

AN ASSESSMENT OF THE CONTRIBUTION OF URBAN AGRICULTURE TO
HOUSEHOLDS' LIVELIHOODS IN ROYSAMBU WARD, NAIROBI COUNTY.

By

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DECLARATION

This research project is my original work and has not been presented in this or any other University for a degree or any other award.

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APPROVAL

We confirm that the work reported in this research project was carried out by the candidate under our supervision.

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Signature..... Date.....

DEDICATION

To the Almighty God for his grace and loving care. To my beloved Family: My dear wife Mary and children Chiku, Isaac and Faith for their patience, understanding and encouragement.

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ABSTRACT

Urban agriculture plays a significant role in national development by contributing towards food security, employment creation and income generation. However, it is associated with diverse negative impacts on public health and the environment. Development of UA has been affected by lack of specific laws and policies geared towards addressing the development this important sub- sector. However, various legislations refer individually to the sub-sector. Some of these legislations indirectly support or hinder the growth and development of the sub sector. Despite these shortcomings UA has continued unabated in most parts of Nairobi. Many households in Nairobi are facing a serious decline in their purchasing power and poverty levels are on the rise. The poorer the household the more they depend on farming to supplement their food requirements. As Nairobi metropolis expands, it encroaches on the hitherto agricultural areas in its periphery. These areas are an integral part of the city as they provide the bulk of the food especially vegetables to the city. Their close proximity to the city provides ready market for farm produce and hence encourages peri- urban agriculture. This study examined the contribution of urban agriculture to households' livelihoods in Nairobi County. It covered various aspects such as legal and policy framework, problems affecting development of UA, trends and patterns of land use in Nairobi and its implications on UA and finally came up with an integrated plan for sustainable urban agriculture in Roysambu Ward. The Sampling frame for the study comprised of farmers in Roysambu Ward, a number of institutions and farmer groups in Roysambu Ward. Primary data was derived from field surveys using questionnaires, key informants interviews and focused group discussions. A sample size of 90 was used for household interviews, 5 institutions interviewed and 3 focused group discussions held. Secondary data was synthesized from books, journals, newsletters, electronic media and Government policy papers. Landsat satellite images were used to obtain the land use trends in Nairobi. Probability and non-probability sampling methods were used in data collection. Quantitative data was analyzed using Statistical Package for Social Scientists whereas qualitative data was analysed either in text, diagrams or photographs. GIS generated maps were analysed to capture land use trends over the last 20 years ie year 1995 to year 2014. Review of legal and policy framework revealed that there is a dire need to harmonize all the conflicting pieces of legislation governing UA in Kenya and this can only be achieved by bringing all stakeholders on board. UA policy is also overdue. The trend of UA in Nairobi County showed a decline of 28% of the area under forests and crops compared to an increase of 35% of the area under built up areas over the last 20 years. This shows that all the hitherto agricultural areas in the County will soon be taken up by the built up areas. However UA remains popular especially among the urban poor because of food security and income generation. Some middle and upper income people also prefer growing their own food for food safety reasons. Health and environmental concerns were noted especially in the low income areas of Mathare, Ruaraka and Njathaini which reinforces the fact the UA should be controlled if not outlawed in these areas. It is strongly recommended that agricultural areas in the study area and in Nairobi County should be designated so that they are easily controlled. Investments should be done in the City waste management to allow use of treated liquid and solid waste, while building capacity of farmers on its utilization. This may involve integration of UA in the City land use planning.

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ACRONYMS AND ABBREVIATIONS:

| | |
|---------|--|
| ASDS | Agricultural Sector Development Strategy |
| CBO's | Community Based Organizations |
| EMCA | Environmental Management and Coordination Act |
| GDP | Gross Domestic Product |
| FAO | Food and Agricultural Organization |
| FGD | Focused Group Discussions |
| GIS | Geographical Information System |
| GEF | Global Environment Facility |
| KARI | Kenya Agricultural Research Centre |
| NGO's | Non-Governmental Organizations |
| NEMA | National Environment Management Authority |
| SPSS | Statistical Package for Social Scientists |
| UA | Urban Agriculture |
| UPA | Urban and Peri-Urban agriculture |
| UN | United Nations |
| UPAL | Urban and Peri-Urban Agriculture and Livestock |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environmental Programme |
| MoAL&F | Ministry of Agriculture, Livestock and Fisheries |
| MoH | Ministry of Health |
| MoEW&NR | Ministry of Environment, Water and Natural Resources. |
| MoLH&UD | Ministry of Land, Housing and Urban Development |
| MoI&ED | Ministry of Industrialization and Enterprise Development |
| NCIDP | Nairobi County Integrated Development Plan |

CHAPTER ONE: INTRODUCTION

1.1 Background of the problem

Urban agriculture can be defined shortly as the growing of plants and the raising of animals within and around cities. Urban and peri-urban agriculture (UPA) occurs within and surrounding the boundaries of cities throughout the world and includes crop and livestock production, fisheries and forestry, as well as the ecological services they provide. Often multiple farming and gardening systems exist in and near a single city. UPA is estimated to involve 800 million urban residents worldwide in income-earning and/or food-producing activities. The findings of national censuses, household surveys and research projects suggest that up to two-thirds of urban and peri-urban households are involved in agriculture. Much of the food produced is for own consumption, with occasional surpluses sold to local markets. Farming is done in city core areas, wedge areas and corridors out of the city, and on the periphery. One study of urban agriculture in Nairobi showed the land used for farming was 32% private residential land, 29% roadside land, 16% along river banks, and 16% in other publicly-owned areas. Vegetable production has expanded in and around cities in many developing countries. The broad diversity of horticultural crop species allows year-round production, employment and income. Growers have realized that intensive horticulture can be practiced on small plots, making efficient use of limited water and land resources (FAO, 1999)

The most striking feature of urban agriculture, which distinguishes it from rural agriculture, is that it is integrated into the urban economic and ecological system: urban agriculture is embedded in -and interacting with- the urban ecosystem. Such linkages include the use of urban residents as labourers, use of typical urban resources (like organic waste as compost and urban

wastewater for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions and being influenced by urban policies and plans. Urban agriculture is an easy-in, easy-out entrepreneurial activity for people at different levels of income. For the poorest of the poor, it provides good access to food. For the stable poor, it provides a source of income and good quality food at low cost. For middle-income families, it offers the possibility of savings and a return on their investment in urban property. For small and large entrepreneurs, it is a profitable business (Smit, 2001).

Horticultural species have considerable yield potential and can provide up to 50 kg of fresh produce per square metre per year, depending upon the technology applied. In addition, due to their short production cycle they provide a quick response to emergency food needs (several species can be harvested 60 to 90 days after planting.) Leafy vegetables provide a quick return that helps families meet their daily cash requirements for purchasing food. Urban production has another advantage: leafy vegetables are particularly perishable and post-harvest losses can be reduced significantly when production is located close to consumers. Urban producers also achieve real efficiencies by making productive use of under-utilized resources, such as vacant land, treated wastewater and recycled waste, and unemployed labour (FAO, 1999).

Urban farming is intensive and makes the best use of space, with a predominance of shorter-cycle, higher-value market commodities. It employs multicropping and integrated farming techniques and makes judicious use of both horizontal and vertical space (through such techniques as chicken coops on shelves, multi-species fish ponds, and container farming). Because water is expensive and usually in short supply, urban farming often uses water more efficiently than rural farming.

Urban agriculture is, with exceptions, oriented to close-by urban markets rather than national or global markets. Proximity to the market predisposes crop selection to perishable products for which urban farmers have a competitive edge over rural farmers by being able to deliver fresh products to consumers. Urban agriculture also normally involves fewer middlemen between farmer and consumer than rural agriculture, and the transportation and storage needs of urban produce are much lower (Veenhuizen, 2006).

The world population is now 50 percent urban. The least urban continents, Africa and Asia, are rapidly urbanizing — in Africa, from one-fifth in 1970, the urban population increased to one-third by 1995, and is expected to exceed one-half around 2020. The available data indicate that urban agriculture is growing at least as fast as urban population and in many countries considerably more rapidly (UNDP, 2001)

It is estimated that by year 2030, 60% of the world's population will be living in the cities (UN Habitat, 2004). The phenomenon of urbanization includes the dire fact that poverty is changing from being predominantly rural to mostly urban. Significantly, food insecurity and malnutrition are more wide-spread in low-income urban areas than in poor villages, calling for food production within urban areas to provide *non-money* benefits to the poor (Smit, 2001). As the cities grow, so does the number of urban poor. Unemployment, hunger, and malnutrition are commonplace. In the big city, most of any cash income the poor might bring home goes to feeding themselves and staying alive; any food that does not have to be bought is a bonus. As a result, more and more people are attempting to grow at least some of their own food to supplement poor diets and meager incomes. But farming in the city -- urban agriculture -- is too often seen by municipalities as a problem to be eradicated rather than as a part of the solution to making the city and its environment more sustainable (Mougeot, 2007).

In both developing and developed countries, metropolitan areas are always expanding. The periphery is fluid, always shifting outwards. It is a transitional area, not heavily built up, and close enough to the city (based on time rather than distance) to be an integral part of its food- and fuel-sheds (Smit, 2001).

Kenyan urban centres have registered rapid rate of urbanization of about 6% during the last three decades. As a result the growth of informal settlements has been more pronounced, for example they have been growing at the rate of up to 12%. While the colonialists restricted rural urban migration, the independence in 1963 ushered in freedom of movement. This explains rapid rate of urbanization in independent Kenya. This rapid rate of urbanization has been associated with increasing poverty. The other driver of rapid rate of urbanization in Kenya has been dualism between rural and urban areas. Since colonial times successive governments have made urban centres more attractive to human settlements through investments in infrastructure and services compared to rural areas. Therefore urban centres have been perceived as areas with better opportunities compared with rural areas. Dualism is manifested in the situation where modern urban market economy co-exists with traditional peasant farming communities. As the modern urban market economy grows, the hitherto traditional indigenous rural communities persist. They are thus engulfed in the urban areas .Urban dualism is also reinforced by continued loss of their only physical capital-land through sale to urban developers (Mireri, 2007).

Agricultural growth and development is crucial for Kenya's overall economic and social development. Agriculture directly contributes 24% to GDP and 60% of the export earnings. The sector has experienced growth from 2002 after a decade long decline. Government has outlined, in its Vision 2030 policy paper, the key role the Agriculture sector will play under the economic pillar and the Agricultural Sector Development Strategy (ASDS) 2009-2020, both of which aim at improving the standard of living of Kenyans by substantially reducing the number of people

affected by hunger, famine and starvation. These measures are also in line with the Millennium Development Goal No.1 of halving extreme poverty and hunger by the year 2015. ASDS recognizes the risks of agricultural waste to human health and calls for the design of appropriate agricultural waste management systems, which is in line with Millennium Development Goal No.7 of ensuring environmental sustainability by the year 2015.

The City has witnessed rapid rate of urbanization since independence. The population of Nairobi County has risen from 350,000 people in 1963 to 3,138,369 people (2009 census) and is growing at a rate of about 5% per year. This means increase in demand for food as there more mouths to feed and hence the proliferation of urban and peri urban agriculture.

1.2 Statement of the problem

Growing poverty, hunger and lack of formal employment opportunities, as well as the special opportunities provided by the city including the growing demand for food, proximity to markets and availability of cheap resources such as urban organic wastes and wastewater have stimulated the development of diverse agricultural production systems in and around Cities (Smit, 2001).

In Nairobi City, one land use of emerging importance is urban agriculture. It is estimated that crops worth over US\$ 3.2 million are produced each year from irrigated urban agriculture in the city (Ayaga *et.al.* 2004), as quoted in (CCN, 2007). While urban agriculture presents opportunities in support of alternative livelihood strategies, it is not without environmental impacts. Pollution and waste management from industrial, domestic and other sources are a growing problem in Nairobi (CCN, 2007). However according to Smit (2001) urban agriculture has the potential of making use of waste water and urban solid waste as key input to production thus ensuring environmental sustainability.

As Nairobi metropolis expands, it encroaches on the hitherto agricultural areas in its periphery. These areas are an integral part of the city as they provide the bulk of the food especially vegetables to the city. Their close proximity to the city provides ready market for farm produce and hence encourages peri-urban agriculture.

Many households in Nairobi are facing a serious decline in their purchasing power and poverty levels are on the rise. People have responded in various ways, most notably by diversifying their income sources, including urban agriculture. Other households especially in middle income bracket prefer growing their own vegetables due to their increased awareness of health risks associated with most farm produce in the market places. These farmers also practice intensive

agriculture to supplement their incomes, using modern technologies eg green houses, drip irrigation, hydroponics etc. They also keep livestock like dairy cattle, poultry etc.

All this has continued without supportive policy and legal framework which has definitely led to uncontrolled urban agriculture in Nairobi .This has resulted in unsafe agricultural produce, environmental pollution, poor public health as well as conflicts with other land uses. This study seeks to therefore undertake research to establish measures that can lead to sustainable agriculture in Roysambu Ward.

1.3 Research questions

- i) What is the policy and legal framework governing urban agriculture in Kenya?
- ii) What are the trends and patterns of land use in Nairobi County over the last 20 years and what is its implication on urban agriculture?
- iii) To what extent does urban agriculture affect household livelihoods in Roysambu ward?
- iv) What are the problems constraining urban agriculture development in Roysambu Ward?
- v) What measures can lead to sustainable urban agriculture in RoysambuWard?

1.4 Research objectives

- i) To examine the policy and legal framework governing urban agriculture in Kenya
- ii) To assess the trend and patterns of land use in Nairobi County over the last 20 years and its implications on urban agriculture.
- iii) To determine the effects of urban agriculture on house hold livelihoods in Roysambu Ward.

iv) To examine the problems constraining urban agriculture development in Roysambu Ward

iv) To prepare an integrated plan for sustainable urban agriculture in Roysambu Ward.

1.5 Research premise

i) Sustainable urban agriculture in Nairobi County can be enhanced with conducive legal and policy framework.

ii) Nairobi County land use patterns have changed in over the last 20 years leading to diminishing of agricultural land as a result of competition from developers.

iii) Urban agriculture significantly affects household livelihoods in Roysambu Ward.

iv) There are a number of problems constraining development of urban agriculture in Roysambu Ward.

1.6 Justification of the study

Urban agriculture is not a thing of the past that will fade away (urban agriculture increases when the city grows) nor brought to the city by rural immigrants that will lose their rural habits over time. It is an integral part of the urban system .Food security means that safe and nutritious food is consistently available, accessible, and reasonably priced. Urban agriculture improves food security by providing healthy and plentiful substitutes for purchased food, especially for poor households. Households that practice urban agriculture are also more likely to have access to a wider variety of nutritious foods such as vegetables and animal products. Urban agriculture can also provide people with a primary or supplemental income. Income from urban agriculture is particularly high in many African cities, farmers using wastewater irrigation can sell vegetables at more than double the wet-season price, pollution notwithstanding. Collective benefits from

urban agriculture include solving transportation problems and converting urban waste into fertilizer (Urban Harvest, 2006).

Although many poor households benefit from urban agriculture, land cultivation and livestock production are actually illegal in many cities. Often, farmers lack legal rights and thus have less incentive to make costly improvements. For example, instead of installing costly irrigation, farmers often use wastewater irrigation that, if polluted, can pose health risks to consumers. Given the potential benefits of urban agriculture, government policies for urban planning need to address land tenure for farmers and provide access to clean irrigation water, while also protecting public health (Smit, 2001).

