DETERMINANTS OF THE ADOPTION OF URBAN AGRICULTURE AS A STRATEGY FOR SUSTAINABLE LIVELIHOODS IN NYALENDA 'A' SUB-LOCATION, KISUMU CITY

BY

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DECLARATION

This research project is my original work and has never been presented for the award of any degree in any other university.

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DEDICATION

This project report is dedicated to my fiancé Ben Mitchell. His inspiration and encouragement has kept me going on in my intellectual journey.

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TABLE OF CONTENTS

DECLARATION ..... **ii**

DEDICATION ..... **iii**

ACKNOWLEDGEMENT ..... **iv**

TABLE OF CONTENTS ..... **v**

LIST OF TABLES ..... **vii**

LIST OF FIGURES ..... **viii**

LISTABBREVIATIONS AND ACRONYMS ..... **ix**

ABSTRACT ..... **x**

CHAPTER ONE **1**

INTRODUCTION **1**

1.1 Background to the study 1
1.2 Statement of the problem 4
1.3 Purpose of the study 5
1.4 Research Objectives 5
1.5 Research questions 5
1.6 Significance of the Study 5
1.7 Basic assumptions of the study 6
1.8 Limitations of the study 6
1.9 Delimitations of the study 7
1.10 Definition of significant terms 7
1.11 Organization of the study 8

CHAPTER TWO **9**

LITERATURE REVIEW **9**

2.1 Introduction 9
2.2 Urban policies and urban agriculture 10
2.3 Socio-economic statuses and adoption of urban agriculture 13
2.4 Urban agriculture and food insecurity 22
2.5 Environmental risks and urban agriculture 26
2.6 Theoretical framework 29
2.7 Conceptual framework 30

CHAPTER THREE **31**

RESEARCH METHODOLOGY **31**

3.1 Introduction 31
3.2 Research design 31
3.3 Target Population 31

3.4 Sample size and sampling procedure 31
3.5 Research instruments 33
3.8 Ethical Considerations 36
3.8. Operationalization of Variables 37
CHAPTER FOUR 38
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION 38
4.0 Introduction 38
4.1 Response Rate 38
4.2 Demographic Information 38
4.3 Urban Policies and Urban Agriculture 44
4.4 Socio-Economic Status and Urban Agriculture 48
4.5 Food insecurity and Urban Agriculture 54
4.6 Health and environmental risks and Urban Agriculture 60
CHAPTER FIVE 65
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION 65
5.1 Introduction 65
5.2 Summary of Findings 65
5.3 Conclusions 68
1.4 Recommendations 69
5.5 Contribution to Body of Knowledge 71
5.6 Area for further Research 72
REFERENCES 73
APPENDIX I: QUESTIONNAIRE 84
APPENDIX II: KEY INFORMANT INTERVIEW GUIDE 88
APPENDIX III: MAP OF KISUMU COUNTY 89
APPENDIX IV: MAP OF KISUMU MUNICIPALITY 90
APPENDIX V: MAP SHOWING NYALENDA 'A' 91
APPENDIX VI: SAMPLE SIZE TABLE 92

LIST OF TABLES

Table 4:1: Response Rate 38
Table 4:2: Marital status of the respondents 39
Table 4:3: Age of respondent 39
Table 4:4: Size of the household 40
Table 4:5: Practice urban agriculture as a household 41
Table 4:6: Agricultural practices carried out 41
Table 4:7:Planting of vegetables 42
Table 4:8: Role urban agriculture plays in your household 43
Table 4:9: Influence of urban policies on adoption of urban agriculture 44
Table 4:10: Nature of the land tenure 46
Table 4:11: Correlation between urban policies and sustainable livelihoods 46
Table 4:12: Correlation between urban policies and adoption of urban agriculture 47
Table 4:13: Household monthly income 48
Table 4:14: Level of education of the household head 49
Table 4:15: Occupation of the household head 50
Table 4:16: Life influenced by culture 51
Table 4:17: Household breadwinner 51
Table 4:18: Correlation between economic status and sustainable livelihoods 52
Table 4:19: Correlation between socio-economic factor and adoption of urban agriculture 53
Table 4:20: Number of meals in a day 54
Table 4:21: Household members going hungry 54
Table 4:22: Storage of food in house to last you one week 55
Table 4:23: Household members getting the right amount of food 56
Table 4:24: Household getting balanced diet on a given day 56
Table 4:25: Clean water for drinking at the household 57
Table 4:26: Correlation between food security and sustainable livelihoods 58
Table 4:27: Correlation between food insecurity and adoption of urban agriculture 59
Table 4:28: View of health and environmental risks 60
Table 4:29: Household management of waste from the farm 61
Table 4:30: Household management of waste from the farm 62
Table 4:31: Correlation between environmental health/risk and sustainable livelihoods 63
Table 4:32: Correlation between health/ environmental risks and adoption of urban agriculture 64

LIST OF FIGURES

Figure 1: Research Permit From NACOSTI 93
Figure 2: Acknowledgement Letter from UON 95

LISTABBREVIATIONS AND ACRONYMS

CBO	Community Based Organization
FAO	Food and Agriculture Organization
IFPRI	International Food Policy Research Institute
LED	Local Economic Development
NGO	Non-governmental Organization
oPT	Occupied Palestinian Territory
RUAF	Resource for Urban Agriculture Foundation
SL	Sustainable Livelihoods
SUD	Sustainable Urban Development
UA	Urban agriculture
UN	United Nations
UNDP	United Nations Development Programme
UNRWA	United Nations Relief and Works Agency
WFP	World Food Programme

ABSTRACT

Urban agriculture is the practice of crop cultivation and rearing livestock within the boundaries. Despite its many benefits it is still considered "illegal", backward or rural and therefore has no place in the cities. Urban agriculture across the world has been attributed towards livelihood development and ultimate reduction of hunger, malnutrition and poverty. Kisumu County experiences one of the highest incidents of food poverty in the country with 53.4% of the population experiencing different levels of hunger. The purpose of this study was to examine how different phenomena influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location. The study addressed four specific objectives: to determine how urban policies influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location; to examine how socio-economic statuses influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location; to establish the relationship between food insecurity and adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location; to examine how environmental risks influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location. The study used a descriptive survey design combining both quantitative and qualitative methods. A non-probability sampling technique, snowballing sampling was be used in sample selection. The data collection instruments used were household questionnaires and interviews. To ensure validity of the instruments the researcher did a pilot study and also trained the data assistants on correct data collection and requisite skills. The target population in this study were residents of Nyalenda 'A' sub-location. The sample size to be used was 370 households. The study reached a total 339 respondents of Quantitative data was analyzed through descriptive to generate mean, frequency and percentages. Inferential statistics involved spearman correlation and p-value. The findings were presented using table and narrative discussions. The study established that there was a moderate positive and significant correlation between awareness on urban policies and the practice of urban agriculture in Nyalenda 'A' sub-location. r= 0.299, p=0.000, CI=99% .There was a weak negative and insignificant correlation between the socio-economic status and the adoption of urban agriculture in Nyalenda 'A' sub-location, r=-0.071, p=0.195, CI=95%. It was established that there was a weak negative but significant correlation between food insecurity and practice of urban agriculture in Nyalenda 'A' sub-location, r= -0.187, p=0.001, CI=99%. It was found out that there was a strong positive and significant correlation between health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location, r= 0.109, p=0 .046, CI=95%. The study concluded that those who were aware of urban policies in agriculture adopted urban agriculture better. Residents who practiced urban agriculture were less food insecure. Residents who were exposed to health and environmental risks were more likely to strive towards sustainable livelihoods from the adoption of urban agriculture. The study recommends that the ministry of agriculture and other stakeholders need to strengthen sensitization on the urban policy and urban agriculture, viability of urban agriculture especially those who have higher socio-economic status in Nyalenda. Governments both local and national, need to put measures to reduce the environmental risks and hazard especially among those who practice urban agriculture.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Urban Agriculture (UA) can be defined as the growing, processing, and distribution of food and other products through plant cultivation and raring livestock within city boundaries (Goldstein, 2011). UA has increased in popularity over the past few years due concerns about food insecurity and nutritional value, poverty and climate change (Hardman & Larkham, 2014).

Rising urban food deserts across the world have motivated people to come up with improved or new and innovative methods of UA to complement urban food needs (Wallimann, 2014). One significant challenge for UA is finding ways to monitor, control, and reduce environmental, physical, economic and social risks; and understanding how UA can be sustainably incorporated into the global urban food systems. Those against the practice of UA have highlighted its negative impacts in relation to health risks, productivity and pollution but those supporting UA have countered those sentiments by emphasizing its viability and potential to increase the locality of food and reduction of energy expenditure in production (Despommier, 2014).

UA is very diverse and can be adapted to a wide range of urban environments, situations and needs of a wide range of stakeholders (FA0, 2007). According to van Veenhuizen (2006), there has been a significant increase in the adoption of UA in cities in both developed and developing nations. Many cities are now revising existing non-supportive policies or formulating new ones. However, many urban farmers around the world operate without formal recognition of their main livelihood activity and lack the structural support of proper municipal policies and legislation (FAO, 2007). For these reason, UA has failed to reach its full potential because people are worried about security of tenure and threats to their growing crops. If well implemented UA has the potential of revitalizing brown-fields, preserving cultivatable land, cooling buildings, improving biodiversity and creating vibrant green spaces in the city (Mendes, 2008).

During the last half of the 20th century, there has been rapid growth of urban populations in many developing countries. This has resulted in urban food production and distribution

becoming less reliable. Urban hunger levels have had parallel rise with urban population, aggravated by economic and political instability. Urban agriculture, as a response, has become more common in many countries but initially, it was mainly urban residents who adopted the practice of UA, but later agricultural researchers and policymakers realized its significance (Veenhuizen, 2006). UA in most countries, UA was considered a rural agriculture activity that had no place within city boundaries but this is now starting to change due to the rapid increase in urban population especially in the developing countries (UNEP, 2002).

In the United States, the city of Atlanta created a Sustainability office to encourage people to adopt UA, and also to create policies and programs that are supportive of UA. Through this office, universities began a statewide program to educate and carry out research on UA and provide support to urban agriculture groups. Supportive bills on UA were introduced to modify the prohibitions on the retail sale of agricultural products to allow direct transaction between farmers and consumers and second bill prohibiting any government institution or local authority from demanding "any permit for the growing or raising of food crops in home gardens, coops, or pens on private residential property" (Goldstein, et. al., 2011).

In the occupied Palestinian territory (oPt) Lack of peace, recurrent hostilities and lack of political progress due to the prolonged occupation of the West Bank and the Gaza Strip are the main drivers of humanitarian needs and vulnerabilities in oPT (OCHA, 2013). Studies show that there has been significant rise in food insecurity in Gaza with food insecurity levels surging from 44 percent in 2011 to 57 percent in 2012, which means more than 1.57 million Palestinians are food insecure (WFP/FAO/UNRWA, 2012). Despite the chaos and turmoil, lack of farmland and sporadic unemployment, some residents of Gaza are adopting UA to provide food for their families and neighbors by growing vegetables and fish on rooftops of story buildings (Global Post, 2013). In Gaza, aquaponics has been the most appealing approach to UA inadequate water and access to good quality soil.

Vietnam's capital city of Hanoi is one of the oldest capitals in South East Asia, and in 2010, celebrated its 1000^{th} year of existence and survived turbulent dynasties and conflicts (Boudarel & Van Ky, 2002). Hanoi's rapidly increasing population has given rise to concerns about food provision and how food security can be achieved sustainably (Van Den Berg et al.,

2003). After the "American war" non-progressive policies were changed to transform the nature of UA in Hanoi. People experimented with different crop types and invested in a range of new production strategies (Vien *et al.*, 2005). Today more than 50%of fresh vegetables, 50% of meats (pork, poultry and fish) and about 40% of eggs, come from urban and peri-urban (Tien Dinh, 2000). However there is pressure to convert this land to other uses. According to the planning of Hanoi city in 2010, agricultural land will decrease to 1,640 ha (93.8% of the current land) in the present boundary of urban Hanoi and 31,725 ha (77.8% of the current land) in the present boundary of peri-urban Hanoi (HARDD, 2003).

In Dar-es-Salaam, the practice of UA dates back to the 1930's where urban laborers were expected to be fed by their wives (Hovorka & Lee-Smith, 2006). After independence, UA only continued to grow because food and agricultural policies failed to effectively meet the needs of urban residents. The proportion of urban laborers with farming plots increased from seven percent in 1950 to 70 percent in 1974 and to 80 per cent in 1980. It was also noted that two-thirds of the agricultural workers were women.

However in 1982 supportive policies were formulated and implemented to allow for controlled urban crop and livestock production (Jacobi et al., 1999). In 1992, a strategic plan involving UA was developed and implemented by the Sustainable Dar-es-Salaam Programme in conjunction with the United Nations. The strategic plan aimed at building the capacity of local government and UA was thus incorporated into laws and institutions, particularly the Agriculture and Livestock Policy of 1998 (Mwalukasa, 1999).

In Kenya, after independence UA witnessed rapid growth due to increased urban population. There is also no specific National law or policy addressing urban agriculture rather it is addressed through the various sectoral laws (Mireri, 2007). Kisumu County is still governed mainly by bylaws of 1954 that were prepared long before independence. However, these bylaws permit agriculture under very stringent conditions far beyond the reach of most urban farmers within the municipality (Mireri, 2013). Despite these official prejudices, agriculture still dominates the urban landscape suggesting that the practice will persist even in the foreseeable future. Exclusion of urban agriculture in the land use classification deprives the sub-sector of the much-needed support and thus reinforces the gap between the modern and

traditional sectors. However, the passage of National Land Policy of 2009, which is awaiting implementation, creates room for the development of the urban agriculture as it recognizes the sub-sector (Mireri, 2013).

1.2 Statement of the problem

Poverty, malnutrition and hunger levels in Kisumu County have rapidly increased over the years and more than half the population is food insecure. The practice of agriculture within city or town boundaries is not a new phenomenon but the adoption of this practice among many city dwellers has greatly declined. There is therefore a need to come up with innovative solutions to tackle these problems at household level (Whyte, 1991).

Despite its crucial role, urban agriculture is "de jure" and/or de facto illegal in almost all developing countries and continues to be ignored by urban planners and policy makers. It is still perceived as a marginal activity that does not belong in modern cities. The common perception in many African and Latin American countries is that UA is marginal, temporary and an archaic practice which is harmful to consumers, farmers, the environment, the urban land economy and the city's appearance (Lee, Binns, & Dixon, 2010). In addition to policy, urban farmers are usually faced with other challenges such as lack of land, insecure land tenure and various public and environmental risks. This lack of proper governance and lack of access to secure and safe resources has left cultivators disempowered and cities with more fragile environments. There is, thus, a need to fill the governance vacuum by legalizing urban agriculture, formulating policies, and institutionalizing regular management of urban agriculture and involvement of all stakeholders in the policy formulation process (Lee, Binns, & Dixon, 2010).

1.3 Purpose of the study

The purpose of this study was to examine how different phenomenon influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location.

1.4 Research Objectives

The study addressed four objectives:

I. To determine how urban policies influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location.
II. To examine how socio-economic statuses influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location.
III. To establish the relationship between food insecurity and adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location.
IV. To examine environmental risks influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location.

1.5 Research questions

The study was guided by the following questions

I. How do urban policies influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location?
II. How do socio-economic statuses influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location?
III. What is the relationship between food insecurity and adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location?
IV. How do environmental risks influence the adoption of urban agriculture for sustainable livelihood in Nyalenda 'A' sub-location?

1.6 Significance of the Study

The study of urban agriculture in Kisumu City has the potential of having a significant impact on household livelihood development and its contributions can no longer be ignored. At the household level, urban agriculture can play a major role in being a source of income and also provide nutritious food to the household (Maxwell, 2003).

