipments; 13.57% have a storage room for care; and 3.5% have farm vehicles. The study results also indicate that, most of the urban farmer households are engaged in dairy cattle production having their own farm equipments; and it is only 0.7% of the sample that are found owning their own feed processing machine.

4.2. Econometric Analysis of Impact Evaluation

In this study three different methods were used to analyze the impact of household participation in urban agriculture on their income and food security level. The level of Food security is measured using household food expenditure.

OLS (ordinary least square)

The first method applied is OLS (ordinary least square). OLS has its own limitation due to the absence of counterfactual in the data. The second method applied is PSM technique. Kernel and neighborhood matching technique were also employed for matching. One risk with the kernel method is that, only a small subset of non farming participant households will ultimately satisfy the criteria to fall within the common support; and thus, construct the counterfactual outcome. In Nearest Neighborhood matching each treatment unit is matched to the comparison unit with the closest propensity score. Finally Instrumental Variable Regression Technique has used to control on their endogeneity problem in the participation variable.

In a sequential discussion, first the result of PSM has discussed. Hence, propensity score matching constructs a statistical comparison group that is based on a model of the probability of participating in the treatment, using observed characteristics. Participants are then matched on the basis of this probability, or propensity score, to nonparticipants. The average treatment effect of the participation is then calculated as the mean difference in outcomes across these two groups. Identification is a problem because even if households are matched along a vector of different characteristics, one would rarely find two households that are exactly similar to each other in terms of many characteristics. Because many possible characteristics exist, a common way of matching households is propensity score matching. Therefore, PSM avoids the curse of dimensionality associated with trying to match participants and nonparticipants on every possible characteristic. Before running PSM technique, it is important to analyze the probability of households' participation in urban agriculture.

Estimation of Propensity Score

Table 6 below presents the result of participation equation. According to the study findings presented in the same table, households' attitude to urban agriculture, access to farm credit and owning house is positively related with probability of participation in urban agriculture and are more likely to participate in urban agriculture. The region of common support for distribution of estimated propensity scores of members and non-member ranges from 0.13013544 to 0.99670913. In this study, observations that are outside the common support region are dropped.

Table 6: Probability of households Participation in Urban Agriculture

UA participation	Coef.	Std. Err.	Z
Age of the HHs head	-0.016	0.012	-1.26
Gender	-0.958	0.6	-1.6
Log total expenditure	0.039	0.314	0.12
HHs size	-0.062	0.106	-0.58
Married households	-0.366	0.667	-0.55
HHs attitude to UA	0.495*	0.27	1.83
Retired	-0.755	0.48	-1.57
Own house	0.950***	0.319	2.98
Private rented house	0.240	0.424	0.57
Farm credit access	0.828**	0.336	2.46
Credit saving member	-0.099	0.275	-0.36
Constant	28.821	24.661	1.17
LR chi2(11)	42.99		
Prob > chi2	0.00		
Pseudo R2	0.2215		
Log likelihood	-75.5456		
Number of obs	140		

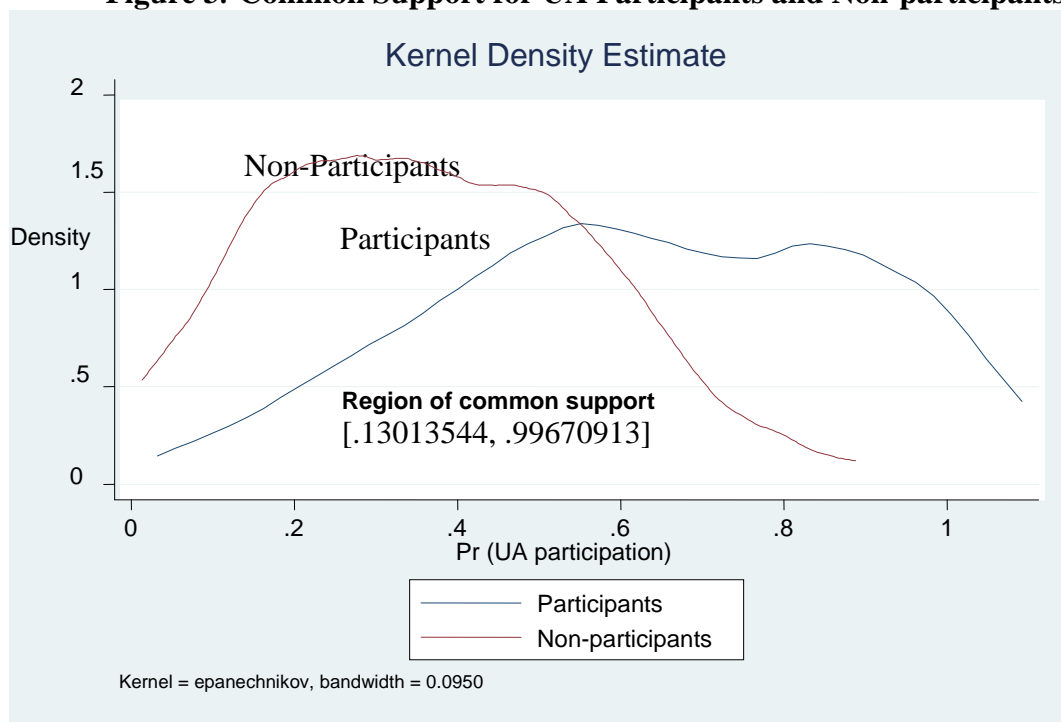
*Note that: ***, **and * statistically significant at 1%, 5% and 10% probability levels, respectively.*

Source: Field survey data, 2013

UA=Urban Agriculture, HH=Household

Before running the PSM technique, it is important to create a counterfactual for the treatment group. In PSM case, a graph used to show the common support on which the impact evaluation to estimate average treatment effect on the treated. Figure 3 below indicates the common support for the impact evaluation. The study does not include those households that are outside the common support. Only households that fall within common support are included for the study to ensure comparability. The bias in propensity score matching program (Figure 3) estimates was lowered as it is used the same survey instrument and source of data, i.e, a representative sample survey of eligible (#140) was used to facilitate good matching and finally, both groups were chosen from the same geographic area having same socio-cultural background.

Figure 3: Common Support for UA Participants and Non-participants



Source: Field survey data, 2013

In evaluating the reliability of estimates, Figure 3 above clearly shows both participants have similar characteristics indicating robustness to the hidden bias. After matching, there is no statistically significant difference observed between participants and non-participants. The above figure also shows, the two groups (participant and non participants) have substantial overlap in the distribution of propensity score.