Rural urban migration has contributed to high levels of unemployment as formal jobs cannot sustain the influx of job seekers into Nairobi in search of better living. These job seekers rely on informal jobs to survive as casual workers in factories, transport sector, telecommunication etc. This has contributed to high poverty levels as most city inhabitants have no meaningful ways of earning their living and since they have no land of their own, they depend on agricultural produce mostly grown around Nairobi. This offers ready market and encourages peri-urban agriculture. As Nairobi expands and demand for land for development increases land sizes become smaller as original dwellers of the city dispose off their land to urban developers. This diminishing land sizes call for high value commercial farming as opposed to subsistence farming earlier practiced. This is well demonstrated by intensive farming found in the study area like, green houses, poultry keeping, dairy cattle keeping, fish farming (CCN, 2007).

Despite agriculture dominating most urban landscape, it has not received the much needed institutional support to be responsive to the ever increasing urban population thus the need to review policy and legal framework (Mireri, 2007).

Roysambu ward is representative of Nairobi County, from high end farmers practicing intensive agriculture in Garden and Thome areas to the low end farmers in Mathare and Utalii areas practicing subsistence farming .It also include Mathare slums with very high population to feed inspite of its high poverty level (CBS, 2001).

1.7 Significance of the study

The study aims at assessing the contribution of urban agriculture to households' livelihoods in Roysambu Ward of Nairobi County. It suggests measures and recommendations that can lead to sustainable urban agriculture in Roysambu ward, which can be replicated to other areas of Nairobi and beyond which share similar characteristics. The findings of the study are also beneficial to the local residents since it will stimulate Government and other institutions to appreciate how urban agriculture affects households' livelihoods in Roysambu and in Nairobi County in general. Documentation of the findings adds to the pool of knowledge which is vital for development and for use by current and future scholars.

Policy makers, planners, environmentalists, agriculturists and other professionals are expected to take advantage of the findings of this study to improve their strategies towards solving the existing challenges facing sustainability of urban agriculture for today's and future generations.

1.8 Theoretical Framework

VON THUNEN'S THEORY

Von Thunen's primary concern was to discover and examines the laws which governed the pattern of agricultural land use existing in his time and within his experience. He recognized that land use pattern depended upon competition between various types of agriculture for the use of a particular piece of land. The controlling factor in this competition was Economic Rent, defined here as return from investment in the land. Stated briefly, that form of land use providing the greatest Economic Rent would make the highest bid for the land and displace all others. Moreover, because transport costs increased with distance, they imparted a spatial variation to Economic Rent. Hence, Economic Rent from any one land use can be expressed as a function of distance from the market.

Commodities which yield a large bulk per hectare, e.g., potatoes or firewood, in Von Thunen's time, yield a high Rent close to the market, but because the transport cost per hectare is high, the rent diminishes rapidly with distance from the market. Commodities which yield a lower bulk per hectare, e.g. grain, do not yield such a high rent close to the market. However, because transport costs per hectare are relatively low, and the actual value per unit of weight is relatively high, ie economic rent diminishes much more slowly with distance from the market.

Because of rapid deterioration, perishable commodities, e.g., milk, during Von Thunen's time, can only be produced close to the market. Hence their Economic Rent declines very rapidly with distance from the market.

At the market, an extremely intensive use of land is desirable, because the resulting increased production pays off in higher Economic Rent. With greater distance from the market, such intensive land use becomes less feasible, because the advantages of increased per-hectare

production are offset by increasing transport costs. A less intensive system becomes more desirable (Rodrigue, 2013)

MODERNIZATION THEORY

The modernist theory views urban agriculture as a backward, subsistence and rural habit practiced by migrants who are new to urban areas until they acclimatize to the 'urban way' of life, or become employed in the formal sector. Mbiba (2005) states that the modernist theory finds urban agriculture to be damaging to the environment and recommend its destruction or elimination without compromise. The activity is viewed as a temporary, unsanitary and unsightly activity which should not be practiced in urban areas at all. It is also reinforced by the idea that it creates rural landscapes within the urban environment, described by Mbiba (1995) as 'ruralisation' of urban areas.

NEW MARXIST THEORY

The New Marxist theory views urban agriculture as labour adapting to its circumstances and a means to reproduce itself. This view (as argued by Mbiba, 1995) holds that urban agriculture exploits labour, therefore needing it to work twice i.e. in formal employment and at home. According to this theory, there is no need to engage in urban agriculture if the workers are adequately paid in their formal employment. The underlying notion here is that urban agriculture reduces the pressure on modern industry to pay workers what they deserve. Urban agriculture is then viewed as exploitative and backward.

1.9 Conceptual framework

Von Thunen's theory has stood the test of time. It was quite applicable to reality throughout his lifetime and for many decades after his death. Indeed, until very recently, the basic pattern of agricultural land use around cities in Europe and North America was in keeping with it and

presumably remnants of the pattern still exist in those areas. Moreover, it appears likely that in those parts of the world where transportation is less developed and modern refrigeration techniques nonexistent (Kenya included), Von Thunen principles still apply.

The basic force upon which the model was based, namely the influence of transport costs (reflecting distance to the market) on agricultural land use, was the determining force for a long period of time in Europe and North America and remains the determining force today in much of the non-industrialized world.

The situation is quite different today, however, in the highly industrialized parts of the world. The change has been brought about by the revolutionary developments of the last few decades in technology, in human organization, and in living habits. Developments in the field of transportation have had the greatest influence. Improved and more efficient means of transport have displaced former rudimentary methods. Costs of all types of transport have declined greatly in relation to most other agricultural production costs. Moreover, transport costs are not necessarily directly proportional to distance and bulk. Because of refrigeration and air-conditioning techniques, perishable commodities can be carried long distances without spoiling. An increasing amount of agricultural produce is processed before shipment. These new developments help to satiate the changing tastes of the modern city dweller, who demands a more varied and exotic diet than local agriculture can provide.

One significant fact differentiates most modern urban areas from the cities of Von Thunen's experience. Whereas Von Thunen envisaged a static city, with set boundaries, in most modern industrialized nations the theme is urban expansion, with population growth and constantly expanding areas of urban land use. The spreading urban region influences rural land use far in advance of the built-up area. This influence, however, has little to do with the market provided by the city, but is the result of the very nature of the expansion process. Although urban

expansion is uneven and in many ways chaotic, there is evidence that it creates consistent agricultural land use patterns in the neighborhood of many of our cities.

Urban land today is much more valuable than rural land, so that where there is direct competition between urban and rural land uses, urban uses generally take over. Further, land where urbanization is expected also is more valuable than rural land. Such land rises in value, and either is purchased from the original owner by developers and speculators, or held by the original owner as a speculation. Finally, land which the owner thinks might become urban land at some vague future date changes in value. It does not generally change hands, but the owner carries out his activities, or changes his activities, with the feeling that something is going to happen

For, obviously, the greater the chances of urban land uses taking over, the less practical it becomes for the owner to invest highly in capital and labor for agricultural purposes. The degree of anticipation declines with distance from the encroaching city. Hence, distance from the city again becomes the factor which determines the agricultural land use pattern.

However, whereas Von Thunen theory was meaningful in terms of transport costs to the market, it is here meaningful in terms of anticipation of urban encroachment.

In brief, given the stated assumptions of a uniform farming region, flexible farmers, and an orderly influence of the expanding city's price mechanism, the agricultural land use pattern would show zones of gradually increasing intensity from the built-up edges of the metropolitan area to where the city has no direct influence upon agricultural practices.

Modernization Theory view is misleading and at odds with the goals of poverty alleviation and food security. Infact UA is not limited to poor people living in informal settlements or recent migrants to cities. All social classes, including those employed and working in the formal sector engage in the activity. What varies is the extent and purpose of participation in the activity.UA negative effects on the environment should not be used to outlaw it but should be viewed as a challenge to sustainable urban development and hence incorporate it in urban planning.

The new Marxist theory does not view UA as a business as is the case in Nairobi today. It only views UA as coping strategy to low pay from formal employment which is not always the case.

1.10 Scope

This study was conducted in the entire seven sub locations of Roysambu Ward of Kasarani Sub County. These were Njathaini, Roysambu, Garden, Ruaraka, Mathare North, Utalii and Mathare 4A. These areas represented a broad spectrum of Urban Agriculture running from the sparsely populated high income areas of Garden estate to the densely populated low income areas of Mathare. Variables used were- incomes generated from farming , their percentage contribution to overall family income, daily working hours for both hired and family labour in the farm, monthly wages for farm workers, education levels and ages of urban farmers, farm sizes and the type of farm enterprises practiced in them. Source of irrigation water, chemicals used as well as farm waste disposal methods were also used to assess environmental and health impacts.

CHAPTER 2: LITERATURE REVIEW

2.1 Brief history of urban agriculture

For centuries, and in different parts of the world, cultivation and animal husbandry inside and outside city walls were standard practices. Before ‘modern’ urban sanitation systems were developed in the latter part of the 19th century, urban agriculture was the principal treatment and disposal method for urban wastes. Food was delivered by donkey cart to the markets, and the city’s wastes in turn were delivered to both rural and urban fields.

In many parts of the world, beginning in the late 19th century, machines replaced manual labor in many forms of agriculture, and units of production, processing, and marketing became larger. Urban agriculture has responded to this rural-dominated trend by concentrating on niche markets, barter trade and currency trade, reuse of waste, and household and community organization to foster food security (Veenhuizen, 2006).

Throughout the world, there are long traditions of farming intensively within and at the edge of cities. Each tradition is deeply rooted in local concepts of city and community, and in local societal and cultural practices. There are numerous instances of urban agricultural practices with roots that date back decades or centuries but have evolved to accommodate contemporary conditions — allotment gardens in Europe that were invented in the second half of the 19th century, vegetable patches in African colonial cities with their roots in ancient communal practices, the centuries-old Chinese system of reusing the night soil of cities to fertilize nearby farms, or Mexico City’s *chinampas*, which represent a specific farming system predating the arrival of Columbus (Smit, 2001).

In recent decades, agriculture was further dissociated from urban locations by well-intentioned and well-funded development experts. The division of the United Nations into many specialized agencies separated technical assistance for food production from the other disciplines important

to urban agriculture, including health, nutrition, city planning and management, waste management, and the environment.

Rural urban migration has played a big role in the development of UA in the world.

In North America and Europe people have been abandoning the rural life since the industrial revolution of the 19th century. The trend accelerated following the 2nd world war with the result that about $\frac{3}{4}$ of the population in the north is now urban. However the growth of urban population in the developed world has now slowed down to just 0.4% annually, while in developing countries the urban population is growing at an annual rate of 2.3%. The past half century has seen a massive movement of population in most developing countries. At the midpoint of 1990's fewer than 20% of people in developing countries lived in cities and towns. By the turn of the millennium, that percentage had more than doubled (UN-Habitat, 2004)

With the growth of urban populations in most developing countries during the last half of the 20th century, urban food production and distribution systems became less and less reliable. Urban hunger grew in parallel with the urban population, accelerated by political and economic instability in too many places. In response, urban agriculture became increasingly common in an ever-growing number of countries. Initially, urban residents undertook urban farming, but it was only later that urban and agricultural researchers and policymakers took notice of its significance (Veenhuizen, 2006). In most countries, agriculture was considered a rural activity until recently but this has changed due to the rapid increase in urban population especially in the developing countries (UNEP, 2002).

In Kenya UA dates back to 1899 when railway workers mainly from India started the practice in the mainland towns. During this time UA was restricted and the colonial regime strictly enforced planning regulations that prohibited UA, but after independence UA witnessed rapid growth due to increased urban population (Mireri, 2007).

2.2 Policy and Legal Framework

In the past, because of a dominant view on urban planning and a lack of access to research data, among other reasons, policy-makers often had a misconceived view of UA as a temporary phenomenon or a remnant from migration of rural farmers to the city that would fade over time. UA was seen as incompatible with urban development, a nuisance and risk factor; for that reason, legislations and policies on UA were mainly restrictive and at best, agriculture was temporally tolerated (mainly peri-urban) as a reserve area for future urban expansion.

These anachronistic legislations prohibiting agricultural activities of different kinds have continued to be on the books of many African cities, keeping open opportunities for harassment and corruption on the side of the authorities and insecurity on the side of the producers (Urban Harvest, 2010)

However, research reveals that UA must be understood as a permanent and dynamic part of the urban socio-economic and ecological system, using typical urban resources, competing for land and water with other urban functions, influenced by urban policies and plans, and contributing to urban social and economic development (Veenhuizen, 2006).

Throughout the developing world, municipal policy makers are waking to the fact that properly managed agriculture can make a major contribution to a city's food security. It also has potential to provide employment, improve the environment, and make productive use of vacant spaces within the city (Mougeot, 2006).

Recognizing and legalizing UA as a legitimate land use is a crucial first step. Potential health risks for example related to the use of agrochemicals, non-treated organic waste and waste water and lack of hygiene in food processing and marketing need to be managed and regulated.

Dynamic planning must provide for UA land uses to evolve as the city expands and transforms itself (Veenhuizen, 2006).

A growing number of cities are designing policies and programs on UA. In the 1960s, China overhauled its land-use regulations and developed a specific urban development policy and strategy that included self-reliance in vegetables and protein for its established large cities and growing new towns.

Montreal has incorporated UA as a permanent land use of municipal parks, it has the largest community garden programme in Canada. Vancouver has created its food policy council, which allows the city to integrate and coordinate the activities of the various departments in UA and other aspects of its policies on food and environmental sustainability (Mougeot, 2006).

In Africa and Latin America there is increasing recognition of the value of UA and many cities are attempting to find positive ways to tackle the issues. Regardless, City Governments are faced with two certainties. First-people will still keep moving to cities and many of them will find ways to grow at least a little food. Second, if City Governments adopt policies that encourage UA the number of urban farmers will likely increase substantially .Clearly UA must be viewed not as a problem but as one tool contributing to sustainable urban development.

UA is increasingly on the international agenda, recognized as a key part of a comprehensive solution to the problems of the runaway growth of cities in the developing countries (Mougeot, 2006).

UA has been promoted over the last couple of years by a large number of local and national Governments, urban actors and international agencies, such as UN Habitat's Urban Management programme, FAO, International Development Research (ICRC-Canada),CGIAR-Urban Harvest and the International Network of Resource Centres on Urban Agriculture and Food Security(RUAF) as a strategy to promote food security and poverty reduction, sustainable

resource use and environmental management, social integration and local participatory governance (IDRC,2004).

Demarcating areas for UA as a form of permanent land use and its integration into city land use planning (as in Dar es Salaam and Dodoma, Tanzania; Dakar, Senegal; Maputo, Mozambique; Bissau, Guinea-Bissau; Pretoria, South Africa; Kathmandu, Nepal; Accra, Ghana; and Harare, Zimbabwe). These areas aim to support agriculture and/or to protect open green areas from development, create buffer zones between conflicting land uses (e.g. between residential and industrial areas) and reserve inner city space for future uses (Veenhuizen, 2007).

In Lima- Peru, UA has been included in the city's integral development plan for year 2001-2010. In Nepal the Government has formulated a 20 year agriculture perspective plan (APP) in which the development of advanced technology and infrastructure for achieving high agricultural production is emphasized. The mechanism for achieving institutional and policy recognition of agriculture has been the stakeholder platform. The most significant advances by such a platform – including its formalization – have been in Kampala, where new ordinances or laws governing urban agriculture were put in place, the City's Department of Agriculture was empowered and policy was drafted (Urban Harvest, 2010).