UA is also capable of stabilizing a household's food consumption against temporary shortages or seasonality. UA can also increase family bonding time especially when families work together in the farm. This is not usually the case with non-agricultural activities, which are more likely to be situated further away from home (Maxwell, 2003; Maxwell *et al.,* 1998; Armar-Klemesu, 2001). This study intends to show that households can save expenditure on food, transport and medication by growing their own food. Poor people spend a substantial part of their income (50-70%) on food. Selling produce (fresh or processed) generates money (Mougeot, 1994). Besides the economic and health benefits of UA, it also stimulates the development of related micro-enterprises (RUAF, n.d.). UA may function as an important strategy for poverty alleviation and social integration and by being a part of the urban ecological system UA can play an important role in the urban environmental management (RUAF, n.d.). UA has been accused of being a public health nuisance and pollutant but according to evidence collected by Lock & Veenhuizen (2001), with proper planning and management, UA is a very effective and safe means of producing food. UA can also be used as an empowerment tool for the underprivileged as it affords the poor and marginalized an opportunity to increase control over their own nutritional intake (Mbiba, 2005).

1.7 Basic assumptions of the study

The study relied on the following assumption; that the respondents would be honest and truthful in giving their responses, that participants would respond to all the questions, that all the questionnaires would be returned and finally that all factors that might interfere with the research exercise for example weather conditions would be constant.

1.8 Limitations of the study

There is a general lack of published literature on urban agriculture in Kenya. Much of the existing literature is from a decade ago or information from recently published literature does not capture much of the advancement in the field of agriculture here in Kenya.

1.9 Delimitations of the study

This study was conducted in Kisumu City but restricted to Nyalenda 'A' sub-location. The researcher restricted the study to how urban agriculture has contributed to household livelihood development and the various barriers that hinder successful adoption of urban agriculture as a livelihood strategy.

1.10 Definition of significant terms

Food security	Access by all people at all times to enough food for an active healthy life" (Ellis, 1992)
Food insecurity	A situation of "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways", (FAO, 2004)
Livelihoods	Livelihood is defined as a set of activities, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity
Urbanization	The increasing number of people that live in urban areas
Urban agriculture	The production of crop and livestock goods within cities and towns

1.11 Organization of the study

This project report is organized into five chapters. Chapter one is the introduction and presents the general background of the study, statement of the problem, research objectives and questions, significance of the study, limitations and delimitations of the study, basic study assumptions, and operational definitions of key terms used in the study. Chapter two presents literature review related to the study. It particularly concentrates on four thematic areas based on the research objectives, theoretical and conceptual frameworks on which the study is based and also gives a summary of the literature reviewed. Chapter three describes the research methodology. This includes introduction, research design, target population, sample size and sampling procedures, validity and reliability of research instruments, data collection procedures, data analysis techniques and ethical consideration. Chapter four presents data analysis results, interprets the findings of the study and discusses the findings in light with earlier findings. The analysis, presentations, interpretations and discussions of the findings are in accordance with the three objectives of the study. Chapter five presents a summary of the findings of the main study, conclusions, recommendations arrived at and contribution to knowledge base. It also gives suggestions for further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature relevant to this study. The various topics discussed have been presented with respect to the views of other authors and academicians. The topics discussed here include; Concept of sustainable livelihood; urban policies and urban agriculture; socio-economic statuses and their relationship to urban agriculture; the significance of urban agriculture on food insecurity; risks associated with urban agriculture; theoretical framework and lastly, the conceptual framework.

A number of people practice UA for different reasons. A case study of Kasarani Division by Ngugi (2012) on potential environmental impact of UA found that 75% of the respondents carried out urban farming for food and any surplus was sold to generate income. The money made was used in other things such as paying school fees, clothing and investments. Kinuthia in her study to determine effect of urban agriculture in reducing poverty in urban areas found that majority at 50% did crop farming for food, 27.8% did it for income, 22.2% did it to diversify income and the least at 11.7% did it as a hobby. Kinuthia (2008) also established that there were hardly any differences between the income groups as far as the reasons for crop cultivation and livestock keeping are concerned.

A study by Muriithi (2013), on factors affecting adoption of urban agriculture interventions among HIV and AIDs affected households in Nakuru Municipality, found that 78% of the households among 43% of the respondents were headed by women. He also established that 63% of the respondents reported to increase their income, gained social benefits such as reduced stigma, raised their social status and enhanced scope of friends through urban agriculture.

Astudy by Echakara (2015), in Lang'ata Sub-County, found that 38% of the respondents had practiced UA for 1-3 years, 24% had practiced UA for 4-6 years, 19% had practiced UA for 7-9 years, 17% had practiced UA for 10-12 years, while 2% had practiced for 13 years and above. The findings therefore showed that most of the residents had practiced Urban Agriculture for some time and thus some experience of some sort.

2.2 Urban policies and urban agriculture

Although urban agriculture is a new concept in African policy development and planning, people planting food and raring animals within city boundaries is not a new phenomenon. UA was largely forgotten or ignored in the 1960s and 1970s by researchers and policy makers (Rakodi, 1985). Structural Adjustment Programmes and economic recessions encouraged the cultivation of food crops in public and private open spaces (Drakakis-Smith, 1994). During rainy seasons, urban spaces are transformed into vibrant farms, by armies of urban dwellers who till open spaces to produce food (Lado, 1990).

Governments and public agencies assume the most comprehensive and complex functions that directly or indirectly affect UA. They set, regulate and facilitate urban agriculture practices and in addition, they are major landowners and managers of wastewater, solid waste, and water supply systems. The above roles give them the highest potential for partnership with urban farmers, as well as the potential to hinder their activities. Finally, they often hold the key to bringing the different stakeholders together (Smit, Nasr and Ratta, 2001). Most governments still perceive urban food and fuel production as a marginal and temporary activity. In general, the trend toward increased urban agriculture is being followed, not led, by organizational changes in government. Lack of communication with NGOs, farmers groups, researchers, and institutions within the urban region can result in missed opportunities (Smit, Nasr & Ratta, 2001).

Urban agriculture increases the efficiency of national food system and complements rural food supplies, which aren't always capable of supplying perishable products, products that require rapid delivery upon harvest (van Veenhuizen, 2007). Despite the widespread rise in urban food consumption, the production of food within city boundaries is still not appreciated by urban authorities nor planned for or supported (Lee-Smith and Trujillo, 1992).

Both local and national governments and other relevant institutions as policy-setting authorities, need to advocate, regulate and facilitate urban agriculture, instead of banning it and leaving urban cultivation in a policy vacuum where there is no governance (Drakakis-Smith, 1993; UNDP, 1996). With no governance urban cultivators are disempowered and the city is left with less resources and more fragile environments. Urban planners have also been accused of not

being flexible towards urban cultivation. To them the practice is seen as reminiscence from the past, which does not comply with the general "modern" view of the city (Drakakis-Smith, 1993; Mbiba, 1995a). This is particularly apparent in cities like Harare for example, where there is sporadic, ad hoc and unplanned urban agriculture with no direct law prohibiting the practice, but where laws such as environmental and habitation, are used to act against the cultivators (Mbiba, 1995a: 96). It is therefore important to fill the governance vacuum by legalizing UA, formulating supportive policies, and institutionalizing regular management of the practice. These processes should also involve all stakeholders are in policy formulation in order to secure its sustainability (UNDP, 1996).

According to the Resource Center on Urban Agriculture and Food security, RUAF, urban agriculture has a cross-cutting and multidimensional nature that dictates that policy development and action planning involving urban agriculture ought to include multiple sectors and disciplines such as agriculture, health, waste management, community development, environment, among others (RUAF n.d.). Urban farmers, CBOs and NGOs should also be involved in the planning process. Significant to strategic urban planning is the participation of the urban poor themselves in situation analysis, in priority definition and in action planning and implementation. These consultative processes will facilitate robust and comprehensive outcomes of policy development and action planning and also make these policies acceptable and sustainable (RUAF n.d.). In order to secure the benefits of urban agriculture and do away with hazards of unplanned cultivation, legalization of the practice and recognition of the potential is necessary (Bryld, 2002). If legalized, most of the problems associated with UA could be handled through action plans at municipality, city or state levels. Different measures could be taken to improve the farming techniques and aid in creating the proper and safe environments for urban food generation. As long as UA remains illegal there shall be no adequate service provision for urban agriculturalists (Rogerson, 1997).

By amending its zoning policies to include support for urban agriculture, a municipality can establish urban agriculture as a priority in its communities and set the stage for the revision of its zoning regulations (Henrickson and Porth, 2012). In Ontario, Canada, each municipality's zoning by-law relies on Official Plan for strategic direction, meaning that urban agriculture is

first and foremost encouraged by the official plan before it can be integrated into the zoning by-law. Zoning by-laws don not just regulate the uses that are permitted within each area of the city, but also the conditions under which they can be used (Heydorn, 2007). By defining and regulating urban agriculture land uses in zoning by-laws, municipalities legitimize the activities of current and prospective urban agriculture practitioners. Furthermore, they provide both municipal staff and citizens with clarity about what is, and is not, a permitted agricultural land use within the city (City of Hamilton, Ontario, 2013).

2.2.1 Recommendations to Policy Makers

UA should be integrated into urban development and land use plans as a crucial step towards its effective regulation and facilitation. Policy makers need to identify, review and remove unsubstantiated legal restrictions in existing policies and by-laws and integrate adequate measures to effectively stimulate and regulate the development of sustainable urban agriculture (RUAF n.d.) Municipal authorities also need to fill in this by creating an institutional home for urban agriculture, with proper staffing and powers.

Policy makers also need to have dialogue and co-operation with the direct and indirect stakeholders and this can be done by setting up a multi-actor, multi-sector platform and working group on urban agriculture which will organize joint analysis of the presence, role, problems and development perspectives of urban agriculture in the city and coordinate the process of interactive formulation of a policy and the planning and implementation of action programmes, by the various actors (RUAF n.d.)

Naturally, land is a critical asset for urban agriculture, and its availability, accessibility and suitability are of particular concern to urban farmers. Local governments should facilitate access of urban farmers to available urban open spaces. In Dar es Salaam (Tanzania), Dakar (Senegal), Maputo (Mozambique); Pretoria (South Africa), Kathmandu (Nepal), Accra (Ghana), Kathmandu (Nepal) and Beijing (China), local governments demarcated zones where people could practice urban agriculture. Urban agriculture is thus identified as a permanent land use that is supported and protected (RUAF n.d.)

2.3 Socio-economic statuses and adoption of urban agriculture

Socioeconomic status (SES) is a combined total measure of economic and sociological attributes of a person (breadwinner) and the household. Work experience, economic position, income levels, education and occupation are measured in relation to other households (Conger et al., 2010). A number of studies established that different factors such as farm size, animal resources, crop grown, fertilizer used, technology adopted, labor, input and output markets, age, education and experience on farm income, had an effect on the performance of UA (Backman & Sumelius, (2009); Diogo et al., (2011); Sharma et al., 2007).

Employment in the formal sector has decreased making life very expensive in urban areas. Salaries and wages are also not parallel with prices or have even declined in absolute terms, making purchasing power among urban households to be on a serious decline. As a response to this economic crisis, people are responding in various ways, most notably by diversifying their income sources. The continued increase in rural-urban migration and reduced job opportunities, more people living in cities are born into poor families and in some instances families that are not very poor are slipping below the poverty line (Mougeot, 2005).

With volatility of rapid shifts in global food prices, urban residents, particularly the urban poor have had little to no capacity to adjust to those hikes. These changes have a huge impact on people's spending capacity and have affected their nutrition by causing them to shift to cheaper, lower quality, and less nutritious foods (von Grebmer, *et al*., 2011). Bush (2010) and Zezza & Tasciotti (2010) established that UA has the potential to improve a household's access to food during times of shortage, instability or uncertainty. They also established that UA contributes to improved health among the urban population by providing highly nutritious and fresh foods. It was also established that UA could be an income generating activity where urban farmers can grow food to sell which ultimately contributes to a household's income security (Cohen & Garrett, 2010; Mougeot, 2005).

Some high-income urban inhabitants use agriculture as a strategy for further accumulation through the production of high yield crops close to the market, while some middle-income households use urban agriculture as a means of consolidating and securing the family's wellbeing. The majority of urban farmers, however, practice urban agriculture as a means of

survival (Atukunda and Maxwell, 1996). Echakara (2015) established that increased poverty levels contributed to increased adoption of urban agriculture. Other related studies further showed that urban agricultural practices contribute to local economic development, poverty alleviation and social inclusion of the urban poor and women in particular, as well as to the greening of the city (UN-HABITAT, 2008; Githugunyi, 2014)

2.3.1 Income

Income is one of the main factors that can contribute significantly to an individual's or household's socioeconomic status. Income can be defined as any money coming in form of salaries, wages, rent or some sort of earnings. Some unemployed people can also receive incomes in the form of worker compensation, pensions, dividends, alimony, e.t.c (Okioga, 2013). Because UA plays a significant role in food security and income generation, a lot more interest is being shown towards the practice (Egziabher, *et al*., 1994).

An increase in the cost of living without corresponding increase in income has pushed more Kenyans below the poverty threshold. In 2008, an increase in staple food prices caused "riots of hunger" in several capitals across the world. In less than a year, the price of wheat rose by 130% and rice by 74%. Nationally, in 2005/6, almost 47 % (17 million Kenyans) were unable to meet the cost of buying the amount of calories sufficient for the recommended daily nutritional requirements (Abbott & De Battisti, 2011). Analyses of informal settlements in Nairobi show that poverty incidence is high. 63% of Nairobi's slum residents fell below the poverty line in 2006 (Mireri et al, n.d.). With constant rain failures and other vagaries of global warming, there has been renewed public interest in Urban Agriculture owing to its potential contribution to food security and the rarely talked benefit of ecological health. As urban populations increase, agriculture in the cities and towns has also been on the rise. Initially, Urban Agriculture was practiced as a survival strategy among the poor who farmed on riparian land. Today, Urban Agriculture has grown from a basic survival activity to a reliable source of food and livelihood especially for the urban poor (Mireri et al, n.d.).

Farm income in urban areas is affected by different factors as farm size, animal resources, crops grown, fertilizer used, technology adopted, labor, input and output markets, age an experience on farming activity (Bäckman & Sumelius, 2009; Diogo et al., 2011; Drechsel et al., 2004;

Edmonds, 1999; Ndambi &Hemme, 2009). Generally farm income is highly sensitive to changes in inputs used, inputs prices, outputs produced and output prices (Diogo, 2009; Drechsel et al., 2004; Urassa & Raphael, 2002).

It was noted that UA practitioners are either food and/or income seekers. They support urban households by improving food supply and enhancing household income (Adedeji & Ademiluyi, 2009; Diogo et al., 2011; Thompson et al., 2010). UPA can provide access to supplementary income for some people and it is the sole source of income for others (Dongmo et al., 2005) regarded UPA as a source of employment and incomes through crop cultivation and livestock rearing. Mougeot (2000) stated that "UA is comparatively affordable, a noteworthy source of income and savings and is more profitable than rural-based production".

Most urban informal settlement dwellers (96.6%) are employed though majority (83.3%) are in casual employment that are often low paying jobs; an indication that most people in the informal settlement lack a regular income and a slight shock in the economy, as had been witnessed in 2008 following the post-election violence and currently the weakened Kenya shilling, can have severe effects on their ability to meet their basic food needs. The study by Ibrahim further showed that the majority of Kibera informal settlement residents (80.4%) earn less than Kshs. 15,000 a month with an average household income of Kshs. 11,078.43 though 51.8% earned less than Kshs. 10,000. This indicates that majority of the households are struggling to meet their food needs due to high prices of food hence food insecure (Ibrahim, 2010)

Echakara (2015) found that majority of the respondents at 60% earned above Kshs. 19,000 and 40% earned 19 000 and below from urban agriculture. On the other hand, in the study by Githugunyi (2014), respondents who said they practiced UA for food security and income generation were mostly from low-income areas of Njathaini, Utalii and Mathare areas. They get food supplements such as fresh vegetables, cowpeas and maize, which are staple foods in most families and also cheap sources of proteins from livestock inform of milk, eggs and meat. These savings plus the income earned from sale of surplus farm produce is then used to meet other family expenses. Poverty is now increasing more rapidly in urban areas than in rural areas, the findings further confirms with findings by Tevera, (2011) that even after a more stable macroeconomic environment is restored, urban gardening has remained an important source of food for the large urban food-insecure population.

2.3.2 Education

Education is the process of facilitating learning or the acquisition of knowledge, skills, values, beliefs, and habits, and it can be done in formal or informal settings. Thoughts, feelings or actions that have a formative effect or impact on how a person lives their life can be considered education, which can come in the form of stories, discussions, teachings, training or research (Dewey, 1944).