Average Treatment Effect on the Treated (ATT)

The impacts are estimated using various estimators, including: Non-parametric kernel method and Nearest-neighborhood matching technique. Moreover, IVREG and the naive t-test method has employed for same purpose.

Table 7: Impact Evaluation Summary Using OLS, PSM and IVREG Techniques

Indicators	ATT estimation of participation in UA by PSM						OLS (Naive) Method			IVREG		
	Kernel Matching			Neighborhood			ATT.	Std. Err	t	ATT	Std. Err	t
	ATT.	Std. Err	t	ATT	Std. Err	t						
Income	1.13	0.16	7.19***	1.03	0.28	4.01***	1.35	0.11	12.57***	1.89	0.332	5.69***
Food-Expenditure	-0.01	0.12	-0.03	-0.05	0.14	-0.34	0.16	0.09	1.73**	0.65	0.14	4.42***

Note that: ***, **and * statistically significant at 1%, 5% and 10% probability levels, respectively.

ATT=Average Treatment effect on Treated, PSM=Propensity Score Matching.

Source: Field survey data, 2013.

Analysis results in Table 7 above show that households' participation in urban agriculture has significant effect on their income level. This is indicated in all the methods used, showing a robust result. The findings in Table 7 however, show that households participation in urban agriculture have mixed result. That is same results indicate that participation in urban agriculture has significant effects when using OLS and IVREG methods. On the other hand, there is no effect when using PSM technique. Food expenditure has a proxy variable for food security might have a problem of endogeneity. This may be affected by the level of income, educational status, farming experience and other variables.

The reliability of the estimates from PSM methods depends on selection of observables. It is clearly important to check the robustness of the result on selection of observables. (i.e, if urban agriculture participants and non-participants are different in terms of unobservable characteristics, like motivation. This might create hidden bias in the estimation of the model. It is used the traditional instrumental variable regression technique to account for the self-selection problem due to unobservable characteristics. Using IVREG, the result is quite different for food security (see above Table 7). Here, it shows that household participation in urban agriculture has significant effect in improving both their income and food security level.

After the instrumentation, it is found that urban agriculture has a significant effect at 1% probability level on household level food expenditure and income (see details in Appendices V and VI). After controlling for 5 variables: household size, married household, urban participation, gender and farm credit, it is found that households' participation in urban agriculture still has a significant effect on household level food expenditure and income. Table 8 below shows the two stage least square method. The table shows the average treatment effect of urban agriculture on the participant households' food consumption expenditure.

Table 8: IVREG: Average Treatment Effect on Food Expenditure

	Robust		
log_foodexp	Coef.	Std. Err.	Z
Age of the HHs head	0.002293	0.003416	0.67
Gender	-0.01883	0.181251	-0.1
HHs size	-0.08575***	0.030959	-2.77
Married households	0.427122**	0.179329	2.38
HHs attitude to UA	0.046123	0.084868	0.54
Private rented house	0.250881	0.142305	1.76
Farm credit access	-0.05578	0.126197	-0.44
Credit saving members	0.148396	0.101038	1.47
UA participation	0.652472***	0.147535	4.42
_cons	1.232437	6.682422	0.18
/athrho	-0.95284	0.260226	-3.66
/lnsigma	-0.69819	0.079083	-8.83
Rho	-0.74107	0.117315	
Sigma	0.497483	0.039342	
Lambda	-0.36867		
Prob > chi2	0.0064		
Wald chi2(9)	44.86		
Prob > chi2	0.0000		
Wald test of indep. eqns. (rho = 0): hi2 (1)	7.43		
Log pseudo likelihood	-152.68224		
Number of obs	140		

*Note that: ***, **and * statistically significant at 1%, 5% and 10% probability levels, respectively.*

Source: Field Survey data, 2013

- a. *Household Size:* As pinpointed in various literatures, household size is identified as one of the important demographic factors that negatively affect household food security status. In light of this, it was hypothesized that household size acts as a push factor for urban farming to support the households' additional food demand, in such a way that households with large family size have more chance of being food insecure than those with small family

size. In this study, the family size is found to be highly significant to participate in urban agriculture in generating additional income and improve household food security level. The coefficient for household size was found to be negatively related with household level food expenditure and statistically significant at 1% probability level. This indicates that larger household size tends to be exposed to larger amount of food expenditure as compared to those with smaller household size in the study area.

- b. *Married households*: This variable affects positively the level of household food expenditure and its effect is significant at 5% probability level in the study area. The positive relationship implies that married households have better chance to participate in urban agriculture and secure their household level of food expenditure.
- c. *Urban agriculture participation*: The sign of the coefficient of this variable showed a positive relationship with household level income and food expenditure; and is significant at 1% probability level. The positive relationship implies that households with access to urban farming have the capacity to generate additional income with less chance to be food insecure (have a better purchasing power than non-participants in urban agriculture). This result is fully in conformity with the previous expectation. This is due to the fact that urban agriculture participation gives the households an opportunity to be involved in income generating activities so that derived revenue increases their financial capacity and purchasing power of each household to escape from the risk of food insecurity.

This concurs with previous hypothesis which predicted the positive and significant effect of households' participation in urban agriculture. Analysis results using IVREG method (see Table 8 and 9) reveals that households' participation in urban agriculture is an endogenous variable. It was tested for endogeneity problem involving retired farmers and interviewees that have their own house as an instrumental variable.

The table 9 below shows the average treatment effect of urban agriculture on the participant households' level income.

Table 9: IVREG: Local Average Treatment Effect on income.

	Robust		
Log income	Coef.	Std. Err.	Z
Age of the HHs head	-0.00414	0.00527	-0.79
Gender	0.545255***	0.159829	3.41
HHs Size	0.078735	0.050374	1.56
Married households	0.212221	0.157304	1.35
HHs attitude to UA	0.035781	0.119787	0.3
Private rented house	0.224067	0.142234	1.58
Access to Farm credit	-0.32691**	0.148832	-2.2
Credit saving member	0.110382	0.130561	0.85
UA participation	1.890078***	0.33227	5.69
Constants	14.97393	10.38905	1.44
/athrho	-0.78657	0.386614	-2.03
/lnsigma	-0.41845	0.1246	-3.36
rho	-0.65646	0.220005	
sigma	0.658066	0.081995	
Lambda	-0.432	0.193921	
<i>Prob > chi2</i>	<i>0.0175</i>		
<i>Wald chi2 (9)</i>	<i>82.33</i>		
<i>Log pseudo likelihood</i>	<i>-197.6543</i>		
<i>Prob > chi2</i>	<i>0.0000</i>		
<i>Wald test of indep. eqns. (rho = 0): chi2(1)</i>	<i>5.65</i>		
<i>Number of obs</i>	<i>140</i>		