2.3 The trend of urban agriculture

Growing poverty, hunger and lack of formal employment opportunities, as well as the special opportunities provided by the city – including the growing demand for food, proximity to markets and availability of cheap resources such as urban organic wastes and wastewater – have stimulated the development of diverse agricultural production systems in and around cities. These systems are often specialized in perishable products, such as green leafy vegetables, milk, eggs and meat, and exploit vacant open spaces. This development has important potential and

responds to some of the key challenges facing the cities. However, UA may also have negative effects, however, if certain associated risks are not considered and proper preventive and guiding measures not taken (Veenhuizen, 2007)

Surveys in Moscow in 1970 and 1991 indicated a shift from 20 percent to 65 percent of families engaged in agriculture. Surveys in Dar es Salaam, Tanzania in 1967 and 1991 showed an increase of family agriculture from 18 percent to 67 percent. Reports from Kinshasa, Kampala, and Maputo speak of massive shifts of urban land from open space, and from institutional and transportation use to agricultural production. Roadsides, portions of streets, electrical utility rights-of-way, golf courses, hospital grounds, and airport land beyond the runway were used to grow food for the poor. Studies in Kenya and Tanzania have found that three of every five families in towns and cities are engaged in urban agriculture.

This high frequency of urban farmers is not limited to the poorest countries. Taiwan (province of China), with a primarily urban population, reports that more than half of its families belong to farmers' associations. In greater Bangkok, Thailand, a government-sponsored land use survey found that 60 percent of the land was farmed (Smit, 2001)

In the United States, more than one-third of the dollar value of agricultural produce is produced within urban metropolitan areas. An upward trend was identified by an agricultural census conducted twice each decade. As city populations and urban area increase, agricultural production also increases within metropolitan and adjacent areas. From 1980 to 1996, this increase was 30-40 percent.

Cairo reports 80,000 livestock within the city. Asia has the most diverse and largest number of modern intensive farming systems. Urban farms in Asia provide vegetables, poultry, mushrooms, fish, seaweed, swine, fruit, medicinal herbs, and wood for furniture. These countries tend to have intense and widespread urbanization, a long tradition of urban agriculture, and early recognition

of the benefits of recycling waste for agricultural uses. Urban agriculture is still accepted in most Asian countries as a normal urban function and land use

It is estimated that until the 1980s, Hong Kong, the densest large city in the world, still produced within its boundaries two-thirds of the poultry, one-sixth of the pigs, and close to half the vegetables eaten by its citizens and visitors.

Japan has little cultivable land. A mountainous and populous island-nation, it has long been concerned with food security. As a result, most available open space in and near cities (on land, lake, and sea) is put to agriculturally productive use (Smit, 2001)

Urban agriculture in Africa presents a contradiction — it has a relatively long tradition and is widely practiced, yet in most African countries urban agriculture has been undervalued and resisted by generations of public officials. This attitude has only recently begun to change as leaders realize the potential of urban agriculture to alleviate the growing hunger, economic, and environmental crisis in the ever-expanding metropolitan areas of Africa.

In contrast to Asia, however, there has been only limited continuity of urban agricultural practices in Sub-Saharan Africa from the pre-colonial period to modern times. Many current African cities were established in the 19th and early 20th centuries by colonial rulers who had concepts of grandeur, precepts of cleanliness, and a firm intent to distinguish themselves from ‘the bush’. In some cases, however, these rulers encouraged urban agriculture on the periphery to grow high-value European crops for colonials (Smit, 2001)

In Nairobi, the urban poor populations in the informal settlements are the major actors in the Sub sector. Vulnerable groups such as female-headed households, children, retired people, widows, and people with limited formal education are particularly involved in urban agriculture. Studies carried at Dagoretti Division in Nairobi on Characterization of Benefits and Health Risks in Urban Smallholder Dairy Production (Kangethe *et al*, 2008), as quoted in draft national urban and peri-urban agriculture and livestock policy (2010), has brought to light that urban dairy

production has potential to increase availability of food and income for the households. Farmers use manure to grow crops like maize, beans and vegetables and they are able to increase their yields and there is significant income from keeping dairy animals.

According to Maingi(2010) ,Nairobi experienced a shift from rain fed agriculture to irrigated agriculture from year 2000 to year 2009.As global warming and climate change continue to accelerate there are water shortages. The area under coffee and forest also decreased by 5.4% and 10.2% respectively and this could be attributed to increase in population .Most of coffee cooperative societies demarcated their land for development purposes.

2.4 Effects of urban agriculture on urban livelihoods

2.4.1 Urban agriculture and food security

Food security means that safe and nutritious food is consistently available, accessible, and reasonably priced. Though the crisis in world food prices exploded during 2008, the problem of urban food insecurity in Africa has been a fact of life for many low-income urban dwellers for decades, and especially since the period of structural adjustment in the 1980s.

(Maxwell 1995), as quoted in(urban harvest, 2010).

It is not that there is no food; it's that poor urban consumers cannot afford it. This is the stark but simple truth lying behind much of the agriculture that is widespread within and around African cities. What urban households have known and practiced for generations, urban decision-makers have begun to recognize much more recently: urban agriculture is a livelihood strategy

(Urban harvest, 2010)

The contribution of UA to food security and healthy nutrition is probably its most important asset. Food production in the city is often a response of the urban poor to inadequate, unreliable and irregular access to food and lack of purchasing power. In urban settings, lack of income translates more directly into lack of food than in rural settings. The costs of supplying

and distributing food from rural areas to the urban areas, or to import food for the cities, are rising continuously and distribution within the cities is uneven. As a consequence, urban food insecurity will increase. (Argenti, 2000) as quoted in (Veenhuizen, 2007).

Households that practice urban agriculture are also more likely to have access to a wider variety of nutritious foods such as vegetables and animal products.

2.4.2 Urban agriculture and employment

Employment, unemployment and other labour market issues attract considerable interest in Kenya. Creation of jobs for the youth is particularly a major focus of development policy. The interest in the youth is partly explained by their large share of Kenya's population. Individuals aged below 35 years constitute about 80 per cent of the population, while the youth aged 15-35 years account for about 37 per cent of the population. In addition, employment and unemployment are unevenly distributed across age groups, with the youth having particularly higher rates of unemployment. Specifically, only about 19 per cent of all employment is formal, while the share of informal economy jobs have steadily increased from 70 per cent in 2000 to 83 per cent in 2012. Most of the informal economy jobs are characterized by higher ratios of casualization, are more precarious, and exhibit lower productivity and wages (Republic of Kenya, 2013a).

Kenya has experienced rapid increase in unemployment especially in the last two decades. This was the time the Government opened up the domestic economy to international competition after the structural adjustment programs of 1980's and 1990's. Weak economic structures were for the first time exposed to international competition brought by market liberalization. Many industries were closed and this led to loss of employment opportunities. As a result, many urban households especially the poor are facing a serious decline in their purchasing power and have responded in various ways, most notably by diversifying their income sources including practicing UA (Mireri, 2007)

2.4.3 Urban agriculture and the environment

UA is linked to environment in several ways .It demands resources, which may be scarce such as treated domestic water supply. This may lead to serious resource conflicts and use of unsafe water for farming. Lack of suitable land for various categories of urban farmers may cause farmers to cultivate on hazardous sites with serious health implications.UA generated wastes must be efficiently managed to safeguard the lives of urban residents .

Livestock kept close to humans increases incidences of zoonotic diseases. Other concern pertaining to livestock in dense urban setting are unpleasant odours, noise pollution ,traffic jams and hazards (Mireri, 2007).

Waste disposal has become a serious problem for most cities. UA can contribute to solving this and related problems by turning urban wastes into productive resources (Cofie, 2006), as quoted in (Veenhuizen, 2007).eg compost production, irrigation with wastewater.

UA may also reduce the city's ecological footprint by producing fresh foods close to the consumers, thereby reducing energy use for transport, packaging and cooling, among others (Veenhuizen, 2007).

In some cases, urban cultivators divert municipal water supplies meant for other uses in the City, contributing to water shortages. Soils near roadways and industries risk heavy metal pollution from airborne lead and cadmium from gasoline exhaust (Mireri, 2007).

UA may contaminate local water sources if large amounts of chemical fertilizers and pesticides are used. Also, the excessive use of nitrate-rich manure, such as chicken or pig manure can contaminate groundwater. In particular, wastewater discharge from intensive poultry farms can carry heavy loads of micro-organisms and may contaminate drinking water supplies (Veenhuizen, 2007).

2.4.4 Sustainability of urban agriculture

Although sustainable development is susceptible to somewhat different definitions, the most commonly accepted and cited definition is that of the Brundtland Commission on Environment and Development, which stated in its 1987 Report, *Our Common Future*, that sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The parameters of sustainable development are clarified in Agenda 21 and the Rio Declaration, both adopted at UNCED, and in subsequent international regional and national instruments (UNEP, 2004).

Agricultural production systems in urban and peri-urban areas can pose risks to public health and the environment. These arise from the inappropriate or excessive use of agricultural inputs - including pesticides, nitrogen, and raw organic matter containing heavy metal residues - which may leach or runoff into drinking water sources, microbial contamination of soil and water, and air pollution. In particular, leafy vegetables can be contaminated through overuse of chemical sprays, while zoonotic diseases and veterinary public health problems can arise from intensive livestock production.

The most viable source of water for urban and peri-urban agriculture is recycled treated wastewater. FAO has estimated that typical wastewater effluent from domestic sources, when appropriately treated for agricultural reuse, could supply all of the nitrogen and much of the phosphorus and potassium that are normally required for agricultural crop production (FAO, 1999).

According to Smit (2001), Urban planners and educators should make a point of studying the ecology of natural systems. On a predominantly urban planet, cities need to adopt circular metabolic systems to assure their own sustainability and the long-term viability of the

environments on which they depend. Urban *outputs* will need to be regarded as crucial *inputs* into urban production systems, with routine recycling and composting of organic materials for re-use on local farmland. Urban agriculture contributes to this process by reusing its waste and the waste of other sectors to produce food and fuel. It reduces both the intake and the output in the resource stream, thus fewer resources are consumed and pollution is lower. Very up-to-date methods for recycling urban wastes into nutrients for urban and urban-fringe farming and gardening are now available.

2.5 Problems affecting urban agriculture

In a world increasingly dominated by cities, UA is practiced in a very dynamic environment and with multiple stakeholder interactions. Because of competition for urban space from economic and politically more accepted functions, and different demands from urban inhabitants, UPA needs to be dynamic and continuously adapt to the rapidly changing conditions, in location and type of crops or animals produced and even people involved. This contributes to the perception that agricultural production in and around urban areas is unsustainable. But is this perception correct? UPA is increasingly accepted by municipalities as part of urban development (Veenhuizen, 2007).

The problem with UA arises from its close proximity to dense human populations sharing air, water and soil resources. Food production in the polluted environment of cities may cause contamination. Livestock rearing and use of chemicals and waste in farming can contaminate the soil and water used by city residents. Although these problems are shared with rural farming, the population concentration in cities makes their impact more serious (Smit, 2001)

In most developing countries, UA has been faced with many problems, among them:

- Lack of specific policies and laws geared towards addressing the development this important sub-sector.

- Non availability of adequate land. Agricultural land is slowly diminishing and the resultant effect is less production. Competition between agriculture and construction of buildings for commercial and residential purposes are on the increase due to rapid urbanization.
- Health and Safety .There are related health risks from urban agriculture, ranging from the upsurge in zoonotic disease to chemical poisoning.

Zoonotic diseases presenting such risks include brucellosis, swine erysipelas, taeniasis, echinococcosis, Newcastle disease and psittacosis. Unattended livestock (those allowed to graze, often on refuse, as well as those who are merely strays) are liable to consume industrial effluents or waste products containing heavy metals, which can end up in the human food chain, apart from being hazardous to the animals themselves.

When it comes to vegetables, there is an intake of heavy metals in vegetables grown along roadsides with heavy traffic, and lead is of particular concern in Kenya, which still has leaded fuel.

The health risks associated with waste reuse include the pathogenic organisms in waste residues, respiratory problems from dust or gases released, injuries from sharp fragments in waste, and crop contamination from heavy metals contained in waste.

Urban and peri-urban flower farms, which have become economically beneficial to many farmers, present a specific set of problems. They consume a lot of water, which contributes to urban water shortages. They may also contaminate boreholes or shallow wells which people rely on for domestic water supply. Since a large share of peri-urban farming is city oriented, it tends to be intensive and focused on market crops such as poultry, vegetables, and fruit. Thus it is expected that there is significant use of agrochemicals in peri-urban farming.

➤ Environmental Pollution

The rise in pollution has mainly been due to the following factors:

- Rampant use of raw sewage obtained from vandalized sewer lines for cleaning of produce and irrigation purposes.
- Sanitary disposal of agricultural waste like manure and crop residues from individual farm holdings and industrial waste from agro based industries like slaughter houses, hides and skin; and fruit processing plants.
- Disposal of pesticides wastes due to limited space leads to land, water and air pollution.
- Noise and air pollution from UPAL activities. Intensive livestock farming can also lead to odor and noise pollution. In a survey in Dar es Salaam, about 80 percent of respondents reported bad odors from urban livestock as a problem, and two-thirds reported noise as a problem.(Smit,2001).

- Inadequate linkages and networking between researchers with stakeholders coupled with unavailability of resources for research have led to poor prioritization and response to research needs of Urban and Peri-Urban Agriculture and Livestock sub-sector (Draft UPAL Policy, 2010).

CHAPTER 3: STUDY AREA

3.1 Location and Extent

This study was done in Roysambu Ward of Kasarani Sub County in Nairobi County, which hosts Nairobi, the capital City of Kenya .Kasarani is one of the eight Sub Counties comprising Nairobi County. Others are Makadara, Kamukunji, Starehe, Lang'ata, Dagoretti, Westlands and Embakasi as shown in figure 3.1 below.

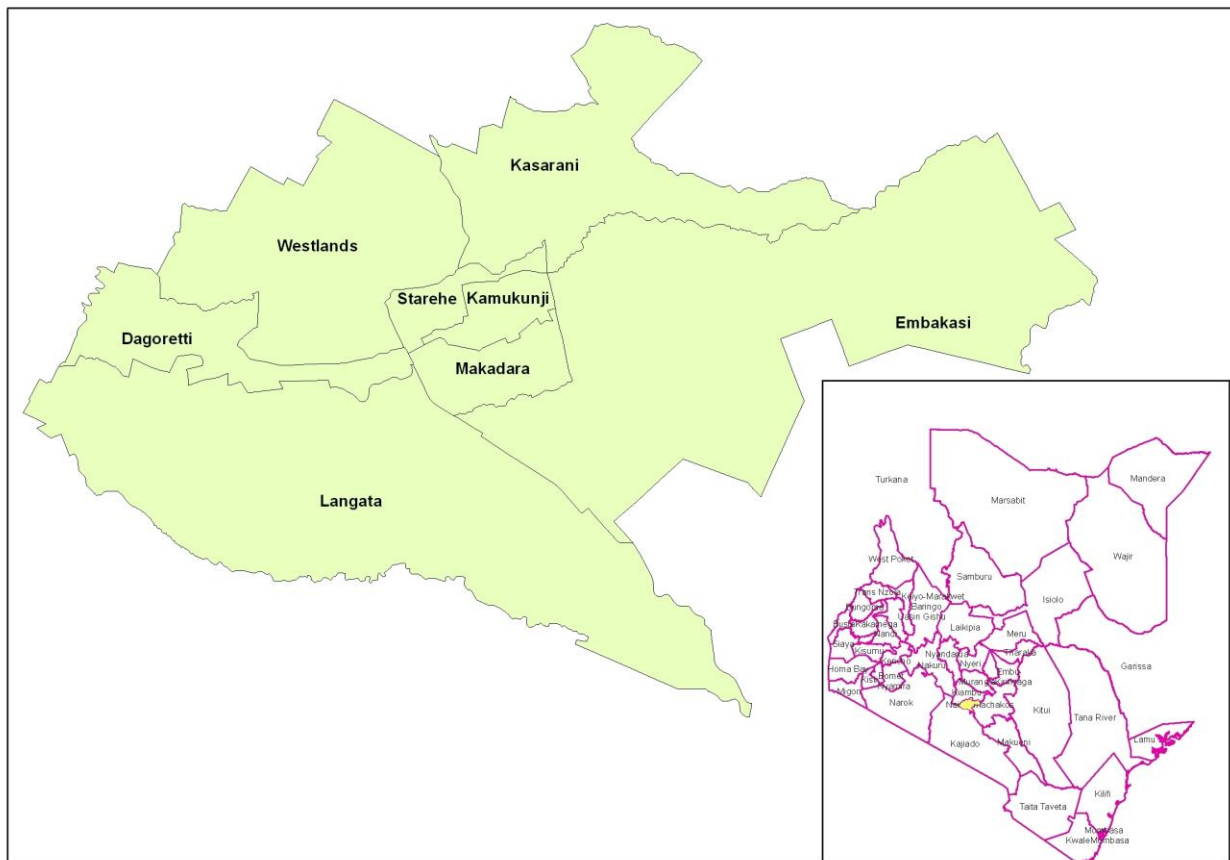


Figure 3. 1 Map of Nairobi showing study area

Source: Field survey, 2014

Nairobi lies at an altitude of 1695 metres above sea level, longitude 36° 50' east and latitude 1° 17' south, about 140 kilometres south of equator. The City and its surrounding area form the Nairobi County. Roysambu Ward is located in the Eastern part of Nairobi, about 10 kilometres from the city centre along Thika Road, which traverses the study area.