Formal education has always been assumed to have several vital contributions to a person's skill level and human capital although how one is raised, individual capability and abilities together with peer influence are also key contributing factors. Learning institutions are considered to be a special place because education is impacted and skills developed. Income can sometimes have a direct impact on the amount of education a person can have (UNESCO, 2005).

For proper calculation of farm inputs and finances, farmers ought to have increased literacy and numeracy particularly in these modern times that are characterized by constant change. A change in habits, attitudes and sometimes beliefs, can lead to willingness to accept change, innovation and risks (Appleton and Balihuta 1996; Cotlear 1990). One's access to external resources or information can be increased with education through experience with technology. Technology can help farmers work more efficiently and effectively (Rosenzweig 1995).

Education may indirectly increase output through its interaction with other institutional variables. For example, schooling may substitute for access to credit by providing the skills necessary to obtain waged employment, thereby generating cash to finance agricultural investments (Appleton and Balihuta 1996). Collier and Lal (1986) note the importance of non-agricultural income for farm productivity. Remittances from migrants educated by the household may also serve this function. Furthermore, Phillips and Marble (1986) note that educated farmers are able to interact more effectively with credit agencies, because they can understand financial transactions and keep records, increasing the likelihood of obtaining credit

Benefits of investment in schooling may accrue not only to the person who has acquired the education, but also to other members of that person's household or village. Internal (or private) benefits of schooling include enhanced income-generation capacity as well as other quality of life improvements. External (or social) effects of schooling include the diffusion of new farm

inputs and productivity-enhancing techniques. Ironically, the presence of externalities may obscure evidence that education affects productivity at the household level (Phillips and Marble 1986). Jamison and Lau (1982) suggest that external effects of education upon farmer productivity may not be apparent when the household is the unit of analysis, since less educated farmers may copy the agricultural practices of their more educated (more productive) neighbours. As well as presenting an empirical consideration, this point is highly relevant from a policy perspective, since the presence of externalities may reduce the private demand for schooling, while at the same time raising its social value.

A study by Mwangi (2015) on factors influencing agricultural practices in Kenya established that most of the respondents as shown by 29.6% had college diploma certificates, 25.0% had attained certificates, 23.7% had attained undergraduate, 15.1% had attained masters level and 6.6% had attained PhD level of education. This implies that majority of the respondents were literate and therefore possessed sufficient information on urban agricultural practices. Similar findings were reported in a study by Echakara (2015) at Lang'ata Sub-County which showed that majority of the respondents at 51% had post-secondary level of education, 78 (25%) of them had no formal education, 42 (14%) had attained Kenya Certificate of secondary education and 30 (10%) of the respondents had attained Kenya Certificate of Primary Education.

2.3.3 Occupation

Occupation is considered to be another significant factor of SES, which encompasses both income and education. Occupational level is usually a result or reflection of education level needed for a particular job. Occupational levels can also be as a result of a person's skill level. Income levels vary from one job to another and within ranks of occupations. One's occupational level can determine a person's social position in regards to job characteristics and decision-making control and ability and also the physical and psychological demands of a job (Okioga, 2013).

A good percentage of researches believe that education, income and occupation best represent SES, although some believe family structures and the changes affecting them should also be considered. Discussions on the effects of SES on cognitive abilities of students should also be discussed (Milne, A., & Plourde, L. A., 2006).

A study by Karanja (2004) established that there was a significant difference in the expenditure patterns of two groups, with the urban farming households having significantly lower food budget than the non-farming households (p-value=0.00l; X^2=11.2). Own food production contributed 20-30% or more of the households' food supply. Home-cultivation supplied the equivalent of 17% of their income and saved approximately KShs 3,850 of their expenditure in food per month. The mean availability of calories at the household level for the entire sample was 2,071 kilocalories (69%) per consumer unit (male adult equivalent) per day (kcallcu/day). The average caloric intake for the two groups respectively, was less than 75% of the estimated requirements. Maize and other staples contributed most of the calories, but the urban farming households had a slightly more varied diet than the non-farming households. Own food production provided on average an estimated 10% extra calories. In conclusion, home-cultivated foods contributed significantly to nutrient availability and accessibility in the households and reduced the expenditure on food. It is therefore recommended that urban agriculture be integrated in national policy strategy in overall poverty reduction and specifically addressing vulnerability and poverty in urban areas.

2.3.4 Culture

Culture is also considered to be an important SES factor that can contribute how people think and act. Culture can be passed down from generations and ultimately shape a person's identity.
UA has not been spared by culture as you may find that in most cities the predominant crops grown may be as a result of food consumption patterns influenced by culture, climatic conditions, soil types, SES, political economy, e.t.c (UNESCO, 2010).

Most civilizations have been built on the cultivation of a particular staple food crop, which has, almost undoubtedly been influenced by culture or religious values. In most cultures, people often not satisfied if their traditional staple food, e.g. pasta, bread, rice, millet, maize, potatoes, etc is not available (Mervyn, 2010).

Culture, although a unifying factor among people it also creates barriers. People's beliefs and behavior can contribute or block the process of developing and implementing new ideas. Wycoff (2003) pointed out that culture is the first issue when the "Big 10 Innovation Killers" were

identified. Culture is learned – most intensively in the early years of life – and has a continuing impact on every person's mind throughout life. An understanding of one's culture helps predict the behavior of typical of members of that culture in normal situations. Culture can be described as unquantifiable and intangible factors by which all societies are governed, and is regarded as 'natural' or 'normal' (Kassa, 2008).

Agriculture is not only about seeds and soil, sun and rain, but also about the people who plant and produce each season's crop (UNESCO, 1995). In this way, agriculture is intrinsically a cultural activity. How a farmer tills land is usually guided by the norms of the culture that was instilled in them.. Traditionally, there is work done by men and work done by women. Tasks that involved heavy labor were always assumed to be a man's responsibility but as men migrated to the cities to look for work, women were forced to take over traditionally male tasks, including heavy labor (UNESCO, 1995). According to Lowrey (2012), the relationship between farmers with huge tracks of land and those with very small pieces of lance, the relationship between landowners and the landless, relationship between men and women, relationship between different class structures and relationship between different cultures may have a significant impact on how new ideas and technology are assimilated by different groups.

2.3.5 Gender Dimensions

According to Simiyu & Foeken (2013) there is little doubt that gender relations affect the character of urban food production and that UA may have an impact on societal gender divisions. Gender, according to Ogato et al., (2007), refers to socially assigned roles and behaviors attributable to men and women and also the social meaning of biological sex differences. Gender roles are roles played by both men and women that are not determined by biological factors but by the socio-economic and cultural environment or situation (Mollel & Menga, 2007). As such, UA provides opportunities for women's empowerment, but according to Hovorka, this usually takes place under "formidable constraints". In many sub-Saharan African societies, women have subordinate roles in household decision-making, including agricultural activities (Hovorka, 2006a).

Socio-economic conditions and legal arrangements determine how different genders access and control productive resources. Women are too often on the disadvantaged point where institutionalized gender inequities related to access to capital, education, and off-farm employment opportunities, as well as laws governing inheritance and land transfer take center stage. There is thus a need to carry out considerable research, formulate and implement policies and advocate for initiatives that will ensure women are able to compete on an equal basis with men (Mitullah, 1991, Robertson 1997, Purushothaman et al., 2004). Research shows that women are usually discriminated in most almost all spheres relating to agricultural resources, such as land, farm inputs (seeds, fertilizers, pesticides, fodder and water), credit facilities and external labor. As a result women tend to grow crops of lower value and lower start-up costs (Hovorka, 2006b). Men, traditionally, have the first choice of any available vacant plots of land, leaving their female counterparts with lesser or poorer land quality and not as secure or located far from their homes. A lot of time and effort are thus devoted to travel, which proves to be a significant constraint for women, especially the elderly or those with young children (Wilbers et al., 2004). Empirical studies have demonstrated that opportunities provided by increased agricultural commercialization, are usually within the reach of their male counterparts versus their female counterparts (Horvoka, 2006). Women as was noted, are less likely to command resources required such as credit, land or information, compared to their male counterparts (Ogunlela & Muktar, 2009), rendering them relatively poorer than their male counterparts.

UA being an emerging development strategy is well positioned to accommodate just and equitable guidelines for addressing the needs and interests of both men and women. To achieve this, there needs to be clarity on what gender means and how to "do it" (van Veenhuizen, 2006). A recent study by RUAF reported that nowhere is the gap between stated intentions and operational reality as far apart as it has been in promoting gender equality (RUAF, n.d.). Many development practitioners other than "gender experts" actually understand what gender mainstreaming is and how it is done. This is made worse by the over use or misuse of the term "gender" in policy documents and strategic frameworks. A gendered development agenda recognizes that concrete, positive structural change can only be achieved if both men and women make concerted efforts to addressing gender inequities. Unfortunately, the concept of gender has

come to be widely simplified to be just another word for women, instead of denoting human rights based approach (van Veenhuizen, 2006).

According to Moser (1989), practical needs are "immediate needs that relate to the inadequacy of people's living conditions, such as the supply of food, water, health care and employment". Satisfying them rarely has any changes on gender relations. Strategic needs "are related to the division of labor, power and control by the genders, and can include issues such as legal rights, eradication of household violence, equal wages". Satisfying them helps men and women achieve greater equality and bring about shifts in existing roles. Practical and strategic needs are interrelated, and involvement in urban agriculture can contribute to satisfying both (Hovorka, 2006; Wilbers et al., 2004).

Logistical support and material requirements are essential for gender mainstreaming. Building capacity for gender mainstreaming has emerged as a particularly elusive goal in development cooperation, and initiatives have constantly faced a lack of necessary skills, inadequate resources, and weak institutions. Training is fairly general for civil servants – participants are rarely asked to look beyond the difference between sex and gender, the differing roles of men and women, and their own prejudices and stereotyping practices. Even those who emerge from such training convinced and committed after are unsure how to translate their convictions into daily work, particularly in the more specialized sectors that seem remote from gender concerns (van Veenhuizen, 2006).

2.4 Urban agriculture and food insecurity

Food security and nutrition is probably the most valuable asset of UA. UA is viewed as a response to food inadequacy, unreliability and irregularity. Lack of access to food and lack of purchasing power by the urban poor has translated into urban households lacking food (van Veenhuizen, 2006). With the rise in rural-urban migrating, particularly the rural poor, a lot more urban residents are being born into impoverished families and in some cases not-so-poor families are finding themselves below the poverty line. This rise in poverty and malnutrition has lead to considerable interests in urban agriculture (Mougeot, 1999; Mougeot (ed.), 2005).

According to the World Food Summit, food security is "when all people at all times have physical and economic access to sufficient, safe and nutritious food for a healthy and active life". This points to the issue of access and affordability of food. Food insecurity is the absence of food security and in extreme cases can lead to hunger. Hunger has been defined as a situation in which someone cannot obtain adequate amount of food; hunger therefore represents the more severe form of food insecurity. The concept of food security has three pillars: food availability, food access and food use. Food availability means that there is enough quantity of food available at all times; food access refers to the availability of resources to obtain the amount of food needed for a nutritious diet; and food use means the appropriate use of variety of food items based on the knowledge of basic nutrition and care.

As Binns and Fereday (1996) suggest, UA is has lifted millions of people from poverty and improved their health and nutrition. Urban food production (subsistence) can lead to improvement in health and nutrition and also immediate reduction in hunger (Bryld, 2003). In urban areas, lack of money/ income can directly mean lack of food. This is not usually the case in rural areas. Food supply and distribution from rural areas to the urban areas has become very costly therefore it is expected that urban food insecurity will increase (Argenti, 2000).

The value of understanding UA and food insecurity, and the causes of food insecurity have been fuelled further by the rise in the world food price crisis. Poor urban dwellers being largely net food buyers who depend mostly on markets purchasing their food supplies and who suffers most from higher food prices are particularly vulnerable to these food prices (Zezza *et al.,* 2008). The rate via which urban poverty is rising, food security is only becoming an increasingly critical

issue. IFPRI did a study in eight large countries, which was representing 2/3 of the global population, found that poverty levels are rising and the locus of poverty shifting from rural to urban areas (Rosegrant et.al., 2014). Egziabher et al. (1994) noted with concern that although UA plays an important role in contributing to income generation and food security for households, policy makers have largely ignored UA. They also noted that policy makers, government officials and urban planners more often than not perceive UA as a marginal activity that does not belong in modern cities (Egziabher et al., 1994).

After realizing that increased food production was only part of the solution but the problem is associated more with inequalities in distribution. The idea of food security is no longer viewed as a question of availability of food only at the national or even local levels but to deeper and more complex issues of access (at the household or individual level). Currently the definition of food security incorporates issues of adequacy of food, food supply, stability of supplies and access to secure supplies. The dimension of activity level and definition of food security as "secure access at all times to sufficient food for a healthy and active life" was added by the World Bank in 1986 (World Bank, 1986).

Food security incorporates a measure of resilience of an individual or household to disruptions or unavailability of critical food supply in the future (FAO, WFP & IFAD, 2013). Various factors such as droughts, shipping disruptions, fuel shortages, economic instability, and wars, can be disrupted the stability of food security. A good number of urban households depend on UA as a source of income by selling surpluses and saving household expenditure, which in turn will be a substantial amount since most of these households spend about 50-70 percent of their income on food (Mousteir & Danso, 2006).

Food availability In Kenya relies heavily upon the agricultural sector. Constant and persistent rain failure and changing weather patterns have had a negative impact on the agriculture sector. Productive land has at the same time been reduced dramatically for housing and other forms of developments. Calls for innovative and efficient ways of increasing food security especially for the urban poor has thus been called for (Solidarités International, 2011).

Nyoike (2009) did a study on role of urban agriculture in ensuring food security in Nairobi showed that those households that engage in urban agriculture are more food secure and that households headed by a female head are more likely to be engaged in urban agriculture. In addition, a study by Mwangi (2015), established that food insecurity highly contributed to increased urban agricultural practices. It sought to determine the extent to which food Insecurity contribute to increased urban agricultural practices and found that majority of the respondents as shown by 62.5% indicated that food insecurity contributes to increased urban agricultural practices to a very high extent, 22.4% of the respondents indicated to a high extent whereas 15.1% of the respondents indicated to a moderate extent, this implies that food Insecurity contributes to increased urban agricultural practices to a very high extent. The study further revealed that urban agricultural practices plays an important role in enhancing urban food security since the costs of supplying and distributing food to urban areas based on rural production and imports continue to increase, and do not satisfy the demand, especially of the poorer sectors of the population. These findings concur with the research Kutiwa et al. (2010) that urban agriculture is one way to escape the food insecurity and poverty cycle in a cash intensive environment.

In a study by Ibrahim established that residents of Kibera slums had on average two meals in a day of which one was taken outside the home. The meals were regular and frequent where the household head had permanent or more regular income in contrast with households where the head of the household depended on casual labour, indicating a direct relationship between the livelihood status of the breadwinner and household's food security. According to the study, people in the informal settlement lack money to buy food hence access to food is determined by household income and not food availability. Households in the informal settlement now purchase more frequently on credit, get donations, borrow from friends and neighbors or get assistance from families in rural areas. Further most of the households (74.6%), purchased food or other essential household goods on credit due to lack of income to buy them in cash. This is a very common practice amongst informal settlement residents and the extension of credit lines to households is highly dependent upon their ability to either clear or reduce the amounts of debts they have from their creditors. These households have also over the last four years become more dependent on support from relatives in the rural areas.

2.4.1 Measuring Food Insecurity

No single indicator can capture the full range of food insecurity. Bickel *et al.,* (2000), continued to say that a household's food insecurity or hunger levels should be determined by obtaining relevant information on specific conditions, experiences and behaviors, that act as indicators for varying degrees of severity of the condition. Bickel et al., (2000) continued to show that households go through different experiential and behavioral stages as food insecurity, which only become more severe with time.

In stage one, households are anxious about food sufficiency of their food to meet basic needs, they also experience inadequacy in food supplies and implement food budgets and make adjustments on types of food served. As the situation becomes worse or severe, food intake by adults is reduced and adults experience hunger, but the children are spared. In the third stage, children also suffer reduced food intake and hunger and adults' reductions in food intake are more dramatic (Bickel et. al. 2000).

In a study by Odera on contribution of urban agriculture on nutritional status of pupils in Nakuru town showed that there was no significant difference between the intakes of proteins and energy between pupils from schools that had a feeding programme and those that did not. Based on Zscores, the nutritional status of pupils in schools that practice agriculture and have a school feeding program was significantly better than those in schools that do not have these activities (Odera, 2007).