Note that: *, **and * statistically significant at 1%, 5% and 10% probability levels, respectively.**

Source: Field Survey data, 2013

- a. *Gender/ Sex of the household head:* This variable is significant at 1% probability level in households' level of income in the study area. The positive relationship means that male household heads have better chances to generate income as compared to female household heads through participating in UA. This is possible because male headed households are

mostly less participant in informal income generating sector, (i.e, they mainly lead their household life by engaging in formal income generating activities). However, this variable affects urban participation negatively and significantly at 1% and 5% probability level in the case of household income and food expenditure respectively. This negative relationship may indicate that in the study area male headed households were more sensitive to secure household level food expenditure through urban farming participation.

b. Access to farm credit services: The sign of the coefficient of this variable showed a negative relationship with household income; and is significant at 5 % probability level. The negative relationship implies that households with access to formal farm credit service have less chance to be low income generating households than those who do not have access to the same services. This result is fully in conformity with the prior expectation. This is due to the fact that credit services give the households an opportunity to be involved in income generating activities so that derived earned revenues increase the financial capacity and purchasing power of the households to escape the risk of food insecurity. Moreover, it helps to smooth food consumption when households face temporary food shortage.

This result conforms to the findings of Hovorka *et al* (2009) which states that urban farmers in Ghana did not have access to formal credit schemes due to their limited land space for cultivation. However, access to farm credit services positively affects urban farmers' participation; and is significant at 1% and 5% probability level of food expenditure and income, respectively in the study area. This coefficient sign indicates households who have access to farm credit have the opportunity to involve in urban agriculture than those who do not have access to farm credits services.

c. Households' attitude to urban agriculture: This variable affects households' participation in UA positively; and is significant at 5% probability level. The positive relationship suggests that urban households who have a positive attitude towards urban farming have a better chance to generate household income at least from one of the urban farming activity. The positive attitude of households towards participation in urban farming may ensure their household level of income and food expenditure.

d. Owning house: This variable affects households' participation in UA positively; and is significant at 1% probability level to their food expenditure. Similarly, owning house

positively affects households' participation in UA and is significant at 5% probability level to their income. The positive relationship implies that household having their own houses have better chances to participate in urban farming than those who do not have their own houses. This is due to the fact that owning a house gives a household an opportunity to be involved in urban farming to generate additional household level income and supplement food expenditure.

e. Retirement: This variable affects households' participation in UA negatively and significantly at 1% probability level to their food expenditure and at 5% probability level to households' level income. Assessment results show that, retired household heads benefit less from urban agriculture. Comparatively; the youth groups are more benefiting in generating more income followed by retired participant household heads than non-participants retired household heads. The negative relationship indicates that retired households are less participants in urban agriculture than the youth working group. The possible explanation is that households' with non-retired household heads largely participate in urban farming working effectively; are competent; have diversified income; easily adopt appropriate technologies; and are relatively visionaries in establishing modern urban farming systems.

4.3. Constraints and Opportunities of Urban Agriculture

4.3.1. Constraints facing urban farmers

Analysis results in Table 10 below show the mean scores of the Likert rating of the factors considered as constraints to urban farming by the sample respondents. Three factors out of ten were rated as the most important constraints. These include: limited access to farm land ($X=4.51$), poor farm extension services ($X=4.30$); lack of farm credit services ($X=3.97$); and limited veterinary services ($X=3.90$), in their sample order. This implies that most of the sample respondents could not gate access to credit services for investment in urban farming. They also lacked access to farm extension services and legal support for UA shade construction. The absence of these critical institutional services coupled with limited access to land are constraints responsible for lowering farm productivity, household income and food security. This finding agrees with that of Egbuna (2008) who identified some of the constraints for the development of urban agriculture in Nigeria that include poor access to land, lack of support services (like farm credit, farm extension and production inputs supply), and high cost of labor among others.

Table 10: Mean Scores of Likert Rating of Factors Affecting Urban Agriculture

Constraints (Factors affecting UA)	Mean scores	Ranking
Limited Land access	4.51***	1 st
Lack of market linkage & specified market place	3.6	9 th
Lack of farm credit	3.97*	3 rd
Limited access and Expensive production inputs	3.8	7 th
Limited access and high cost of animal feed	3.95	5 th
Limited access to improved varieties/breeding	3.95	5 th
Limited extension Services	4.30**	2 nd
Limited irrigation access	3.45	10 th
Limited veterinary service	3.9*	4 rd
Severity of disease and pests	3.81	8 th

Source: Field Survey, 2013

*= Serious constraints.

4.3.2. Opportunities of Urban Agriculture

Analysis results in Table 11 below show the mean scores of the Likert rating of the benefits considered as opportunities of urban farming by the sample respondents.

Table 11: Mean Scores of Likert Rating of Opportunities Gained from Urban Agriculture

Opportunities	Mean scores	Ranking
Higher consumption of vegetables and forage	4.72*	1 st
Availability of improved inputs in low cost and transportation services	4.45	6 th
Farm near animal corrals and market (Easy for management)	4.63*	3 rd
Extended cultivable areas, short plant life, daily income and year round work.	4.5	5 th
Availability of different Services	4.34	7 th
Higher return	4.54	4 th
Variability and availability of vegetables and forage for urban dwellers	4.7*	2 nd

Source: Field Survey, 2013

*= higher opportunities.

Three higher benefits out of seven were rated as the most important opportunities of urban agriculture. These include: higher consumption of vegetables and forage at household level ($X=4.72$); Variability and availability of vegetables and forage for urban dwellers ($X=4.70$); and ease for management ($X=4.63$) in their respective order. This implies that most of the

sample respondents could benefit to their household consumption and sale for neighbor households. The practice of urban farming at urban level helps the practitioners' to supplement their income and household expenditure.

4.4. Discussion

The purpose of this study is to provide empirical evidences that characterize the socio-economic nature of urban agriculture, its impact on households' welfare (household level food security and income) as well as challenges and opportunities taking the experience of urban agriculture in Addis Ababa. The study applied various impact evaluation methods like PSM, IV and the Naive method to evaluate the impact of households' participating in urban agriculture on their income and food consumption expenditure.

