UNIVERSITY OF CAPE COAST

FARMERS' PERCEIVED EFFECT OF URBAN VEGETABLE PRODUCTION ON THEIR LIVELIHOODS IN THE KUMASI METROPOLIS OF ASHANTI REGION OF GHANA

SOLOMON KODJO DARKEY

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BY

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Thesis Submitted to the Department of Agricultural Economics and Extension, School of Agriculture, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy Degree in Agricultural Extension

NOVEMBER, 2011

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Name: Solomon Kodjo Darkey

Signature: ……. Date: ……

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Name: Ernest L. Okorley (Prof)

Signature: …… Date: ……

Co-Supervisor's Name: Nathan A. Gyimah (Mr)

Signature: ……. Date: ……...

ABSTRACT

The study examined farmers' perceived effect of urban vegetable production on their livelihoods in the Kumasi Metropolis of Ashanti Region of Ghana. Descriptive survey design was used for the study. Based on a simple random sampling technique, 300 urban vegetable farmers were selected and interviewed for the primary data from mid June to July 2010. The data was analysed using Statistical Package for Social Sciences (SPSS) version 15.

From the study, lettuce was the most cultivated vegetable crop with a production area of 39.7ha and French beans the least (0.4ha). The study also revealed that the vegetable industry was male dominated. The effect of vegetable production on farmers' livelihoods was perceived generally to be 'low'. However, it impacted 'moderately high' on their natural and physical capitals. Farmers' vegetable production and marketing challenges such as high input cost, inadequate credit facilities, fluctuating demand and low price offer affected the level of impact on their livelihoods. From the ANOVA results, there were statistically significant differences among the mean livelihood assets at 0.05 alpha level.

The formation of formal or informal farmer associations would provide the platform to address common challenges of high input cost, inadequate credit facilities and improve marketing avenues to improve farmers' incomes and livelihoods. The associations' functions should be diversified to include training on new innovations to increase productivity of members. Research-Extension-Farmer Linkage should be strengthened to enhance contacts with farmers and also update their knowledge and skill levels for improved productivity.

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DEDICATION

I dedicate this work to my lovely wife Patience Nyuiemedi and the entire Darkey family especially my parents Mr. Andreas Yao Darkey and Mrs Veronica Awushie. Darkey all at Natriku, Akuse

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LIST OF ACRONYMS

CSIR-CRI	Council for Scientific and Industrial Research of Crops Research Institute
DFID	Department for International Development
FAO	Food and Agricultural Organisation
FBOs	Farmer Based Organisations
FFD	Farmer Field Day
FFS	Farmer Field School
GSS	Ghana Statistical Service
IARC	International Agency for Research on Cancer
ICT	Information and Communication Technology
ISSER	Institute of Statistical, Social and Economic Research
IWMI	International Water Management Institute
KNRMP	Kumasi Natural Resource Management Project
KNUST	Kwame Nkrumah University of Science and Technology
MoFA	Ministry of Food and Agriculture
NGOs	Non-Government Organisations
UN	United Nations
UNCHS	United Nation Centre for Human Settlement
UNDP	Unites Nations Development Programme
UNHCS	United Nations Centre for Habitable Settlement
UNPD	United Nations Populations Division
US	Unites States
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

Background of the Study

Half the world's population is already urban and another 1.5 billion people will be living in cities by 2020 (Maxwell, 1998). This explosive growth of urban settlement which is occurring mostly in developing countries, bring with it two critical challenges. The first challenge is that migration of people towards the urban world has brought with it a migration of poverty which cities are ill-equipped to deal with. The second challenge is that unplanned urban growth is accompanied by environmental pollution, health risks, and a decline in the quality of life. Population growth and migration over the past 30 years and structural adjustment policies introduced in the 1980s undermined whatever 'urban bias' that has existed during the post – Second World War (Maxwell, 1998).

According to United Nations Population Division (2004), population growth in Africa is estimated to triple by 2050. It is also projected that by 2015, there would be 25 countries in Sub - Saharan Africa including Ghana with higher urban than rural populations. It is further estimated that by 2030, this would increase to 41 countries. Already, about 44 percent of the population in West Africa Sub region lays in urban areas compared to only 4 percent in 1920. It is reported in 2000 that 38 percent of Africans lived in

urban areas. This figure is expected to increase to about 55 percent by 2030 (United Nations, 1995). Urban population in Ghana has also witnessed considerable upsurge over the years. For instance, urban population increased from 32 percent in 1984 to 43.8 percent in 2000 (Ghana Statistical Service, 2002). Difficult economic conditions especially in the urban areas have affected job opportunities. Many migrants to urban cities, especially in Africa face the reality of increasing unemployment and food insecurity among others. As a result, many urban dwellers undertake farming activities within the cities either on part-time or full-time basis to improve their livelihoods (Kyessi, 1997). The phenomenon is known as Urban Agriculture and it involves the rearing of animals and the growing of crops (mostly vegetables) on rented small scale lands in the city centres for sale to the immediate urban communities. There are two types of urban agriculture and these are open-space and backyard gardening. For the purposes of this study, the former will be treated.

Cities have enormous potential for food production. Smit, Ratta, and Nasr (1996) reported that the 1980 United States census revealed that urban metropolitan areas produced 30 percent of the dollar value of US agricultural production. This figure increased to 40 percent by 1990. There are 80,000 community gardeners on municipal land in Berlin, Germany with 16,000 more on the waiting list. Presently, 65 percent of Moscow families are involved in urban food production compared with 20 percent in 1990. Singapore produces 25 percent of its vegetable needs in the urban centres. Dar-es Salam, one of the world's fastest growing cities, now has 65 percent of families engaged in farming compared with 18 percent in 1967. Denninger, Egero, and Lee-Smith

(1998) also estimated that nearly 25million out of the 65 million people living in urban areas of Eritrea, Ethiopia, Tanzania and Kenya currently obtain part of their food from urban vegetable production and that by 2020, at least 35-40 million urban dwellers will depend on urban agriculture to feed themselves. Smit *et al.* (1996) claimed that an estimated 800 million people are commercial producers, employing about 150 million people full-time.

Altieri *et al*. (1999) noted that in Havana (Cuba) urban gardens have significantly increased the quantity and quality of food available to the producers, households, neighbourhood, improved the financial welfare of the households and enhanced the environmental quality of the community. Cepal (1999) reported that while the majority of developing countries poor people continue to be rural in absolute terms, this no longer holds true for Latin America where the urban share of poverty has dramatically increased from 37 percent in 1970 to 62 percent in 1997. According to the United Nations Centre for Human Settlement (2001), Africa and Asia have experienced similar changes. In Africa, about 40 percent of the poor are now urban, though there is considerable variation among countries.

World Bank (2000) reported that in Asia, rapid urbanisation occurred in populous countries such as Bangladesh. This has led to about 15 million poor people living in urban areas, about 24 percent of the total poor. Despite the limited availability of poverty data disaggregated for urban population and even fewer datasets that permit analysis of trends, it is still clear that urban poverty is growing steadily and significantly. This is partly through continuing migration but now, more significantly through new generations of urban dwellers being unable to escape from poverty (Bouquier, 2004). The absolute

and relative growth in urban poverty and under nutrition raises two important issues. First, there is a clear link with food insecurity among poor urban populations. This in turn is connected to the inability of families to purchase food. Secondly, there is evidence of a link between poverty and instability in the urban labour market and its vulnerability to economic shocks (Amis, 2002).

Urbanisation presents both opportunities and challenges, but indications for Africa are that the challenges outweigh the opportunities. Unlike many other parts of the world, Africa's increasing urbanisation has not been matched by infrastructure and economic development. As Stren (1989) has noted, across much of the continent, basic urban services and infrastructure - housing, road repair, water supply, health, educational facilities, public transportation and garbage removal are insufficient and in a state of deterioration.

Increase in urban poverty is accompanying the urbanisation process and poverty is gradually concentrating in the urban areas 'urbanisation of poverty' (Baud, 2000). The effects of rapid urbanisation in Ghana include unemployment, reduction of wages of some urban dwellers and high prices of food (Okorley & Kwarteng, 2002). In response to this situation, an increasing number of city dwellers have resorted to all kinds of income generating activities in the urban informal sector. Among these is the intensive irrigated agriculture, mostly vegetables which takes advantage of urban demand for perishable crops and water resources for all-year or dry season production (Cofie, van Veenhuizen & Drechsel, 2003). Although urban agriculture demands considerable technical skills, it receives little or no research attention

and is frequently ignored and sometimes outlawed by municipal authorities. This has compelled local people to engage in agricultural systems operating well-below their potential and frequently to use unacceptable production practices.

Kumasi, the study area, is a rapidly growing city with an annual growth rate of 5.4 percent (Ghana Statistical Service, 2002). The main crops grown in urban Kumasi are often accompanied by dry-season vegetable farming especially along streams. It is estimated that about 41ha of land in the urban areas is put under informal dry-season vegetable production which is more than twice the area currently under formal irrigation in the entire country (Ghana) (Cornish & Lawrence, 2001). According to Danso, Drechsel, Wiafe-Antwi and Gyiele (2002), a collaborative study by International Water Management Institute (IWMI) in Kumasi and other cities in Ghana (Accra and Tamale) showed that between 40 and 80 percent of urban farmers consider urban farming as their main income generating activity. Furthermore, urban vegetable farmers generate at least twice the income of their rural colleagues, which is an important contribution to poverty alleviation and livelihoods improvements.

Vegetables are rich sources of essential micronutrients (especially vitamins, iron and calcium) and generally have high fiber content. Inadequate consumption of vegetable is recognised as one of the key risk factors for cardiovascular diseases and some form of cancers, the two leading causes of death the world over today. Chronic degenerative diseases are spreading within the developing world at unprecedented rates. The World Health Organization (WHO) (2004) estimates that low vegetable and fruit intake

accounts for approximately 2.7 million deaths a year from chronic diseases and causes about 31 percent of ischaemic heart diseases and 11 percent of strokes worldwide.

Low intake of vegetables and fruits is ranked as the sixth main risk factor for mortality in the world. The consumption of vegetable is grossly inadequate in both developed and developing countries despite ample evidence of their protective effects. Only three countries Israel, Italy and Spain are able to meet the recommended minimum per capita consumption rate of 146 kg per year (International Agency for Research on Cancer, 2003). Though, it is impossible to meet the recommended minimum per capita consumption level in the immediate future in Ghana, efforts should be made to increase the current production and consumption levels of vegetables considering the numerous health benefits.

Problem Statement

The upsurge of urban vegetable production in Ghana has been attributed to unemployment in the formal sector, declining purchasing power and the potential profitability of the enterprise (Mougout, 1993). Kumasi, the second largest city in Ghana after Accra has a population of 1,170,250. The 2000 census further projected the population to 1,889,934 by 2009 (Ghana Statistical Service, 2002). The total land area under informal dry-season vegetable production in the metropolis is estimated to be 41 hectares (Cornish & Lawrence, 2001)

The income level of all-year-round vegetable production can reach US$400 to $800 while irrigated vegetable farming (lettuce, cabbage and

onions) figure was US$2,000-$8,000/ha/year (Drechsel, Danso & Keraita, 2002). Urban vegetable farming no doubt contributes substantially to the economy of Ghana in general and the Metropolis in particular beyond the provision of livelihoods and food security. Though, some work has been done on urban vegetable production over the years in Ghana and Kumasi Metropolis in particular, farmers' perceived level of impact of urban vegetable production on their livelihoods such as access to biophysical resources for vegetable production (natural capital) and other capitals including information, financial, human, social and physical capital have not been adequately examined. The study seeks to fill in this information gap.

Objectives of the Study

The general objective of the study is to assess farmers' perceived effect of urban vegetable production on their livelihoods in the Kumasi Metropolis of Ashanti Region of Ghana. The specific objectives of the study are to:

1. describe the demographic characteristics of urban vegetable farmers in the Kumasi Metropolis.
2. describe the farm related characteristics of urban vegetable farmers.
3. determine the production and marketing challenges of urban vegetable farming.
4. examine farmers' perceived level of effect of urban vegetable production on their livelihoods.

5. determine whether there are significant differences in the livelihood assets of farmers as a result of their urban vegetable production.

Research Questions

The study attempts to answer the following questions:

1. What are the demographic characteristics of urban vegetable farmers in the Kumasi Metropolis?
2. What are the farm related characteristics of urban vegetable farmers in the Kumasi Metropolis?
3. What are the production and marketing challenges of urban vegetable farmers?
4. What is the urban vegetable farmers' perceived level of effect of urban vegetable production on their livelihoods?
5. Are there significant differences in the livelihood assets of farmers as a result of their urban vegetable production?

Hypothesis of the Study

1. **H_0**: There are no significant differences in the farmers' perceived level of effect of urban vegetable production on their livelihoods in terms of natural, information, financial, human, social, and physical capitals.

   H_1: There are significant differences in the farmers' perceived level of effect of urban vegetable production on their livelihoods in terms of natural, information, financial, human, social, and physical capitals.

Research Variables

The variables to be examined for the study include demographic and farm related characteristics of urban vegetable farmers. Variables that were considered in the former include sex, age, marital status, educational status and household size. Those variable captured under farm related characteristics are land acquisition, total land put to vegetable production, sources of irrigation water, irrigation methods and technologies used, access to agricultural information, sources of financial capital, sources of labour, investment level, productivity level, marketing of vegetable produce and vegetable farmers years of experience. Livelihood assets of urban vegetable farmers in terms of natural, information, financial, human, social and physical capitals were also considered for the study.