2.5 Environmental risks and urban agriculture

Urban agriculture's unreliability and informal out-look has made it to not only be vulnerable but very risky. This sector has failed to be formally integrated in agriculture policies or urban planning. Most urban farmers don't have secure land tenure or substantial investment in terms of infrastructure or soil fertility and their activities/ practices are often not supervised which can expose them to "innocent" risks from use of pesticides, polluted and untreated water public health nuisance (FAO, 2008).

According to Armar-Klemesu et al., (1998), a huge proportion of urban farmers irrigate their farms using polluted water from untreated water sources like polluted rivers, drainage systems, streams, canals e.t.c. These farmers risk illnesses and contamination of the crops with bacteria, protozoa, viruses or helminthes, which may cause sicknesses or death (Amuzu and Leitmann, 1992). Unhygienic handling of fresh food products during transportation, processing or marketing is an important source of bacterial contamination, especially of fresh vegetables and meat. Transfer of diseases from vectors to human as is the case with malaria transmission is normally high in cities than those in the rural areas. This is because of the highly polluted city waters, which create a suitable breeding ground for mosquitoes.

There a number of ways crops in urban centers can be contaminated. Heavy metals including lead, cadmium, chromium, zinc, copper, nickel, mercury, manganese, selenium, mercury and arsenic are the main causes of crop contamination. People are irrigating their farms with water from streams contaminated by industry, or cultivating on former industrial plots that are contaminated with industrial wastes or spilled oil. Because of heavy traffic and pollution (vehicle fumes) in the cities crops are being contaminated by lead or chromium. Some urban farmers are also applying contaminated compost (e.g. by leaking batteries), which can contaminate crops and accumulate in the edible parts of crops thus causing illnesses (Iretskaya and Chien, 1999). Maconachie and Binns (2006) did a study in Kano region in northern Nigeria and they identified serious environmental and health risks stemming from high levels of toxins that are discharged into water sources from tanneries and factories.

In regards to Transmission of diseases from domestic animals to people (zoonosis), certain diseases (trichinosis, anthrax, pig and beef worm, salmonella bovine, tuberculosis and campylobacter) can be transmitted to humans by livestock kept in close proximity to them if proper precautions are not taken. Ingesting contaminated unpasteurized milk from infected cows (bovine tuberculosis), eating meat infected with tapeworm (pig and beef worm), through a cut in the skin (anthrax), drinking water contaminated with animal urine (Weil's disease), eating meat from animals that consumed contaminated animal feeds (Salmonella and campylobacter) can all cause a variety of sickness, infection or poor health (Kathleen Flynn, 1999). Poor handling of agrochemicals, urban organic wastes and contaminated irrigation water may lead to health problems among urban farmers (Kishi et al, 1995).

Urban agriculture may contribute to environmental degradation by contaminating sources of drinking water by heavy use of chemical fertilizers and pesticides.
Over-use of chicken or pig waste, which is usually rich in nitrate, may lead to ground water contamination (Rabinovitch and Schmetzer, 1997). Siltation of water bodies may also occur if people use inappropriate farming practices, which may, lead to reduction of vegetation. UA can also be deemed a public nuisance if poor aesthetics are involved or noise from animals (Bowyer-Bower, 1999).

2.5.1 Recommendations to Health and Environmental Risks

Different ministries should cooperate and assess actual health and environmental risks associated with urban agriculture and design effective strategies that are preventive and mitigating for safe UA practice. In Kampala, Uganda, town-planning specialists together with ministries of health and agriculture closely cooperated to develop new ordinances on urban agriculture livestock and fisheries (RUAF, n.d.). Geographic information system should be used to identify levels of vulnerability in different areas and also identify different crop uptake rates of contaminates. Areas can then be tested further and zoned to either ensure that planned cropping and farming methods reduce health hazards or ban farming completely and additional monitoring of hazard-prone areas could also be done (RUAF, n.d.).

Food hygiene and safety can be ensured if all foods sold in markets are tested and monitored for metals and pathogens. These safety measures should not only be limited to restaurants and wholesale city markets but also need to be moved to roadside stands. A proper safety monitoring system should include food safety regulations, food standards, testing facilities, and have public and/or private institutions geared towards monitoring the safety and standards of food and enforce measures (RUAF, n.d.). The spreading of disease causing vectors can be controlled using expensive methods such as aerial spraying, or simply by 'good housekeeping', which is affordable. Awareness and best practice are other strategies that can start at home and in primary school that can be utilized to avoid vector breeding include: There are curative and preventive measures such as regulation and control of selected farming activities and methods; habitat management to reduce the number of intermediate hosts; adoption of better farming practices through education; adequate solid waste management; proper water storage to reduce breeding grounds and environmental contamination; elimination of breeding sites by eradicating still and stagnant water and ensuring that streams and rivers are flowing.

To Manage or prevent heavy metal hazards in the farms, it is important to understand the different soil characteristics and how they affect the rate of metal absorption by plants. Adding phosphorus to the soil. Metal uptake by plants is reduced by adding phosphorous to soil which thus reduces the uptake of iron, chromium and arsenic by plants. Changing salt concentrations can reduce uptake of arsenic and cadmium in some crops. Lowering the acidity in soils reduces the rate of absorption of metals thus ensuring that minerals are more readily available to the plants instead. Waste Treatment should be monitored recycled and reused but only if appropriate guidelines for use and treatment are created. It is necessary and important to create local waste recycling and reuse programs to reduce the risk of contamination, ensure adherence to standards, and institute treatment and application standards. UA also has the potential to greatly benefit urban economies but only if all government bodies developed an institutional and policy framework on the sector, ensuring agricultural productivity and food safety (Mireri et al., 2006).

2.6 Theoretical framework

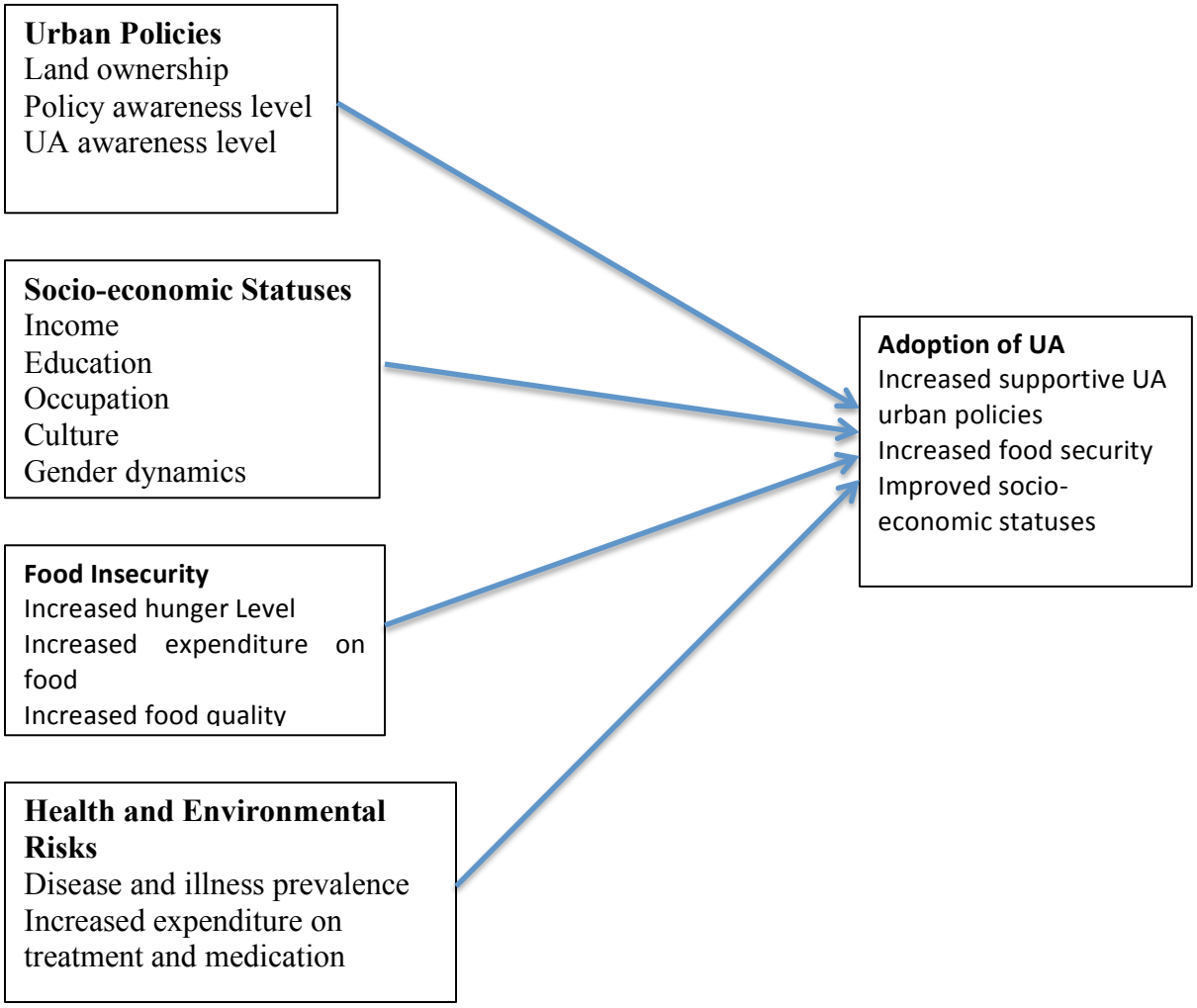
2.6.1 Sustainable Livelihoods (SL) approach

Sustainable Livelihood is a holistic approach of eliminating or reducing poverty by encouraging and supporting people to build on their strengths. This approach tries to go beyond the more traditional or conventional approaches to poverty eradication. These conventional approaches were found to be too limited and narrow because they only focused on particular aspects of poverty, such as low income but did not consider other valuable aspects affecting poverty like access to supports and services, social exclusion and vulnerability, skill development, social connections, meaningful work and active learning (Demonstrating Value n.d.)

According to Chambers and Conway (1992), livelihood refers to the capabilities (both material and social resources), assets and activities required for a basic but meaningful life. A sustainable livelihood can recover and cope with stress and shocks of life or maintain and enhance its capabilities and assets. By adopting coping strategies that are economically effective, ecologically sound and have no irreversibly damage on natural resources within a given ecosystem. These strategies are also expected to be socially equitable (L Krantz, 2001).

2.7 Conceptual framework

Independent variables **Dependent variable**



CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the study area, research design, study population and unit of analysis. It proceeds further to illustrate the sampling procedure and source of data, method of data collection, ethical consideration protocol, operational definitions of variables, and data analysis.

3.2 Research design

The study adopted a descriptive survey design. The major purpose of the research design was to describe the state of affairs, as they exist without influencing it in any way. A descriptive survey is a method of collecting information by interviewing or administering questionnaires to a sample of individuals (Orodho, 2003). It can be used when collecting information about people's attitudes, opinions, habits or any of the variety of educational or social issues (Orodho and Kombo, 2002). It was therefore applicable to this study since both qualitative and quantitative approaches were used. Descriptive survey design was used as it allowed the researcher to get more detailed information at a more personal level from respondents (Orodho, 2003).

3.3 Target Population

Target population is the specific population about which information is desired. According to Ngechu (2004), a population is a set of people, services, elements, events, group of things or households that are being investigated. Mugenda and Mugenda, (2003), explain that the target population should have some observable characteristics, to which the researcher intends to generalize the results of the study.

The target population of this study is 100 households in Nyalenda 'A', sub-location in Kisumu County. Nyalenda 'A' has a population of 28,269 with 14,829 being men and 13,440 being women. There are an estimated 8,070 households within Nyalenda 'A', within an area of 3.2km^2 (Maoulidi, 2012).

3.4 Sample size and sampling procedure

According to Mugenda (1999), a sampling frame is a list of elements from which the sample is actually drawn from and is closely related to the population.

3.4.1 Sample Size

A sample is simply a subset of the population. The concept of a subset arises from the researchers' inability to test all the individuals in a given population. The researcher used the Krejcie and Morgan Sample Size Determination Table (See appendix viii) to arrive at the desired sample size. The table is constructed using the formula below:

n *= required sample size*

t **=** *confidence level at 95% (standard value of 1.96)*

p **=** *estimated prevalence of food insecure in the target area (42%)*

m **=** *margin of error at 5% (standard value of 0.05)*

$$s = \frac{1.96^2 \times 0.40\ (1 - 0.40)}{0.05^2}$$

$$s = \frac{3.8416 \times 0.40\ (0.6)}{0.0025}$$

$$s = \frac{3.8416 \times 0.24}{0.0025}$$

$$s = \frac{0.922}{0.0025}$$

$$s = 368.79$$

Sample size =370

3.4.2 Sampling Procedure

The study used purposive sampling to sample households in Nyalenda 'A' sub-location. Using Stratified random sampling, the population was then divided into five subpopulations according to the five villages. The study then obtained a list of respondents and using a sequence of numbers, a simple random sample was used to select 339 respondents to participate in the study. This method permitted the study to apply statistics to the data and provided equal opportunity of selection of each element of the population. This further ensured that all the individuals defined in the population had equal and independent chance of being selected as a member of the sample

3.5 Research instruments

The study used questionnaires and Interview guide to source for information from the respondents. A structured questionnaire was the main instrument of the study and was administered to the respondents to gather quantitative data. The researcher preferred to use this method because of its ability to solicit information from respondents within a short time as supported by Gupta, (2009). Both open and closed ended questions were included. This is because closed ended questionnaires are easier to analyze since they will be in an immediate usable form and again each item may be followed by alternative answers. Open-ended questions permit a great depth of response, and respondents are allowed to give personal responses.

Interviews were designed in such a way that more specific and truthful answers related to the topic were realized. Interviews are preferred because according to Gupta (2009), they give an opportunity to probe detailed information on an issue. Interviews made it possible to obtain data required to meet the study sub themes. Interviews were more flexible than questionnaires because the interviewer can adapt to the situation and obtain as much information as possible.

3.5.1 Pilot Testing

A pilot study is usually carried out on members of the relevant population, but not on those who will form part of the final sample. This is because it may influence the subsequent behavior of research subjects if they have already been involved in the research (Haralambos and Holborn, 2000). Pilot study was carried out to pretest the research instruments before actual administration to respondents. According to Connelly (2008), extant literature suggests that a pilot study sample

should be 10% of the sample projected for the larger parent study. In order to conduct a pilot test, a sample of 21 respondents were picked from Nyalenda 'B' .The pilot test served to ascertain the clarity, consistency and coherence of the questions in the tools of data collection. The pilot also informed the logistical arrangements thus enabling the researcher to establish the time it would take to administer one questionnaire.

The feedback from the respondents on the questionnaire was incorporated to make the data collection tools more valid and reliable before the actual data collection. The result from the pilot test was analyzed to determine if the research instruments were capable of addressing the objectives under study. The respondents in the pre test did not take part in the final data collection exercise.

3.5.2 Validity of instruments

Validity refers to process of ascertaining the degree to which the test measures what it purports to be measuring. Best and Khan, (2003) define validity as the degree to which empirical measures or several measures of a concept accurately measures a concept. To ensure validity of the data collection instruments, the research assistants were trained for two days on data collection tools and requisite skills needed to undertake the process of data collection and minimize biasness. In order for the study to control quality, the researcher endeavored to attain validity co-efficient of at least 0.70 or 70%. The instruments were piloted in a village in Nyalenda 'B' sub-location which was not included in the study sample and modified to improve their validity coefficients to at least 0.70. Validity of instruments was determined by giving the proposal to two experts to evaluate the relevance of each item in the instrument to the objectives and rate each item on the scale of very relevant (4) quite relevant (3) somewhat relevant (2) and not relevant (1). The questions that rated an average of less than 3 were eliminated from the data collection tools.

Content validity was determined using content validity index (C.V.I) CVI= items rated 3 or 4 by both judges divided by the total number of items in the questionnaire. This is symbolized as n¾ / N. This technique was selected because it was easy to establish the validity of the research instruments thus revising and adjusting them based on the responses obtained and recommendation from the experts. Items with validity coefficients of at least 0.70 were accepted as valid and reliable as suggested by Kathuri, (1993).