The study was carried out in two large sub cities of Addis Ababa (Bole and Akaki kality) experiencing UA, considering 140 sample urban households. The Sample households are selected equally from UA participants and non participants having the same socio-cultural and agro-ecological area. The questions that include the socio-economic characteristics of UA, the impact of UA on income and food expenditure of urban households, opportunities, and major constraints of UA in Ethiopian cities, and finally its policy suggestion were addressed by the research.

The role and impacts of UA on household level income and food security which was measured by taking the proxy of food expenditure, and socio-economic challenges in relation to urban farming as well as benefits derived are investigated. As indicated in the descriptive part above, urban farming in Addis Ababa was found to contribute significantly (75%) to the livelihoods of urban farmers at both sectoral and household levels. The 75% contribution of urban agriculture to the livelihood of households can be attributed (51%), to livestock rising and (24 %) to vegetable crop production.

Urban farmers produce a variety of vegetable crops and livestock products for home use and/or for the market. The fact that dairy cattle's farming is the most common activity by many urban farmers in the city implies farmers' options for commercialization. Cultivating vegetable crops is a relatively a more common practice for crop producers; and this may be associated with the sample size of landholdings (being small), and suitability of vegetables for cultivation, piece by piece harvesting and their liquidity. With the respect to urban livestock production, mostly it is

dairy cattle raising that are widely practiced by most urban farmers. This may be because of land constraints faced by households as it requires relatively small size of land despite its high initial investment requirement.

Urban farmers in Ethiopian cities make their livelihood strategies from different farm and nonfarm based activities. The result in the case study area show that, over 75 % of the total income of the urban farming community is derived from crop production and livestock keeping, or both. Among the total households' annual income in the case study area, vegetable production contributes to 46 %, while livestock keeping accounts to 24%. Income share of non-farm based activities is found to be relatively low, accommodates to less than 30% of the households total income.

In this study, it was found that the mean annual income of the urban farming households was 16,519.8 ETB (equivalent to 855.5 USD). In light of this it was hypothesized that urban agriculture is the major source of livelihood for urban farming households contributing the larger share of the total income. Participation in UA was found to be highly significant in contributing households' food expenditure and income. This indicates that households' participating in urban farming tends to be generating additional income and has access to spend more money on food expenditure. This finding fully agrees with prior expectation. This high income status might increase their ability to procure capital intensive technologies as income level has a positive relationship with the level of technology adoption (Agbamu, 2006). The report also confirmed that "in the case study area; above-normal profits are earned by even the smallest-scale backyard producers with very low capital" (RUAF 2007).

As it is mentioned in various literatures, involving in UA is identified as one of the important coping households' mechanism to alleviate food insecurity problem; especially for women and disadvantaged groups. Urban households engaged in farming activities tend to consume greater quantities of food, sometimes as much as 30% more, FAO (2010). They also seem to have a more diversified diet, as indicated by an increase in the number of food groups consumed. Relatively higher consumption of vegetables, fruits and meat products translates into an overall higher intake of energy as well as higher calorie availability.

The study result generally shows that involving in urban farming is statistically significant at 1% probability level as tested by OLS and IVREG. This indicates households' participation in

UA improves the status of their level of food security. This result fully agrees with prior expectation. As RUAF (2007:2) report emphasized that the contribution of UA to household food security and healthy nutrition is probably its most important asset. Moreover, RUAF (2007) also reported that the poor households in developing countries spend 50-70 % of their income to purchase foods; hence, it appreciated the benefits of self-growing crops and/or participating in other forms of UA by the urban poor.

It was found that, urban farming households have significantly varied with different socio-economic variables. In this finding the average land size of the interviewed farming households is 0.7 ha. Among the sample households selected 84.28% have between 0.25 ha to 1.0 ha of farm land, and 15.71% of the households have between 1ha to 1.5 ha farm land. This might be because of land availability and individual's ability to work on it. This implies that the farm sizes of the households are statistically different; and most of the urban farmers are operating on subsistence level, using farm land below one hectare. This finding concurs with Daniel Senkgoa (2006), who reported that the sizes of the plots differ according to the availability of space and the ability of the individual to work in the area. Moreover, studies by (Emodi, 2009) have shown that most urban farmers in Nigeria operated on small scale. Similarly, it was found that 76% and 24% of the urban farm households in the case study area are male and female headed households respectively and this finding coincides with the prior expectation.

The households mean farming experience in the case study area is 17 years with a standard deviation of 11.66. This implies that most of the respondents in the case study area and other Ethiopian cities are well experienced in urban farming, and are expected to have acquired relevant skills for effective operations. The finding of this study is found consistent with what had been reported by Salau, E. S and Attah, A. J (2012). Moreover, among the sample respondents 65.72% never had access to farm credit services while 34.28% had access to it. This finding is in same line with the study findings of Hovorka *et al* (2009), who reported that urban farmers in Ghana did not have access to formal credit schemes due to their limited land space for cultivation.

The majority of sample respondents (64.28%) had no access to farm extension support throughout the year; while 35.72% of them had at least four extension contacts in a year. This implies that, there is a significant difference between urban farmer households and a very poor extension service for urban farmers in the case study area as well as major urban settings (see

Table 3). Phoebe *et al.* (2000) found that exposition of the farmers to extension services and their access to general farming information increase the probability to adopt the new technology.

Similarly, the analysis results have revealed that, 20% from the participants and 7% from non-participants haven't attended formal education, whereas 40% of UA participants and 15% of non-participant households had primary to junior education level. In the same way, 22% of the UA participants and 29% of non-participant households attended secondary education; and 19% of the participants and 50% of non-participant households had attended tertiary level. Many of the urban farmer household heads had below secondary school education (82%); and this suggests that urban farmers are not capable to adopt new technology. This result agrees with prior hypothesis and conforms to the findings of Agbamu (2006). Agbamu argued that, formal education has always been known to positively influence the adoption of improved technology by farmers. Generally speaking, there is a significant difference between urban household in-terms socio-economic variables.

The finding of the study (see appendix II) reveals that, among the interviewed urban farm households, 51.5% keep livestock (mostly Cow's Milk and poultry production); and about 24.28% of them are engaged in different vegetable production followed by 24.28% covering mixed farming practices across the surveyed sub-cities. This result is fully in conformity with the prior expectation, which says that there is a significant socio-economic difference among different urban farmers in terms of types of urban agriculture. From the focus group discussion report and researchers' observation, the socio-economic difference among urban farmers is may be due to family background, land availability and ability of the households to cultivate either of two or both.