Whilst the variables for production challenges faced by urban vegetables producers include high input cost, lack of credit facilities, incidence of pests and diseases, inadequate water, poor soil fertility and irrigation, those for marketing challenges consist of lack of cold transport and storage facilities, fluctuating demand, postharvest losses, female dominance and low price offer.

Justification of the Study

The outcome of the study will assist in the following directions:

Urban vegetable production is a viable intervention strategy for the urban poor to earn extra income and grow their own food. However, policy makers and governments have neglected this important sector. The study would highlight the potentials and constraints to its development and assist Ministry of Food

and Agriculture (MoFA) and other stakeholders to capitalise on the potentials and integrate it into the city system in a more viable and sustainable way.

The growing awareness in recent years of the health promoting and protecting properties of non-nutrient bioactive compounds found in vegetables and fruits have directed increased attention to vegetables as vital components of daily diets. The study results would assist MoFA and other stakeholders to promote vegetable production and consumption.

As urban population soars, the role of urban agriculture in supplying perishable food to cities becomes increasingly important. The study results would therefore inform the decision of MoFA and other stakeholders in the industry to create the enabling environment for its integration into the ecosystem in view of the added advantages besides employment creation, food security improvement and livelihood enhancement.

Furthermore, the study results would provide a road map for other stakeholders in the industry such as Non-governmental Organizations (NGOs), input dealers and financial institutions who may want to promote or support urban vegetable production.

The study results would also assist the MoFA, research institutes and other stakeholders in the industry to identify and address some if not all the production and marketing challenges faced by urban vegetable farmers in order to increase not only production to ensure food security and address nutritional inadequacies and malnutrition but also improve their sustainable livelihoods to alleviate poverty as spelt out in the Millennium Development Goal 1.

Lastly, the study results would add to the body of knowledge. This is because it would help to understand, appreciate the contribution of urban vegetable farming to the livelihoods of farmers and also serve as a platform for further studies.

Limitation of the Study

This study is not immune to the general limitation inherent in research based upon interviewing techniques and structured interview schedule. Factors militated against the conduct of this study include the absence and or inadequate record keeping by farmers compelled the study to rely on farmers' ability and willingness to recall. This made the data generated varied widely with different farmers in terms of the possibility of farmers giving inaccurate answers to certain question. The study was also limited by individual farmer's perceptions and interpretation of the items on the instrument. Furthermore, inadequate information from MoFA on vegetable farming, led to information gap on urban vegetable farmers in the Kumasi Metropolis. Though, a complete list of vegetable farmers was generated, the information gap affected the sampling of the population since a complete list of the population (vegetable farmers) could not be obtained for effective randomisation to be done.

Delimitation of the Study

Though, the study seeks to access the urban vegetable farming and its effects on farmers' livelihoods, not all vegetable farmers in the urban Kumasi were assessed. This is because the focus of this study was solely on open-

space vegetable farmers in the Metropolis. It excluded all enclosed or backyard vegetable farmers.

Definition of Terms

This section indicates the optional definition of terms used in the study.

An urban area refers to land area covered by the Kumasi Metropolis.

Vegetables refer to the leafy green, stem, root and flower stalk portion of an edible plant.

Open – space vegetable production refers to cultivation of vegetables in an open area usually for commercial purpose.

Informal irrigation refers to the kind of irrigation that is practiced by individuals or groups of farmers without reliance on planned irrigation infrastructure operated through the intervention of a government or donor agency.

Livelihoods refer to the ways and means by which urban open-space vegetable farmers obtain income to take care of their household.

Critical Fund Shortage refers to the period in the vegetable production process where farmers are in dire need of funds.

Natural capital comprises all the biophysical resources that are utilised to generate income by the household.

Information capital is the availability of facts used to access other capital assets.

Financial capital refers to income, financial savings and debt levels of the household.

Human capital is the quantitative and qualitative of labour in terms of skills and health.

Social capital is the relationship of mutual interdependence.

Physical capital refers to ownership and or access to production tools and equipment.

Vulnerability refers to the susceptibility of farmers to external shocks.

Organization of the Study

The study is divided into five chapters. Chapter one provides an introduction to the study. It covers various areas such as background of the study, problem statement, objectives of the study, research questions, hypothesis, justification of the study, scope of the study and definition of terms.

Chapter two reviews related literature relevant to the study. Literature was reviewed on boundaries of an urban area, urban agriculture, types of urban agriculture, gender of urban vegetable farmers, age distribution, marital status, educational level and household composition of urban vegetable farmers. Other issues reviewed include land acquisition by urban vegetable farmers, total land put to vegetable production, sources of irrigation water and technologies used, major traditional farming sites, access to agricultural information, sources of financial capital for urban vegetable farming, sources of labour for vegetable farming activities and investment in urban vegetable production. The rest are productivity level of urban vegetable farmers, marketing of vegetable produce, farmers' years of experience, vegetable production and marketing challenges, theories and basic concept of

livelihoods, livelihood assets and vulnerability of vegetable farmers and conceptual framework for urban vegetable production.

The third chapter of this study considers the methodology that was employed for the study. It captures research design, study area, study population, sampling procedure, sample size, instrumentation, pilot study, data collection and analysis.

Chapter four deals with the results and discussion whiles chapter five contains the summary, conclusions, recommendations of the study and suggestions for future research.

CHAPTER TWO

REVIEW OF LITERATURE

Boundaries of an Urban Area

The most fundamental source of potential confusion in the study of urbanisation is the measurement of urban itself. There is no universal definition of what constitute an 'urban area'. The implication is that the definition of what constitute an 'urban area' is country specific (Frey & Zimmer, 2001). A similar view is held by Simon, McGregor and Thompson (2006) that there is no accepted universal definition of what constitute urban and peri-urban area. The census definition of an urban centre in Ghana is any settlement with a population of about 5,000 or more persons (Nabila, 1998).

According to Rakodi (1999) and Simon, McGregor and Thompson (2006), while it is practical to delimit the administrative boundary of a city as the 'urban area', general commonalities define the 'peri-urban area' more as a dynamic interface with urban and rural features rather than a fixed geographical zone. The extent of the urban area of Kumasi is estimated following the methodological approach described by Blake and Kasanga (1997) and Adam (2001) that the peri- urban area of Kumasi has a radius of approximately 40km from the city centre. Erenstein, Moussa, Oswald and Keijzer (2004) and Drechsel, Graefe and Fink (2007) also buttressed the

findings by Blake and Kasanga (1997) and Adam (2001) by estimating rural-urban interface to be about 30-40km from urban centres.

Urban Agriculture

Urban agriculture has been defined differently by various authors but there are key features that characterise the activity. Urban agriculture involves crops, livestock and poultry production, but it may also include fisheries, agro-forestry and fuel production and it is practiced both within the urban boundary and its periphery. Madden and Chaplowe (1997) defined urban agriculture as the practice of crop cultivation and livestock rearing within the boundaries or the immediate periphery of the city. The definition provided by United Nations Development Programme (UNDP) (1996) goes beyond that provided by Madden & Chaplowe (1997). It defines urban agriculture as an industry that produces, processes and markets food, and fuel, largely in response to daily demand of consumers' within a town, city, or metropolis, on land and water dispersed throughout the urban area, applying intensive production methods, using and recycling natural resources and waste, to yield a diversity of crops and livestock. The definition offered by Bailkey and Nasr (2000) that urban agriculture is the growing, processing and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities is in line with that offered by UNDP (1996). The definition by Butler and Marone (2002) on 'urban agriculture' is also similar to that offered by UNDP but oversteps the traditional core activities into areas described as multiplicity of other benefits and services including recreation and leisure, economic vitality and well-being, landscape beautification, and environmental restoration and remediation.

Types of Urban Agriculture

There are two main types of urban agriculture: enclosed (backyard) and open-space cultivations. People who cultivate in enclosed areas around their residences are called enclosed cultivators. The term 'open-space cultivation' is used for any cultivation away from the individual's residence. These areas are not enclosed by any wall. Operators of this cultivation have lower socio-economic status, unskilled and formally unemployed compared to enclosed cultivators (Obosu-Mensah, 1999).

Among the authors who focused attention on enclosed (backyard) production (Lee-Smith, Manundu, Lamba and Gathuru-Kuria, 1987; Freeman, 1999) and those who studied open-space production Mbiba (1994) admit these two types of urban agriculture described by Obosu-Mensah (1999). The only difference however, lies in the terminologies used for their description. They also argued that the description of these two types of cultivation is based on location and development status of the site of farm. In Ghana, urban farming comprises of two types: (a) open-space production for the urban market and (b) backyard gardens cultivated mostly, but not only for home consumption. The views of Drechsel, Graefe, Sonou and Cofie (2006) confirm the earlier findings by Obosu- Mensah, Lee -Smith *et al.* and Freeman that two types of urban agriculture exist. This study however focuses on urban open-space vegetable production.

Gender of Urban Vegetable Farmers

Gender relations are influenced by traditions, religion, ethnic origin, age and marital status. In agriculture these include access to land and control

of tangible and intangible resources as well as division of labour at the household level and among farming activities. Traditions of patrilineal inheritance, according to Wilbers (2003), limit women's access to land acquisition for subsistence farming. Gender differences also exist between men and women heads of households. Female farmers in female headed households tend to limit their labour in farm activities because of heavy commitment to productive role such as nurturing and caring for children and attending to the elderly members of the household (Kamara & Denkabe, 1993).

Most of the open-space vegetable farmers in West African cities including Dakar, Lome, Cotonou, Bamako and Ouagadougou are men (Kessler, Streiffeler & Obuobie, 2004). Only 10 percent of all urban open-space farmers on the average are women (Obosu-Mensah, 1999; Gbireh, 1999; Armar-Klemesu & Maxwell, 1998). Drechsel, Blumenthal and Keraita (2002) argued that though women and men play similar roles in crop production, urban vegetable farming is mostly done by men. The findings of Kessler *et al.* also confirm the earlier studies by Drechsel *et al*. and Obosu-Mensah (1999) that men dominate urban agriculture production. Men dominated open-space vegetable farming in 16 cities in 10 of 13 countries in a study comparing 21 countries in West Africa as shown in Table 1.

In contrast to vegetable farming, women both in Ghana and elsewhere dominate vegetable marketing sector, particularly retailing (Gerstl, 2001). On urban vegetable production, there are crops which are traditionally handled by men, while others are considered preserve of women. Among the vegetables, cabbage, sweet pepper and cucumber are normally associated with men in

Ghana, while lettuce, carrots, spinach, okra, garden eggs and others are associated with women (Kessler, Streiffeler & Obuobie, 2004). This confirms the earlier findings by Keraita, Drechsel, Huibers and Raschid-Sally (2002) that crops men grow differ from that of women traditionally.

Table 1: Gender Ratio in Vegetable Farming in Various Cities in West Africa

Country	City	Female (%)	Male (%)
Benin	Cotonou	25	75
Burkina Faso	Ouagadougou	38	62
Cameroun	Yaounde	16	84
Cote d' Ivoire	Abijan, Bouake	5 - 40	60 - 95
Gambia	Banjul	90	10
Ghana	Kumasi, Accra, Takoradi, Tamale	10 - 20	80 - 90
Guinea	Conakry,Timbi-Madina	70	30
Mali	Bamako	24	76
Mouritania	Nouakchott	15	85
Nigeria	Lagos, Ibadan	5 - 25	75- 95
Senegal	Dakar	5 - 30	70 - 95
Sierra Leone	Freetown	80-90	10 - 20
Togo	Tsevie, Lome	20 - 30	70 - 80

Source: Drechsel *et al.,* (2006)

Women dominance in urban vegetable marketing has also been confirmed by Flynn-Dapaah (2002) and Obuobie, Drechsel, Danso and Raschid-Sally (2004) that women handle about 60-90 percent of farm produce from the point of origin to consumption in coastal West Africa. The views of Drechsel, Graefe, Sonou and Cofie (2006) that the activities of these women vendors are their primary means of obtaining cash income for household expenditure is consistent with the previous assertions.

Influences of Gender Disparity in Land Access for Vegetable production

Various studies have assigned reasons or attempted to explain influences of men and women dominance in vegetable production and marketing in urban Ghana respectively. Among the reasons offered include access to land, the nature of vegetable production, traditional role of farmers, unwillingness to take risks and economic strategy. Land issues are major constraint in urban vegetable production. According to Hosna (1998), Ghanaians have asserted that women do not own land either in their marital or natal ancestral home. It might imply that women may not be able to cultivate because they do not own land. In some regions under customary law, women do not have the right to hold land except through male relatives or as widows. However, they can have user rights unless land is in short supply. Sometimes they are pushed towards more marginal lands (Zibrilla & Salifu, 2004). The findings by Cornish and Lawrence (2001) and Jacobi, Amend and Kiango (2000) that women farmers in Eastern African cities like Nairobi and Dar es Salaam dominate urban vegetable production is at variance with those reported in Ghana.