3.5.3 Reliability of instruments

Reliability refers to the consistency of a measure. A test is considered reliable if we get the same result repeatedly. To ensure quality of data collected, research assistants were trained for two days prior to data collection. To test consistency in producing a reliable result (reliability), a test-retest method was used. The research instruments were administered to respondents twice within a time span of one week. Cronbach's coefficient was then calculated for one question from objective one to three as well as for the dependent variable, the Cronbach's coefficients were 0.71, 0.84, 0.89 and 0.76 respectively. All the values were more than 0.7, which were considered high reliability of the research instruments.

3.6 Data collection procedures

Permission to collect data was sought from the ministry of higher education through the department of National Council for Science, Technology and Innovation. The researcher distributed the questionnaires to the sampled respondents; participation in the study was voluntary, the objectives and purpose of the study were explained to the participants and their informed consent sought. Adequate instructions and explanations were given upon issue. The researcher then picked the questionnaires after one day. On-spot checks were done for completeness, omissions and commission errors. Errors found were corrected immediately. The respondent also had the opportunity to seek clarification on responses that were not clear. Appointments were sought from participants for interview schedule and participants who were interviewed in private at agreed time, place and date. Confidentiality was observed and anonymous numbers were used to identify participants.

3.7 Data analysis techniques

The research used quantitative data, which was coded, entered into a database and analyzed through descriptive statistics (frequency, percentages and mean) and used to describe the population. Study results are presented in textual form and in form of tables. Statistical Package for the Social Sciences (SPSS) computer software version 19 was used for analysis of quantitative data. Qualitative data was analyzed by content and context; the researcher read through the responses, identified key themes and generated discussions around them. Spearman's Correlation analysis was used to establish the determinants of the adoption of urban agriculture in Nyalenda 'A' sub-location.

3.8 Ethical Considerations

Permission to conduct the study was obtained from the University of Nairobi and Ministry of Higher education through the department of National Council of Science, Technology and Innovation. Participation in the study was voluntary and participants were taken through an oral consent to seek their permission to participate in the study. The objectives of the study were explained to the participants during the consenting. To ensure confidentiality interviews were conducted in private and data collected was only used for the purpose of the study. Respondent's personal identities were not taken. The study did not pose any risk to the participants since the kind of questions used were not personal or of a sensitive nature.

3.8. Operationalization of Variables

Objectives	Variables	Indicators	Measurements	Data collection method
Asses how urban policies influence adoption of urban agriculture	Government / County Government Policies	Access to land Land tenure and security Land use planning Zonification	Title deeds Policies on UA Attitude towards UA Knowledge of UA	1. Questionnaires 2. Interviews
To examine how socioeconomic statuses influence the adoption of urban agriculture	Socio-economic factors	Income Education Occupation Culture Gender dimensions	Occupation Income levels Education Level Age and marital status Family size Expenditure on food Gender roles	1. Questionnaires 2. Interviews
To examine the relationship between food insecurity and the adoption of urban agriculture	Food insecurity	Hunger level Income Household inhabitants	Income levels Qualification level of different household Age of household members Number of people in the household	1. Questionnaires 2. Interviews
To examine how health and environmental risks influence adoption of urban agriculture	Health and environmental risks	Household health Public health Environmental nuisance Environmental degradation	Household illness Household disease epidemic Public health and contamination Food handling and safety measures Waste management	1. Questionnaires 2. Interviews 3. Photos

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.0 Introduction

This chapter presents data analysis results, interprets the findings of the study and discusses the findings in light with empirical literature. The analysis, presentations, interpretations and discussions of the findings are in accordance with the four objectives of the study.

4.1 Response Rate

The researcher worked out the response rate of the research and the findings presented in Table 4.1

Table 4:1: Response Rate

Sample size	Respondents interviewed	Percent
369	**339**	**91.86**

The response rate for the study was 91.86% represented by 339 respondents reached and interviewed out of the targeted 369 respondents. The high response rate was attributed the professional approach displayed by the research assistants in explaining the purpose of the study and convincing the respondents to participate. A response rate of 50% is considered adequate for analysis and reporting, 60% is good and that of 70% and above is very good (Mugenda & Mugenda, 2003).

4.2 Demographic Information

This section analyses, presents and interprets the findings on the marital status of the respondents, their age, size of their household, the role urban agriculture plays in their households, production of vegetables and practice of urban agriculture.

4.2.1 Marital status of the respondents

The respondents were asked to state their marital status and the findings are shown in table 4.2

Table 4:2: Marital status of the respondents

	Frequency	Percent
Married	265	78.2
Single	58	17.1
Divorced	2	.6
Widow	14	4.1
Total	**339**	**100.0**

In regards to marital status, it was asserted that 265(78.2%) of the respondents were married, 58(17.1%) were single and 14(4.1%) were widowed while 2(0.6%) divorced**.** A study done by Ibrahim (2010) in Kibira on informal settlement established that 72.5% of the respondents were married though the rate of separation was high due to what respondents called hard economic times (Ibrahim, 2010).

4.2.2 Age of respondent

The respondents were asked to state their age. The findings are shown in table 4.3.

Table 4:3: Age of respondent

	Frequency	Percent
17-26	128	37.8
27-36	118	34.8
37-46	49	14.5
47-56	24	7.1
57-66	13	3.8
67-76	7	2.1
Total	**339**	**100.0**

128(37.8%) of the respondents stated that they were between 17 and 26 years old, 118(34.8%) were between 27 and 36 years, 49(14.5%) were between 37 and 46 years, 24(7.1%) were between 47 and 56 years, 13(3.8%) were between 57 and 66 years with the least of respondents at 7(2.1%) between 67 and 76 years.

4.2.3 Size of the household

The respondents stated the size of their households and the results are shown in table 4.4

Table 4:4: Size of the household

Frequency		Percent
1	247	72.9
2	87	25.7
3	4	1.2
4	1	.3
Total	**339**	**100.0**

The respondents were able to state the size of their households; 247(72.9%) had one person, 87 (25.7%) had two people, 4 (1.2%) had 3 and 1 (0.3%) had four people. The minimum number of household members was 1 person with a maximum of 18. This was similar with a study done by Ibrahim (2010) for a study in Kibera where the average size of an informal settlement household was four with a considerable proportion of household (40.2%) having children below five years.

4.2.4 Practice urban agriculture as a household

The respondents were asked to state whether they practice urban agriculture as a household and the results are shown in table 4.5

Table 4:5: Practice urban agriculture as a household

	Frequency	Percent
Yes	119	35.1
No	220	64.9
Total	**339**	**100.0**

The respondents were able to state whether they practiced urban agriculture as a household; 119(35.1% said yes while 220(64.9%) said that they did not practice urban agriculture. This was confirmed by the officer in charge of urban agriculture during a Key Informant Interview, who stated that the practice of urban agriculture by residents of Nyalenda could be rated as moderate since some people found it cheaper to buy food than adopt urban agriculture and there also were municipal by-laws which did not allow the practice of urban agriculture. Nyoike (2009), established that those households that engage in urban agriculture are more food secure.

4.2.5 Agricultural practices carried out

The respondents were asked to state the agricultural practices they do carry out. The findings are shown in table 4.6

Table 4:6: Agricultural practices carried out

Agricultural Practice	Frequency	Percent
Grow crops for household consumption	27	25.23
Keep animals for household consumption	19	17.76
Grow crops and keep animals for household consumption	22	20.56
Grow crops to sell for profits	27	25.23
Keep animals to sell for profits	7	6.54
Grow crops and keep animals for sale	5	4.67
	107	**100**

The respondents who said they practices urban agriculture further stated the agricultural practices that they carried out. 27(25.23%) stated that they grow crops for household consumption and to sell for profit, 22(20.56%) said they grow crops and keep animals for household consumption, 19(17.76%) said they keep animals for household consumption, 7(6.54%) stated that they keep animals to sell for profit and 5(4.67%) constituting those who grow crops and keep animals for sale.

4.2.6 Planting of vegetables

The respondents were asked to state where they plant their vegetables. The results are shown in table 4.7

Table 4:7:Planting of vegetables

	Frequency	**Percent**
Backyard garden	46	13.6
Backyard garden	2	.6
Sacks	1	.3
Roadside garden	14	4.1
Farm	14	4.1
N/A	262	77.3
Total	**339**	**100.0**

262(77.3%) respondents stated that they did not plant vegetables, followed by 46(13.6%) who planted vegetables at the backyard gardens, preceded by 14(4.1%) constituting those who planted vegetables on roadsides and farms at home, 2(0.6%) planted vegetables in Containers with the least at 1(0.3%) planting vegetables in sacks. The findings diverged with those of Echakara (2015) who found that a big percentage of the respondents engaged in commercial gardening at 51%; general landscaping or home yard care at 17%; home or personal gardening at 11%; balcony gardening or planters at 14% while community gardening or yard shares at 7%. Another study by Ngugi (2012) showed that cultivation took place on own/family land (52%), along the river/under power line/road (30%) and within estates (18%).

4.2.7 Role urban agriculture plays in your household

The respondents were asked to state the role urban agriculture plays in their household. The findings are shown in table 4.8

Table 4:8: Role urban agriculture plays in your household

	Frequency	Percent
Main source of food	28	8.3
Main source of income (after sales profit)	32	9.4
Complements other food sources	22	6.5
Complements other income sources	37	10.9
Not Applicable	220	64.9
Total	**339**	**100.0**

On the question about the role urban agriculture in their household, 220(64.9%) said that it played no role, 37(10.9%) said that it complemented other income sources, 32(9.4%) said that it served as the main source of income (after sales profit), 28(8.3%) said that it was the main source of food with the least of respondents at 22(6.5%) saying that it complemented other food sources. The findings of the study are in convergence with those of Tevera, (2011) that residents of informal settlements practiced urban agriculture because they got supplement food supplements such as fresh vegetables, cowpeas, maize which is a staple food in most families and also cheap sources of proteins from livestock inform of milk, eggs and meat. This helps them save money which would otherwise been used to buy the food. These savings plus the income earned from sale of surplus farm produce was then used to meet other family expenses.

4.3 Urban Policies and Urban Agriculture

This section analyses, interprets, presents and discusses findings on the first objective: To assess how urban policies influence the adoption of urban agriculture in Nyalenda 'A' sub-location.

4.3.1 Influence of urban policies on adoption of urban agriculture

This section presents the views on the influence urban policies on the adoption of urban agriculture in Nyalenda 'A' sub-location. The respondents were given 5 point Likert Scale questions to respond to 1-Strongly Disagree,2-Disagree, 3-Neutral,4-Agree and 5-Strongly Agree; the means were calculated and interpreted . The results are as shown in table 4.9

Table 4:9: Influence of urban policies on adoption of urban agriculture

Statements	Disagree (%)	Neutral (%)	Agree (%)	Mean	SD
I am allowed by law to conduct any sort of agricultural activity here in Nyalenda	53(15.7%)	30(8.8%)	256(75.5%)	3.72	0.911
There is some sort of government regulation on the conduct of urban agriculture in Kisumu	52(15.3%)	48(14.2%)	239(70.5%)	3.56	0.928
I am aware of the concept of urban agriculture in Kenya and all that it entails	67(19.8%)	38(11.2%)	234(69.0%)	3.59	0.982
Both the municipal staff and citizens are clear about what is permitted agricultural land use within Kisumu,Nyalenda	37(10.9%)	78(23.0%)	224(66.1%)	3.60	0.821
I have been sensitized on urban policies and urban agriculture	169(49.9%)	14(4.1%)	156(46.0%)	2.95	1.131
Average	**75.6(22.32%)**	**41.6(12.26%)**	**221.8(65.42%)**	**3.48**	

256(75.5%) of the respondents stated that they were allowed by law to conduct any sort of agricultural activity in Nyalenda 'A' sub-location, Mean=3.72, SD=0.911, 53(15.75%) stated that they were not allowed by law to conduct any sort of agricultural activity in Nyalenda 'A' sub-location, while 30(8.8%) were undecided.

239(70.5%), Mean= 3.56, SD=0.928 said that there was some sort of government regulation on the conduct of urban agriculture in Kisumu, 52(15.3%) stated that there was no sort of government regulation on the conduct of urban agriculture in Kisumu and 48(14.2%) undecided.

Preponderance at 234(69.0%), Mean=3.59, SD=0.982 were aware of the concept of urban agriculture in Kenya and all that it entails, 67(19.8%) were not aware and 38(11.2%) were undecided on whether they were aware or not of the concept of urban agriculture in Kenya and all that it entails. The urban agricultural officer in Kisumu East sub-location revealed that the residents understood urban agriculture to be agriculture practiced in the urban areas where people have small pieces of land and there's scarcity of water.

224(66.1%), Mean=3.60, SD=0.821 said that both the municipal staff and locals were clear about what is permitted agricultural land use within Nyalenda 'A' sub-location, 78(23.0%), undecided and lastly 37(10.9%) stated that both the municipal staff and locals were not clear about what is permitted agricultural land use within Nyalenda 'A' sub-location.

On the question on urban policies and urban agriculture sensitization or awareness, 169(49.9%) Mean=2.95, SD=1.131, said no, they were not sensitized, 156(46.0%) said yes while 14(4.1%) were undecided.

4.3.2 Nature of the land tenure

The respondents were asked to state the nature of the land tenure and the findings shown below

Table 4:10: Nature of the land tenure

	Frequency	**Percent**
Freehold	23	6.8
Leasehold	128	37.8
Community land	107	31.6
Government land/Public land	81	23.9
Total	**339**	**100.0**

Preponderance at 128(37.8%) stated that the nature of their land was leasehold, 107(31.6%) stated community land, 81 (23.9%) government/ public land with the least at 23(6.8%) stated freehold as the nature of their land tenure.

4.3.3 Correlation between urban policies and sustainable livelihoods

The researcher did a spearman correlation between urban policies and sustainable livelihoods on the adoption of urban agriculture, the results were as shown in Table 4.11

Table 4:11: Correlation between urban policies and sustainable livelihoods

			Sustainable Livelihoods	**Urban Policies**
Spearman's rho	Sustainable Livelihoods	Correlation Coefficient	1.000	.084*
		Sig. (2-tailed)	.	.022
		N	338	338
	Urban Policies	Correlation Coefficient	.084*	1.000
		Sig. (2-tailed)	.022	.
		N	338	339

It was established that there was a strong significant positive correlation between awareness of urban policies in agriculture and sustainable livelihoods in Nyalenda 'A' sub-location. Spearman's rho= 0.084, p=0.022, CI=95%, which meant that the awareness of urban policies influenced sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location.

4.3.4 Correlation between urban policies and adoption of urban agriculture

The researchers did a spearman correlation between urban policies and adoption of urban agriculture in Nyalenda 'A' sub-location. The results are as shown in Table 4.12

Table 4:12: Correlation between urban policies and adoption of urban agriculture

			Urban Policies	**Adoption of urban agriculture**
Spearman's rho	Urban Policies	Correlation Coefficient	1.000	0.299**
		Sig. (2-tailed)	.	.000
		N	339	339
	Adoption of urban agriculture	Correlation Coefficient	0.299**	1.000
		Sig. (2-tailed)	.000	.
		N	339	339

It was found out that there was a moderate positive and significant correlation between urban policies and the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.299, p=0.000, CI=99%. This meant that those who were aware of urban policies practiced urban agriculture more.

4.4 Socio-Economic Status and Urban Agriculture

This section analyses, interprets, presents and discusses findings on the second objective: To examine how socio-economic status influence the adoption of urban agriculture in Nyalenda 'A' sub-location.

4.4.1 Household monthly income

The respondents were asked to state how much income in Kshs. got/earned as a household on a monthly basis and the findings are shown in table 4.13

Table 4:13: Household monthly income

	Frequency	**Percent**
Less than 4000	24	7.1
4001 thru 8000	70	20.6
8001 thru 12000	107	31.6
Over 12,000	138	40.7
Total	**339**	**100.0**

The respondents were able to state the amount of income that they earned as a household on a monthly basis, it was registered that 138(40.7%) earned over 12000 shillings, followed by 107(31.6%) who earned between 8001 and 12000 shillings, 70(20.6%) of the respondents earned between 4001 and 8000 shillings with the least of the respondents at 24(7.1%) earning less than 4000 shillings. The minimum amount of income earned by the household of Nyalenda per month was Ksh. 600 with the maximum being Ksh. 90,000,the mean earning was Ksh. 12,787.91.These findings were supported by a study by Ibrahim (2010) who established that majority of Kibera informal settlement residents (80.4%) earn less than Kshs. 15,000 a month with an average household income of Kshs. 11,078.43 though 51.8% earned less than Kshs. 10,000.