The analysis result have revealed that, some 70% of the urban farm households are self-employed, earning mean annual income of 16,519 birr (855 USD). This income helps them to adopt new technology; cover their household expenditure. This result signifies that urban farm households are fully engaged in different types of urban agriculture; not only to subsidize their income from mainstream businesses, but also considering it as a major occupation. This result is beyond the prior expectation. According to van Veenhuizen (2006) report, urban agriculture supports food security and nutrition, provides employment and generates income for the urban poor in general and the disadvantaged groups such as women, the disabled, the elderly and the

unemployed youth in particular. According to Armar-Klemesu (2006), about 200 million urban dwellers in the world participate in urban farming and the sector provides about 800 million people with at least some of their food.

CHAPTER FIVE

CONCLUSIONS AND POLICY SUGGESTION

5.1. Conclusion

The purpose of this study was to provide empirical evidences on the role and impact that urban agriculture contributes to the socio-economic development, household level income and food security of urban dwellers in Ethiopia, taking Addis Ababa as a case study. The role of urban agriculture in household income and food security; and socio-economic challenges in relation to urban farming were investigated. As the case study result revealed; urban farming was found to contribute significantly (70-75%) to livelihood of urban farmers at household level; income and food security; for which livestock and vegetable production accounted for 51% and 25%, respectively. The urban farmers produce a variety of crops and livestock for home use and market. The fact that mixed farming is a common activity by many urban farmers implies farmers; options for diversification.

The result in Addis Ababa revealed that urban farmers in most Ethiopian cities are socio-economically different to one another. (i.e, age of the household head, major occupation, marital status, sex of the household head, level of education, farm size, household size, households attitude towards urban agriculture, and owning housing, which might have also implication on their Livelihood strategies. The majorities of farmers have low formal education and consider farming as their major occupations. Participation of the youth is relatively low in the sector, leaving it for adults over 45 years old and women who also support large families. Most of the urban farming households are a member of farmer's organization that may help them to enjoy and share any of the benefits of cooperatives. Insufficient earnings from non-farm sector and food insecurity were major reasons for adapting urban agriculture as survival strategy in the city, that is, to fulfill daily food and other essentials.

Using key informants and Focus group discussions, analysis of constraints in UA pointed that households have limited access to land; limited farm extension services; lack of veterinary services; lack of access to farm credit; shortage of improved seed and animal breeds; lack of production technologies; limited access and high cost of fertilizers and quality animal feeds; coordination gap among government bodies for the sector are considered among major factors that constrained urban agricultural development in the urban areas in Ethiopia.

Finally, urban agriculture in Ethiopia, particularly in Addis Ababa city is left with a range of policy implications. Despite its dominant contribution to the welfare of the urban farmers, urban agriculture is strikingly found to remain as a survival strategy for the urban poor and a source of income for the better-off households. The asset constraints for farming typically limited the livelihood outcomes of the poor urban farmer households, and showed a significant difference in income status between the participants and non farming households. Generally, lack of assets such as animal breed and access to credit services, farm land, inputs and technology constraints were found to significantly hold investments on farming in Ethiopian cities, and particularly Addis Ababa city for low income urban farmer households.

This study used very classical way of measuring income and food security. New studies could use more reliable methods; considering the limitations of this study like BMI or Dietary based evaluations and there should be a detailed investigation of urban agricultures' role. Any research that could be done should be considering a representative sample size to generalize at Ethiopia level. Moreover, since PSM suffers from missing data problem further impact evaluation should use more quasi-experimental techniques like Regression discontinuity etc

5.2. Policy Suggestion

Current employment situations, level of food security and income in the urban areas are becoming a challenge both for urban dwellers and to the government. Thus, urban agriculture should be regarded as an integral component for urban income generation, employment and food systems. However, certain constraints were facing the venture. Based on the study findings the following policy suggestions are provided for consideration:

The country policy makers, urban planners, city/town Administrators and other stakeholders should partially change their attitude and see urban agriculture as a viable sector that could contribute to households level income, food security, and nutrition of the urban dwellers; and absorb urban waste. In a labor-rich, but capital poor country such as Ethiopia, urban agriculture should, therefore, be encouraged, strengthened and given recognition for its role and impact towards increasing households' welfare in urban planning and development. The problems of access to farm credit service, limited land access, high cost of production inputs; and insufficient extension service, lack of pragmatic rules guiding UA better if considered. To address the problems government and/or city/town administrators need to establish policy and strategy, especial fund, national and international link creation for collaborative work etc.

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APPENDICES:

APPENDIX I: Asset ownership of urban farming households.

Variable	Mean	Std. Dev.
Ox (no.)	0.2	0.401436
Milking Cow (no.)	0.35	0.478682
Horse and Donkey (no.)	0.164286	0.371865
Sheep and Goat (no.)	0.121429	0.349055
Hen/Chicken (no.)	0.107143	0.310405
Water Pump (no.)	0.135714	0.364044
Feed Processing machine (no.)	0.007143	0.084515
Farm equipment (no.)	0.385714	0.488511
Storage room(care/m)	0.135714	0.343715
Farm vehicles (no.)	0.035714	0.186243

Source: Field survey, 2013

APPENDIX II: Types and proportion of urban farmers interviewed, by sub-city.

Type of Urban Agriculture	Akaki-Kality	Bole	Total	% age
Vegetable producers	12	5	17.0	(24.28%)
Livestock keepers (Cow's Milk and poultry)	24	12	36.0	(51.5%)
Mixed farmers	9.0	8.0	17.0	(24.28%)
Total (%)	45	25	70	100

Note: Non-farm activities are not included.

Source: Field survey, 2013

**APPENDIX III: Econometric Analysis of Impact Evaluation with OLS (Naive) Method
on pc Food Expenditure**

Robust						
	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
log_foodexp						
UA participation	0.161612	0.093409	1.73	0.086	-0.02324	0.346466
Age of the HHs head	-0.00365	0.003457	-1.06	0.293	-0.0105	0.003188
Gender	-0.21264	0.205245	-1.04	0.302	-0.61881	0.193533
None of formal education	-0.25899	0.193429	-1.34	0.183	-0.64178	0.123801
Primary (1 to 6)	-0.18598	0.154368	-1.2	0.231	-0.49147	0.119504
Junior (7 to 8)	-0.01183	0.156853	-0.08	0.94	-0.32223	0.29858
Secondary (9 to 10)	-0.14241	0.14948	-0.95	0.343	-0.43822	0.153409
Preparatory/above	0.022325	0.144189	0.15	0.877	-0.26302	0.30767
HHs size	-0.07574	0.032318	-2.34	0.021	-0.1397	-0.01179
Married households	0.337654	0.209586	1.61	0.11	-0.07711	0.752418
Own house	0.102344	0.096236	1.06	0.29	-0.0881	0.292792
Private rented house	0.236948	0.131532	1.8	0.074	-0.02335	0.497246
Retired	-0.27469	0.114343	-2.4	0.018	-0.50097	-0.04841
_cons	13.57625	6.803369	2	0.048	0.112582	27.03992