3.2 Historical background.

The name "Nairobi" comes from the Maasai phrase Enkare Nyrobi, which translates to "cold water". The phrase is also the Maasai name of the Nairobi River, which in turn lent its name to the city. Founded by the British in 1899 as a simple rail depot on the railway linking Mombasa to Uganda, the town quickly grew to become the capital of British East Africa in 1907, and eventually the capital of the newly independent Kenyan republic in 1963. Nairobi as an urban centre was officially defined in 1900 under the Nairobi Municipal Community regulations and it became the capital of Kenya in 1907 (Mitullah 2003).

3.3 Physical and Topographical Features

Whereas the Kenyan territory is characterized by a wide topographical diversity, ranging from glaciated mountains to deserts, the County of Nairobi is characterized by undulating hilly topography with an elevation in a range 1,460 m to 1,920 m. Lowest elevation occurs at the eastern boundary of the County, at Athi River, and the highest at the western rim.

The key physical features include the Nairobi, Ngong and Mathare rivers. The indigenous Karura forest lines the Northern part of the County whereas the Ngong hills stand majestic to the west. Mt Kenya provides the Northern view whereas Mt Kilimanjaro is the key attraction towards the South-east.

The Rift Valley factor as a County Neighbour is the source of occasional minor earthquakes and tremors. Uniquely, the Nairobi County has the Nairobi National Park, with an area of 117 square

km, within its administrative area, extending along the western boundary, a key factor to the huge number of both domestic and international tourists.

3.4 Ecological Conditions

Nairobi's main drainage follows the regional slope of the volcanic rocks towards the east while subsidiary internal drainage into the Rift regions is confined to the western part.

The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits tuff and volcanic ash.

These plains comprising mainly the Athi plains and the northern section of the Kapiti plains extend western, rising from 4900 feet (1493 m) at Athi River to about 6000 feet (1829 m) in the faulted region near Ngong (Seggerson 1991).

Water draining eastwards from the hill area accumulates on low-lying grounds between Parklands in the north and Nairobi south estate forming perched water table above the Nairobi phonolite.

3.5 Demographic Features.

Nairobi is the most populous city in East Africa, with a current estimated population of about 3 million, according to the 2009 Census. In the administrative area of Nairobi 3,138,295 inhabitants live within 696 km². Nairobi is currently the 14th largest city in Africa, including the population of its suburbs. Average population density is 4840 persons per sqkm. This is expected to rise to 5671 by 2015, and 6119 persons per sqkm in 2017.

This rapid increase in population has led to unprecedented sprawl of informal settlements and outstripped the city's delivery of social services (education, health care, water supply and sanitation) and increased poverty levels within the city.

3.6 Climatic conditions.

Nairobi has a subtropical highland climate . At 1,795 meters (5,889 ft.) above sea level, evenings may be cool, especially in the June/July season, when the temperature can drop to 10 °C (50 °F). The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F). Nairobi has two rainy seasons, with the long rain season between March and April, and the short rain season between November and December. The mean annual rainfall ranges between 850-1050 mm. As Nairobi is situated close to the equator, the differences between the seasons are minimal. The timing of sunrise and sunset varies little throughout the year for the same reason (Wikipedia).

3.7 Soils

The soils are poorly drained, dark grey to black half ripe clay in most part of the County. There are however a few pockets of red soil to the west of Nairobi.

Roysambu ward is one of the four wards comprising Kasarani Sub County in Nairobi County. Others are Githurai, Kasarani and Kariobangi north Wards. Administratively Roysambu Ward consists of seven sub locations ie. Njathaini, Roysambu, Garden, Ruaraka, Mathare North, Utalii and Mathare 4A as shown in Figures 3.2 and 3.3.

IEBC REVISED RUARAKA CONSTITUENCY COUNTY ASSEMBLY WARDS

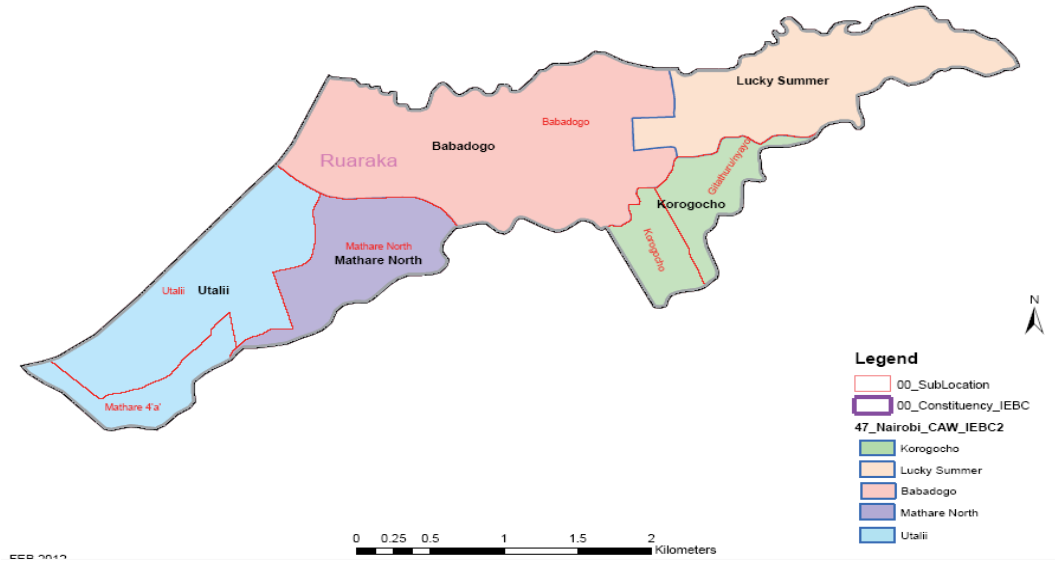


Figure 3. 2 Utalii and Mathare

Source: Field Survey, 2014

IEBC REVISED ROYSAMBU CONSTITUENCY COUNTY ASSEMBLY WARDS

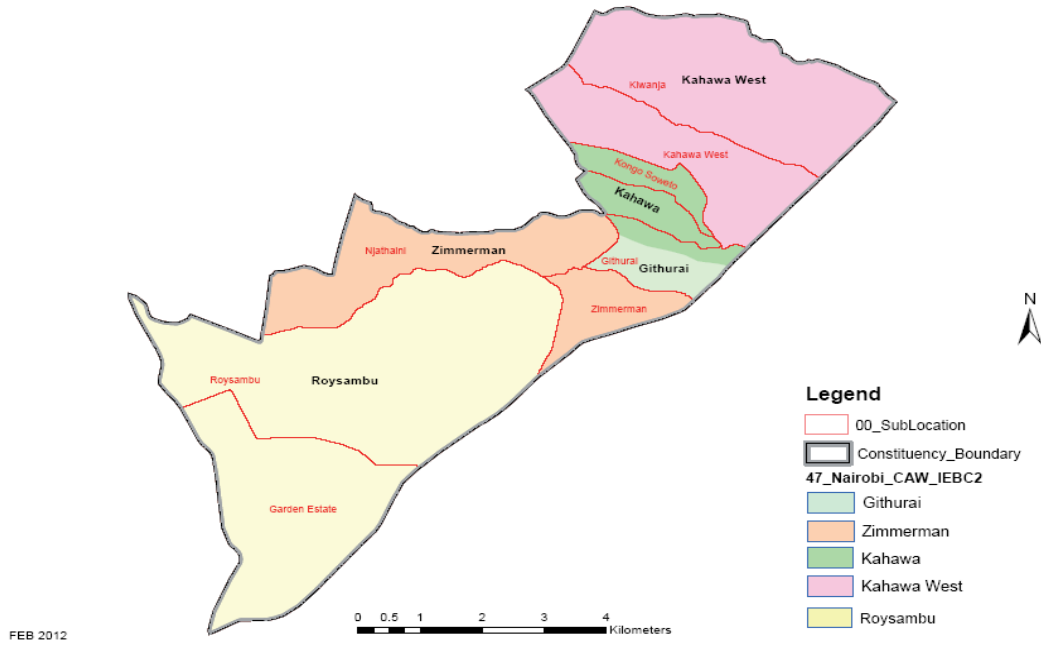


Figure 3. 3 Njathaini and Garden Estate

Source : Field Survey, 2014

It also includes Mathare slums traversed by Mathare River which poses a major environmental concern since a lot farming is done along the River which is heavily contaminated. It has a population of 199,852 persons in 64,303 households and an area of 34 square kilometers (2009 census).Average population density is 6082 persons per sqkm.

Agro-ecological zones are Upper midland zone 3 and 4. Soils are mainly black cotton soils with some pockets of loam soils. Annual rainfall ranges from 850-1000mm and is bimodal, with the long rain season between March and April, and the short rain season between November and December.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Research design

The study employed descriptive research design. Descriptive research attempts to describe systematically a situation, problem, phenomenon, service or programme, or provides information about , say, living condition of a community, or describes attitudes towards an issue (Kumar, 2005). This study therefore describes the current situation of urban agriculture and its contribution to household livelihoods in Roysambu Ward, Nairobi County. It used representative samples of the population to generalize findings of the larger population.

4.2 Nature and sources of data

4.2.1 Nature of data

Two types of data were collected, Primary and secondary data. The primary data was collected from the field to give first-hand information about the problems constraining the development of UA as well as the effects of urban agriculture to household livelihoods in Roysambu in terms of food security, employment creation and farm incomes. Data on types of farm enterprises, farm sizes, farm inputs and methods of farm waste disposal was also collected.

Secondary data which is documented information was used on policy and legal framework review as well as any documented information on effects of UA on household livelihoods and problems constraining UA development in Kenya and beyond. Information on land use changes in Nairobi County over the last 20 years was also obtained.

4.2.2 Sources of data

Primary data sources included households, resource persons and focus group discussions. Resource persons included officers in National and County Governments in various related disciplines ie. Environment, Planning, Agriculture, Lands, Nairobi County Government. NGO's and CBO's in the area were also interviewed. Field observations were also done.

Secondary data was obtained from various sources which included published books, documented information from relevant line ministries like strategic, annual, quarterly and other reports, relevant publications, Government policy documents and electronic data. Landsat satellite images covering Nairobi County for the last 20 years was also obtained.

4.3 Methods and instruments of data collection

Structured and unstructured questionnaires were administered to each sampled households (both open ended and closed). Pre-survey was conducted to gain insight on the study area` and refine research instruments.

Interview schedules were used on resource persons in the five institutions visited and three focused group discussions were conducted to consolidate information generated from households and resource persons,ie one in Ruaraka(Songa Mbele Women Group),one inNjathaini(Njathaini Self Help Group) and a meeting with Kasarani Sub County agriculture officials.

Field observations were made to pick any unique features. This was used to determine the effects of urban agriculture to house hold livelihoods as well as examine the problems affecting urban agriculture development in the study area.

On policy and legal framework governing urban agriculture in Kenya, review of Government policy documents and the various acts of parliament was done. The Constitution of Kenya (2010) also offered a lot of insights.

To assess the trend in land use in Nairobi County, GIS tools were used to generate maps of land use changes over the last twenty years and its implication on agriculture. Twenty years span was chosen because Structural adjustment programmes were first implemented in Kenya about twenty years ago and most changes witnessed in the country today is associated with them. For the first time in history Kenyans were exposed to international competition and as a result, many urban households especially the poor started facing a serious decline in their purchasing power. They have responded in various ways, most notably by diversifying their income sources including practicing UA. (Mireri,2007).Landsat images using remote sensing data obtained from Regional Centre for Mapping of Resources for Development (RCMRD), Nairobi were analysed to detect the changes. Photography using digital camera was used to capture any area of interest.

4.4 Sample design

The households were sampled using a combination of stratified, cluster, snowballing and purposive sampling methods. Stratification was based on population densities, the low population areas of Garden and Thome with population densities of 979-1,385 persons per sq.km and the high population areas of Ruaraka, Njathaini and Mathare with population densities of 10,362-119,055 persons per sq.km formed the two strata.

Snowballing and purposive sampling methods were used in Garden and Thome areas where a tour guide was used to identify farmers as well as farmers leading us to other farmers. This method was ideal because farmers were sometimes far from each other and the community was gated and sometimes hesitant to be interviewed. In Ruaraka, Njathaini and Mathare areas, four

clusters were identified, each in Ruaraka, Mathare North, Njathaini and Mathare 4A, then purposive sampling was used to identify farmers in each cluster. Officer in charge of Agriculture in Roysambu Ward served as the guide since she was well versed with the area.

Purposive sampling method was used to select resource persons in the various institutions identified as well as in focused group discussions. Five resource persons in five Institutions were interviewed, that was in Nairobi County Government (Planning Department), Roysambu City Government Office, Nairobi County Agriculture Office, Kasarani Sub County Agriculture Office, NEMA Headquarters.

Sample size was determined using formula (Naissiuma, 2000) $n = \frac{NCv^2}{(CV^2 + (N - 1)e^2)}$

Where N=Population, Cv=Coefficient of variation (0.5), n=sample size

e=Tolerance of desired level of confidence (take 0.05% at 95% confidence levels)

N being 199,852 persons hence,

n (sample size) = 100

90 household questionnaires (structured and unstructured) and 8 interview schedules were administered and analysed.

4.5 Data analysis and presentation

Qualitative and quantitative methods were used to analyze the information collected from the respondents. The quantitative techniques were done by coding the data from the questionnaires based on broad thematic areas then undertaking analysis using Statistical Package for Social Scientists (SPSS) version 20.

Qualitative techniques involved grouping answers to various questions as answered by respondents. Proportions and percentages were used to make general inferences. The analysis was descriptive in nature and was analyzed in text, diagrams or photographs. Data presentation was done through, pie charts, graphs and maps.

Landsat satellite images covering Nairobi County over the last twenty years was interpreted using GIS software Arc view 3.3 to capture the land use trend in Nairobi County.

4.7 Limitations of the study

- Prejudice – Suspicions from most of the respondents who wanted to know if we had been sent by the City Council. This was because the City Council askaris have been harassing them since the City's by laws have outlawed farming in the City. However our public relations initiatives overcame this as well as interventions by Government officers.
- Budgetary constraints – The study involved a lot of travelling and interviewing which involved money. However Government officers on the ground were very helpful especially in identification of respondents and field guides.
- Inadequate time – Time was limited, for example data collection was done in two weeks only. This necessitated working overtime.
- Sometimes the respondents took time to understand the questions. This caused delays in administration of the questionnaires.