4.4.2 Level of education of the household head

The respondents were asked to state the level of education of the household head and the results are shown in table 4.14

Table 4:14: Level of education of the household head

	Frequency	Percent
Non-formal	17	5.0
Primary	100	29.5
Secondary	115	33.9
College	94	27.7
University Degree	13	3.8
Total	**339**	**100.0**

The respondents were able to state the level of education of the household head, it was found that 115(33.9%) had secondary education, 100(29.5%) had Primary education, 94(27.7%) had college education, 17 (5%) had no formal education with the least at 13(3.8%) having degree level of education. This meant that majority of the respondents were literate and could comprehend the questions for which the study was soliciting answers. A study by Mwangi (2015) showed that most of the respondents as shown by 29.6% had college diploma certificates, 25.0% had attained certificates, 23.7% had attained undergraduate, 15.1% had attained master's level and 6.6% had attained PHD level of education. Similar findings were reported in a study by Echakara (2015) at Lang'ata Sub-County which showed that majority of the respondents at 51% had post-secondary level of education, 78 (25%) of them had no formal education, 42 (14%) had attained Kenya Certificate of secondary education and 30 (10%) of the respondents had attained Kenya Certificate of Primary Education.

4.4.3 Occupation of the household head

The respondents were asked to state the occupation of the household head and the findings are shown in table 4.15

Table 4:15: Occupation of the household head

	Frequency	Percent
Formal employment (white collar)	25	7.4
Informal employment (Blue collar)	99	29.2
Informal employment (self-ployment)	215	63.4
Total	**339**	**100.0**

On the question about the occupation of the Household head, 215(63.4%) were in the informal employment, followed by 99(29.2%) who were in the informal employment (Blue Collar) with least of household heads at 25(7.4%) engaged in the formal employment (White Collar).This was an indication that most people in the informal settlement lack a regular income. The findings of this study diverge with those of Abdulla (2011), which established that most urban informal settlement dwellers (96.6%) were employed though majority (83.3%) are in casual employment that are often low paying jobs. Ibrahim (2010) in a study in the informal settlement of Kibera established that the meals were regular and frequent where the household head had permanent or more regular income in contrast with households where the head of the household depended on casual labour, indicating a direct relationship between the livelihood status of the breadwinner and household's food security. This meant that the households in Nyalenda were more susceptible to food insecurity because majority of the household heads did not have regular income.

4.4.4 Life influenced by culture

The respondents were asked to state if the way they live and manage their household influenced by culture and the results are shown in table 4.16

Table 4:16: Life influenced by culture

	Frequency	Percent
Yes	239	70.5
No	100	29.5
Total	**339**	**100.0**

The respondents were able to state whether how they lived and managed their household was influenced by culture. 239(70.5%) agreed while 100(29.5%) said that the way they live and manage their household was not influenced by culture. This meant that the residents of the Nyalenda had been influenced by the urban way of life so much so that their traditional cultured had been greatly eroded.

4.4.5 House hold breadwinner

The respondents were asked to state the individual to be providing for the family. The results are shown in table 4.17

Table 4:17: Household breadwinner

	Frequency	Percent
The man	236	69.6
The woman	25	7.4
Both the man and the woman	78	23.0
Total	**339**	**100.0**

Asked about who should be providing for the family, 236(69.6%) said it was the role of the Man, 78(23%) said it was the role of both the man and the woman with the least at 25(7.4%) saying that it was the role of the Woman to provide for the family. This meant that the respondents'

thoughts were still influenced by the traditional order of life where a man was seen as the sole breadwinner.

4.4.6 Correlation between economic status and sustainable livelihoods

The researcher did a spearman correlation between economic status and sustainable livelihoods on the adoption of urban agriculture in Nyalenda 'A' sub-location.

Table 4:18: Correlation between economic status and sustainable livelihoods

			Sustainable Livelihoods	**Socio-Economic Status**
Spearman's rho	Sustainable Livelihoods	Correlation Coefficient	1.000	-0.071
		Sig. (2-tailed)	.	.195
		N	338	338
	Socio-Economic Status	Correlation Coefficient	-0.071	1.000
		Sig. (2-tailed)	.195	.
		N	338	339

It was established that there was a weak negative and insignificant correlation between the socio-economic status and sustainable livelihoods in Nyalenda 'A' sub-location. Spearman's rho=-0.071, p=0.195, CI=95%. This meant that those whore were better in socio-economic status in Nyalenda 'A' sub-location were less likely to attain sustainable livelihood from adoption of urban agriculture. The key informant interview with the urban agricultural officer in Kisumu East also confirmed that, socio-economic factors influenced the adoption of urban agriculture in Nyalenda in that, household members with low income are more likely to adopt urban agriculture in order to complement other foodstuff as those with high income less likely to adopt urban agriculture because they can afford to buy food and can maybe just do urban agriculture as a hobby.

4.4.7 Correlation between socio-economic factor and adoption of urban agriculture

The researchers did a spearman correlation between adoption of urban agriculture and socio-economic factors in Nyalenda 'A' sub-location. The results are as shown in Table 4.19

Table 4:19: Correlation between socio-economic factor and adoption of urban agriculture

			Adoption of Urban Agriculture	**Socio-Economic Factor**
Spearman's rho	Adoption of Urban Agriculture	Correlation Coefficient	1.000	-.016
		Sig. (2-tailed)	.	.775
		N	339	339
	Socio-Economic Factors	Correlation Coefficient	-.016	1.000
		Sig. (2-tailed)	.775	.
		N	339	339

It was found out that there was a weak negative and insignificant correlation between the adoption of urban agriculture in Nyalenda 'A' sub-location and socio-economic factors. Spearman's rho= -0.016, p=0.775, CI=95%. These finding converge with those of Ibrahim (2010) that increased poverty level contributes to increased urban agricultural practices to a high extent. The findings are also in line with those of Githugunyi (2014), respondents said they practiced UA for food security and income generation was mostly from low-income areas of Njathaini, Utalii and Mathare areas.

4.5 Food insecurity and Urban Agriculture

This section analyses, interprets, presents and discusses findings on the third objective: To find out the relationship between food insecurity and adoption of urban agriculture in Nyalenda 'A'.

4.5.1 Number of meals in a day

The respondents were asked the number of meals get in a day and the results are shown in table 4.20

Table 4:20: Number of meals in a day

	Frequency	Percent
1	9	2.7
2	61	18.0
3	252	74.3
4	13	3.8
5	4	1.2
Total	**339**	**100.0**

Majority of the respondents at 252(74.3%) stated that they had three meals in a day, 61(18.0%) had two meals, 13(3.8%) had 4 meals, 9(2.7%) had one meal with the minority at 4(1.2%) had five meals and above in a day. This was an indication that most of the households were food secure. The findings diverge with the findings of Ibrahim (2010) for a study in the informal settlement of Kibera that the residents had an average of two meals in a day of which one was taken outside the home.

4.5.2 Household members going hungry

The respondents were asked to state whether their household members went hungry in the last one month and the results are shown in table 4.21

Table 4:21: Household members going hungry

	Frequency	Percent
Yes	120	35.4
No	219	64.6
Total	**339**	**100.0**

Preponderance at 219(64.6%) stated that none of their household members went hungry in the last one month with the minority at 120(35.4%) stated that some members of their household members went hungry in the last one month. This meant that most of the household were food secure; never going hungry and getting food in right quantities and nutrients. This diverges with the findings of Abdulla (2011) that that households in the urban informal settlements are food insecure.

4.5.3 Storage of food in house to last you one week

The respondents were asked to state whether they had food stored in their house to last them one week from now. The results are as shown in table 4.22

Table 4:22: Storage of food in house to last you one week

	Frequency	**Percent**
Yes	189	55.8
No	150	44.2
Total	**339**	**100.0**

It was popular among 189(55.8%) of the respondents to say that they did not have food stored in their house to last you one week from then as the minority at 150 (44.2%) had food stored in their house to last you one week from then.

4.5.4. Household members getting the right amount of food

The respondents were asked if their household members get the right amount of food and the results were as shown in table 4.23

Table 4:23: Household members getting the right amount of food

	Frequency	Percent
Yes	214	63.1
No	125	36.9
Total	**339**	**100.0**

Majority of the respondents at 214(63.1%) stated that their household members did not get the right quantity of food given their body requirement with the minority at 125(36.9%) stated that their household members get the right quantity of food given their body requirement.

4.5.5 Household getting balanced diet on a given day.

The respondents were asked if they get balanced diet on a given day in their households and the findings are as shown in table 4.24

Table 4:24: Household getting balanced diet on a given day

	Frequency	Percent
Yes	201	59.3
No	138	40.7
Total	**339**	**100.0**

Preponderance at 201(59.3%) stated that their household members get balance diet/meals on any given day with the least at 138(40.7%) stated that their household members did not get balance diet/meals on any given day. However, an interview with the urban agricultural officer revealed that a good number of the residents were not food secure in Nyalenda. She stated,

"Majority of the residents lack nutritious food which meets their dietary needs as they eat ugali and plain sukumawiki every day. Food is also expensive and most people can't afford to buy."

4.5.6 Clean water for drinking at the household

The respondents were asked to state whether their household members had clean water for drinking and the findings are shown in table 4.25

Table 4:25: Clean water for drinking at the household

	Frequency	Percent
Yes	304	89.7
No	35	10.3
Total	**339**	**100.0**

Majority at 304(89.7%) stated that their household members had clean water for drinking with the minority at 35(10.3%) stated that they lacked clean water for drinking. This meant that the residents had a chance of reducing instances if diarrhea. The study finding diverge from the findings of Tulo (2012) who did a study in Nyalenda and established that there was dirty, unclean and inadequate water supply and poor sanitation services which negatively influenced the health of slums dwellers. The study also revealed that there was less community participation and low perception in acquiring safe water and sanitation facilities.

4.5.7 Correlation between food security and sustainable livelihoods

The researcher did a spearman correlation between food security and sustainable livelihoods on the adoption of urban agriculture in Nyalenda 'A' sub-location. The results are as shown in Table 4.26

Table 4:26: Correlation between food security and sustainable livelihoods

			Sustainable Livelihoods	Food Insecurity
Spearman's rho	Sustainable Livelihoods	Correlation Coefficient	1.000	0.046
		Sig. (2-tailed)	.	.400
		N	338	338
	Food Insecurity	Correlation Coefficient	0.046	1.000
		Sig. (2-tailed)	.400	.
		N	338	339

It was found out that there was a weak positive and insignificant correlation between food insecurity and sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.046, p=0.400, CI=95%. This meant that the households that experienced food insecurity were more likely to strive to achieve sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location. KII with the urban agricultural officer Kisumu east also confirmed that food security determines the likelihood of a household to take up urban agriculture.

4.5.8 Correlation between food insecurity and adoption of urban agriculture

The researchers did a spearman correlation between adoption of urban agriculture and food insecurity in Nyalenda 'A' sub-location. The results are as shown in Table 4.27

Table 4:27: Correlation between food insecurity and adoption of urban agriculture

			Adoption of Urban Agriculture	**Food Insecurity**
Spearman's rho	Adoption of Urban Agriculture	Correlation Coefficient	1.000	-0.187**
		Sig. (2-tailed)	.	.001
		N	339	339
	Food Insecurity	Correlation Coefficient	-0.187**	1.000
		Sig. (2-tailed)	.001	.
		N	339	339

It was established that there was a weak negative but significant correlation between the adoption of urban agriculture and food insecurity in Nyalenda 'A' sub-location. Spearman's rho= -0.187, p=0.001, CI=99%. This meant that those who adopted urban agriculture in Nyalenda 'A' sub-location experienced food insecurity to a lesser extent. This is supported by the findings of Nyoike (2009) who established that those households that engage in urban agriculture are more food secure. Mwangi (2015) also established that food insecurity highly contributed to increased urban agricultural practices. Further, the findings concur with the research by Kutiwa et al. (2010) that urban agriculture is one way to escape the food insecurity and poverty cycle in a cash intensive environment.

4.6 Health and environmental risks and Urban Agriculture

This section analyses, interprets, presents and discusses findings on the third objective: To determine the influence of health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location.

4.6.1 View of health and environmental risks

This section presents the views on the influence health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location. The respondents were given several 5 point Likert Scale questions to respond to 1-Strongly Disagree, 2-Disagree, 3-Neutral,4-Agree and 5-Strongly Agree; the means were calculated and interpreted . The results are as shown in table 4.28

Table 4:28: View of health and environmental risks

Statements	Disagree (%)	Neutral (%)	Agree (%)	Mean	SD
There are physical hazards in your environment that pose safety and health risks	78(23.0%)	8(2.4%)	253(74.7%)	3.84	1.232
There are chemical hazards in my environment that pose safety and health risks	154(45.4%)	39(11.5%)	146(43.1%)	2.99	1.253
There are biological hazards in my environment that pose safety and health risks	156(46.1%)	10(2.9%)	173(37.8%)	3.15	1.332
Average	**129(38.17%)**	**19(5.6%)**	**191(51.87%)**	**3.33**	

Preponderance at 253(74.7%), Mean=3.84, SD=1.232, stated that there were physical hazards in their environment that posed safety and health risks, 78(23.0%), stated that there were no physical hazards in their environment that pose safety and health risks with the minority at 8(2.4%) undecided whether were physical hazards in their environment that pose safety and health risks or not. Given that majority of the respondent did not practice urban faming, this could explain the reason why there were physical hazard in their environment. Ngugi(2012)

noted that urban agriculture has also led to positive impact. He found that most urban farmers utilized urban waste in carrying out farming hence minimizing pollution.

It was also popular among 154(45.4%), Mean=2.99, SD=1.253 that there were no chemical hazards in their environment that posed safety and health risks, 146(43.1%) stated that there were chemical hazards in their environment that posed safety and health risks with the minority at 39(11.5%) undecided whether there were chemical hazards in their environment that posed safety and health risks or not.

Majority at 173(37.8%), Mean=3.15, SD=1.332, stated that there were no biological hazards in their environment that posed safety and health risks, 156(46.1%) stated that there were with the minority at 10(2.9%), undecided whether there were biological hazards in their environment that posed safety and health risks or not.

4.6.2 Household management of waste from the farm

The respondents were asked how they managed waste from the farm and the results are as shown in table 4.29

Table 4:29: Household management of waste from the farm

	Frequency	**Percent**
Compost	26	7.7
Burn	235	69.3
Landfill	29	8.6
Collection (Private or council)	48	14.2
Recycle	1	.3
Total	**339**	**100.0**

Preponderance at 235(69.3%) stated that they managed waste from their farm by burning, 48 (14.2%) collection (Private or council), 29(8.6%) landfill, 26(7.7%) compost with the minority at 1(3%) recycled as a means of managing waste from their farm.

4.6.3 Household members taken ill in the last one year

The respondents were asked whether a member of their household had been taken ill in the last one year. The results are as shown in table 4.30

Table 4:30: Household management of waste from the farm

	Frequency	Percent
Yes	201	59.3
No	138	40.7
Total	**339**	**100.0**

A greater mass of the respondents at 201(59.3%) stated that a member of their household had been taken ill in the last one year because of the nature of environment that they stayed with the minority at 138(40.7%) stated that a member of their household had not been taken ill in the last one year because of the nature of environment that they stayed, illness was particularly common among the those who practiced urban agriculture. This result is supported by assertions by Mireri et al. (2006) that due to environmental degradation and heighten poverty, there are health risks associated with urban agriculture in hazardous areas or use of unsafe water. The findings of the study could be explained by those of Maingi (2012) who showed that about 81.6% of urban farmers used farm inputs in their farms with potential negative implication on the environment and human health. He noted that the morbidity report for Kahawa health centre showed that respiratory diseases, diarrhoea, malaria and intestinal worms were most common.

4.6.4 Correlation between environmental health/risk and sustainable livelihoods

The researcher did a spearman correlation between the relationship between health and environmental risks and sustainable livelihoods on the adoption of urban agriculture in Nyalenda 'A' sub-location.