Source: Field survey, 2013

*Note: Linear regression Number of obs = 140, $F(13, 126) = 3.99$, $Prob > F = 0.0000$
 $R\text{-squared} = 0.2148$, $Root\ MSE = 0.44696$*

**APPENDIX IV: Econometric Analysis of Impact Evaluation with OLS (Naive) method on
Income**

Log income	Robust					
	Coef.	Std. Err.	t	P>t	[95% Conf.]	Interval]
UA participation	1.348907***	0.107353	12.57	0.000	1.136458	1.561356
Age of the HHs head	-0.01379**	0.005741	-2.4	0.018	-0.02515	-0.00243
Gender	0.322918**	0.151264	2.13	0.035	0.023571	0.622265
None of formal education	-0.61589**	0.250187	-2.46	0.015	-1.11101	-0.12078
Primary (1 to 6)	-0.28946	0.23199	-1.25	0.214	-0.74856	0.169638
Junior (7 to 8)	-0.4585*	0.254501	-1.8	0.074	-0.96215	0.045145
Secondary (9 to 10)	-0.20315	0.217687	-0.93	0.352	-0.63395	0.227644
Tertiary	0.100633	0.220017	0.46	0.648	-0.33477	0.536039
HHs size	0.061894	0.041923	1.48	0.142	-0.02107	0.144858
Married households	0.152865	0.185135	0.83	0.411	-0.21351	0.519242
Own house	0.229791*	0.126259	1.82	0.071	-0.02007	0.479654
Private rented house	0.256616*	0.151758	1.69	0.093	-0.04371	0.556941
Retired	-0.20129	0.221067	-0.91	0.364	-0.63877	0.236196
Constraints	34.59943***	11.3166	3.06	0.003	12.2042	56.99465

Source: Field survey, 2013

Note: Linear regression Number of obs = 140, $F(13, 126) = 22.32$, $Prob > F = 0.0000$,
 $R\text{-squared} = 0.6183$, $Root\ MSE = .56743$

APPENDIX V: IVREG (Instrumental Variable Regression): Local Average Treatment Effect on pc Food Expenditure. When the intervention is dummy

Robust						
UA participation	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Retired	-0.93542***	0.311977	-3	0.003	-1.54688	-0.32395
Own house	0.866745***	0.281413	3.08	0.002	0.315186	1.418304
Age of the HHs head	-0.01941**	0.009864	-1.97	0.049	-0.03874	-7.3E-05
Gender	-0.78569**	0.316791	-2.48	0.013	-1.40659	-0.16479
HHs size	-0.10618	0.081396	-1.3	0.192	-0.26571	0.053354
Married households	-0.28726	0.329658	-0.87	0.384	-0.93338	0.358858
HHs attitude to UA	0.540211**	0.226947	2.38	0.017	0.095404	0.985018
Private rented house	0.161279	0.418492	0.39	0.7	-0.65895	0.981508
Farm credit access	0.803879***	0.306108	2.63	0.009	0.203919	1.403839
Credit saving member	-0.16954	0.268627	-0.63	0.528	-0.69604	0.356963
Constraints	36.54288	19.28748	1.89	0.058	-1.2599	74.34565
/athrho	-0.95284	0.260226	-3.66	0	-1.46288	-0.44281
/Insigma	-0.69819	0.079083	-8.83	0	-0.85319	-0.54319
Rho	-0.74107	0.117315			-0.89821	-0.41597
Sigma	0.497483	0.039342			0.426052	0.58089
Lambda	-0.36867	0.082548			-0.53046	-0.20688

Source: Field survey, 2013

Wald test of indep. eqns. (rho = 0): chi2(1) = 7.43 Prob > chi2 = 0.0064

Treatment-effects model -- MLE

Number of obs = 140

Wald chi2(9) = 44.86

Log pseudolikelihood = -152.68224

Prob > chi2 = 0.0000

APPENDIX VI: IVREG (Instrumental Variable Regression): Local Average Treatment Effect on income. When the intervention is dummy.

Robust						
UA participation	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Retired	-0.97877**	0.486894	-2.01	0.044	-1.93306	-0.02447
Own house	0.901831**	0.353557	2.55	0.011	0.208871	1.594791
Age of the HHs head	-0.01617	0.010975	-1.47	0.141	-0.03768	0.005337
Gender	-0.86824***	0.334191	-2.6	0.009	-1.52324	-0.21324
HHs Size	-0.03898	0.101139	-0.39	0.7	-0.23721	0.159246
Married households	-0.39505	0.388121	-1.02	0.309	-1.15575	0.365656
HHs attitude to UA	0.481303**	0.214239	2.25	0.025	0.061402	0.901204
Private rented house	0.233612	0.414933	0.56	0.573	-0.57964	1.046867
Farm credit access	0.688256**	0.28302	2.43	0.015	0.133546	1.242965
Credit saving member	-0.12182	0.266579	-0.46	0.648	-0.64431	0.400661
Constants	30.25386	21.65673	1.4	0.162	-12.1926	72.70027
/athrho	-0.78657	0.386614	-2.03	0.042	-1.54432	-0.02882
/Insigma	-0.41845	0.1246	-3.36	0.001	-0.66266	-0.17424
Rho	-0.65646	0.220005			-0.91284	-0.02882
Sigma	0.658066	0.081995			0.515478	0.840096
Lambda	-0.432	0.193921			-0.81207	-0.05192

Source: Field survey, 2013

* Wald test of independent eqns. (rho = 0): chi2 (1) = 5.65 Prob > chi2 = 0.0175

Note:

Treatment-effects model -- MLE

Number of obs = 140

Wald chi2 (9) = 82.33

Log pseudo likelihood = -197.6543

Prob > chi2 = 0.0000

APPENDIX VII: Operational definition, hypothesis and Measurement of Variables/Terms