CHAPTER 5: RESULTS AND DISCUSSIONS

5.1 Policy and legal framework governing UA in Kenya

In Kenya there is no specific National law or policy addressing urban agriculture, rather UA is addressed through the various sectoral laws. Draft National Urban and Peri-Urban Agriculture and Livestock Policy is in place, awaiting cabinet approval. Kenya colonial administration officially designated agriculture as a rural land use and the successive independent Governments have maintained the same policy position. Urban agriculture will remain a major feature in urban landscape in the foreseeable future despite policy and legal bias against it. Therefore there is need to create a framework to support productive and safe urban agriculture as it remains an important aspect of urban economy and source of livelihood (Mireri, 2007).

Kenya is a signatory to the Harare Declaration 2003 on Urban and Peri-Urban Agriculture in Eastern and Southern Africa which recommends the development of policies to create an enabling environment for integrating urban agriculture into the urban economies.

In the recent past especially after enactment of Constitution of Kenya (2010), a lot of effort has been made in putting in place policy and legal framework that supports UA but in a regulated manner so as to address its negative environmental and health concerns. The Constitution puts agriculture and animal husbandry functions under County Governments which means agriculture in the study area is squarely under Nairobi County Government. The Constitution also says that every person has the right to a clean and healthy environment, which means that negative environmental impacts associated with urban agriculture have to be addressed.

Constitution of Kenya (2010) also says that the State may regulate the use of any land, or any interest in or right over any land, in the interest of defence, public safety, public order, public morality, public health, or land use planning. This means that the state has powers to regulate use of land for agriculture in the interest of public health. This study showed that UA exposed people

to a lot of health risks especially in low income areas and the State should come in to protect people's lives and safety.

Agriculture Act, Cap 318 has since been repealed, resulting to The Agriculture, Fisheries and Food Authority Act (2013) and The Crops Act (2013). Though these two new acts are not very explicit on UA, they have given a lot of lee way for its development.

Below are some of the Acts of Parliament and policies that govern UA in Kenya:

- Urban and Cities Act (2011)

The Act says that every city and municipality established under this Act shall operate within the framework of integrated development planning which shall provide a framework for regulated urban agriculture. This allows Nairobi County Government to incorporate UA in its planning

- Environmental Management and Coordination Act (1999)

The Act sets water and air quality standards, identifies materials and processes that are dangerous to human health and the environment including pesticides and other toxic substances. This will address environmental and health concerns associated with UA. However a discussion with NEMA officials showed it has inadequate capacity to deal with these ever increasing challenges

- The Agriculture, Fisheries and Food Authority Act (2013)

The Act makes general rules for the preservation, utilization and development of agricultural land and aquatic resources. This may include advice on the control or prohibition of the cultivation of land or the keeping of stock or any particular kind of stock. This will control and regulate UA.

- The Crops Act (2013)

The Act says that the County Governments may from time to time, through the relevant County Executive Committee member, identify land suitable for the production of each of the scheduled crops listed in the act. This gives Nairobi County Government leeway to identify land suitable for agriculture.

- The Land Control Act (Cap 302)

Defines agricultural land as land that is not within a municipality or a township

.Agricultural land in Nairobi Area or in any municipality, township or urban centre can only be declared so by the Minister in charge, by notice in the *Gazette*.

- The Public Health Act (Cap 242)

Empowers the Minister for Health to prohibit cultivation or irrigation within and around townships. This has been unsupportive of UA and should not be implemented in isolation since it is in conflict with other Acts with regard to UA.

- County Government Act (2012)

The Act says that every County is supposed to have a 5 year County Integrated Development Plan which should be people centered. This gives an opportunity for Nairobi County Government to incorporate UA its planning and facilitates legal and policy review through public participation.

- Physical Planning Act (1996)

This Act excludes UA in the land use classification. This deprives the sub-sector of the much needed institutional support and it should be harmonized with other Acts.

- National land policy (2009)

Acknowledges that UA has not been properly regulated and facilitated. It advocates putting in place an appropriate legal framework to facilitate and regulate urban agriculture and forestry.

- Agriculture Sector Development Strategy (2010)

Recognizes the risks of agricultural waste to human health and calls for the design of appropriate agricultural waste management systems.

- National Food and Nutrition Security Policy (2011)

Recognizes that UA is increasingly being practiced and holds potential to improve food access and overall food security and nutrition conditions in urban and peri-urban areas. However regulatory guidelines are required to ensure the safety and quality of food produced, sold and consumed in these areas.

- Kenya's vision 2030

Identifies agriculture as a major driver to economic growth. This will be done through an innovative, commercially oriented and modern agriculture, livestock and fisheries sector. Modern agriculture which is land and capital intensive is the only way for Nairobi due to scarcity of land. Investments should be done in modern farming technologies including value addition.

The defunct City Council of Nairobi, operating under the then Local Government Act, suppressed agricultural activities within the city on the premise that agricultural activities were a nuisance in the city. The trend world over is that urban agriculture is gaining momentum and the Nairobi County Government should not lose the moment to expand the people's economic activities and efforts to feed themselves.

The County Government of Nairobi is currently in the process of drafting The Nairobi City County Urban Agriculture Promotion and Regulation Bill (2013), to provide for the promotion of urban agriculture within the Nairobi City County, and to provide the necessary regulatory framework for the practice of agriculture in the County.

The Draft National Urban and Peri-Urban Agriculture and Livestock Policy is already in place awaiting Cabinet approval. It aims at giving clear direction for sustainable development of the UA and underscores the importance of public-private sector partnerships in accelerating growth in the subsector. All the changes proposed in this policy paper will need to be supported by an appropriate legal framework and will require the support of all stakeholders for its successful implementation.

There are legal and policy gaps as shown above, therefore there is need to coordinate and build partnerships among the enforcing agencies in order to maximize synergies and build on the progress already made. This calls for consultative fora for all stakeholders to pick out conflicting laws and identifying any legal and policy gaps.

5.3 Trends and Patterns of Land use in Nairobi County and its implications on urban agriculture.

A spatial analysis of urban land use for Nairobi County was carried out in order to understand how it affects agriculture. Land use cover maps were generated using Arc GIS software to show land uses in Nairobi County for year 1995 and year 2014 as shown in Figures 5.1 and 5.2.

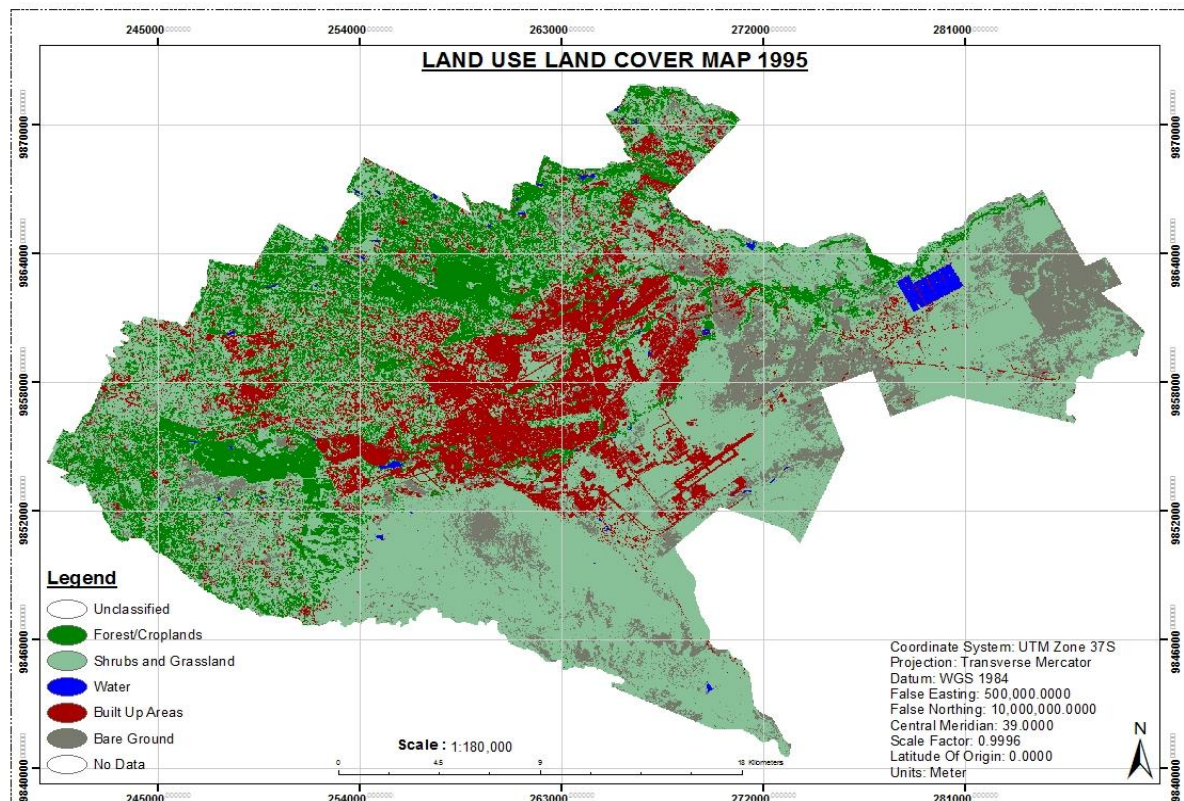


Figure 5. 1Nairobi County Land use Land cover for year 1995

Source: Regional Centre for Mapping of Resources for Development (RCMRD), Nairobi

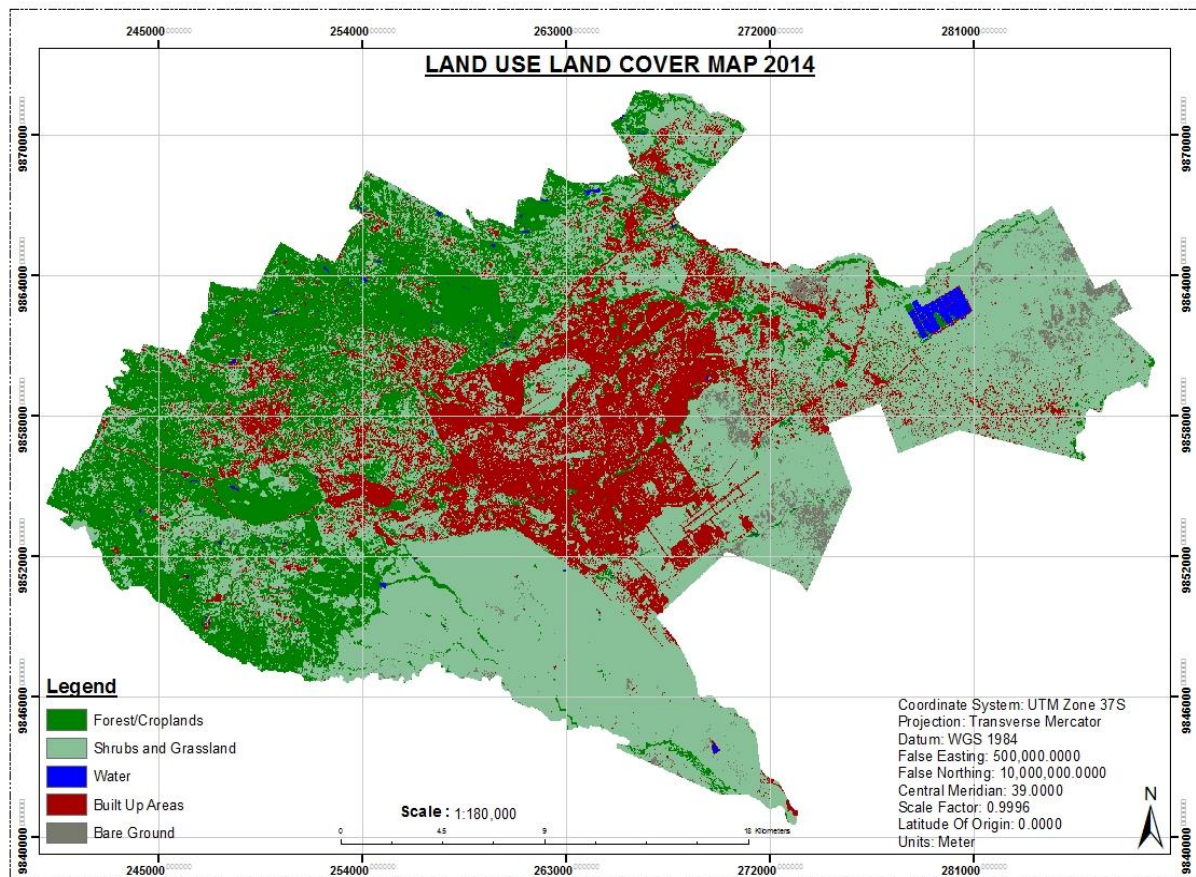


Figure 5. 2 Nairobi County Land use land cover for year 2014

Source: Regional Centre for Mapping of Resources for Development (RCMRD), Nairobi

The study showed that area under forests and croplands reduced from 178.13Km² to 129.69Km² during the 1995-2014 period. The area under shrubs and grasslands reduced from 378.61Km² to 366.55Km² over the same period. Bare grounds also reduced from 91.75Km² to 15.8Km². Built up areas increased from 107.87Km² to 144.02 Km² over the same period, as shown in Table 5.1

Figures 5.3

Table 5. 1 Nairobi County Land Use Land Cover changes (1995-2014).

| | Area(km ²)1995 | Area(km ²)2014 |
|-------------------|----------------------------|----------------------------|
| Forest/croplands | 178.18 | 129.69 |
| Shrubs/Grasslands | 378.61 | 366.55 |
| Water | 4.43 | 3.8 |
| Built up areas | 107.87 | 144.02 |
| Bare grounds | 91.75 | 15.8 |

Source: Regional Centre for Mapping of Resources for Development (RCMRD), Nairobi

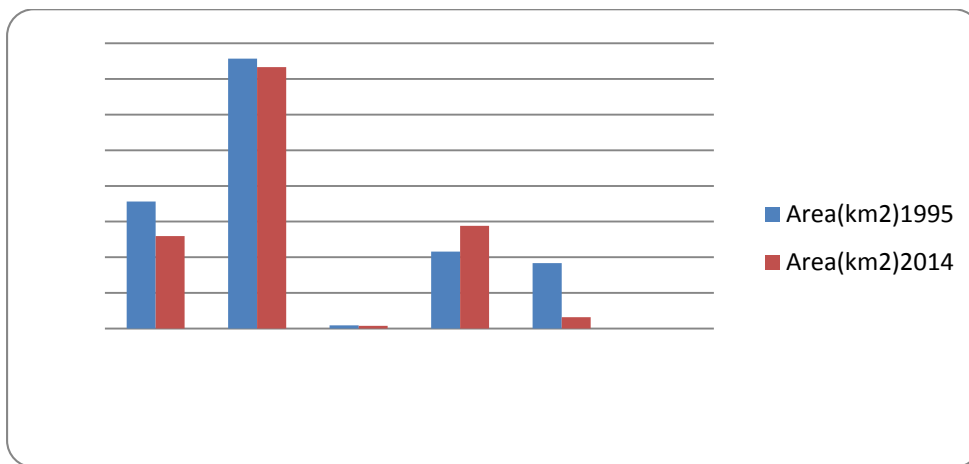


Figure 5. 3 Nairobi County Land use land cover changes (1995-2014)

Source: Regional Centre for Mapping of Resources for Development (RCMRD), Nairobi

The above scenario is as a result of increased demand for land for development as opposed to agricultural land. This has led to encroachment of the hither to agricultural land for development.

Forests have been grabbed, sometimes leading to protests by environmental activists eg Karura

Forest. (Ndungu land report, 2004). This means that nearly all the previously agricultural land in Nairobi County has been taken up by buildings or other developments as the City expands and encroaches on the neighboring land. So, over the 20 year period, agriculture in Nairobi has diminished at the expense of other land uses and this trend is bound to continue and agriculture will soon be driven out of Nairobi. The little land available for agriculture calls for land intensive modern farming technologies.