The Nature of Vegetable Production

The difficult nature of most of the farm tasks account for male dominance in open-space vegetable farming (Cornish & Aidoo, 2000). Land has to be cleared and prepared followed by the raising of beds, nursing of seeds, transplanting, weeding, watering and stirring. Cornish and Lawrence (2001) study results agree with earlier findings by Cornish and Aidoo that vegetable production is difficult and most women will not dare. Another decisive activity in the cultivation of some exotic vegetables is the nursery management (Cornish, Aidoo & Ayamba, 2001). Cornish and Lawrence (2001) again reported that generally women do not have this knowledge and skill making nursery management a male task, occasionally assisted by women and their children in watering. The findings of Cornish and Lawrence that women have little knowledge in nursery management and will not dare to take risk are consistent with his earlier results.

The Traditional Roles of Farmers

The conventional function of men and women provide a supplementary explanation as to why men dominate open-space vegetable production in urban Ghana. Generally, farming is considered in most Ghanaian communities as preserve of men particularly if it is market oriented. Zakaria, Lamptey and Maxwell (1998) reported that it is still unacceptable for women who hail from the northern part of Ghana to farm by themselves in any city. They could only work on their husbands farms where they are made to concentrate on food crop production for home consumption whilst their husbands focus on commercial crops. The findings of Hosna (1998) that

women do not own land in their marital or ancestral home confirms the report by Zakaria *et al*. (1998).

Unwillingness to take Risks

Nursery management practices though not difficult; it requires special knowledge and or skills in early detection of pests and diseases and careful study of seedlings growth. Vegetable seeds are relatively expensive and yet one could easily lose the seedlings without the necessary nursery skills and knowledge (Cornish, Aidoo & Ayamba, 2001). These findings are in line with that report by Cornish and Lawrence (2001) that generally, women lack nursery management practices making it a preserve of men but occasionally assist these men together with their children in watering. This is an indication that, most women are reluctant to take the risk of nursing their own seedlings. It also makes it difficult for the few women cultivating to become independent cultivators.

Economic Strategy

Economic factor is last but not the least reasons assigned for men and women's dominance in the vegetable industry. Cofie, van Veenhuizen and Drechsel (2003) reported that between 40 and 80 percent of urban farmers in Kumasi consider urban farming to be their main income generating activity. For most of them, it is their only source of income. According to Zakaria, Lamptey and Maxwell (1998), the cost of transportation to and from the farm deters women from cultivating. Unlike their men counterparts most of whom have bicycles which they use to commute between their farms and places of

residence. Obuobie, Drechsel, Danso and Raschid-Sally (2004) however, argued that irrigation with two cans per walk is what actually daunts women who would have otherwise been engaged in the industry.

Age Distribution of Urban Vegetable Farmers

A random sample of urban vegetable farmers conducted by IWMI (2006) in three cities (Kumasi, Accra and Tamale) in Ghana showed that 54 - 79 percent of vegetable farmers were between the ages of 20 and 40 years. Again, 4 percent of the vegetable farmers were below age 20 whilst 28 percent were over 40 years. The findings of Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) in Southern Nigeria (Lagos) also revealed that only 20 percent out of a total of 113 vegetable farmers were below age 30. The report further indicated that 80 percent fell between the age ranges of 30 and 50 indicating that no farmer aged above 50. Though, the result of the former study is inconsistent with the latter, it is clear from both studies that the majority of the farmers were in their prime age and therefore stronger than the aged. Another study by Lewu and Assefa (2009) on 48 urban vegetable farmers indicated that about 70 percent were in their active age affirming the prime age group of the urban vegetable farmer.

Marital Status of Urban Vegetable Farmers

In a study conducted in three cities in Ghana (Kumasi, Accra and Tamale) by IWMI (2006), indicated that more than half of the respondents were married and occasionally involve their wives in the marketing of the produce. Similarly, the findings of Keraita (2002), Obosu-Mensah (1999) and

Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) that the majority of urban vegetable farmers in cities like Lagos (80 percent) and Abeokuta (93.3 percent) were married is in line with IWMI's (2006) claim. The study results of Egyir and Beipuo (2009) that about 81 percent of urban vegetable farmers were found to be married compared to 19 percent unmarried further support the earlier assertion that the majority of urban farmers are married.

Educational Status of Urban Vegetable Farmers

Farmers who are better educated are generally more open to innovative ideas and new technologies that promote technical change (Lepar & Ehui, 2003). Educated farmers are also more open to improve farming techniques and hence have better production efficiency than the less educated or those without formal education (Obwona, 2000). The findings by Das (1997) that educational background and active labour have significant positive effects on adoption of technologies further buttressed the previous study results. According to a survey conducted by IWMI (2006), in three cities in Ghana (Kumasi Accra and Tamale), there is high level of literacy among farmers in Kumasi (65 percent) and Accra (52 percent). Tamale however recorded the highest illiteracy rate of 79 percent. The majority of farmers in Kumasi and Accra have either acquired primary or secondary education or both. According to the fifth round of the Ghana Living Standards Survey report (GLSS-5), only 13.6 percent of students possessed Senior High School or higher qualification (Ghana Statistical Service, 2008) Furthermore, a study conducted in Abeokuta, Abanla and Akufo by Ojo, Connaughton, Kintomo, Olajide-Taiwo and

Afolayan (2010), that 73.3 percent of the farmers are not educated beyond primary school level agree in part with the findings of IWMI (2006). On the contrary, the results of the same study conducted in Lagos and Bode that the majority of the respondents had secondary school education contradict the findings reported in Abeokuta, Abanla and Akufo. Nonetheless, it is obvious that urban vegetable farmers have at least acquired basic education.

Household Size of Urban Vegetable Farmers

Urban vegetable farmers' household in this study is described in terms of those who eat from the same pot. Household size of urban vegetable farmers in three cities studied in Ghana (Kumasi, Accra and Tamale) according to IWMI (2006) indicates a wide distribution in household size in Accra and Tamale. Household size of farmers in Kumasi were either single or had households up to 5 members. Only few farm household exceeded this. The mean household size was 2 for Kumasi and 4 for both Accra and Tamale against the average figure of 5.1, 4.5 and 6.1 for Kumasi, Accra and Tamale respectively according to the 2000 population and housing census. The largest households had 8, 16 and 18 members for Kumasi Accra and Tamale respectively. According to Egziabher *et al*. (1994), a household size ranged from one person to over 10. Those with 4 to 6 member represented about 50 percent of the household. Their findings are consistent with the outcome of IWMI's studies except that in Kumasi which did not record any household size above 10 members.

Land Acquisition by Urban Vegetable Farmers

According to Cornish and Lawrence (2001) and Flynn-Dapaah (2002), most urban vegetable production sites belong to government institutions and private developers who have not commenced construction. Other production sites include reserved areas along streams and other water bodies. Mostly, farmers enter into informal agreement with the land owners or care takers and do not necessarily pay for the use of such lands. As a result of this there is no security of tenure as farmers are permitted to cultivate only as long as the owners do not require immediate use of the land. The findings of Obosu-Mensah (1999) that most urban farmers (both male and female) cultivated land that belong to either government or private developers agree with the earlier assertions but further added that access to these lands depend on the individual's ability to lobby and not influenced by gender.

The situation is however different in cities like Lagos and Abeokuta where about 50 percent each of urban vegetable farmers leased and rented land in Lagos. The majority (93 percent) also leased land for similar purpose in Abeokuta (Ojo, Connaughton, Kintomo, Olajide-Taiwo & Afolayan, 2010). According to Van den Berg (2002), urban vegetable farming appears unsustainable as a result of low tenure security. He therefore likened urban vegetable production to 'shifting cultivation' due to the frequent relocation of urban farms to pave way for infrastructural developments.

Total Land Put to Vegetable Production by Farmers

Land is a major factor of production or natural asset which supports production. Most of the urban vegetable farmers do not own the land on

which they cultivate (Cornish & Lawrence, 2001 and Flynn-Dapaah 2002). According to Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2006), most of the urban vegetable producers, are small scale farmers cultivating farm sizes ranging between 0.1ha and 0.33ha with average farm size of 0.02ha. To Moustier, Moumbele and Huat (2004), urban vegetable farm sizes are dependent on land and labour availability. They indicated that though farm sizes ranged between 0.2ha and 0.3ha, typical farm sizes ranged between 0.05ha and 0.1ha. The findings of Moutier *et al*. are consistent with that of Ojo *et al.* but further stated that farm sizes could be larger where small motor pumps are used to support irrigation. The findings by Tallaka (2005) and Zalle (1997) however, differ from the earlier assertions. To them, farm sizes in Kumasi or Dakar ranges from 0.1ha to 0.8ha but revealed that they could reach about 1.5ha to 2.5ha or more in cities such as Bamako and Lome.

Sources of Irrigation Water and Technologies Used

Irrigation water is obtained from a range of sources, conveyed to the fields and applied to the crops using different methods (Cornish & Aidoo, 2000). The quality of irrigated water varies between pipe-borne water and raw wastewater. The views of Keraita, Danso and Drechesel (2003) are consistent with the findings of Cornish and Aidoo (2000) and Tandia (2002) that most water used for irrigation is stream and drain water which is highly polluted with domestic grey water. Polluted rivers and streams are the main sources of water for 70 percent of farmers. There is an extensive use of shallow dug wells on valley bottoms (27 percent). More than 75 percent of the 70 farmers interviewed confirmed they use the source of water that is accessible and

reliable. Pipe-borne water is not only inaccessible to farmers but also expensive and unreliable (Keraita, *et al.*, 2003). Vegetable farmers in Kumasi Metropolis use watering cans, buckets, motorised pumps with hosepipe, surface, drip and sprinkler irrigation methods.

Plate 1: A stream used by some vegetable farmers for irrigation

Source: Farmers' Field (2010)

Watering Can is the most common means of irrigation used in all farming areas. Farmers use watering cans with 15 litres capacity to fetch and manually carry water from a water source, mostly shallow dug wells and streams to the fields and water their crops through the spout making it an overhead irrigation method. In many cases, farmers carry two watering cans at a time contrary to the peri-urban areas where buckets are used to convey water by women (Keraita, Drechsel, Huibers & Raschid-Sally, 2002). The views held by Obuobie *et al.* (2006) on the use of watering cans as one of the various irrigation technologies employed by vegetable farmers agree with that of Keraita *et al.* that watering cans are used to fetch water from streams, rivers, ponds and or dug-out well and transported manually onto the field for watering.

Plate 2: Irrigation of spring onions with watering cans

Source: Farmers' Field (2010)

Bucket Method according to Keraita, Drechsel and Raschid- Sally (2002), involves the use of bowls and buckets to fetch water, usually from a stream/river or dugout. It is then manually carried to the field where it is either applied directly or put in a drum to be used later. This practice mostly involves women and children carrying buckets as 'head loads' and is commonly done in the peri-urban areas where farms are farther from the water source. Keraita, Drechsel, and Amoah (2003) though agree to the fact that in addition to the watering cans, women vegetable farmers particularly use buckets to fetch and manually transport irrigated water to the fields, they insisted that such practice is unhygienic due to contamination of the water source. This is because these women are forced to step into the water.

Motorised Pumps are mostly seen in the peri-urban areas but are increasingly being used in the cities. It is a small motor pump placed temporarily near a water source; usually, the bank of a river or a big stream and water is pumped through rigid plastic pipes or semi-flexible pipes which are connected to a flexible hosepipe at the end (Keraita, Drechsel and Raschid-

Sally (2002). Farmers use the hose to apply water to their crops either overhead or near the roots on the surface. Pumps helps to reduce transport ways: water was pump into a dugout from where water was fetched with cans. The opinion of Keraita, Drechsel and Amoah (2003); Obuobie *et al*. (2006) that motorised pump usage is no longer confined to the peri-urban areas concurs with the findings of Keraita *et al.* (2002). However, they admitted that its usage is on limited scale as a result of high initial cost out lay on the use of motorised pump.

Sprinkler Irrigation is confined to a few sites in urban Kumasi behind Georgia Hotel. In this method, the sprinkler system is connected to a pipe borne water source. Improvise materials were used such as bamboo for the sprinkler risers (Keraita, Drechsel & Raschid- Sally 2002). The findings of WHO (2007) are consistent with Keraita, Drechsel, and Konradsen (2007) that the use of localised irrigation technologies like bubbler, trickle and drip could offer healthy protection for vegetable farmers who use untreated wastewater for irrigation. Though Kay (2001) and Postel (2001) admit this irrigation technology offer vegetable farmers' protection from untreated wastewater they indicated that its high cost impedes its large scale adoption in Ghana unlike India and Cape Verde.

Major Traditional Farming Sites in the Kumasi Metropolis

Most urban land in Kumasi used for urban vegetable production does not belong to the individual farmers. There are about 41ha of land in the urban areas under informal dry-season vegetable irrigation (Cornish & Lawrence, 2001). Some open-space (traditional) vegetable production sites in the

Metropolis are presented in Figure 1. Though many other production sites have sprung up lately, all these sites are within the city boundary and were considered in the study.