S.No.	Independent Variables	Operational Definition (HHs head)	Hypothesis of independent variables on indicators	Measurement and categories
1.	Age	Age of the HHs head	More of the urban farmers are old people.	In completed years (Continuous)
2.	Education Level	The number of years HHs head attended formal education.	The more the educated/trained farmers, the higher the rate productivity. (<i>Agbamu 2006</i>), <i>Formal education has always been known to positively influence the adaption of improved tech. among farmers.</i>	0=primary, 1=secondary, 2=tertiary,(Categorical)
3	Gender	Sex of the household head	Majority of the urban farmers are women. <i>Hovorka et al (2009), women are the majority of among the UFs worldwide, 80% -Uganda and 56% Kenya.</i>	1 if he is male ,0 otherwise (Dummy)
4	Marital status	The marital status of the responder	Married HHs are the major participants of urban farming.	1=married, 2= single, 3= widowed (Categorical)
5	Major Occupation	Occupational status of the HHs head	There is occupational difference between farmers in treatments and control groups.	1= Civil Servant, 2= Trading 3=working on own farm/fulltime. (Categorical)
6	Farm size	Farm size of the HHs	Participation in urban farming is limited by land size. The more the farmers have access to land the higher probability to participate. <i>Aniedu, (2000) Emodi, (2009) found that most urban farmers operating on small scale size with the difficulty in acquiring land for farming purpose in the city.</i>	Size farm in ha. (Continuous)
7	Household size	The number of members of the HHs	The number of household size acts as pushing factor for urban farming to support the household additional food demand.	Number of years (Continuous)
8	Extension service	The professional	Has a direct effect on the innovativeness of	1 if he/she gets service

S.No.	Independent Variables	Operational Definition (HHs head)	Hypothesis of independent variables on indicators	Measurement and categories
		support provided for UFs	farmers and increase productivity. Phoebe <i>et al.</i> (2000) found that exposition of the farmers to extension services and their access to general farming information also increase the probability to adopt the new technology.	0 otherwise (Dummy)
9	Farming experience	The farmers Skill towards farming	There is a difference in terms of family experience between the treatment and the control groups.	Number of Years (Continuous)
10	Farmers Membership	Membership in farmer based associations	Participation in Member based organizations and urban farming has got positive relationship. <i>Agbamu (2006), argued that the greater the participation of urban farmers in social organization the more interaction with other farmers & the earlier adoption of innovations.</i>	1 if he/she yes, 0 otherwise, (Dummy)
11	Farm credit	Access to credit	Farm size and farm credit has got positive relationship in urban farming setting. <i>Hovorka et al (2009) urban farmers in Ghana did not have access to formal credit schemes due to their limited land space for cultivation.</i>	1 if he/she yes, 0 otherwise, (Dummy)
12	UA participation	Getting job on urban agriculture	Participation in urban farming has a positive effect on income, productivity and food security.	1 if he/she yes, 0 otherwise, (Dummy)
13	Types of UA	The venture type the urban farmers involved	Farmers get more economic benefits from participating in livestock keeping. <i>Van Veenhuizen and Danso (2007) UFs undertake the production of profitable products that are high in demand & have a comparative advantage over the rural production.</i>	1= Mixed, 2= Crop, 3= Livestock (Categorical)
Dependent Variable/ impact indicator				
1	Income (on and off-farm	Income earned from	There is a significant income difference	Annually in Birr (Continuous)

S.No.	Independent Variables	Operational Definition (HHs head)	Hypothesis of independent variables on indicators	Measurement and categories
	income)	the on & off farm activities	between the treatment and the control group.	
2	Food Security	Monthly food expenditure	There is a significant food security difference between the treatment and the control group.	In Ethiopian Birr (Continuous)

NB¹: UA Participation can be considered as dependent variable in case of PSM and as independent in case of Probit model.

¹ Food Security is defined by (FAO) of the United Nation (UN) as “a situation in which all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 2001).

World Bank defined food security as access by all people at all times to sufficient food for an active and healthy life.

World Bank, food insecurity can be defined as ‘the lack of capability to produce food and to provide access to all people at all times to enough food for an active and healthy life’.

APPENDIX VIII: Questionnaires and checklist used for the field work/data collection

A. QUESTIONNAIRES

Part I: Household Background Information

Sub-city: Akaki Kality (1) Bole (0), Woreda 02 (1) 12 (0), Household ID-----Date & Month-----

Enumerator-

a. Questions Related to Household Characteristics:

1. Now we will start asking you some questions about you and the members of your family.

Please take time to answer about other members of your family.

Full Name	Relation to Primary Respondent (Code 1)	Year born (yrs)	Gender (Code 2)	Education level (yrs) (Code 3)	Major occupation (Code 4)

Code 1 HH heads (1 ⁰ respondent)	Code 2 Gender	Code 3 Education (yrs)	Code 4
1. Husband	1. Male	1. None	1. Self-employed/ own Farm
2. Wife	0. Female	2. Primary (1-6)	2. Employed on others farm
3. Son		3. Junior (7-8)	3. Working off-farm
4. Daughter		4. Secondary (9-10)	4. Civil Servant
5. Grand Father/Mother		5. Post-secondary (11-12)	5. Home Maker
		6. Tertiary	6. Retired
			7. Unemployed

2. What is the marital status of the primary respondent? 1) Single 2) Married 3) Divorced
4) Separated

3. What is the ethnicity of the primary respondent? 1) Amhara 2) Oromo 3) Gurage
4) Tigrie 5) Others, specify-----

1) What type of house do you live? 1) Own House 2) Private rented 3) Kebele rented

b. Questions Related to Asset Ownership

S.N	Type	Unit of measurement	Code	Do you own? 1)Yes 0) No	Number
1	Ox	number	(1)		
2	Milking Cow	Number	(2)		
3	Horse and donkey	Number	(3)		
4	Sheep and Goat	Number	(4)		
5	Hen	Number	(5)		
6	Water pump	Number	(6)		
7	Feed processing machine	Number	(7)		
8	Farm equipments	Number	(8)		
9	Storage room in Care meter	Number	(9)		
10	Output and feed Transportation vehicles	number	(10)		

Part II: Respondents Attitude towards Urban Agriculture

Now we will start asking you some questions about the attitude you have about urban agriculture. Please take time to answer the following questions in the below table.

S.N.	List of attitudinal measurements	Is this a benefit?	Please rank the benefits as per the following scale					Total
		Yes (1) No (0)	Very Important (5)	Important (4)	Undecided (3)	Less important (2)	Not important (1)	
1	Create income source							
2	Contribute to food security							
3	Create job opportunities							
4	Solve waste water and organic waste problems in to a productive resource							
5	Reduce household expense							
6	Recreational opportunities for citizens							
7	Educational value							

Part III: Socio-Economic Characteristics of the Households:

1. What is the on-farm income of the household? _____
2. What is the off-farm income of the household? _____
3. Could you tell us something about your expenditure? _____ Now we will start asking you some questions about the type of expenditure you have on monthly bases. Please take time to answer the following questions in the below table.