Table 4:31: Correlation between environmental health/risk and sustainable livelihoods

			Sustainable Livelihoods	Health and Environmental Risks
Spearman's rho	Sustainable Livelihoods	Correlation Coefficient	1.000	.109*
		Sig. (2-tailed)	.	.046
		N	338	338
	Health and Environmental Risks	Correlation Coefficient	.109*	1.000
		Sig. (2-tailed)	.046	.
		N	338	339

It was found out that there was a strong positive and significant correlation between health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.109, p=0 .046, CI=95%. This meant that those who were exposed to health and environmental risks were more likely to strive towards sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location.

4.6.5 Correlation between health/ environmental risks and adoption of urban agriculture

The researcher did a spearman correlation between adoption of urban agriculture and health/ environmental risks in Nyalenda 'A' sub-location. The results are as shown in Table 4.32

Table 4:32: Correlation between health/ environmental risks and adoption of urban agriculture

			Adoption of Urban Agriculture	Health and Environmental Risks
Spearman's rho	Adoption of Urban Agriculture	Correlation Coefficient	1.000	.009
		Sig. (2-tailed)	.	.863
		N	339	339
	Health and Environmental Risks	Correlation Coefficient	.009	1.000
		Sig. (2-tailed)	.863	.
		N	339	339

It was established that there was a weak positive and insignificant correlation between the adoption of urban agriculture in Nyalenda 'A' sub-location and food insecurity. Spearman's rho= 0.009, p=0.863, CI=99%. This meant that those who experienced health and environmental risks practiced urban agriculture more.

CHAPTER FIVE
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

5.1 Introduction

This chapter presents the summary of the findings of the main study, conclusions, recommendations arrived at and contribution to body of knowledge. It also gives suggestions for further research.

5.2 Summary of Findings

For the first objective, which was to assess how urban policies influence the adoption of urban agriculture in Nyalenda 'A' sub-location. Majority of the respondents stated that they were allowed by law to conduct any sort of agricultural activity in Nyalenda at 256(75.5%), Mean=3.72, SD=0.911.It was popular among the respondents at 239(70.5%), Mean= 3.56, SD=0.928) that there was some sort of government regulation on the conduct of urban agriculture in Kisumu. Preponderance at 234(69.0%), Mean=3.59, SD=0.982) were aware of the concept of urban agriculture in Kenya and all that it entails. It was also popular among 224(66.1%), Mean=3.60, SD=0.821) that both the municipal staff and citizens were clear about what is permitted agricultural land use within Kisumu. Majority at (169(49.9%), Mean=2.95, SD=1.131), had not been sensitized on urban policies and urban agriculture. Majority at 128(37.8%) had land on leasehold, 107(31.6%) had community land, 81(23.9%) cited government/ public land with the least at 23(6.8%) stating freehold. It was established that there was a strong significant positive correlation between awareness of urban policies in agriculture and sustainable livelihoods in Nyalenda 'A' sub-location. Spearman's rho= 0.084, p=0.022, CI=95%.It was found out that there was a moderate positive and significant correlation between awareness of urban policies and the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.299, p=0.000, CI=99%.

For the second objective that was to examine how socio-economic statutes influence the adoption of urban agriculture in Nyalenda 'A' Sublocation. Majority of the respondents at 138(40.7%) earned over 12000 shillings, followed by 107(31.6%) between 8001 and 12000 shillings, 70(20.6%) between 4001 and 8000 shillings with the least of the respondents at 24(7.1%) earning less than 4000 shillings. Majority of the respondents at 115(33.9%) had

secondary education, 100(29.5%) had Primary education, 94(27.7%) had college education, 17(5%) had no formal education with the least at 13(3.8%) having degree level of education. Majority of the household heads at 215(63.4%) were in the informal employment, followed by 99(29.2%) who were in the informal employment (Blue Collar) with least of household heads at 25(7.4%) engaged in the formal employment (White Collar). Majority of the respondents at 239(70.5%) agreed while 100(29.5%) disagreed that the way they live and manage their household was influenced by culture. Majority of the respondents at 236(69.6%) said it was the role of the man to provide for the family, 78(23%) said it was the role of both the man and the woman with the least at 25(7.4%) saying that it was the role of the woman. It was found out that there was a weak negative and insignificant correlation between the adoption of urban agriculture in Nyalenda 'A' sub-location and socio-economic factors. Spearman's rho= -0.016, p=0.775, CI=99%. There was a weak negative and insignificant correlation between the socio-economic status and the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho=-0.071, p=0.195, CI=95%.

The third objective was to find out the relationship between food insecurity and adoption of urban agriculture in Nyalenda 'A'. Majority of the respondents at 252(74.3%) stated that they had three meals, 61(18.0%) had two meals, 13(3.8%) had 4 meals, 9(2.7%) had one meal with the minority at 4(1.2%) had five meals and above in a day. Preponderance at 219(64.6%) stated that none of their household members went hungry in the last one month with the minority at 120(35.4%) stated that some members of their household members went hungry in the last one month. It was popular among 189(55.8%) of the respondents that they did not have food stored in their house to last you one week from then as the minority at 150(44.2%) had food stored in their house to last you one week from then. The bulk of the respondents at 214(63.1%) stated that their household members did not get the right quantity of food given their body requirement with the minority at 125(36.9%) stated that their household members get the right quantity of food given their body requirement. A majority at 201(59.3%) stated that their household members get balance diet/meals on any given day with the least at 138(40.7%) stated that their household members did not get balance diet/meals on any given day. Majority at 304(89.7%) stated that their household members had clean water for drinking with the minority at 35(10.3%) stated that they lacked clean water for drinking. It was found out that there was a weak positive

and insignificant correlation between food insecurity and sustainable livelihoods from the adoption of urban agriculture in Nyalenda ‘A’ sub-location. Spearman's rho= 0.046, p=0.400, CI=95%. It was established that there was a weak negative but significant correlation between the adoption of urban agriculture and food insecurity in Nyalenda ‘A’ sub-location. Spearman's rho= -0.187, p=0.001, CI=99%.

The fourth objective was to determine the influence of health and environmental risks on the adoption of urban agriculture in Nyalenda ‘A’ Subcounty. Preponderance at 253(74.7%), Mean=3.84, SD=1.232), stated that there were physical hazards in their environment that posed safety and health risks. It was also popular among 154(45.4%), Mean=2.99, SD=1.253) that there were no chemical hazards in their environment that posed safety and health risks. Majority at (173(37.8%), Mean=3.15, SD=1.332), stated that there were no biological hazards in their environment that posed safety and health risks. Preponderance at 235(69.3%) stated that they managed waste from their farm by burning at 48(14.2%), collection (Private or council) at 29(8.6%) landfill at 26(7.7%) and compost with the minority at 1(3%) recycled as a means of managing waste from their farm. A greater mass of the respondents at 201(59.3%) stated that a member of their household had been taken ill in the last one year because of the nature of environment that they stayed with the minority at 138(40.7%) not having members being ill. It was established that there was a weak positive and insignificant correlation between the adoption of urban agriculture in Nyalenda ‘A’ sub-location and food insecurity, Spearman's rho= 0.009, p=0.863, CI=99%. There was a strong positive and significant correlation between health and environmental risks on the adoption of urban agriculture in Nyalenda ‘A’ sub-location Spearman's rho= 0.109, p=0 .046, CI=95%.

5.3 Conclusions

Objective	
To assess how urban policies influence the adoption of urban agriculture in Nyalenda 'A' sub-location.	It was concluded that there was a moderate positive and significant correlation between urban policies and the adoption of urban agriculture in Nyalenda 'A' sub-location. Those who were aware of urban policies in agriculture adopted urban agriculture better. The researcher inferred that there was a strong significant positive correlation between awareness of urban policies in agriculture and sustainable livelihoods in Nyalenda 'A' sub-location.
To examine how socio-economic statutes influence the adoption of urban agriculture in Nyalenda'A' sub-location	It was established that there was a weak negative and insignificant correlation between the socio-economic status and sustainable livelihoods in Nyalenda 'A' sub-location. Spearman's rho=-0.071, p=0.195, CI=95%.
To find out the relationship between food insecurity and adoption of urban agriculture in Nyalenda 'A'.	It was deduced that there was a weak negative but significant correlation between food insecurity and the adoption of urban agriculture in Nyalenda 'A' sub-location. This meant that those who practiced urban agriculture were less food insecure.
To determine the influence of health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' Subcounty.	It was inferred that there was a strong positive and significant correlation between health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location. This meant that those who were exposed to health and environmental risks were more likely to strive towards sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location.

1.4 Recommendations

Objective	
To assess how urban policies influence the adoption of urban agriculture in Nyalenda 'A' sub-location.	Local and national government institutions to amend old policies or implement new policies that support, protect and manage the practice of urban agriculture. Sensitize the residents of Nyalenda on urban policy how it affects their ability to practice urban agriculture for sustainable livelihood. There is a need for local governments to ensure land tenure security to residents of Nyalenda 'A' to encourage more people to adopt UA without fear of being punished for doing so or losing their farms.
To examine how socio-economic statutes influence the adoption of urban agriculture in Nyalenda'A' sub-location	There is a need for various government and non-governmental institutions to sensitize residents of Nyalenda on the viability of urban agriculture. The ministries of agriculture, health and devolution should champion urban agriculture as a way of making households in Nyalenda more food secure. The study proved a relationship.
To find out the relationship between food insecurity and adoption of urban agriculture in Nyalenda 'A'.	Governments, both local and national together with NGO's need to create more awareness on viability of UA as a strategy toward better SES Urban farmers ought to be sensitized on sustainable and safe farming practices to minimize risks particularly health risks that are as a result of poor hygiene. Urban farmers should be equipped with knowledge, skills and other resources like access to finance, that will secure their practice in UA

To determine the influence of health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' Subcounty.	The ministries of health and environment and the County Government of Kisumu should seek way of reducing the environmental risks and hazard that residents, particularly urban farmers are exposed to. The county government should come up with safe, secure and sustainable ways of managing wastes in informal settlements like Nyalenda because of the high disease and illness prevalence due to unsanitary living conditions. The county government should prioritize a clean and safe environment to entrench the gains of urban agriculture towards sustainable livelihoods.

5.5 Contribution to Body of Knowledge

Objective	Contribution to body of knowledge
To assess how urban policies influence the adoption of urban agriculture in Nyalenda 'A' sub-location.	It was found out that there was a moderate positive and significant correlation between awareness of urban policies and the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.299, p=0.000, CI=99%. It was established that there was a strong significant positive correlation between awareness of urban policies in agriculture and sustainable livelihoods in Nyalenda 'A' sub-location. Spearman's rho= 0.084, p=0.022, CI=95%.
To examine how socio-economic statutes influence the adoption of urban agriculture in Nyalenda'A' sub-location	It was found out that there was a weak negative and insignificant correlation between the adoptions of urban agriculture in Nyalenda 'A' sub-location and socio-economic factors. Spearman's rho= -0.016, p=0.775, CI=99%.There was a weak negative and insignificant correlation between the socio-economic status and the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho=-0.071, p=0.195, CI=95%.
To find out the relationship between food insecurity and adoption of urban agriculture in Nyalenda 'A'.	It was established that there was a weak negative but significant correlation between the adoption of urban agriculture and food insecurity in Nyalenda 'A' sub-location. Spearman's rho= -0.187, p=0.001, CI=99%.There was a weak positive and insignificant correlation between food insecurity and sustainable livelihoods from the adoption of urban agriculture in Nyalenda 'A' sub-location. Spearman's rho= 0.046, p=0 .400, CI=95%.
To determine the influence of health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' Subcounty.	It was established that there was a weak positive and insignificant correlation between the adoptions of urban agriculture in Nyalenda 'A' sub-location and food insecurity. Spearman's rho= 0.009, p=0.863, CI=99%. There was a strong positive and significant correlation between health and environmental risks on the adoption of urban agriculture in Nyalenda 'A' sub-location , Spearman's rho= 0.109, p=0 .046, CI=95%.

5.6 Area for further Research

The study established that majority of the respondents at 201(59.3%) had members of their household taken ill in the last one year because of the nature of environment. There is need to investigate the extent of health risk posed on the lives of residents in the informal settlements of Nyalenda as a result of poor waste management practices

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APPENDIX I: QUESTIONNAIRE

DEMOGRAPHIC FACTORS

1. What is your gender? Male [ ] Female [ ]
2. What is your age……
3. What is your marital status?
   Married [ ] Single [ ] Divorced [ ] Widow [ ] Widower [ ]
4. What is the size of household?(list the number of members)
5. How much do you spend on food on a daily basis? (RA to multiply by 30 days to establish monthly income)
6. Do you practice urban agriculture as a household?
   Yes [ ] No [ ]
7. If yes in above, for how long have you been practicing urban agriculture?(State in completed years)

……

8. What agricultural practices do you carry out?
   a) Grow crops for household consumption [ ]
   b) Keep animals for household consumption [ ]
   c) Grow crops and keep animals for household consumption [ ]
   d) Grow crops to sell for profits [ ]
   e) Keep animals to sell for profits [ ]
   f) Grow crops and keep animals for sale [ ]
9. Where do you plant your vegetables?
   a) Backyard garden [ ]
   b) Containers [ ]
   c) Sacks [ ]
   d) Roadside garden [ ]
   e) Other (please specify) [ ]

10. What role does urban agriculture play in your household?

a) Main source of food [ ]
b) Main source of income (after sales profit) [ ]
c) Complements other food sources [ ]
d) Complements other income sources [ ]
e) Other (please specify) _____

URBAN POLICIES AND URBAN AGRICULTURE

11. I am allowed by law to conduct any sort of agricultural activity here in Nyalenda

Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

12. There is some sort of government regulation on the conduct of urban agriculture in Kisumu

Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

13. I am aware of the concept of urban agriculture in Kenya and all that it entails

Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

14. Both the municipal staff and citizens are clear about what is permitted agricultural land use within Kisumu,Nyalenda

Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

15. I have been sensitized on urban policies and urban agriculture

Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

16. What is the nature of the land tenure?

Freehold [ ] Leasehold [ ] Community land[ ] Government land/ Public land [ ]

SOCIO-ECONOMIC STATUS

17. How much income in Ksh. do you get/earn as a household on a monthly basis?

18. What is the level of education of the household head? Non-formal [ ] College [ ] University degree [ ] Master's degree [ ] Others (specify) _____
19. What is the occupation of the household head? Formal employment(white collar) [ ] Informal employment(Blue collar) [ ] Informal employment [ ]
20. Does the way you live and manage your household influenced by culture? Yes [ ] No [ ]
21. Who should be providing for the family? The man [ ] The woman [ ] Both the man and the woman [ ]
FOOD INSECURITY
22. How many meals does your family members of 5 years and above have in a day? ……..
23. Did any of your household members go hungry in the last one month? Yes [ ] No [ ]
24. Do you have food stored in your house to last you one week from now? Yes [ ] No [ ]
25. Do your household members get the right quantity of food given their body requirement? Yes [ ] No [ ]
26. Do your household members get balance diet/meals on any given day? Yes [ ] No [ ]
Do your household members have clean water for drinking? Yes [ ] No [ ]
HEALTH AND ENVIRONMENTAL RISK
27. There are physical hazards in your environment that pose safety and health risks Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]
28. There are chemical hazards in my environment that pose safety and health risks Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ]

Strongly Agree [ ]
29. There are biological hazards in my environment that pose safety and health risks Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]
30. How do you manage waste from your farm? Compost [ ] Burn [ ] Landfill [ ] Collection (Private or council) [ ] Recycle [ ]
31. A member of my household has been taken ill in the last one year because of the nature of environment that we stay in here Yes [ ] No [ ]
SUSTAINABLE LIVELIHOOD FOOD SECURITY AND NUTRITION
32. Urban agriculture improves food accessibility in a household Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]
33. Urban agriculture improves food availability in a household Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]
34. Urban agriculture enhances nutrition and utilization of food in a household Strongly Disagree [ ] Disagree [ ] Neutral [ ] Agree [ ] Strongly Agree [ ]

THE END

THANK YOU FOR TAKING YOUR TIME TO PARTICIPATE IN THIS STUDY

APPENDIX II: KEY INFORMANT INTERVIEW GUIDE

1) Explain the extent to which urban agriculture is practiced by residents/households of/ in Nyalenda?

2) What is the understanding of the concept of urban agriculture among residents of Kisumu

3) What are by-laws and government that guide the conduct of agricultural activities in Kisumu?