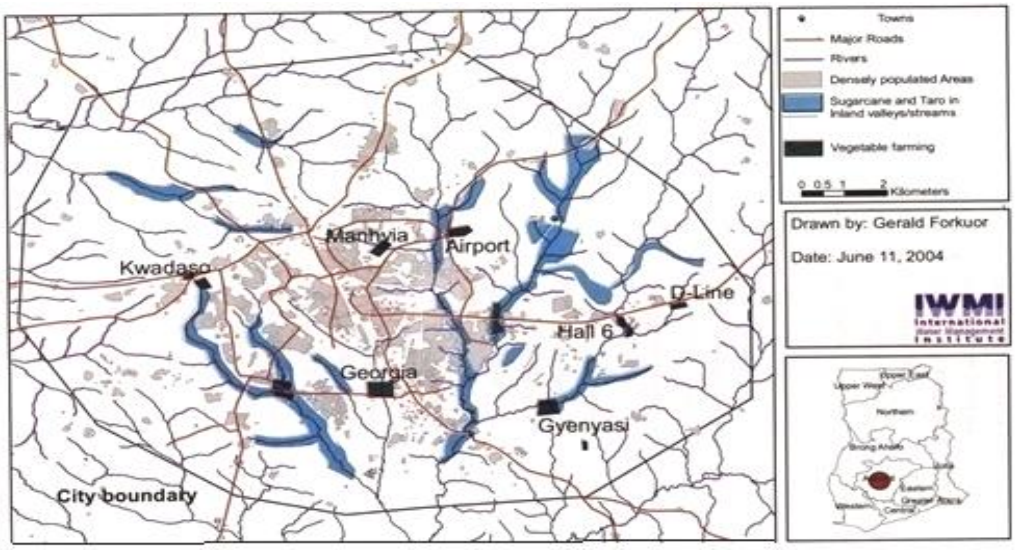


Figure 1: Some vegetable production sites in the Kumasi Metropolis

Source: International Water Management Institute (2006)

Gyinyase/Engineering is one of the largest urban vegetable farming sites in Kumasi (21.8ha). It is located next to the Kwame Nkrumah University of Science and Technology (KNUST) in an inland valley. The site has a diversity of crops, and farmers' practice in part organic farming. Shallow wells are used extensively and there is a well-established farmer's organization.

One of the production sites is located behind Georgia Hotel area and it covers about 0.4ha. It has three male farmers with their families cultivating spring onions, cabbage, green pepper, garden eggs and red onions. The land belongs to the owner of the Hotel and farmers are allowed to cultivate it. This is also one of the few sites in Ghana where farmers use sprinkler irrigation. Farmers use pipe borne water although the pipe connection does not appear to follow official regulations.

D-Line/Weweso site covers an area of about 3.1 ha and is located beside the Kumasi-Accra high way (next to the KNUST police station) and farmers predominantly cultivate spring onions. It has about 30 farmers organised in an association. The source of water is a small stream which receives untreated effluents from a significant number of households. Vegetable production in the metropolis is on the ascendancy as new production sites have emerged lately and have been included in this study.

Plate 3: Spring onion growing in one of the production sites

Source: Farmers' Field (2010)

Access to Agricultural Information

According to Danso, Fialor and Drechsel (2002), out of the 30 farmers' interviewed on the access to agricultural extension services and market information in Accra, 80 percent mentioned that they (both men and women) have equal access to market information on the demand for their produce and extension services. They indicated that these results were not different from that reported in Kumasi. To Drechsel and Kunze (1999) lack of knowledge

among farmers hinders their access to markets or prevents them from producing for markets even when it was profitable to do so. The findings of Van den Berg (1997) that inadequate or lack of agricultural information orientate small-scale farmers towards proving to feed their families rather than for the markets is consistent with previous assertion. Gockowski and Ndoumbé (2004) noted that lack of extension services particularly among small-scale farmers can impede intensification as well as production levels of crops. Their findings agree with the earlier assertion by Van den Berg about lack of or inadequate access of farmers' to agricultural extension services.

Sources of Financial Capital for Urban Vegetable Farming

Agriculture is the main stay of the economy of Ghana. It contributes more than 36 percent of Gross Domestic Product and employs about 60 percent of Ghana's labour force (Institute of Statistical, Social and Economic Research, 2002). Unfortunately, most urban farmers do not have access to formal credit scheme in Ghana. This is mainly due to the fact that farmers cannot meet the collateral demands of the financial institutions. In addition, most of the urban farmers have limited space for cultivation and do not own the land. In spite of these problems, some urban vegetable farmers have informal negotiations with the vegetable sellers in terms of access to informal credit. Sellers pre-finance farming activities by providing seeds, fertilizer, pesticides or cash in order to produce for them. Farmers can sell to other traders only after the regular customers have made their choices. Other West African countries also experienced like situation (Danso & Drechsel, 2003). Similar observations was made by Cornish and Lawrence (2001) and Tallaki

(2005) that urban vegetable farmers have myriad of challenges especially financial capital as a result most of them depend on either their meagre resources or customers for production. The report by Abaidoo *et al*. (2009) that only a small proportion of urban farmers interviewed had access to credit facilities is consistent with the previous findings.

Sources of Labour for Vegetable Farming Activities

According to Drechsel, Giordano and Gyiele (2004) urban vegetable production is labour intensive. All the activities involved in vegetable production require the use of labour. Initial land clearing, raising of beds, nursery management practices, transplanting and all the cultural practices make use of labour. The sources of farm labour for urban vegetable farming are family labour and or hired labour. Contrary to hired labour, family labour receives no wage when engaged in farm activities. The opinions of Faruqui, Niang and Redwood (2004) that to perform all the cultural practices required in vegetable production or to irrigate larger areas, most producers use family labour and paid workers agree with the findings of Drechsel *et al*. According to Ezedinma and Chukuezi (1999), watering and land preparation are the most labour intensive vegetable production operations. They further indicated that hired labour is engaged for major activities, namely, land preparation, transplanting, weeding, irrigation and harvesting. Other activities for which hired labour may be required include organic manure and pesticides application. The findings of Ezedinma and Chukuezi that hired labour is engaged in major vegetable production activities is inconsistent with the observations made by Drechsel *et al*. (2004) and Faruqui *et al*. (2004). The

opinion held by Flynn-Dapaah (2000) that urban farmers depended on personal labour departs from the earlier submissions.

Investment in Urban Vegetable Production

Most people engaged in urban agriculture due to its quick returns and low capital investment. As a user of inputs (land, water, seeds, agro-chemicals, labour), urban agriculture provide very little economic injection into the local market economy. This is because the inputs used are minimal often available, free and not of higher value. These low costs of production are a primary reason that urban agriculture is attractive to low-income people, as they can take up the activity with little investment and operating expenses (United Nations Centre for Human Settlement, 1999). Traders occasionally provide farmers with credit and inputs, especially seeds in order to produce crops for them to sell. Mostly, farmers use watering cans to convey water from dug wells, drains and streams to irrigate their crops. Manual irrigation requires frequent trips making it labour intensive as water application rates are high (Keraita, Drechsel, Huibers & Raschid (2002). Labour for watering accounts for 40-75 percent of the total cost (excluding family labour) and 38 percent of farmers' time. Even higher percentages are possible in drier areas and sandy soils (Tallaki, 2005). The findings agree with the earlier studies by Danso, Drechsel, Wiafe-Antwi and Gyiele (2002) that vegetable production is labour intensive and time consuming. When water is pumped, the cost for hiring pump is estimated to be from US$ 40-70 per dry season. Manual labour in general, is more expensive per volume of water delivered (US$ 3-6 per m3)

compared to using pumps (US$ 0.6-5per m3) (Cornish, Aidoo & Ayamba, 2001).

The major investments in urban vegetable farming include the cost of water which includes hiring of pump, cost of labour (for watering and other activities). Weeding, which is also labour intensive was rated as the most expensive activity by the farmers accounting for an average of about 23 percent of the total cost. Most farmers who depend on family labour rarely pay for it. They hired labour occasionally for lager number of vegetable beds, but hardly pay more than US$ 11 per season. Significant number of vegetable farmers also uses other types of soil amendments as well as pesticides. The use of poultry manure is very common due to its availability and low price (US$ 0.2 per sack). However, only a few vegetable farmers use mineral fertilizers (US$ 14 per 50kg NPK) in addition to the organic manure (mostly for cabbage) (Drechsel, Giordano & Gyiele, 2004). The findings of Drechsel, Giordano and Enters (2005) that crops like cabbage require synthetic fertilizers and further mentioned that manure application rates can be as high (20-100t/ha/yr) agree with the results of Drechsel *et al.* (2004).

Productivity Level of Urban Vegetable Farmers

The productivity of the land is the ratio of gross revenue obtained from production to the land put under production. One common assumption about urban agriculture according to Nugent (1999) and FAO (1998) is that, yields are quite low, largely because of poor-quality inputs, low-technology farm practices and high losses from a variety of sources. They went on to say that such conditions are not universal since high yields have been documented by

urban farmers in some cases. It is also revealing that vegetable farmers in urban Kumasi with access to irrigation water are able to cultivate all-year-round to attain annual income levels of US$ 400-800. This is twice the income they would earn in the rural settings. Urban farming is land and labour constrained as such typical farm sizes range between 0.05ha and 0.2ha. Even with plot sizes that are significantly smaller than in rural areas, urban farmers earn at least as much as rural farmers (Danso, Drechsel, Wiafe-Antwi & Gyiele, 2002) and Drechsel, Blumenthal & Keraita, 2002). The range of farm sizes is consistent with the findings of Moustier, Moumbele and Huat (2004) who mentioned farm sizes between 0.02ha and 0.3ha as pertaining throughout the sub-region. He further indicated that land sizes could be smaller in areas where land is scarce. To Tallaki (2005) and Eaton (2003) farm sizes range from 0.1 to 0.8ha which far exceeds the range indicated by Moustier *et* al.(2004)

To Danso, Drechsel, Akinbolu and Gyiele (2003) monthly net income from mixed vegetable production ranges between US$ 10 and US$ 300 per farmer depending on farm size. The annual net income estimated by Faruqui, Niang and Redwood (2004) was US$ 365 per farmer, a figure lower than what Danso, Drechsel, Wiafe-Antwi and Gyiele (2002) and Drechsel, Blumenthal and Keraita (2002) estimated. Irrigated vegetable farming (lettuce, cabbage and onions) figures was US$2,000-8,000/ha/year while dry season irrigation vegetable farming was only US$300-350/ha/year as reported by Danso, *et al.* (2002). These figures confirm the findings by Drechsel *et al.* (2002) that vegetable production is lucrative. However, they indicated that it was risky to generalise productivity from urban farming because the farming conditions

vary greatly from season to season and location to location. Cornish and Lawrence stated that about 95 percent of the lettuce produced in Kumasi comes from urban farms. The findings of Cornish and Lawrence (2001) that urban vegetable production is for income generation is in line with that of Drechsel *et al.* (2002).

Marketing of Urban Vegetable Produce

The production of vegetables in urban open-space in Ghana is purposely for the market, which explains why few women are involved. Women's dominance in marketing urban farm produce is partly attributed to the Ghanaian tradition that marketing of vegetables is a preserve of women. Furthermore, women held the opinion that marketing is more lucrative and less risky than farming. Maxwell (1997) cited in Obosu-Mensah (1999) reported that urban retail marketing and petty trading are sectors that have been dominated by women in West Africa. Gerstl (2001) also held similar views that women glut the market for the sale of vegetables. Traders usually purchase vegetables at farm gate level. Prices vary significantly from one season to another. The findings of Abaidoo *et al*. (2009) that all farmers sell their produce at farm gate level confirm the earlier assertion by Gerstl (2001).

Vegetable Farmers Years of Experience

The number of years of farming experience impact positively on the production efficiency of farmers. According to a survey carried out by Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010), about farming experience, revealed that 48.0 percent of vegetable farmers in Lagos had over

15 years farming experience. Fourty-five percent had less than 10 years experience and 7 percent had farming experience between 10 and 15 years. The findings of a similar study conducted in Abeokuta also indicated that majority (58.0%) of the vegetable farmers had between 10 to 15 years farming experience (Ojo, *et al.*, 2010). The findings by Abaidoo *et al.* (2009) about farmers production experience was less due to the youthful nature of the respondents. These findings are inconsistent with the earlier assertion by Ojo *et al*. (2010).

Vegetable Production and Marketing Challenges

According to Obuobie, Keraira, Danso, Amoah, Cofie, Raschid-Sally and Drechsel (2006), a survey on vegetable farmers to identify and rate their perception on production challenges revealed that inadequate water especially during the dry season was their main production challenge. Vegetable farmers (68 percent) also identified inputs cost (seeds, agro-chemicals, fertilizer or manure and tools) as a production challenge. In addition, 59 percent of the farmers in Kumasi specified the exact marketing problem as 'fluctuating demand'. More than two-thirds of the respondents indicated crop pests and diseases as responsible for crop damage. None of the constraints was ranked on average as 'most important'. Farmers ranked crop pests and diseases as important constraints. Soil fertility, credit facilities and marketing were ranked 'less important'. To Cornish, Aidoo and Ayamba (2001) poor price information and lack of cold transport and storage facilities were identified as common bottlenecks of traditional marketing structures. The views held by Drechsel and Kunze (1999) that fluctuating demand and absence of storage

facilities were some of the marketing challenges urban vegetable farmers face is consistent with the findings of Cornish, Aidoo & Ayamba (2001).