S.N	Type of Expenditure	Measurement	Qty	Price	Total
1	Cereal (Teff, Wheat, Maize, Barely)	Kg			
2	Oil	ltr			
3	<i>Berbere and Shiro</i>	Kg			
4	Vegetables(Onion, Tomato, Potato, Cabbage, Paper)	Kg			
5	Fruits (Banana, Orange, Mango, Papaya, Avocado)	Kg			
6	Meat	Kg			
7	Sugar	Lit			
8	Milk	Kg			
9	Butter	Kg			
11	Cottage Cheese	Kg			
2	School fee	Birr			
13	Transport cost	Birr			
	Event expense	Birr			
	Rent paid any	Birr			
	Utilities (water, tell, electricity)				
	Medical cost				
	Miscellaneous expense				

4. Did you get any remittance from abroad/NGO? 1) Yes 0) No
If yes, in kind/cash, how much? _____
5. What is the farm size of the household in hectare (ha)? -----

Part IV: Urban Agriculture related characteristics

1. Do you own a farm (do you participate in UA)? 1) Yes 0) No
2. When did you start to participate on urban agriculture? (in yrs) -----
3. Do you have access to credit? 1) Yes 0) No
4. Do you have extension contact? 1) Yes 0) No
If yes how often 1) Daily 2) weakly 3) Monthly 4) Bi-Monthly
5. Are you a member of any farm-based organization? 1) Yes 0) No

Please indicate if you are a member of the following organization.

S.No	Type of Organization	Member 1) Yes 0) No	Participation
1	Cooperatives		
2	Kebele Association		
3	Idir/equb		
4	Agriculture Association		

6. What type of urban farming do you adopt? 1) Crop only 2) Livestock only 3) Mixed farming.
7. Where do you grow crops and rear animals?
1) In backyards 2) In open space
3) In urban fringe areas 4) Roadside/others
8. Do you apply improved seed? 1) yes 0) No
9. Do you use improved cows? 1) Yes 0) No
10. Could you tell us some information about your farming activities?
11. Do you get any professionals training about urban agriculture? 1) Yes 0) No

Please consider the following vegetable crops when interviewing about the list of crops produced by the farmer.

11.1 Vegetable Crops

S. No	Type	Production	Consumed home	Marketed		Total sold
		Qty (kg or quintal)	Qty(kg)	Qty(kg)	Price/kg	
1	Cabbage					
2	Leafy vegetables					
3	Broccoli and Cauliflower					
4	Onion					
5	Tomato					
6	Potato					
7	Carrot					
8	Beet-root					
9	Pepper					
10	Pumpkin					

11.2 Livestock raring

S.No	Type	Measurement	Production	Consumed home	Marketed		Total sold
			Qty	Qty	Qty	Price	
1	Milk	ltr					
2	Butter (<i>Kibe</i>)	Kg					
3	Cottage Cheese(<i>ayb</i>)	Kg					
4	Sure Milk(<i>Ergo</i>)	Ltr					
5	Three month chicken	Number					
6	Meat chicken	Number					
7	Egg	Number					
8	45 day chicken	Number					
9	Cow dung /chicken urine	Quintal					

Part V: Challenges and Opportunities of Urban Agriculture

5.1.Challenges working in urban agriculture.

- Next, we will be asking you about the main challenges you are facing in urban farming. Please mention if the listed constraints are a problem and the importance of the problem.

S.N.	List of constraints / Challenges	Is this a constraint?	Please rank the problems as per the following scale					
		Yes (1) No (0)	Very- Import (5)	Impo rtant (4)	Undecided (3)	Less import (2)	Not import (1)	Tota l
1	Limited access to seed							
2	Lack of fertilizer							
3	Limited extension services							
4	Lack of farm credit							
5	Limited Land access							
6	Watering of crops/limited irrigation access							
7	Droughts							
8	Lack of market linkage							
9	Lack of storage room facilities							
10	Limited access to transportation							
11	Lack of road b/n farms							
12	Severity of disease and pests							
13	Limited access to chemicals							
14	Late delivery of inputs							
15	Limited market information							
16	Expensive fertilizer							
17	Limited veterinary service							
18	Limited feed access							
19	High cost of animal cost							
20	Vitamins and anti biotic cost							

Please mention if there are other constraints

2. Do you think working on urban agriculture has bright future? 1)Yes 0) No
3. If, yes / no bright opportunity, please mention some of them.

5.2. Working in urban agriculture

Next, we will be asking you about the main opportunities you are obtaining from urban farming. Please mention if the mentioned chance is a prospect and the importance of the prospect.

List of Opportunities	Is this a chance?	Please rank the prospects as per the following scale					
	Yes (1)/ No (2)	Very- Impot (5)	Importan t (4)	Undecided (3)	Less important (2)	Not impot (1)	Total
Higher consumption of vegetables and forage							
Availability of improved inputs in low cost and transportation services							
Farm near animal corrals and market (easy for management)							
Extended cultivable areas, short plant life, daily income, year round work,							
Availability of services: education, health, security and variability of income source							
Higher return							
Variability and availability of vegetables and forage (self-satisfaction)							

B. Checklist used for Focus Group Discussion

1. What are the most important practices of urban farming in the area?
2. Do you face any challenges while farming? If yes, can you mention them starting with the most important.
3. How you are tackling these problems?
4. What are the opportunities engaging in UA in production, marketing and financial aspect?
5. How do you evaluate the sustainability of urban agriculture?

C. Checklist used for Key informants

1. How is the extent of urban farming in this sub-city?
2. Which wereda is urban farming most common?
3. Which crop and livestock are commonly produced in this sub-city? Start with the most important.
4. What are the main uses of the crops and livestock? Start with the most important.
5. What problems do the urban farmers face in crop and livestock production?
6. What proportions of the people in the sub-city are engaged in urban farming?
7. How do you rank the living conditions of the urban farmers in the sub-city? What things they don't have?
8. How do urban farmers maintain their level of income throughout a year? If they have other income means?
9. How do you value the significance of urban farming as compared to alternative income generating opportunities?
10. What is the policy towards urban agriculture?
11. Is there a rule and regulation regarding urban agriculture?
12. What looks like the characteristics of urban farmers?
13. What are the possible opportunities of participating in urban farming?