According to Nairobi County Integrated Development Plan (2013-2017), vast grazing lands have progressively been subdivided into smaller units by land developers and speculators. Most of the previously open spaces in the study area have been built up as revealed during our discussions and interviews. A lot of construction going on in the area was observed, sometimes at the expense of social amenities eg school playing grounds.

Due to increased urban population coupled with spiraling poverty levels most urban dwellers especially the poor have turned to urban agriculture to supplement their source of food as well as earn extra income. This has seen proliferation of UA in the low income areas of Roysambu Ward sometimes being practised in very unhygienic conditions due to scarcity of land eg along Mathare River. There is also encroachment of Government land meant for other uses sometimes leading to conflicts. Farming on 'idle' land is very common like below power lines as can be seen in Plate 5.1



Plate 5. 1 Farming being practised below power lines at Ruaraka

Source: Field Survey, 2014

There is also a lot of food safety awareness especially among the high income farmers of Garden and Thome. Most of these farmers prefer growing their own vegetables in their backyards simply to avoid buying the “heavily contaminated” vegetables in the market. Some of these farmers have embraced agriculture as a business and use advanced farming technology eg green houses, hydroponics etc (see plate 5.2) These are some of the coping strategies due to reduced land for agriculture as well as reduced water for agriculture.



Plate 5. 2 Growing of cowpeas in a greenhouse at Thome

Source: Field Survey, 2014

5.4 The effects of urban agriculture to house hold livelihoods in Roysambu Ward.

30% of Nairobi dwellers are involved in UA of which 2/3 are women (Mwangi and Foeken, 2006) as quoted in (Urban Harvest, 2010). UA contributed to livelihoods of the respondents in several ways. These were economic, social as well as ecological. Majority of the respondents were young and middle age. Of the 90 respondents interviewed 36 ranged between 18-35 years ie 40% and 38 ranged between 36-55 years of age ie 42.2%, as shown in Table 5.2 and Figure 5.4. These are people who are energetic and in their prime age and if well supported can contribute the growth of our country.

Table 5. 2 Age respondents

Age

| | Freque ncy | Percent | Valid Percent | Cumulative Percent |
|----------------|---------------|---------|------------------|-----------------------|
| 18-35 yrs | 36 | 40.0 | 40.0 | 40.0 |
| 36-55 yrs | 38 | 42.2 | 42.2 | 82.2 |
| Over 55 yrs | 16 | 17.8 | 17.8 | 100.0 |
| Total | 90 | 100.0 | 100.0 | |

Source: Field Survey, 2014

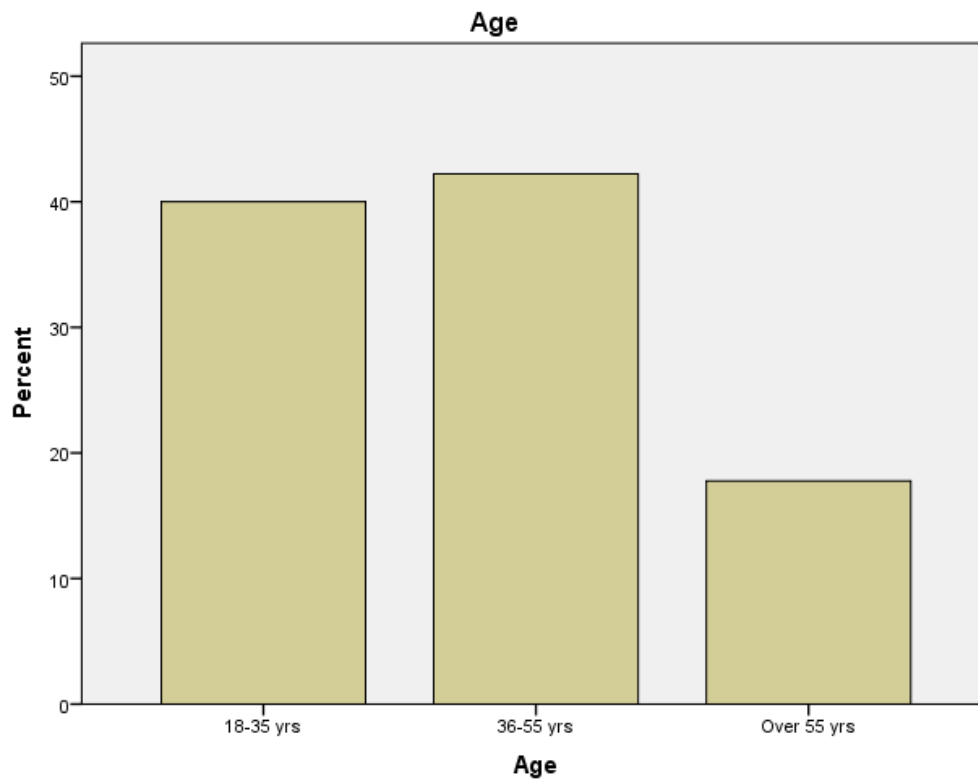


Figure 5. 4 Age of respondents

Source: Field Survey ,2014

On level of education, 45 of the respondents had not gone beyond primary school ie 50% and 27 had not gone beyond secondary school ie 30%, as shown in the Table 5.3 and figure 5.5

Table 5. 3Level of Education

| | Frequenc y | Percent | Valid Percent | Cumulative Percent |
|-----------|---------------|---------|------------------|-----------------------|
| Primary | 45 | 50.0 | 50.0 | 50.0 |
| Secondary | 27 | 30.0 | 30.0 | 80.0 |
| Tertiary | 18 | 20.0 | 20.0 | 100.0 |
| Total | 90 | 100.0 | 100.0 | |

Source: Field Survey, 2014

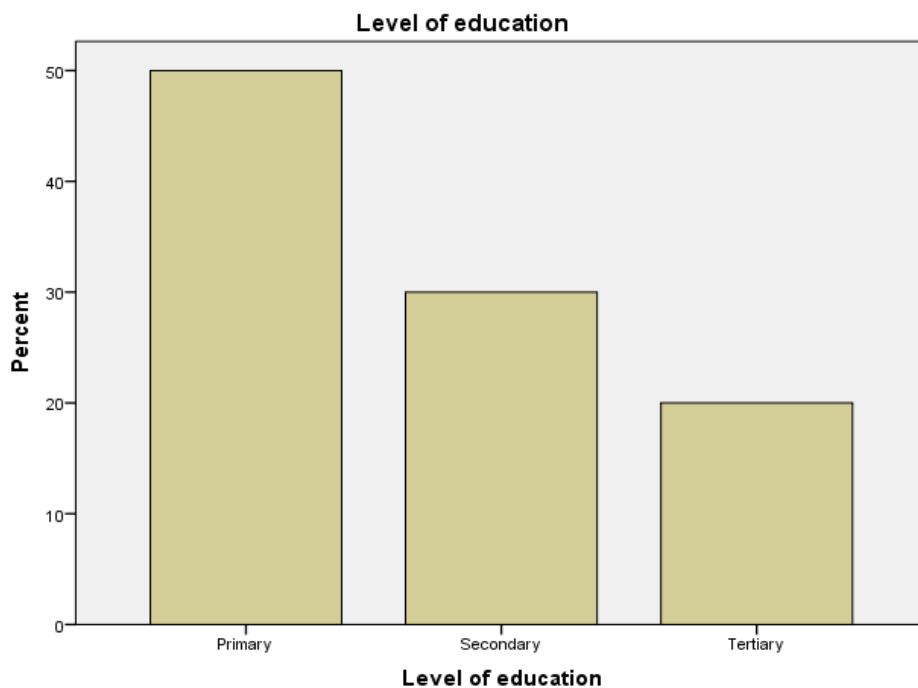


Figure 5. 5 Level of education

Source: Field Survey, 2014

This is slightly higher than the Kenyan average according to The Kenya Economic survey (2013), which says Kenya’s labour force has relatively low education attainment compared to middle-income countries. About 65 per cent of the population has only primary or incomplete secondary education, while another 10 per cent has never attended school. Given the above labour market challenges, government interventions to address unemployment should also give attention to skills development and training (Republic of Kenya, 2013a).

The youth and middle age forming the greatest part of urban farmers should be encouraged to venture into more farming but in an environmentally friendly way. Since most of them are not in any formal employment, the Government should set up vocational training centres where modern farming techniques will be trained. People will in turn use their acquired knowledge in farming to earn a living. This is important as more people enter into UA to make ends meet.

Vegetable growing was the most practised farm enterprise at (33.3%), followed by dairy cows (15.3%), poultry (10.2%) and maize (10.2%) and others, as illustrated in figure 5.8.

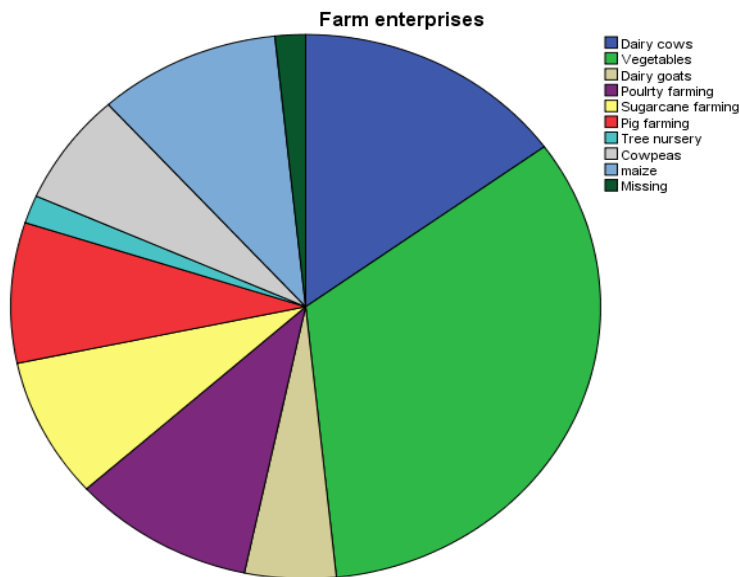


Figure 5. 6 Types of Enterprises

Source: Field Survey 2014

Of the 90 respondents, 31 reported that UA contributed to both food security and income generation ie 34.4%, 27 reported UA contributed to both employment and income generation ie 30% and 11 reported it contributed to food safety ie 11%, as shown in Table 5.4 and Figure 5.9

Table 5. 4 Contribution of UA to households

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------------|-----------|---------|---------------|-----------------------|
| Food security only | 9 | 10.0 | 10.0 | 10.0 |
| Employment and income | 27 | 30.0 | 30.0 | 40.0 |
| Income only | 6 | 6.7 | 6.7 | 46.7 |
| Food security and Income | 31 | 34.4 | 34.4 | 81.1 |
| Food safety | 11 | 12.2 | 12.2 | 93.3 |
| Employment only | 6 | 6.7 | 6.7 | 100.0 |
| Total | 90 | 100.0 | 100.0 | |

Source: Field Survey 2014

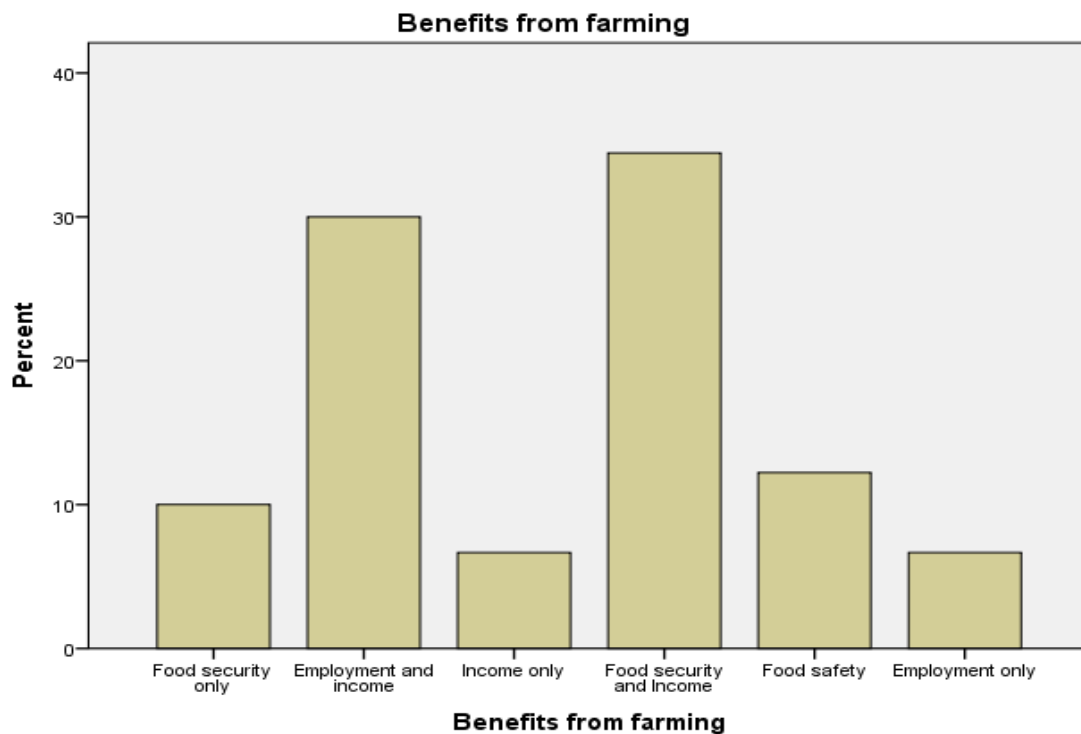


Figure 5.7 Contributions of Urban agriculture to households

Source: Field Survey 2014

5.4.1 Food security and income generation

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, 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 is then used to meet other family expenses.



Plate 5. 3 Sukuma wiki farmer at Mathare 4A

Source: Field Survey, 2014

5.4.2 Employment and income generation

Majority of the respondents who cited employment and income generation as a benefit are from medium and high income areas of Garden and Thome areas. These are commercial farmers who practice farming as a business and some have invested heavily in it. Incidentally these are the farmers who are very wary of the highly contaminated vegetables in the market and prefer growing their own vegetables for food safety.



Plate 5. 4 Quail rearing at Garden Estate
Field Survey 2014



Plate 5. 5 Vegetable growing at Thome
Field Survey 2014

60% of the respondents used family labour and 40% used hired labour. The range of urban agriculture work force was 1-2 for family labour compared to 1-6 for hired labour. This variation was because of nature (subsistence or commercial) and extent (small or large) of farming.

The highest workforce was recorded in dairy and piggery farms which are labour intensive. These also recorded the highest incomes from farming. The study revealed a mean household size of 3, which is comparable with the findings of 2009 population census. For those using family labour, an average of 1-2 family members out of a family of 3 were engaged in UA.

60% of the respondents recorded daily working hours of 6-8 hours, mostly hired labour whereas 30% recorded 3-5 hours working hours, mostly family labour. This is because hired labour was full time and family labour was part time since the workers were engaged in other income generating activities.

52% recorded monthly wages of Ksh 5,001-10,000 which is within Nairobi's basic minimum monthly wage of Ksh 9780.95 whereas 48% recorded monthly wages of Ksh 2000-5000 which is below the recommended rate. (Republic of Kenya, 2013). This indicates that UA is an important source of employment in Roysambu.

Agriculture's contribution to total household income was minimal as shown in the Table 5.5 and Figure 5.8. Out of 90 respondents interviewed 44 reported that agriculture contributed only less than 25% of total household incomes ie 48.9%, whereas 25 respondents reported agriculture contributed 25-50% of the total household income ie 27.8%. Most respondents interviewed engaged in other income generating activities. 30% engaged in business, 17% were casual workers and 8% were in formal employment. This means that farming is not a major income earner but rather it supplements family incomes.