4) Explain the extent to which the residents of Nyalenda have been sensitized on urban policies and urban agriculture

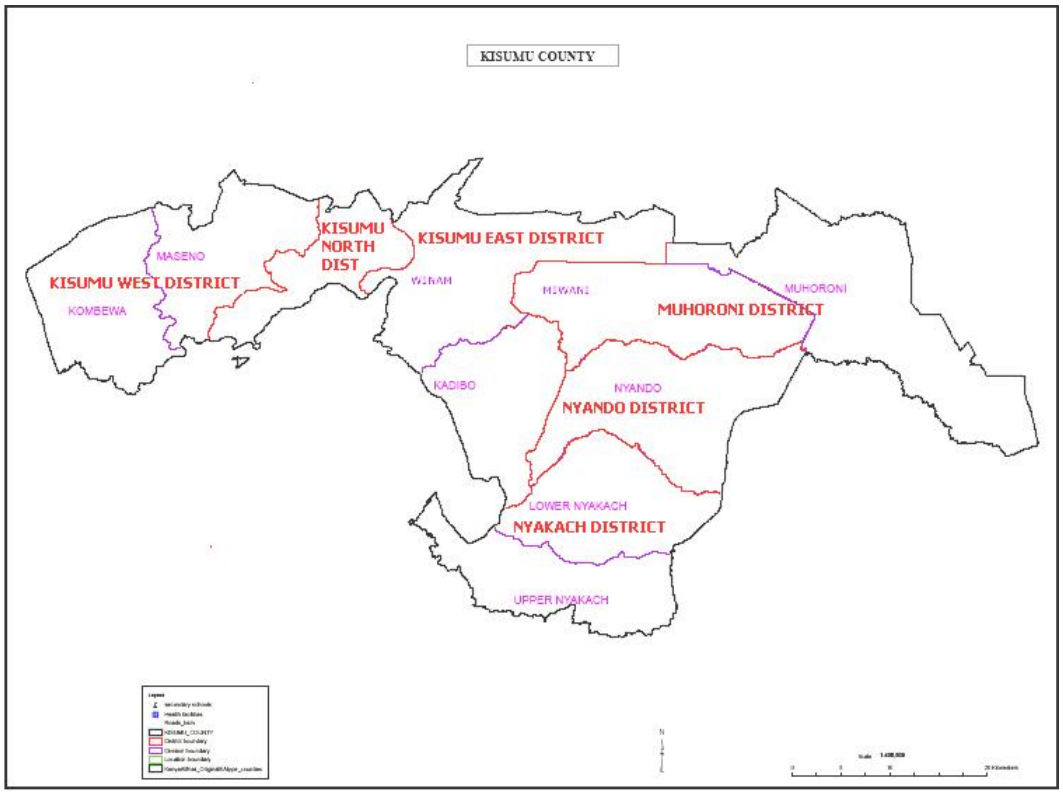
5) Explain the influence of socio-economic factors of urban agriculture for the residents on Nyalenda

6) Is household food security a determinant of whether a household would engage in urban agricultural practices? Explain?

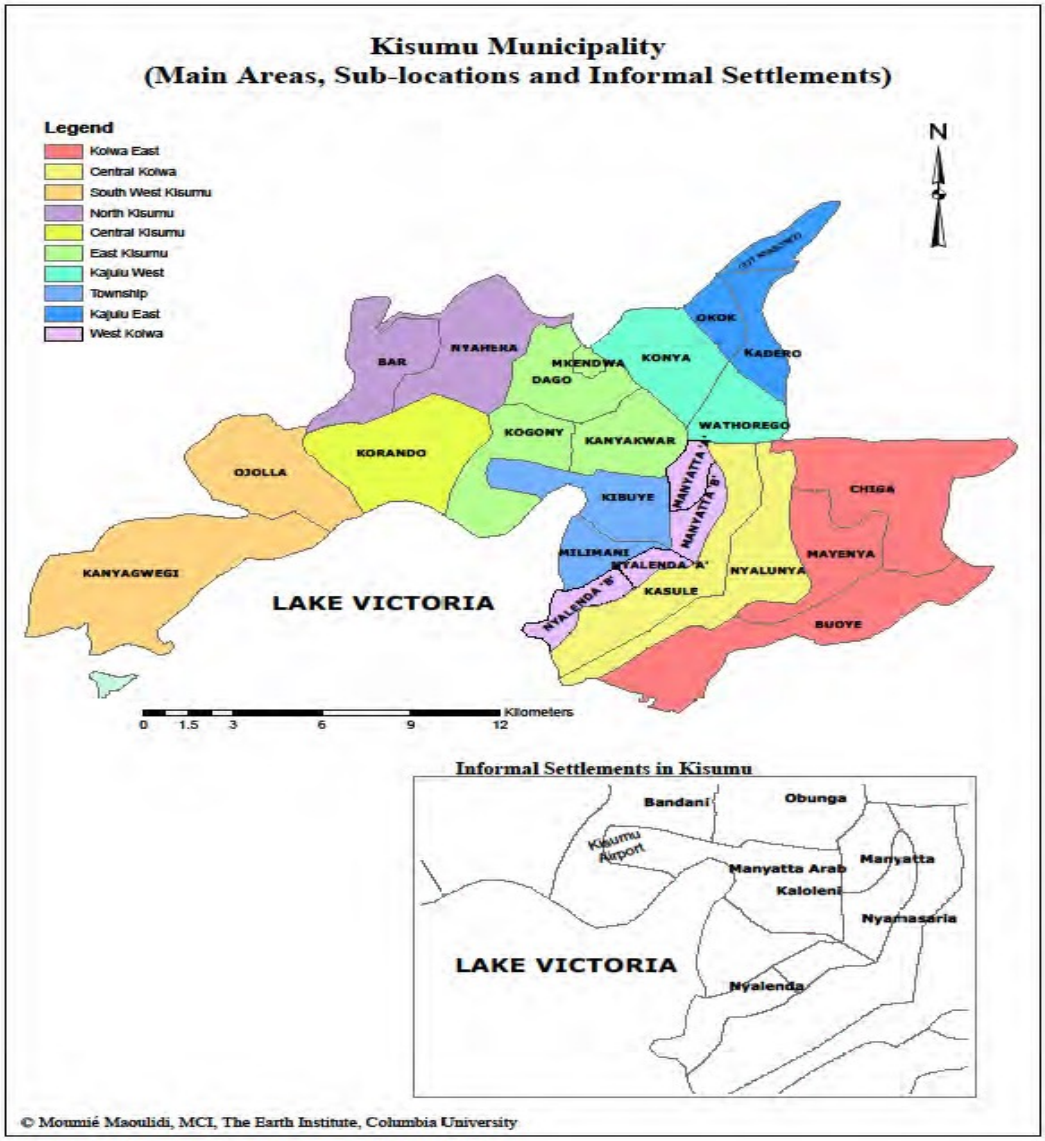
7) Are exposures or considerations of health and environmental risk a determinant of a household engaging in urban agriculture? Explain

8) Explain the extent to which households in Nyalenda food secure?

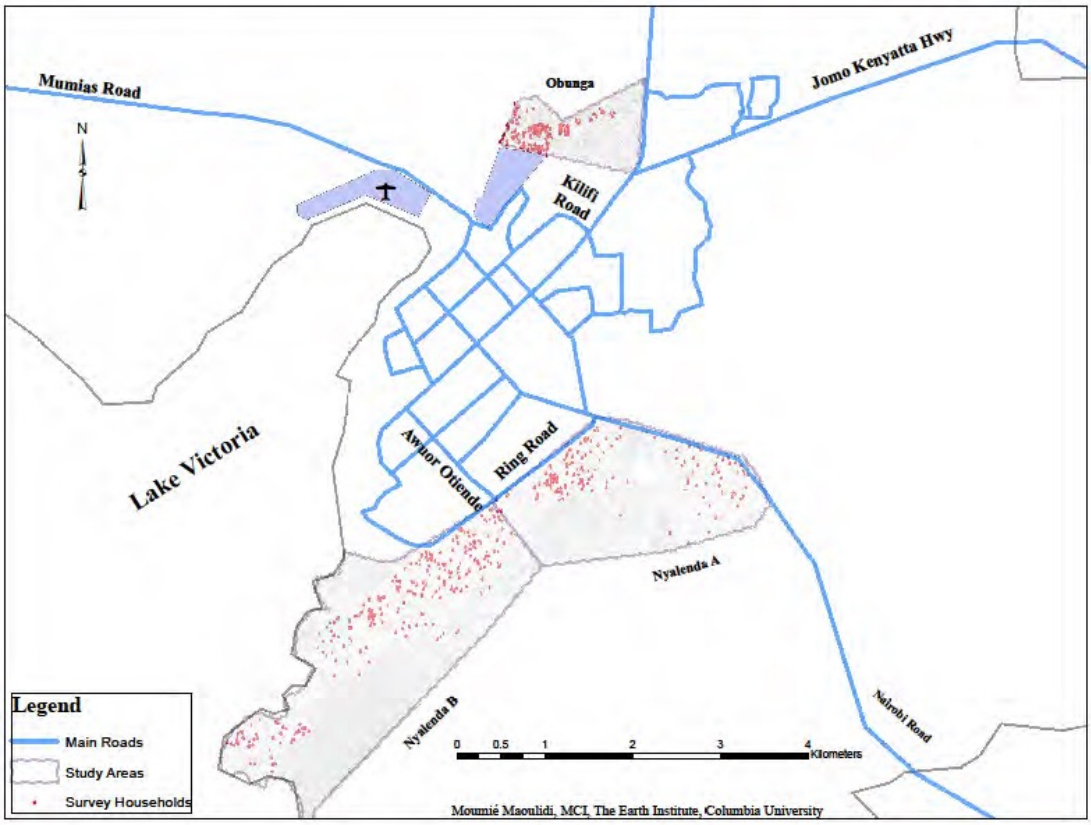
APPENDIX III: MAP OF KISUMU COUNTY



APPENDIX IV: MAP OF KISUMU MUNICIPALITY



APPENDIX V: MAP SHOWING NYALENDA 'A'



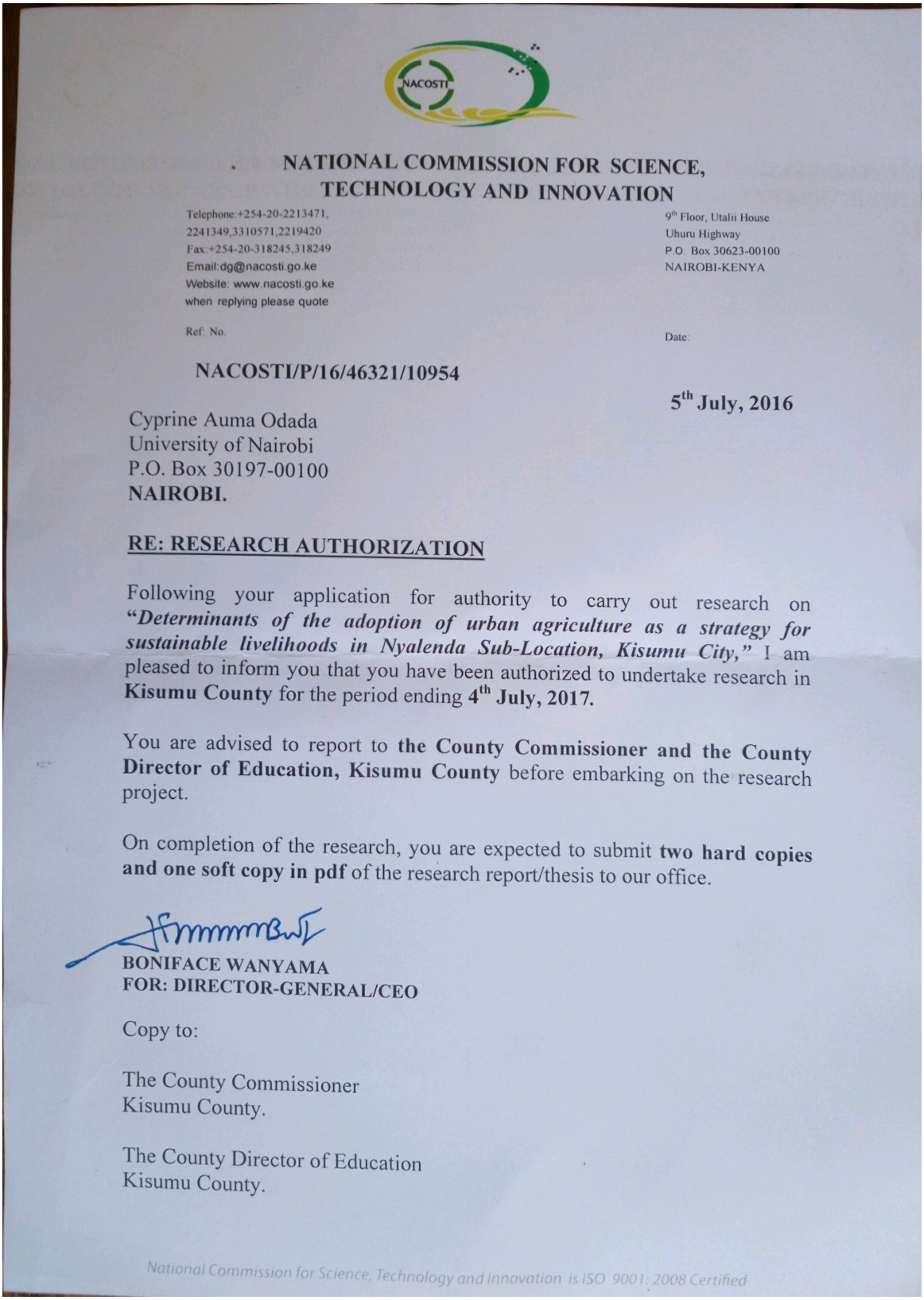
APPENDIX VI: SAMPLE SIZE TABLE

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Figure 1: Research Permit From NACOSTI



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NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Determinants of the adoption of urban agriculture as a strategy for sustainable livelihoods in Nyalenda Sub-Location, Kisumu City,"*** I am pleased to inform you that you have been authorized to undertake research in **Kisumu County** for the period ending **4th July, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Kisumu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kisumu County.

The County Director of Education
Kisumu County.

National Commission for Science, Technology and Innovation is ISO 9001: 2008 Certified

THIS IS TO CERTIFY THAT:
MISS. CYPRINE AUMA ODADA
of UNIVERSITY OF NAIROBI, 2000-40100
Kisumu,has been permitted to conduct
research in *Kisumu County*

on the topic: *DETERMINANTS OF THE ADOPTION OF URBAN AGRICULTURE AS A STRATEGY FOR SUSTAINABLE LIVELIHOODS IN NYALENDA SUB-LOCATION, KISUMU CITY*

for the period ending:
4th July,2017

Permit No : NACOSTI/P/16/46321/10954
Date Of Issue : 5th July,2016
Fee Recieved :Ksh 1000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

Figure 2: Acknowledgement Letter from UON

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
KISUMU CAMPUS

The Secretary
National Council for Science and Technology
P.O Box 30623-00100
NAIROBI, KENYA

15th February, 2016

Dear Sir/Madam,

RE: ODADA CYPRINE AUMA - REG NO: L50/61484/2013

This is to inform you that **Odada Cyprine Auma** named above is a student in the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Kisumu Campus.

The purpose of this letter is to inform you that **Odada** has successfully completed her Masters Course work and Examinations in the programme, has developed a Research Proposal and submitted before the School Board of Examiners which he successfully defended and made corrections as required by the School Board of Examiners.

The research title approved by the School Board of Examiners is: ***"Determinants of the Adoption of Urban Agriculture as a Strategy for Sustainable Livelihood in Kisumu City".*** The Project is part of the pre-requisite of the course and therefore, we would appreciate if the student is issued with a research permit to enable her collect data and write a report. Research project reflect integration of practice and demonstrate writing skills and publishing ability. It also demonstrates the learners' readiness to advance knowledge and practice in the world of business.

We hope to receive positive response so that the student can move to the field to collect data as soon as he gets the permit.

Yours Faithfully

UNIVERSITY OF NAIROBI
15 FEB 2016
KISUMU CAMPUS

Dr. Raphael O. Nyonje, PhD
SENIOR LECTURER & RESIDENT LECTURER
DEPARTMENT OF EXTRA-MURAL STUDIES
KISUMU CAMPUS

Figure 3: Urban Agriculture in Kenya