Theories and Basic Concepts of Livelihoods

Most agencies' definition of livelihood is similar and adopted from Chamber and Conway's (1992) definition of livelihood despite their varied terminologies employed. The word "livelihood" is used in many fields, but the term as used in the Department for International Development (DFID) 'Sustainable Livelihood Guidance Sheet' is understood as follows: 'A livelihood comprises the capacities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capacities and assets both now and in the future, without undermining the natural resource base' (Chamber & Conway, 1992). The definition offered by FAO (2002) suggests that 'livelihood' does not just mean the activities that people carry out to earn a living. It means all the different elements that contribute to, or affects their ability to ensure a living for themselves and their household. This includes:

1) All the activities which are transformed by the livelihood assets that the household depend on for a living, such as natural, information, financial, human, social and physical capitals.
2) The strategies and activities that allow the household to use those assets to satisfy basic needs.
3) The different factors that the household itself may not be able to control directly, like the seasons, natural disasters or economic trends that affect its vulnerability.

4) Policies and processes that may help or make it more difficult for them to achieve adequate livelihood (FAO, 2002).

It is clear that the four elements in concert direct the household processes of decision making on urban vegetable production activities. In summary, the Livelihoods Approach put the livelihoods of vegetable farmers at the centre of analysis and action. It focuses on the main production processes and factors that affect these farmers' livelihoods and the typical relationships between these factors.

Livelihood Assets

Livelihood assets may be described as stocks of capital that can be utilised directly or indirectly to generate the means of survival of the households (Ellis, 2000; FAO, 2002). There are six division or categories of assets that can provide a useful starting point for a household livelihood analysis as well as a guide, which can help a researcher appreciate a complete picture of the household and its livelihood assets (FAO, 2002). These livelihood categories were adopted from DFID's Sustainable Livelihood Guidance Sheets (2000) and they include natural, information, financial, human social and physical capitals.

Natural Capital is clearly important to those who derive all or part of their livelihoods from natural resource-based activities such as farming, fishing and gathering in forests (DFID, 1999). In term of natural processes (e.g flood, drought and seasonality), there is a close relationship between natural capital and the vulnerability context in which many of the shocks devastate the livelihoods of the poor (DFID, 1999). Multiple benefits can be derived from

natural capital. For instance, secured access to land may also mean well-endowed with financial capital as such land can be used for both productive activities as well as collateral to access credit facilities (Akaba, 2008).

Information Capital provides a strong leverage that can be used to assess other forms of capital. Information capital has been defined differently by many authors: 'Information as resource' (Martin, 1995); 'Information as a commodity' (Brama, 1989) and 'Information as an intangible, which involves either the telling of something or that which is being told' (Machlup & Mansfield, 1983). Martin suggested that the idea of information as a resource is not only inherently attractive and intuitively credible; it is also well established in fact. 'Information capital' means different kinds of data endowed with relevance and purpose used by people to make decisions in pursuit of their livelihood objectives. Information capital is such a fundamental and vital livelihood asset that it ought to be integrated into the livelihood framework. Information is such a critical component in people's lives that it is inconceivable to talk about livelihood without referring to the role of information. Indeed, one of the core objectives of sustainable livelihoods approach is to enhance people's access to information. Urban farmers base their livelihoods on the six types of assets that they own or can access, to build livelihood activities involving vegetable farming and improving capacity for their livelihood.

Financial capital for household livelihoods sometimes is not only in the form of money. Each household converts it into forms of productive physical assets such as vehicles, irrigation pumps, knapsack sprayers, wheelbarrows

and watering cans that depends on choices of investment. Its importance is as a result of its versatility of the six categories of assets.

Human Capital - the poor have their own labour as key livelihood assets (FAO, 2002). Human capital is increased by investment in education and training, as well as, by the skills acquired through pursuing one or more occupations (Ellis, 2000). Emphasising education and skills, it is clear that gaining improvement in human capital is not easy and quick, especially to the peasants who are confronted by shocks and risks. However, this asset is important because it is both the object and subject of development. It is also required for the utilisation of remaining capital.

Social Capital - the importance of social capital seems to be considered as 'resource of last resort' – a shock and 'a safety net to ensure survival during periods of intensive insecurity'. Also, in social networks, households develop knowledge and share that knowledge. It further helps to reduce the 'free rider' problem associated with the use of public goods and facilitates innovation. Social capital according to Coleman (1990) is productive making possible the achievement of certain ends that would not be attained in its absence. In a livelihood framework, social capital entails the social networks and associations to which people belong.

Physical Capital includes infrastructure such as buildings, roads, electricity supply and machinery (Ellis, 2000). However, for the purposes of this study, physical capital will be confined to facilities, equipment and tools such as irrigation pumps and sprinkler, knapsack sprayers, watering cans, wheel barrows and seeds that assist in production. According to Bosompim (2006), in an attempt to enhance productivity, farmers' physical capital is

likely to exceed other livelihood assets. However, a given state of infrastructure as well as physical property or a lack of particular type of infrastructure may positively or negatively affects households.

Vulnerability of Urban Vegetable Producers

According to Brooks (2003) cited in Few, Ahern, Matthies, Kovats (2004), vulnerability is a condition of susceptibility shaped by exposure, sensitivity and resilience. Folke, *et al.* (2002) however, argued that the focus of understanding vulnerability is the concept of resilience. The resilience of poor people represents their ability to withstand the impact of the trends and shocks. The definition offered by Brooks (2003) cited in Few *et al*. (2004) and Folke *et al.* (2002) agree with the earlier definition by DFID (1999) that vulnerability stems from the negative external environment in which people exist such as shocks (e.g. floods, droughts, storms), trends (e.g. population, economic resources), and seasonal shifts (e.g. employment opportunities, prices, and production). This study used vulnerability as a concept because it helps to understand the extent to which people adapt to shocks, trends and seasonality.

Urban Vegetable Production Conceptual Framework

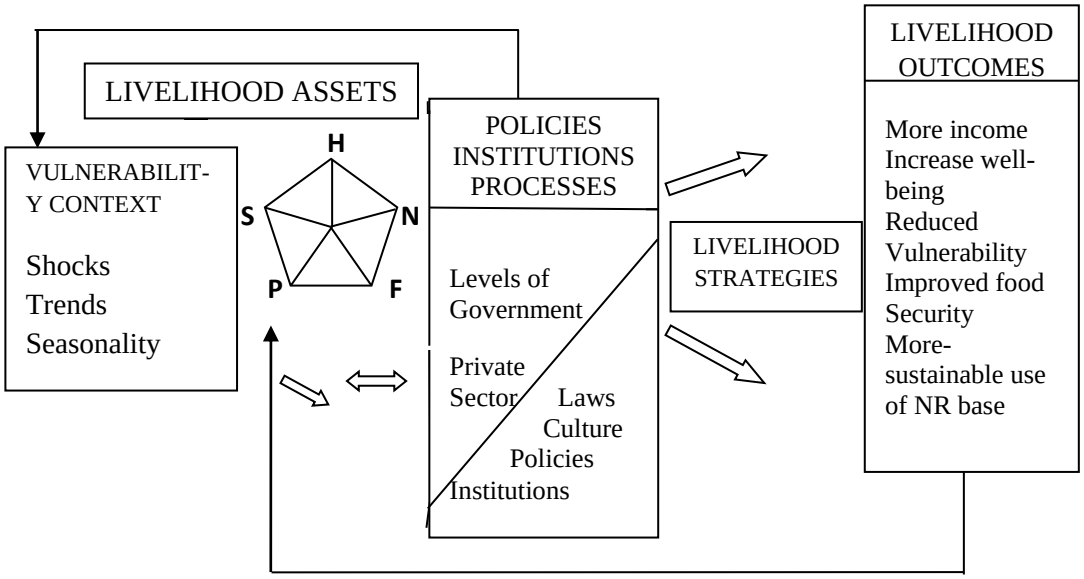
There is no single sustainable livelihood approach to poverty reduction but flexibility in method is a distinctive feature of sustainable livelihoods. In most of these livelihood models, the elements are the same. The conceptual framework (Figure 3) was adapted from the Department for International Development (DFID) Sustainable Livelihoods Guidance Sheet from 1999 to

2005 (Figure 2). The urban vegetable conceptual framework unlike the five (pentagon) used by DFID (1999) and other development agencies, advocates for six (hexagon) livelihood assets due to the inclusion of a sixth asset 'Information capital'. Furthermore, while the conceptual framework holistically considers the livelihood assets in terms of both positive and negative desirable outcomes, the DFID framework focuses only on the positive aspect of the outcomes.

Analysing livelihood strategies involves understanding how vegetable farmers use and combine their resources to meet short-term and long-term needs (more desirable outcomes). It also involves understanding of how these farmers are affected and also cope with disasters. The six (hexagon) livelihood assets as shown in the conceptual framework (Figure 3) are transformed by urban vegetable production. This transformation is through diverse strategies and activities in the vegetable production processes and combination of various livelihood assets (natural, information, financial, human, social and physical capitals) to yield positive outcomes as indicated by the unbroken arrows. This include more income, increased well-being, reduced vulnerability, improved food security, sustainable use of natural resources base among others.

On the contrary, negative outcomes such as depletion of soil resources, increased vulnerability, less supportive and cohesive of social environment may also result. Positive desirable outcomes are fed back into the livelihood assets to help solidify the capital assets base for the continuity of the production process. On the contrary, the negative outcomes go to deplete or erode the assets base and also affect the vegetable production. The vegetable

production and marketing challenges also affect production hence production outcome and ultimately farmers' livelihood assets as ecosystem feedback. The vulnerability of the environment in terms of trends, shocks and seasonality also influence production, livelihood assets and production outcomes as shown by the broken arrows. This conceptual framework (Figure 3) was developed to assist, understand and analyse the livelihoods of vegetables farmers in the Metropolis.



KEY

H = Human Capital S = Social Capital

N = Natural Capital P = Physical Capital

F = Financial Capital

Figure 2: Department for International Development Sustainable Livelihood Framework

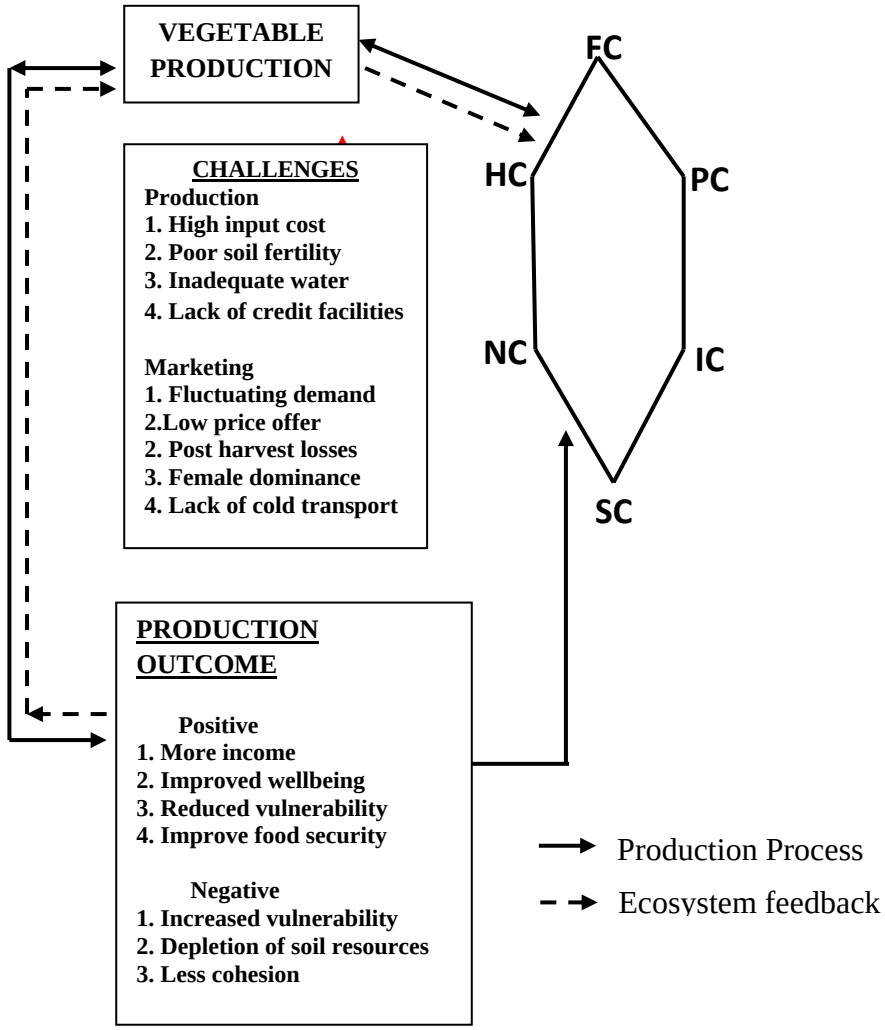


Figure 3: Conceptual Framework for Urban Vegetable Production

Source: Adapted from DFID Sustainable Livelihoods Framework (1999 - 2005)

Legend

PC = Physical Capital	HC = Human Capital
FC = Financial capital	SC = Social Capital
NC = Natural capital	IC = Information Capital

CHAPTER THREE

METHODOLOGY

General overview

This chapter describes the procedure and techniques that were used to collect and analyse data for the study. It includes the research design, study population, sample procedure, sample size, instrumentation, data collection, processing and analysis that were employed as well as the rationale behind the techniques that were chosen for the study.