Table 5. 5 Percentage contribution of farming to total household income

| | frequency | Per centage | Valid Percent | Cumulative Percent |
|---------------|-----------|-------------|---------------|--------------------|
| Less than 25% | 44 | 48.9 | 48.9 | 48.9 |
| 25-50% | 25 | 27.8 | 27.8 | 76.7 |
| 51-75% | 18 | 20.0 | 20.0 | 96.7 |
| Over 75% | 3 | 3.3 | 3.3 | 100.0 |
| Total | 90 | 100.0 | 100.0 | |

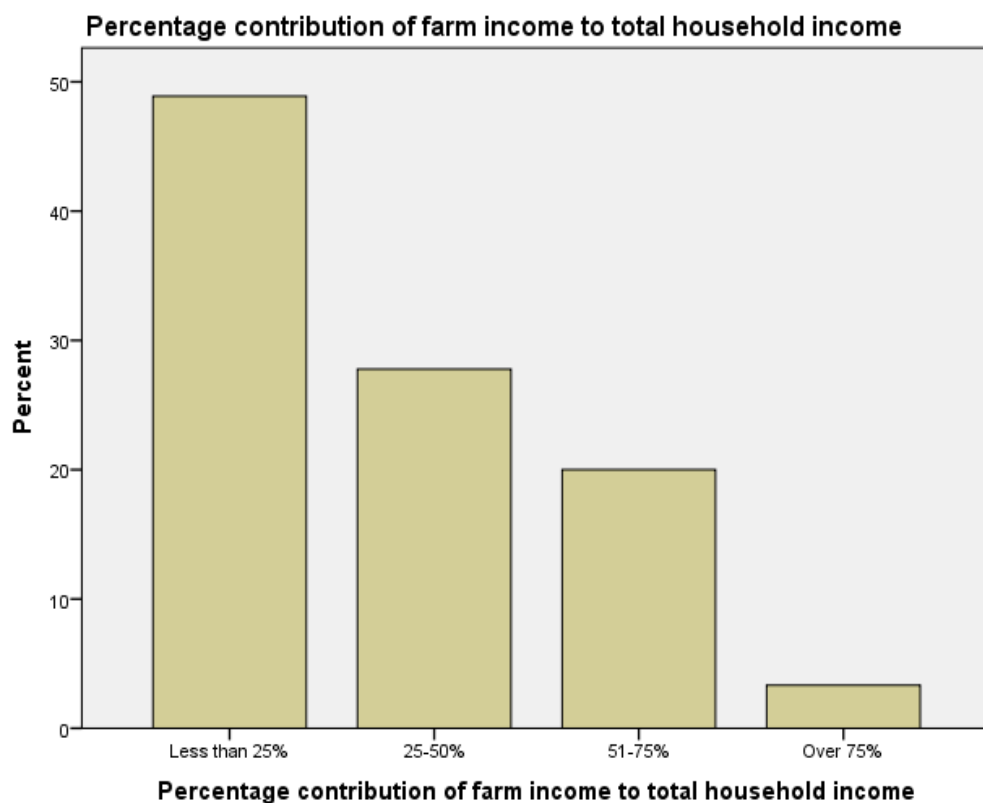


Figure 5. 8 Percentage contribution of UA to household income

Source: Field Survey 2014

5.4.3 Environmental and public health effects

Waste management is one of the key challenges facing urban farmers in the study area. If not properly managed, animal waste can be a significant source of human health hazards. Some farmers direct wastes especially cow and pig manure and effluents along paths causing pollution of the environment sometimes leading to conflict with neighbours. It is also very unsightly.

Human waste is also directed from residential areas towards farms in the neighborhood which contaminates the crops grown and is a human health concern.



Plate 5. 6 In the foreground, effluent flowing from a residential area to farms in Njathaini

Source: Field Survey 2014

There is a lot of farming going on along the heavily polluted Mathare River especially vegetable farming. Some livestock is also kept next to the river which ends up polluting the river since all the livestock waste is swept to the river. This cultivation along the River banks also contribute towards soil erosion, further contaminating the River.

Due to small land sizes especially in Mathare slums, livestock is kept at very close proximity with human being which poses risks of zoonotic diseases, bearing in mind that Kiamaiko slaughter house is just next, receiving livestock all the way from North Eastern Kenya.



Plate 5. 7Women harvesting sukuma wiki next to Mathare River

Source: Field Survey 2014

Use of pesticides to maintain yields has a negative effect on the environment. Farmers were found to use unrecommended pesticides on their crops eg organophosphates which are not easily degradable and persists in the environment posing health risks to consumers.

Observance of pre harvest intervals was minimal with majority of the farmers harvesting their produce as soon as they spray the chemical oblivious of the dangers involved. This may pose the danger of the chemicals entering the food chain.

5.5 Problems affecting urban agriculture:

Majority of the respondents cited lack of Government support (20%) and inadequate land (20%) as the main problems they faced. 11.7% cited inadequate rainfall and another 11.7% cited lack of farming technology as the problem. Other problems were environmental pollution, food safety, conflict with neighbours, high costs of farm inputs and animal diseases, as shown in figure 5.9

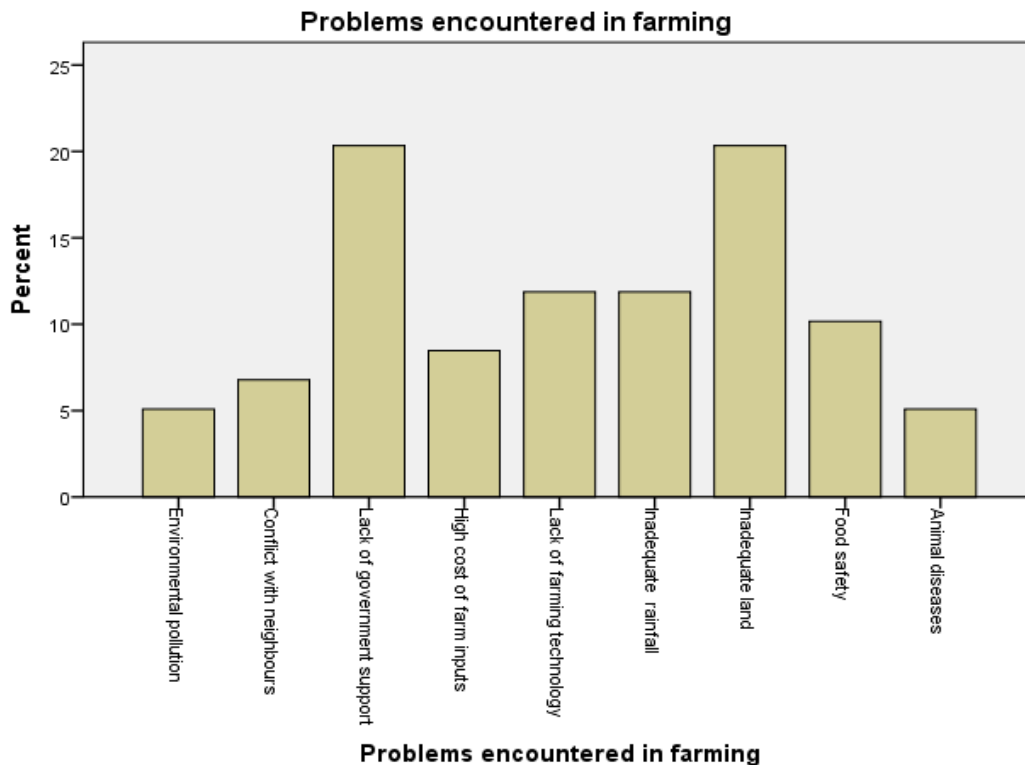


Figure 5. 9 Problems encountered in UA

Source: Field Survey 2014

5.5.1 Lack of Government support

Urban agriculture is commonly perceived by some as an activity that is marginal, temporary, and archaic. Some regard it as an activity that is actually harmful to farmers, consumers, the environment, the urban land economy, and the appearance of a city. However, if not practiced properly, urban agriculture can indeed be both unsanitary and polluting.

Government authorities have frequently responded to these problems by prohibiting urban farming rather than trying to resolve them. In Nairobi, for example, it is illegal to grow crops above a certain height. Lusaka, Kampala and other cities once banned maize cultivation, which was believed to spread malaria. Most North American cities ban poultry production. Lomé, Togo prohibits growing sorghum in the city because authorities think it makes the city dirty. Bamako, Mali has prohibited straw-producing cereals since 1989 because they are believed to breed mosquitoes and serve as hiding places for criminals. (Smit, 2011)

The Government should come up with laws and policies that support UA rather than outlawing it. As cited earlier in this report there is tremendous effort towards this and several documents are in the pipeline including The Nairobi City County Urban Agriculture Promotion and Regulation Bill, 2013 and Draft National Urban and Peri-Urban Agriculture and Livestock Policy which all seek to regulate UA. This way the urban farmer will feel Government support as opposed to the current situation where he/she feels neglected.

5.4.2 Inadequate Land

This was mostly noted in the low income and densely populated areas of Ruaraka, Njathaini and Mathare where farmers have adopted technologies which are land intensive to cope with the problem, as shown in the figure 5.16



Plate 5. 8 Multi storey garden in a residential plot at Njathaini

Source: Field Survey 2014

Some NGO's and CBO's have also supported urban farmers especially those vulnerable and those taking care of the sick like HIV/AIDS patients by providing them with financial and material support.



Plate 5. 9 Green house at Mathare 4A donated by an NGO

Source: Field Survey 2014

Inadequate land for farming has also led to encroachment of Government land meant for other uses sometimes leading to conflicts with the authorities. Farming along roadsides and river banks has increased ,its environmental and health risks notwithstanding.

Due to land scarcity especially in the highly populated areas farmers farm far away from their residence (off farm).Of the respondents interviewed 66.7% farmed off farm and 33.3% farmed on farm, as shown in the figure 5.10

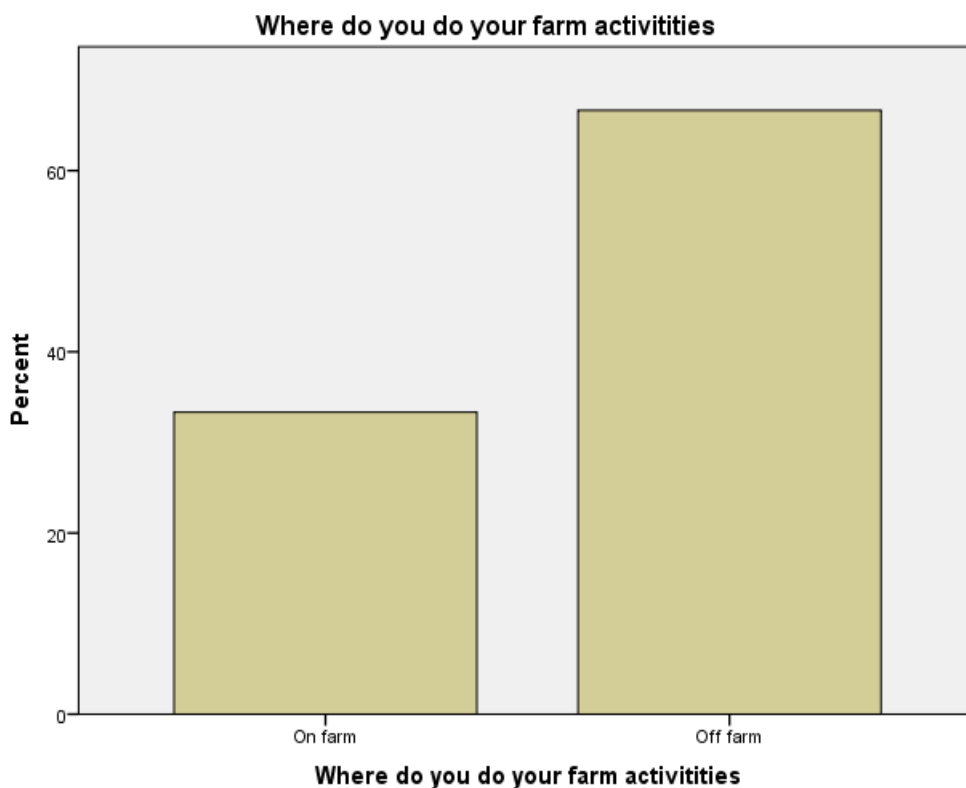


Figure 5. 10 Where Urban Agriculture is practiced

Source: Field Survey 2014

All the on farm farmers were from the high income farmers who owned bigger farms majority of them 0.26-0.5 acres and could spare some land in their backyards to practice farming sometimes intensively. Off farm farmers had small farm sizes of 0.1-0.25 acres which justifies why they have to look for farming land elsewhere, but majority of them do not own any land and they farm under the protection of Government officials. They mainly farm in road reserves, below power lines, along Mathare River and in Government land. Others rent land from land owners.

5.4.3 Health and Hygiene Problems

A number of activities associated with urban agriculture can cause health and hygiene problems. Farming in the city may carry higher health risks than in rural areas because the urban air, water, soil, and waste may be more polluted and hazardous for farming. The close proximity of urban farming to larger population concentrations increases the risk of spreading both communicable

and non-communicable diseases. Urban farming may pollute the environment through use of agrochemicals and leaching of animal excreta, as well as increase the habitat for certain disease-carrying vectors. Heavy metals and pathogens can be harmful if consumed by humans because plants grown in cities may pick them up from the soil, air, or water and transmit them to consumers. This was experienced in the study area as reported earlier in this report and should be urgently addressed. However this was not experienced in the high income low populated areas of Garden and Thome where there was good planning.



Plate 5. 10 A dairy cow in Mathare slums

Source: Field Survey 2014

5.4.4 Environmental Pollution

In urban areas, local authorities are mandated to manage water and solid wastes within their areas of jurisdictions while for the peri-urban areas, individual farmers take responsibility for the management of agricultural wastes. Various forms of environmental pollution were noted in the study area, including

- Land pollution brought about by farmers dumping manure and crop residues on the roadside or in an unhygienic manner within the compound due to limitation of space, excessive use and unsanitary disposal of pesticides and their packages, use of raw sewage containing industrial effluents, heavy metals and microbes. Use of raw sewage was particularly noted in Ruaraka to irrigate tree seedlings for sale. Human waste was also seen following sometimes to adjacent farms hence polluting the soils and contaminating the crops.
- Water pollution as a resulting from of pesticides and fertilizers percolating to the underground water or through runoff, slurry discharge and manure from livestock to unprotected rivers, vandalization of sewer pipes and diversion of raw sewage.
- Noise and air pollution in form of odor and noise from livestock especially pigs and poultry. This was noted in Thome area where some farmers kept livestock in residential areas becoming a nuisance to neighbours.