Research Design

A descriptive survey design was used for the study. This design was used because, according to Glass and Hopkins (1984), it involves the collection of quantitative information that can be tabulated along a continuum in numerical form, such as scores on a test. It can describe categories of information such as gender or patterns of interaction when using technology in a group situation. Descriptive research involves gathering data that describe events and then organises, tabulates, depicts, and describes the data collected. According to Ary, Jacobs and Razavieh (2002); Borg and Gall (1989), descriptive research asks questions about the nature, incidence, or distribution of variables, and is primarily concerned with identifying the characteristics of a population. To Borg and Gall (1989) descriptive research utilises instruments such as questionnaires and interviews to gather information from

groups of respondents and is usually based upon data obtained from participant observation. This study is however, not dissimilar from the various assertions stated above.

Study Area

Kumasi is the second largest city of the nation and the capital of the Ashanti Region. It is located about 270 km north of the national capital, Accra. The city is between latitude 6.40^0 N and longitude 1.30^0- 1.35^0 W, an elevation which ranges between 250-300 metres above sea level with metropolitan area of about 254 square kilometers (KMA, 2006). The region lies within the forest zone of Ghana. Kumasi falls within the wet sub-equatorial type of climate with minimum and maximum average temperatures of 21.5^0C and 30.7^0C respectively. The rainfall pattern of the area is bimodal from March to July and from September to November. The vegetation of the metropolis falls within the moist semi-deciduous South-East ecological zone and forest ochrosol formed the major soil type. The topography of Kumasi is undulating with major rivers and streams including Subin, Wewe, Susan, Aboabo, Oda, Owabi, Suntreso, Acheampomene, Akrudu and Asuyeboa.

The total land area of the Ashanti Region is about 24,389 square killometres with the metropolitan area comprising of 254sq km. The population of Kumasi Metropolis is 1,170,270 (GSS, 2002). It was however projected to 1,889,934 by 2009 with an annual growth rate of 5.4 %. The metropolitan area of Kumasi shares boundaries with Kwabre East District to the north, Atwima District to the west, Ejisu-Juaben Municipal to the east and Bosomtwe - Atwima District to the south (KMA, 2006). At least two of three

households have some kind of backyard farming. A much higher percentage of the population grows few plantain crops and keeps poultry (Kumasi Natural Resource Management Project, 1999). The dominant staple food crops grown include cassava, plantain and maize on upland sites, often accompanied by dry - season vegetable farming especially along streams.

Study Population

The population of the study consists of all open-space vegetable farmers in the Kumasi Metropolis. The population size is about 408 (M. Boafo personal communication, June 10, 2010).

Sampling Procedure

A simple random sampling procedure was used for the study. This probability sampling was employed due to its high degree of representativeness, reliability and high generalisability of results. In simple random sampling, each member of the population under study has equal chance of being selected. This is because the method involves selecting at random from a list of the population that required number of the subjects for the sample. Consequently, for any complete randomisation to be effected, a total list of the population is required. Cohen and Marion (1995) agree that this method needs a complete list of the population which is not always readily available. For this study, however, a good estimate of the population was obtained from the records kept by MoFA office that provides extension services to the farmers.

Sample Size

A common goal of a survey is to collect data representative of a population. In the conduct of any research, one of the major decisions for the researcher is how to determine the appropriate sample size representative of the population. Nwana (1992) however, recommended that for a few hundred population, sample size of about 40 percent or more can be adequate representative; for many hundreds population, sample size of 20 percent will be enough; for population of a few thousands, 10 percent sample size is sufficient and for several thousand population, sample size of 5 percent or less is recommended. It can be inferred from Nwana's (1992) assertion that for larger population, smaller percentage of the population should be used as the sample size and for smaller population sizes; higher percentage sample size is required.

The views held by Best and Kahn (1995) however, differ from Nwana's (1992). To them, there is no fixed number or percentage of subjects that influence the size of a tolerable sample and debated that sample size may depend on the nature of the population, data to be collected, type of analysis to run and funds available for the research. To Cohen and Marion (1995), there is no clear cut answer to how large a sample size should be in order to conduct an adequate survey which will be representative and reliable. What they however said is that correct sample size depends upon the purpose of the study and the nature of the population under investigation. The views of Cohen and Marion (1995) agree with those of Best and Kahn (1995) but went further to say that a sample size of thirty is held by many to be the minimum number of cases if researchers plan to use some form of statistical data.

There is also a growing amount of software used to determine adequate sample size of population considered representative enough. These include nQuery Advisor (Elashoff, 2000) and PASS (Hintze, 2000). To be able to state with sufficient probability that any difference(s) found between groups is likely to be due to the intervention, rather than the particular samples you have, it is necessary to have a large enough sample size (Macfarlane, 2003). Conceiving all these assertions, a total of 300 vegetable farmers were randomly selected from all vegetable growing sites in the metropolis. For descriptive research such as this, where the population is a little over 400, sample size of 300 is considered representative in view of the above reflections.

Instrumentation

Interview schedule (see Appendix 11) was used to elicit information on the urban vegetable farming and its effects on farmers' livelihoods. There are basically about six ways to collect data as revealed by MacMillan and Schumacher (1989). They stated them as observation, questionnaire, interview, document, tests and unobtrusive measures. All research uses a variation of one or more of the instruments mentioned above according to MacMillan and Schumacher. However, they cautioned that the use of any of the instruments depend on the strengths and limitations of each and other considerations.

This instrument was used because of the numerous advantages it has over other instruments. These include its high degree of flexibility making it easily adjustable to meet many diverse conditions. Also the physical presence

of the enumerator as well as the opportunity to discuss participation in the study with the respondent when there are objections, results quite often in a high response rate. Furthermore, the interview schedule unlike the questionnaire also provides the opportunity to record spontaneous responses because the respondent in an interview does not have as much time available to answer questions as when questionnaires are employed. This instrument was employed more importantly because it does not require respondents to have the ability to read or handle complex documents as in the case of questionnaires.

Both face and content validity of the instrument was ensured. The instrument's face validity was checked by the researcher while the content validity was done by the researcher's supervisors in the Department of Agricultural Economics and Extension, University of Cape Coast and researchers at the Socio-economics division of Crops Research Institute of the Council for Scientific and Industrial Research (CSIR-CRI). The structure of the questions in the instrument was a combination of close-ended, open-ended and partially close-ended questions.

The instrument consisted of five sections. In the first section, the instrument included the background information of vegetable farmers. The second section focused attention on factors of production and access to information and it included land, planting materials/seeds, agro-chemicals, water for irrigation, labour, funds, and extension information. Production, marketing and income constituted the third section. The fourth section of the research instrument also considered farmers' perceived level of effect of urban vegetable farming on their livelihoods. Vegetable production and marketing

challenges constituted the final section of the research instrument. Three different 5-Point Likert-type scales were developed and used to determine vegetable farmers' access to agricultural information, farmers' perceived level of effect of urban vegetable production on their livelihoods and the severity of production and marketing challenges faced by urban vegetable farmers.

Table 2: Interpretations of Likert-Type Scale on Farmers' Perceived Level of Effect of Urban Vegetable Production on their Livelihoods

Ratings	Interval	Farmers' Perceived Level of Effect of Vegetable Production on their Livelihoods
3	3.15 - 4.14	High (H)
2	2.15 - 3.14	Moderately High (MH)
1	1.15 - 2.14	Low (L)

Source: Authors' Construct, 2010

Table 3: Interpretations of Likert-Type Scale on Production Challenges

Rankings	Intervals	Severity of Vegetable Production Challenges
6	5.35 - 6	Not Severe (NS)
5	4.35 - 5.34	Slightly Severe (SS)
4	3.35 - 4.34	Moderately Severe (MS)
3	2.35 - 3.34	Severe (S)
2	1.35 - 2.34	Very Severe (VS)
1	0.35 - 1.34	Extremely Severe (ES)

Source: Authors' Construct, 2010

Table 4: Interpretations of Likert-Type Scale on Marketing Challenges

Rankings	Intervals	Severity of Vegetable Marketing Challenges
5	4.35 - 5	Not Severe (NS)
4	3.35 - 4.34	Slightly Severe (SS)
3	2.35 - 3.34	Moderately Severe (MS)
2	1.35 - 2.34	Severe (S)
1	0.35 - 1.34	Very Severe (VS)

Source: Authors' Construct, 2010

Respondents' responses were elicited through the administration of the interview schedule. Presented in Tables 2, 3 and 4 are the interpretations of the likert-type scales developed for farmers' perceived level of effect of urban vegetable production on their livelihoods, production and marketing challenges.

Pilot Study

The instrument was pilot tested in one of the non-selected vegetable farming sites at Kentikrono. The respondents selected for the pilot study also had homogenous characteristics as the vegetable famers in the selected study areas. A total of twenty (20) randomly sampled vegetable farmers were used as the respondents. The essence of the pilot study was to ascertain the reliability and also the internal consistency of the instrument. Access to agricultural information, farmers' perceived level of contribution of vegetable production to their livelihoods, production and marketing challenges were the three main scales developed and used. The farmers' livelihoods were

subscaled under natural, information, financial, human, social and physical capitals. Statistical Package for Social Sciences (SPSS) version 15 was used to determine the reliability of the scales used (Huerta & Lugo 1996; Colosi, n. d). Cronbach's alpha coefficient of the reliability values of the pilot study ranges between 0.648 and 0.914 for the livelihood subscales. Financial capital recorded the lowest value whiles the highest value went for natural capital. Access to Agricultural Information, Production and Marketing challenges scales recorded values above 0.800. This indicates the reliability and internal consistency of the instrument (See Appendix 1 for the results of the reliability test of the scales and subscales of the various items).

According to Pallant (2001), the Cronbach's alpha coefficient value of 0.70 is considered reliable. Huerta and Lugo (1996) however, argue that the reliability coefficient value of 0.50 to 0.60 is adequate for predictor tests in the early stages of a research. Although, Huerta and Lugo and Pallant held different views regarding the Cronbach's alpha coefficient value that actually determines instrument's reliability, the Cronbach's alpha coefficients in this study using Huerta and Lugo's (1996) standard and to a very large extent that of Pallant's (2001) makes the instrument reliable with respect to what it was designed to measure. The pilot study was conducted in April 2010. The final structured interview schedule was developed for administration and collection of the main data.

Data Collection

Four (4) enumerators consisting of two (2) assistant research scientists including the student researcher from Crops Research Institute (CSIR-CRI)

and two (2) students who were trained by the student researcher on the research instrument administration. The training focused mainly on the meaning and interpretation of individual items on the interview schedule. The validated and pretested structured interview schedule was then translated into the local dialect for easy understanding of the respondents and their responses ticked or written on the schedule. The data was collected in Mid June to Mid July, 2010. The entire 300 completed interview schedule were received from enumerators by middle of July 2010 and the response rate was 100 percent.

Data Analysis

Statistical Package for Social Sciences (SPSS) version 15.0 was employed for the analyses. Measures of central tendency, frequency and percentage distributions, standard deviations, cross-tabulation, descriptive statistics, multiple response, Kendall's coefficient of concordance and Analysis of variance were the statistical tools employed to analyse the data. Each of the specific objectives was analysed using the analytical techniques as follows:

Objectives One and Two - were to describe the demographic and farm related characteristics of urban vegetable farmers in the Kumasi Metropolis respectively. Frequencies, percentages, mean, mode, standard deviations, cross-tabulations and multiple responses were computed from respondents' responses to describe the demographic and farm related characteristics of the respondents' general profile. These statistical tools were used because according to Poate and Daplyn (1993), they are the fundamental steps required in an analysis to ascertain data for distribution of responses.

Objective Three – the statistical tool that was used to determine the production and marketing challenges of urban vegetable production is Kendall's Coefficient of Concordance. This statistical tool was used because it measures the agreement among raters considering the fact that each case is a rater and each variable is an item to be rated.

Objective Four - descriptive statistics involving central tendencies and standard deviation were computed for farmers' perceived level of effect of urban vegetable production on their livelihoods. This statistical tool was employed because it displays summary statistics for several variables in a single table and calculates standardised values. In addition, there is the flexibility of ordering variables by the size of their means in ascending or descending order, alphabetically, or by the order in which the variables are selected.

Objective Five - this objective was to determine whether there are significant differences in the farmers' livelihood assets as a result of their urban vegetable production. One-Way Analysis of Variance (ANOVA) was the statistical tool used to analyse this objective. This statistical tool was used because it produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Post-hoc multiple comparisons analysis was done because Levene's test of homogeneity of variance showed statistically significant mean differences among farmers' livelihood assets at 0.05 alpha level. Tamhane's T2 was chosen as the appropriate post-hoc multiple comparisons test for the mean differences. Eta squared statistics was also calculated to determine the strength of association

between the mean livelihood assets and the result interpreted using Cohen (1988) conversion guidelines.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter focuses on the presentation of the results obtained from the study and the discussion of the findings in relation to the specific objectives set.

Demographic and Farm Related Characteristics of Respondents

Demographic and farm related characteristics of urban vegetable farmers in the Kumasi Metropolis were investigated and the findings presented below.

Sex Distribution of Respondents

Sex distribution of respondents was investigated and the results showed that 282 of the respondents representing 94 percent were males. On the contrary, only 18 of the respondents representing 6 percent were females. The higher number of male respondents recorded in this study is in line with the findings of Obuobie (2004) that men dominate most of the open-space vegetable production in West African cities including Darkar, Lome, Cotonou, Bamako and Ouagadougou. The argument by Drechsel, Blumenthal and Keraita (2002) that though women and men play similar roles in crop production, urban vegetable production is mostly practiced by men agrees with this study result. The findings of Obosu-Mensah (1999); Gbireh, (1999);

Armar-Klemesu and Maxwell (1998) that only 10 percent of all urban open-space farmers on the average are women further buttress this study result that men dominate the industry. According to Flynn-Dapaah (2002); Obuobie, Drechsel, Danso and Rachid-Sally (2004), women instead dominate urban vegetable marketing sector. Generally, the higher number of male respondents in the industry may be due to the difficult nature of the production processes such as vegetable bed preparation, transplanting, weeding and watering as reported by Cornish and Aidoo (2000); Drechsel, Danso & Raschid-Sally (2004). Furthermore, farming is considered in most Ghanaian communities as a preserve of men especially if it is market oriented. This might have also contributed to the fewer number of females involved in the industry. The assertion that Ghanaian women do not own land either in their marital or natal ancestral home might have also accounted for the fewer number of female respondents (Hosna, 1998).

According to Cornish, Aidoo and Ayamba (2001), urban vegetable production also requires skills and knowledge especially for nursery practices. Most of the women do not possess these qualities and might have created a barrier for them to engage in the industry hence their fewer numbers. Most of the urban vegetable farms are also located far away from residential areas and men unlike their women counterpart have bicycles which they use to commute between their farms and places residence (Zacharia, Lamptey & Maxwell, 1998). This might have also contributed to the high number of men engaged in the industry since women do not have means of transport of their own hence their fewer numbers in the sector. The findings by Cornish and Lawrence (2001) and Jacobi, Amend and Kiango (2000) that women dominate urban

vegetable production sector in Eastern African cities like Nairobi and Dar es Salaam is inconsistent with this study result.

Age Distribution of Respondents

The study result on age distribution (Table 5) of urban vegetable farmers revealed that respondents between the ages of 15 - 63 years constituted 97.4 percent of the labour force of the vegetable industry in the study area. This observation is relevant because vegetable production is described as tedious, capital and labour intensive. The youthful nature of the age structure of the respondents suggests that they are energetic, physically strong and would be quick to adopt and disseminate new technologies and innovations than the ageing and the aged who constituted only 2.6 percent of the respondents. The mean age of 37 years of the farmers further confirms the age structure of the respondents. Their modal age was 30 and the standard deviation value (1.14) shows considerable age variations among the respondents.

The result of the study also revealed that the ages of the farmers range from 18 - 80 years. The relevance of these observations is that with the provision of the necessary inputs and efforts to address production and marketing constraints, the industry could attract more youth to increase vegetable production, improves food security and more importantly better the livelihoods of the farmers. This is because the youth are more energetic than the aged. Though, the studies of Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) and Lewu and Assefa (2009) indicated varied age group of vegetable farmers, nevertheless, the majority of them falls within the age

category of labour force. This study results further revealed that the number of farmers decreased as they advanced in age with only 2.6 percent of the farmers aged over 63 years. This revelation is good because age is likely to influence the scale of production especially where the farmers are directly involved in the production processes as observed in this study.

Table 5: Age Distribution of Respondents

Age Range (in years)	Frequency	Percent
15 - 21	19	6.3
22 - 28	50	16.8
29 - 35	74	24.6
36 - 42	70	23.2
43 - 49	42	13.9
50 - 56	28	9.3
57 - 63	10	3.3
64 and above	7	2.6
Total	**300**	**100.0**

Mean= 37 SD = 1.14 Modal = 30 Youngest= 18 Oldest = 80

Source: Field Survey Data, 2010

Distribution of Marital Status by Sex of Respondents

It can be observed from Table 6 that the majority of the male (63.6 percent) and female (3.7 percent) respondents were married though female respondents constituted only 6 percent of the total respondents under study. This result confirms the findings of IWM (2006), Keraita (2002), Obosu-Mensah (1999) and Ojo, Connaughton, Kintomo, Olajide and Afalayan (2010)

that more than half of urban vegetable farmers were married. A study conducted by Egyir and Beipuo (2009) revealed that about 81 percent of urban vegetable farmers were married compared to 19 percent unmarried further supports the previous assertions and the findings of this study. The high (67.3 percent) marriage rate among the respondents could be attributed to the need for domestic helper because of exhaustion resulting from the difficult nature of the vegetable production activities.

Table 6: Distribution of Marital Status by Sex of Respondents

Marital status	Male		Female		Total	
	f	%	f	%	f	%
Single	75	25.0	-	-	75	25.0
Married	191	63.6	11	3.7	202	67.3
Divorced	14	4.7	3	1.0	17	5.7
Separated	-	-	3	1.0	3	1.0
Widowed	2	0.7	1	0.3	3	1.0
Total	**282**	**94.0**	**18**	**6.0**	**300**	**100.0**

Source: Field Survey Data, 2010

Educational Status of the Respondents

Education is very important and has been reported to facilitate the adoption and diffusion of technologies and innovations. From Table 7, the study results revealed that most of the farmers had formal education up to the (34.7 percent) and Junior High School (JHS) (28.3 percent) levels. Farmers who had education up to the Senior High School (SHS) level constituted only 5 percent. Respondents who had up to General Certificate of Education (GCE) and tertiary levels constituted 3 percent and 2.3 percent respectively. Only few

(1.7 percent) of the respondents had Middle School Living Certificate (MSLC) education. The number of respondents who had MSLC and JHS qualifications (30 percent) was far lower than the fifth round report of the Ghana Living Standards Survey (GLSS-5) figure (39 percent) (Ghana Statistical Service, 2008). Similarly, the proportion of the respondents that possessed SHS or higher qualification (7.3 percent) was lower than 13.6 percent figure reported by GLSS-5 figure (Ghana Statistical Service, 2008). This implies that the number of pupils who are unable to further their education after the JHS level is declining at an alarming rate. Respondents with no formal education also formed 25 percent of the farmers. Generally, the literacy level of the respondents implies that if any technologies or innovations on vegetable production are introduced, the probability for their adoption and diffusion among the farmers would be high. This is because educated farmers are expected to be more receptive to improve farming techniques and practices and therefore has higher level of efficiency than the less educated or uneducated (Obwona, 2000). This result is supported by IWMI (2006) that, though there are wide variations in the literacy level among farmers many of them are still illiterate.

The low number (2.3 percent) of farmers in the tertiary level might be due to the fact that individuals of higher academic qualifications perceived farming as occupation for the less privileged in society. The studies conducted in Abeokuta, Abanla and Akufo by Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) that the majority (73.3 percent) of the farmers are not educated beyond primary school level is consistent with the outcome of this study as well as that of IWMI (2006). Similar studies conducted by Ojo *et*

al. (2010) indicated that the majority of the respondents on the contrary, had secondary school education in Lagos (50 percent) and Bode (74.1 percent). This suggests that educational status of urban vegetable farmers may vary within countries and between countries. Generally, most of the farmers (34.7 percent and 28.3 percent) have at least acquired Primary and JHS education as shown in Table 7.

Table 7: Educational Status of Respondents

Educational level	Frequency	Percent
Primary education	104	34.7
Junior High School (JHS)	85	28.3
No formal education	75	25.0
Senior High School (SHS)	15	5.0
General Cert. of Education (GCE)	9	3.0
Tertiary	7	2.3
Middle School Living Cert.(MSLC)	5	1.7
Total	**300**	**100.0**

Source: Field Survey Data, 2010

Household Composition of Respondents

The size and household composition of the respondents were also investigated. The size and composition of the household influences the amount of food consumed in the household daily. Out of the 300 farmers interviewed the majority (83.7 percent) had household size ranging from 1- 6 members. The household size of the respondents' ranges from a minimum of 1 to a maximum of 15 members with a mean value of 2.2 which is similar to the

mean household size reported on by IWMI (2006) in Kumasi. Contrary, the mean household size figure is lower than the 2000 population and housing census figure of 5.1. The implication is that household welfare might improve with decreasing household size. The standard deviation figure of 1.1 also suggests that household size varies among the respondents. The findings by Egziabher, Lee-Smith, Maxwell, Memon, Mougeot and Sewio (1994) that a household size ranged from one person to over 10 is at variance with this study results. This suggests that household size does not only differ among countries but within country as well.

Land Acquisition for Vegetable Production by Respondents

Table 8 shows the various methods that urban vegetable farmers acquire land for production. It is evidenced that most of the lands put to vegetable production were either for the state (44 percent) or private individuals (36 percent). Whilst a few (9.7 percent) number of the farmers acquired stool land for production, very few of them (about 1.7 percent) each relied on their own land and family land respectively for production. The implication is that investment and productivity are likely to be affected due to low security of tenure. This is because the farmers do not have control over greater proportion of the cultivated land and are therefore uncertain about the faith of any investment such as sinking of permanent wells and mounting of treadle pumps on the land. The farmers also indicated that there was virtually and absolutely no tenancy agreement (rental payment, abunu and abusa) for all the adopted land tenure. These findings agree with that of Cornish and Lawrence (2001), Flynn-Dapaah (2002) and Obosu-Mensah (1999) that most

urban vegetable production sites belong to institutions of government and private developers who have no immediate use of such lands. The type of land tenure system employed by the respondents also agree with Van den Berg's (2002) assertion that low security of tenure renders farmers insecure due to uncertainty of land use. The findings of Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) that the majority (50 percent) of the vegetable farmers each leased and rented land in Lagos whilst 93 percent also leased land for similar intent in Abeokuta are at variance with this research findings.

Table 8: Land Acquisition for Vegetable Production by Respondents

Type of tenure	**Frequency**	**Percent**
Government land	132	44.0
Private land	108	36.0
Stool land	29	9.7
Lease land	21	7.0
Family land	5	1.7
Own land	5	1.7
Total	**300**	**100.0**

Source: Field Survey Data, 2010

Total Land Available and Used for Vegetable Production by Respondents

The study results showed that more than half (51.7 percent) of the respondents though, did not own the land they cultivate, land acquisition for vegetable production was 'easy'. This revelation is consistent with the report by Cornish and Lawrence (2001) and Flynn-Dapaah (2002) that farmers do not own the land they cultivate. It was also observed that the total land

available to the respondents for farming in general was 157.9 ha. Out of this, a total of 114.0 ha was put to vegetable production. This suggests that the farmers are predominantly vegetable producers. It is revealed from the study results that, 41.7 percent and 24.3 percent of the respondents held land size below 0.2 ha and between 0.2 ha - 0.4 ha respectively. Again, 20 percent and 14 percent respectively had land holdings between 0.4ha and 0.8ha and above 0.8ha. The modal (1.0ha) and mean (1.71ha) land sizes of farm holdings for vegetable production suggests that most of the vegetable farmers were small scale producers. Farm sizes among the respondents were also inconsistent as shown by the standard deviation value (0.78 ha). Furthermore, the respondents had 0.1ha (minimum) and 3.2 ha (maximum) land sizes put to vegetable production.

On the total land put to vegetable production, most of the farmers (49.7 percent) had land holdings at 0.2ha and below. Whilst 29.7 percent had land holding between 0.2 ha and 0.4ha, those who had land holdings above 0.4 ha constituted 20.7 percent of the respondents. These findings partly agree with the report by Ojo, Connaughton, Kintoma, Olajide-Taiwo and Afolayan (2010), Moustier, Moumbele and Huat (2004) and Tallaka (2005); Zalle (1997) that urban vegetable farmers are small scale producers with farm sizes ranging between 0.1ha and 0.8ha. Though, the minimum land holdings for this study are the same for those of Ojo *et al*. (2010), Moustier *et al*. (2004), Tallaka (2005) and Zalle (1997), the maximum land holding for the respondents as revealed by this study exceeds 0.8 ha. The report by Moustier *et al*. (2004) that farm sizes are influenced by the availability of land and labour, contradicts the results of this study.

Sources of Irrigation Water and Technologies Used by Respondents

Table 9 shows sources of water for irrigation and irrigation technologies employed by respondents. Irrigation facilitates all-year-round vegetable production. Farmers relied on various sources of water for irrigation. On the sources of irrigation water, the study results showed that 47.7 percent sourced their irrigation water from dug-out-wells. Also, 39.3 percent and 8.7 percent of the total farmers used stream and both stream and dug-out-wells respectively as their sources of water for irrigation. Only few (2.3 percent, 1.7 percent, and 0.3 percent) of the respondents claimed they used tap water, rainfall and water from the drains respectively. This suggests that most of the vegetables produced in the metropolis might be free from pathogens resulting from the use of contaminated drains water.

In addition, the farmers could engage in all-year-round vegetable production as they are not likely to experience any serious water shortage during the dry spell. These findings are consistent with the earlier report by Keraita, Danso and Drechsel (2003) that rivers and streams were the main sources of water for the majority of farmers in the metropolis for irrigation even though there was extensive use of dug-out-wells as well. The results further showed that the irrigation technology adopted by 78.3 percent of the farmers was the use of watering cans. This is in line with the report made by Keraita, Drechsel, Huibers and Raschid-Sally (2002) that watering can was the most common means of irrigation used in all farming areas. This implies that if urban vegetable farmers want to graduate from their prevailing small-scale farming to large scale production then, there is the need to modify the current

system of irrigation technology practiced to the use of motorised irrigation technologies.