5.4.5 Inadequate Rainfall

High population growth rate in the study area has obviously put a strain on water resources and the many water users including urban farmers are in competition over the resource. Since water from rainfall is never enough, most farmers irrigate their crops majority of them using the city piped water. Of the 90 respondents interviewed, 39 used City piped water for farming ie 43.3%, 22 used rainfall for farming ie 24.4%, 21 used river water ie 23.3% and 8 used City waste water for farming ie 8.9% , as shown in the Table 5.6 and Figure 5.11

Source of farm water

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| River | 21 | 23.3 | 23.3 | 23.3 |
| City piped water | 39 | 43.3 | 43.3 | 66.7 |
| City waste water | 8 | 8.9 | 8.9 | 75.6 |
| rainfall | 22 | 24.4 | 24.4 | 100.0 |
| Total | 90 | 100.0 | 100.0 | |

Table 5. 6 Source of farm water

Source: Field Survey 2014

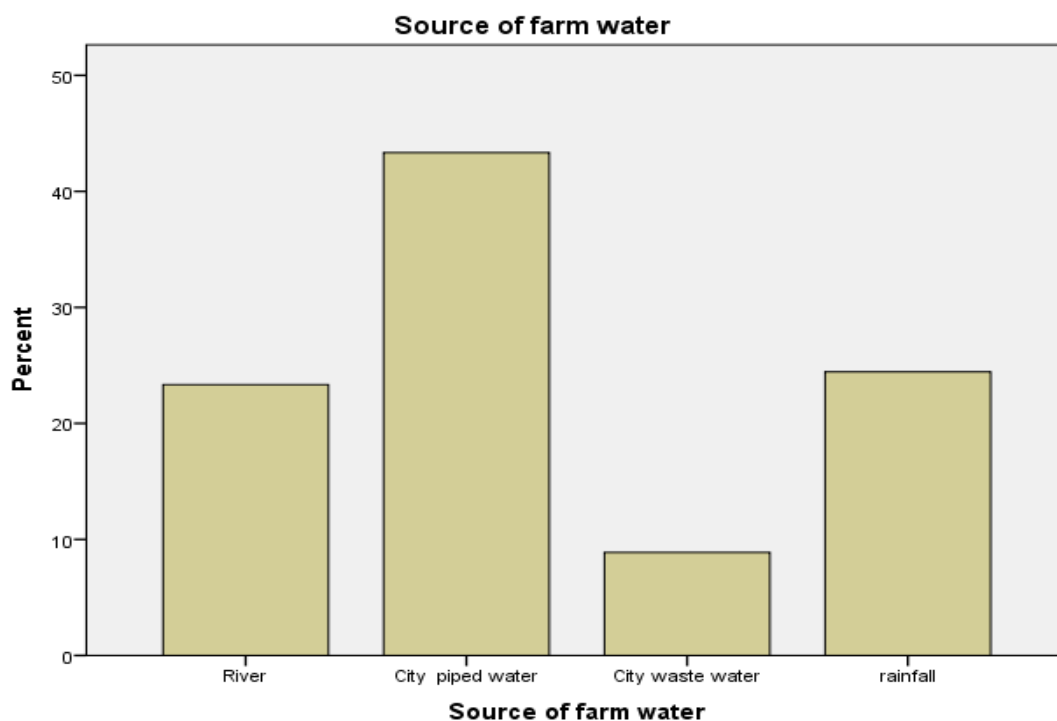


Figure 5. 11 Source of farm water

Source: Field Survey 2014

City piped water is meant for domestic use(human consumption) and its use for agriculture leads to domestic water shortages, moreover this piped water is treated for human consumption and a lot of investment has gone into it eg treatment works, conveyance etc and using it for farming is not recommended. Chlorinated water is also not suitable for growing crops. Most of respondents had their water metered meaning that the City Government was aware of that.

Use of untreated city waste water as well as river water obviously raises health and environmental concerns raised earlier in this report and should be urgently addressed.

Amount of rainfall in Nairobi has been declining and some emergence of irrigated agriculture was noted in the study area. This has put a lot of strain on the water resource bearing in mind that 43.3% of the respondents used piped water meant for domestic use for farming. Use of river and city waste water obviously had its health and environmental challenges. This can be addressed through enforcement by the concerned agencies in the short term but in the long term more investments in waste water treatment as well as zoning of agricultural areas will be necessary.

CHAPTER 6: SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Summary of the findings

The Draft National Urban and Peri-Urban Agriculture and Livestock Policy aims at giving clear direction for sustainable development of the UA and underscores the importance of public-private sector partnerships in accelerating growth in the subsector. All the changes proposed in this policy paper will need to be supported by an appropriate legal framework and will require the support of all stakeholders for its successful implementation. The draft is awaiting cabinet approval and is very important for the development of UA in Nairobi. The Draft Nairobi City County Urban Agriculture Promotion and Regulation Bill (2013) provides for the promotion of urban agriculture within the Nairobi City County, and provides the necessary regulatory framework for the practice of agriculture in the County. However more needs to be done since it has not yet been passed by the Nairobi County Assembly to become law.

In view of the various pieces of legislations and policies for and against UA, there is need to coordinate and build partnerships among the enforcing agencies in order to maximize synergies and build on the progress already made. This calls for consultative fora for all stakeholders to pick out conflicting laws and identifying any legal and policy gaps.

The changing land use cover in Nairobi is as a result increased demand for land for development as opposed to land for agriculture Urban land today is much more valuable than rural land, so that where there is direct competition between the two, urban uses generally take over. This has seen diminishing of agriculture as Nairobi City expands and encroaches on the previously agricultural areas. Irrigated agriculture has also increased as was noted in the study area to

maximally utilize the diminishing land. This has put a lot of strain on the scarce water resources in the study area.

Increased urban population coupled with spiraling poverty levels has also led to most urban dwellers especially the poor turning to urban agriculture to supplement their source of food as well as earn extra income. This has seen proliferation of UA in the low income areas of Roysambu Ward. Food safety awareness is also emerging especially among the medium and high income urban dwellers who prefer growing their food especially vegetables in their back yards to avoid the “heavily contaminated” food in the market.

Agriculture is clearly only a part of diverse livelihoods in the study area, while still providing a significant contribution to food security, income and employment. Otherwise formal employment, business, and casual employment tend to dominate. For most of the households interviewed, agriculture contributes to food security and income generation. This illustrates the importance of local food production not only as a direct food source for enhancing food security but also as a means of saving income for other purposes. UA is also an important source of employment in the study area.

UA impinges on urban ecosystem health, especially its potential to increase or decrease ecosystem health risks and thus vulnerability. While livestock can introduce vital micronutrients into local food systems, they also can be the source of disease affecting humans.

As well as being pathways for micronutrients, horticultural crops are also potential pathways for biological and chemical contaminants, negatively affecting the health of the urban ecosystem, including human health. This is especially so in intensive urban production systems, where the uptake of soil nutrients can be mixed with pathogens and chemicals. There is a potential environmental and economic benefit of recycling solid wastes for composting, but their use in

agriculture can be a pathway for negative human health effects, especially when the wastes contain heavy metals. It is also very capital intensive.

6.2 Conclusion

Because agriculture in Nairobi is intricately bound up with use and competition for resources and with regulations on public health and other sectors, the relation of urban agriculture to City governance is very critical. The mechanism for achieving legal and policy recognition of agriculture should be subjected to the stakeholders' platform especially in addressing conflicting policies and legislation. The few laws put in place so far, should guide the way forward for UA in the study area and Nairobi in general. As the urban dimensions of food crisis and climate change become increasingly apparent, this opportunity will have to be seized and agriculture integrated in the socio-economic and environmental planning of Nairobi County.

6.3 Recommendations

6.3.1 Short term recommendations

- Partner with other stakeholders to develop, disseminate and promote adoption of appropriate technologies to address constraints associated with limited land holdings, unavailability of clean water for irrigation and poor waste management in addition to promoting the adoption of high value crop and livestock enterprises e.g. horticulture and small stock.
- Strengthen diseases surveillance, control and regulate livestock movement within Nairobi County.
- Promote public-private partnership to commercialize developed technologies.

- Invest in capacity building for extension service providers, research and extension clientele, especially in value addition.
- Strengthen existing and promote formation of new commodity based producer organizations.
- Establish and improve market information exchange systems.
- Promote and build capacity on good agricultural and livestock production practices and enhance quality control in feed formulation and safe use of agrochemicals.

6.3.2 Long term recommendations

- On policy and legal framework, there is need to coordinate and build partnerships among the enforcing agencies in order to maximize synergies and build on the progress already made. This calls for consultative fora for all stakeholders to pick out conflicting laws and identifying any legal and policy gaps.
- Set aside land for City waste management while capacity building farmers on refuse utilization. The City County Government should set up solid and liquid wastes treatment sites so that untreated waste is not used for farming. Integration of UA in the City land use planning whereby land would be zoned so that irrigation activities can take place next to treatment plants to allow use of treated sewage is recommended.
- Development of a framework for improving access and use by farmers to idle and unutilized land for agricultural production.
- Strengthen NEMA which is the corporate body responsible for supervision and co-ordination over all matters relating to the environment so that its capacity to deal with the ever increasing environmental challenges is enhanced to ensure safety of urban food

products as well as environmental monitoring and surveillance of urban agricultural practices and products.

6.4 Areas for further studies

- Research on appropriate waste recycling and treatment technologies that are cost effective and easily maintained.
- Establish the exact quantities of pathogens and hazardous residues in solid and liquid waste to check conformity with current international standards and guidelines based on the Hazard Analysis Critical Control Point (HACCP).
- Research on high value crop and livestock enterprises e.g. horticulture and small stock, including value addition.

PLANNING MATRIX

| Objectives | Planning issues | Strategies | Activities | Time Frame | | | Actor |
|--|--|---|--|-------------------------|---|---|---|
| | | | | S | M | L | |
| | | | | T | T | T | |
| To examine the policy and legal framework governing urban agriculture in Kenya | -Conflicting laws on UA (some supportive and others not) -Lack of a Government policy on UA | -Promote consultative processes in legal reforms -Fast track the approval of the draft UPAL policy by Cabinet. -Fast track approval of The Nairobi City County Urban Agriculture Promotion and Regulation Bill (2013) by Nairobi County Assembly -Consolidate on the gains already made. | - Hold stakeholder fora meetings -Lobby Cabinet and Nairobi County Government -Organize public awareness campaigns | x x x | | | -Min. of Agriculture, Livestock and Fisheries -Min. of Health -Min. of Environment, Water and Natural Resources. -Min. of Land, Housing and Urban Development -Nairobi County Government. -NGO's, CBO's -Environmental lobby groups -Public(local) |

| | | | | | | | |
|--|---|---|--|--|---|---|--|
| <p>To determine the effects of urban agriculture to house hold livelihoods in Roysambu Ward.</p> | <p>Increased urban population coupled with spiraling poverty levels has led to most urban dwellers especially the poor turning to UA to supplement their source of food and income.</p> | <p>-Promoting the adoption of high value crop and livestock enterprises e.g. horticulture and small stock, as well as value addition</p> <p>-Strengthen existing and promote formation of new commodity based Producer organizations.</p> <p>-Establish and improve market information exchange systems.</p> <p>- Integration of UA in the City land use planning</p> | <p>-Capacity building for extension service providers, research and extension clientele.</p> <p>-Availability of credit</p> <p>-Community mobilization</p> <p>-Holding Consultative fora</p> <p>-Lobbying Government</p> | | <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> | <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> | <p>MoAL&F</p> <p>-MoEW&NR</p> <p>-MoLH&UD</p> <p>-MoI&ED</p> <p>-Nairobi County Government</p> <p>KARI, Universities, Financial Institutions</p> <p>Donors ,locals</p> |
|--|---|---|--|--|---|---|--|

| | | | | | | | |
|--|--|---|--|---|---|---|--|
| To examine the problems constraining urban agriculture development in RoysambuWard | -Lack of Government recognition of UA as an urban land use | - Review and develop new regulations to bridge existing gaps and enhance coordinated enforcement of existing laws on environmental conservation | -Information gathering and networking | x | | | MoAL&F |
| | - Encroachment of land meant for other uses. | environmental conservation | -Lobby Government | x | x | | -MoEW&NR |
| | -UA is associated with health and hygiene problems as well environmental pollution | - Strengthen diseases surveillance, control and regulate livestock movement. | -Networking | x | x | | -MoLH&UD |
| | -Competition over water resources with other sectors | - Promote and build capacity on good agricultural practices | -Case studies | | | x | -MoI&ED |
| | | - Designate agricultural areas | -Capacity building including training, fund raising. | | | x | -Nairobi County Government |
| | | | -Consultative fora with Government. | | | x | KARI, Universities, Financial Institutions |
| | | | -Community sensitization | | | x | Donors |
| | | | -Lobby Government | | | x | NEMA |
| | | | | | | x | Environmental Lobbyists |
| | | | | | | x | Locals |

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APPENDICES:

Household Questionnaire:

I am a Masters student at Kenyatta University, Department of environmental planning and management. As part of fulfillment of the requirement of this degree programme, I kindly request you to fill this questionnaire for me.

Questionnaire No.....

Date.....

Sub location.....

Estate.....

Section A: General Information

1. Gender Male [] Female []

2. Age

i) Under 18 years [] ii) 18-35 years [] iii) 36-55 years [] iv) Over 56 years []

3. Level of education

i) Illiterate [] ii) Primary [] iii) Secondary [] iv) Tertiary []

4. Occupation

i) Full time Farmer [] ii) Casual labourer [] iii) Formal employment []

iv) Business [] v) Other, specify.....

5. Household Size i) 1-2[] ii) 3-4[] iii) 5-6[] iv) Over 6[]

]

Section B: Agricultural Activities

5. How long have you stayed in this area?

- i) 0-5 years [] ii) 6-10years [] iii) 11-15 years [] iv) Over 15years []

6. Where do you do your farming activities?

- i) On Farm [] ii) Off Farm []

If On farm,

7. What is the size of your farm? Acres

If Off farm,

8. What is the size of your farm?Acres

9. Where exactly do you farm?

- i) Road reserve [] ii) Railway reserve [] iii) Public utility land []

- iv) Privately owned land [] v) Rented farm []

vi) Others, specify.....

10. How did you access your land (plot)?

- i) Inherited [] ii) Bought [] iii) Rented []

iv) Other, specify.....

11. What farm enterprises do you have? (Crops, livestock)

- 1) _____ 3) _____
 2) _____ 4) _____

12. Do you use any farm inputs on your farm? Yes [] No []

13. If yes, please specify

| Farm input | Tick | Source |
|--------------------------|------|--------|
| Seed | | |
| Fertilizers | | |
| Chemicals | | |
| Animal manure | | |
| Compost manure | | |
| Municipal council wastes | | |
| Animal feeds | | |
| Irrigation water | | |
| Others | | |

Section C: Effects of UA on household livelihoods

14. How have you benefited from agriculture?

- i) Food security [] ii) Employment creation [] iii) Income generation []

- iv) Improvement of environment [] v)Others,

specify.....

| Enterprise | Monthly income |
|------------|----------------|
| | |
| | |
| | |

21. What are your other sources of income (if any)?

i) Formal employment [] ii) Business []

iii) Others, specify.....

22. What is your monthly household income (Ksh)?

i) Less than 5000 [] ii) 5001-10,000 [] iii) 10,001-20,000 [] iv) Over 20,000 []

23. What is the % contribution of farm income to household income?

i) Less than 25% [] ii) 25-50% [] iii) 51-75% [] iv) Over 75%

24. What problems do you face as an urban farmer?

i) Diseases [] ii) Pollution [] iii) conflicts with neighbours

iv) Food safety [] v) Lack of Government support [] vi) Inadequate land []

vii) Lack of technology []

iv) Others, specify.....

25. If diseases, please specify which ones

.....

26. If pollution, please specify

.....

.....

27. Of the above, which is the most severe?.....

28. What solutions will you recommend for the above problems?

.....

29. What is the way forward for urban agriculture in Nairobi?

.....

THANK YOU FOR YOUR TIME

Interview Schedule for institutions:

I am a Masters student at Kenyatta University, Department of environmental planning and management. As part of fulfillment of the requirement of this degree programme, I kindly request you to fill this questionnaire for me.

Questionnaire No.....

Date.....

Institution.....

1. What is your role and mandate in relation urban agriculture’s contribution to household livelihoods?.....

2. In your view, how has urban agriculture contributed to households’ livelihoods in Roysambu ward?.....
.....

3. What problems have constrained development of urban agriculture in Roysambu ward?
.....

4. What are the main environmental issues associated with urban agriculture?
.....

5. What will you recommend as the way forward for urban agriculture in Roysambu ward?
.....

THANK YOU FOR YOUR TIME