Table 9: Sources of Irrigation Water and Technologies Used by Respondents

Variable	Frequency	Percent
Sources of irrigation water		
Dug-out-well	143	47.7
Stream	118	39.3
Stream and Dug-Out Well	26	8.7
Tap water	7	2.3
Rainfall	5	1.7
Drains	1	0.3
Irrigation technologies used		
Watering cans	235	78.3
Watering cans & Motorized pump	18	6.0
Watering cans & Water hose	12	4.0
Motorised pump & Water hose	9	3.0
Motorised pump	6	2.0
Others	20	6.7

Source: Field Survey Data, 2010

Respondents Access to Agricultural Information

Investigation was also carried out on the ease or difficulty in accessing agricultural information from various sources by urban vegetable farmers. In all, ten agricultural information sources were outlined and rated in percentages

using the scale: 1 = very difficult, 2 = difficult, 3 = moderately difficult, 4 = easy and 5 = very easy as shown in Table 10. Out of these sources, the majority of the respondents claimed it was 'very difficult' obtaining agricultural information from private extension services (83.3 percent), research institutes (85 percent), market providers (83.3 percent), the print media (94 percent), television (92 percent) and internet sources (95.7 percent). The mean ranges from 0 to 2.9 for internet sources and fellow farmers respectively. The respondents also claimed it was 'difficult' for them to access agricultural information from agricultural extension agents (58.7 percent) and from radio sources (67.3 percent). As a result, the respondents depended on colleague farmers (68.3 percent) and input dealers (75.7 percent) since these were the 'easiest' sources of agricultural extension information. The standard deviation values for these sources 0.85 and 0.82 respectively imply that the farmers were inconsistent in their choices for sources of agricultural extension information. Source of agricultural information such as private extension services (0.39), television (0.39) and internet sources (0.48) showed some level of consistency. The findings therefore suggest that services from agricultural extension agents were unavailable compelling the farmers to depend on other colleague farmers and input dealers for information support. Urban vegetable farmers have not been receiving agricultural extension services perhaps because the practice is seen as unsafe and informal. This might have affected their productivity levels because the credibility of the information they receive from sources other than agricultural extension agents might be unscientific and or obsolete. This study results however depart from the findings by Danso, Fialor and Drechsel (2002) that the majority of the

farmers have access to market demand for their produce and agricultural extension services.

Table 10: Respondents' Access to Agricultural Information

Information Sources	Percentage Ratings						
	VD	D	MD	E	VE	Mean	SD
Input Dealers	5.3	2.3	10.3	75.7	6.3	2.0	1.4
Fellow Farmers	3.3	4.7	3.3	68.3	20.3	3.1	0.7
Agric. Ext. Agents	18.7	58.7	6.3	11.7	4.7	1.6	1.5
Private Ext. Services	83.3	5.3	7.7	2.3	1.3	0.3	0.4
Research Institutes	85.0	6.0	3.3	2.3	3.3	0.3	0.9
Market Providers	83.3	7.3	4.3	2.7	2.3	1.2	1.5
Print Media	94.0	0.3	0.3	5.0	0.3	0.1	0.7
Television	92.0	5.3	1.3	0.7	0.7	0.1	1.3
Radio	21.0	67.3	8.7	1.3	1.7	1.1	0.4
Internet	95.7	0.7	2.3	1.0	0.3	-	0.4

Scale: 5 = Very Easy (VE); 4 = Easy (E); 3= Moderately Difficult (MD); 2= Difficult (D); 1= Very Difficult (VD). Source: Field Survey Data, 2010

Training, Workshop Programmes and Information Needs of Respondents

Investigation was also carried out to find out whether respondents ever attended any training programmes such as Farmer Field School (FFS), Farmer Field Day (FFD), Workshops and Postharvest demonstrations on vegetable production. The results showed that the majority of the respondents indicated that they have never attended any training programmes on FFS (89.3 percent) and FFD (90 percent). The results on workshops and postharvest

demonstrations were not different. Again, 83.7 percent of the respondents mentioned that they had never attended any workshop programmes and postharvest demonstrations (96.3 percent). More than half (53.3 percent) of the respondents mentioned market opportunities or ready market as their most important information needs. The implication is that the productivity of these farmers might be considerably low perhaps due to their unawareness of new innovations and agronomic practices on vegetable production and marketing avenues thereby affecting their livelihoods.

Sources of Financial Capital for Respondents

Finance is very important since it allows farmers to achieve their livelihood objectives. Its availability however, reduces the farmers' vulnerability to food security by allowing them to adopt different livelihood strategies. From the findings of the study, it came to light that 86.7 percent of the farmers self-finance their farming operations. This study results is in line with the findings made by Danso and Drechsel (2003) that urban farmers in general do not have access to formal credit scheme in Ghana due to their inability to provide collateral securities demanded by financial institutions. This is probably because the majority of the farmers do not own the land on which they farm. This situation might have affected the scale of production hence the farmers' livelihoods. This is because the farmers would have to depend on their meagre financial resources for vegetable production. The implication is that even if the market was very attractive, vegetable farmers could not have ceased the opportunity due to their financial restrictions.

Access to Loan by Respondents for Vegetable Production

Out of the 300 respondents, 40 of them representing 13.3 percent claimed to have access to loan from various sources for their farm operations. The minority (13.3 percent) of the respondents who had access to credit facilities claimed they always pay back the credit on schedule through proceeds from the vegetable sales. The respondents (86.7 percent) who were unable to access loan facilities for their farm operations sited lack of collateral as the principal factor (E. Aferi personal communication, July 5, 2010). In addition, most of the urban farmers have limited space for cultivation and do not own land as reported by Obosu-Mensah (1999), Cornish and Lawrence (2001) and Flynn-Dapaah (2002). This makes collateralisation very difficult. Van den Berg (2002) further buttressed the earlier assertions when he indicated that lack of ownership of land for farming leads to unsustainable production as a result of low tenure of security. He went on to say that this subsequently affects prospective investment in the form of erection of farm structures and provision of treadle pumps for irrigation to increase vegetable production, improves farmers' livelihoods and enhanced food security.

Months Respondents Experienced Critical Fund Shortage

The findings from the study revealed that 93.6 percent of the respondents admitted having experienced severe fund shortage once upon a time in their production processes. The study results revealed that the farmers experienced severe fund shortage from the month of April to September. Whilst some of the farmers (43.3 percent) experienced fund shortage from April to June, about 36.3 percent indicated that it was between July and

September. However, few respondents (9.3 percent and 4.7 percent) indicated that they experienced critical fund shortage between January and March and October to December respectively. Few (6.4 percent) of the respondents however, indicated that they had never witnessed funds shortage since they entered the industry. In addition, 93.6 percent of the respondents who experienced critical fund shortage assigned various reasons for this condition. These reasons range from price fluctuation, excessive rainfall, high disease incidence, low market demand and glut on the market to high input cost, scarce resources and poor planning. The implication is that should any financial institutions and or cooperate organisations want to advance credit to these farmers, timing should be considered critical especially from the month of April to September.

Distribution of Major Sources of Labour by Sex of Respondents

Table 11 shows cross-tabulation between major sources of labour and sex of respondents. Labour which constitutes human capital represents the skills, knowledge and good health that enable people to pursue different livelihood strategies and achieve their livelihood objectives. Despite the small proportion of female (6 percent) in this study, the majority (5 percent) of them and male respondents (75.3 percent) depended on personal labour for their farm operations. The reliance on personal labour could be attributed to the scarcity and or high labour cost. The small farm sizes of respondents might also be a contributive factor for the use of personal labour. It can be observed from the results also that the choice and use of personal labour was not confined to one particular sex. This suggests that despite the difficult nature of

the vegetable production process, female respondents were equally up to the task. The findings made by Drechsel, Giordano and Gyiele (2004) that sources of farm labour for urban vegetable farming are family and or hired labour deviates from this study results.

Table 11: Distribution of Major Sources of Labour by Sex of Respondents

Type of labour	Sex of Respondents				Total	
	Male		Female			
	f	%	f	%	f	%
Personal labour	226	75.3	15	5.0	241	80.3
Family labour	32	10.7	1	0.3	33	11.0
Hired labour	20	6.7	2	0.6	22	7.3
Communal labour	4	1.3	-	-	4	1.3
Total	**282**	**94**	**18**	**6.0**	**300**	**100.0**

Source: Field Survey Data, 2010

Respondents' Major Farm Activities for Hiring Labour

The quantity and quality of labour available at household levels varies according to household size, skill levels, health status and leadership potential. The multiple responses of the main activities for which labour is engaged showed that 23.4 percent, 18.9 percent and 18.7 percent of the respondents engaged labour for field activities such as bed raising, watering and weeding respectively (Table 12). About 15.3 percent, 7.9 percent and 6 percent also engaged labour for land clearing, transplanting and stirring respectively. Whilst seed nursing constituted 4.9 percent of the respondents, fertilization and harvesting of vegetable produce summed 4.3 percent and 0.6 percent

respectively. Even though 80.3 percent of the respondents depended on personal labour for most of their farm operations, they also engaged labour especially for land clearing, vegetable beds construction, watering and hand weeding. This suggests that vegetable production is really difficult as admitted by 98 percent of the respondents. The difficult nature of the vegetable production especially the cultural practices might have accounted for the engagement of extra labour by respondents to complement their efforts.

Table 12: Respondents' Major Farm Activities for Hiring Labour

Activities	**Frequency**	**Percent**
Bed raising	110	23.4
Watering	89	18.9
Weeding	88	18.7
Land clearing	72	15.3
Transplanting	37	7.9
Stirring	28	6.0
Seed nursing	23	4.9
Fertilization	20	4.3
Harvesting	3	0.6
Total	**470**	**100.0**

n= 300 Dichotomy group tabulated at value 1 (Multiple responses)

Source: Field Survey Data, 2010

Investment Cost of Planting Materials per Season by Respondents

The source of planting materials is very important as it can affect the farmers' productivity hence their livelihoods. Fortunately, 72.7 percent of the

respondents claimed they obtained their seeds from input dealers. The cost of planting materials per season from Table 13 revealed that some (29.3 percent) of the respondents dispensed between ¢31.00 and ¢60.00 on planting materials. Whilst 25.7 percent each claimed they spent ≤ ¢30.00 and between ¢61.00 and ¢100.00. However, only few (19.3 percent) farmers admitted dispensing above ¢100.00 on planting materials alone. The respondents (74.3 percent) also rated the cost of planting materials as 'high'. These findings suggest that the farmers were inconsistent on the rating of the cost of planting materials. This might have been due to the different input dealers that the farmers perhaps transact business with. The findings of this study agree with that of Keraita, Drechsel, Huibers and Raschid-Sally (2002) that vegetable seeds are relatively expensive.

Table 13: Investment Cost of Planting Materials per Season by Respondents

Cost of planting materials per season (¢)	Frequency	Percent	Cum %
≤ 30.00	77	25.7	25.7
31.00 - 60.00	88	29.3	55.0
61.00 - 100.00	77	25.7	80.7
> 100.00	58	19.3	100.0
Total	**300**	**100**	

Source: Field Survey Data, 2010

Investment Cost of Weeding per Season by Respondents

Weeding cost per season was also investigated and the results presented in Table 14. It is revealing from the study result that the respondents

(34.4 percent) did not engage the services of labour for manual weeding probably either because labour was not readily available or perhaps they wanted to cut down on production cost due to high labour cost. The small farm sizes of the famers might have also prompted this development. This is because it would be economically unwise to engage labour on very small plot of land unless under very critical situations and or conditions of the farmer such as ill-health. Whilst 26 percent incurred weeding cost between ¢21.00 and ¢60.00 per season, 23.3 percent pegged the cost above ¢60.00. Farmers who incurred cost between ¢1.00 and ¢20.00 were about 16.3 percent. The majority (77.7 percent) of the respondents also indicated that they hand weeded their farms more than 5 times per season. This suggests that the more frequent weeding is done, the higher the production cost especially as the cost of weeding was perceived to be high.

On the rating of the cost of weeding, 36.3 percent of the respondents rated it as 'high'. Whilst 15.7 percent mentioned the weeding cost as 'very high', 13.3 percent and 0.3 percent also rated it as 'low' and 'very low' respectively. The results revealed that the farmers were different in the investment cost of weeding. The high labour cost of weeding might have informed some of the respondents (34.4 percent) to resolve to personal or own labour for some of the cultural practices. The finding of Drechsel, Giordano and Gyiele (2004) that weeding was the most expensive among the cultural practices by vegetable farmers is consistent with the results of this study.

Table 14: Investment Cost of Weeding per Season by Respondents

Investment Cost (¢)	Frequency	Percent	Cum %
No cost	103	34.4	34.4
1.00 - 20.00	49	16.3	50.7
21.00 - 60.00	78	26.0	76.7
> 60.00	70	23.3	100.0
Total	**300**	**100.0**	

Source: Field Survey Data, 2010

Investment Cost of Irrigating Farm per Season by Respondents

The study results showed that the majority (59 percent) of the respondents neither cost nor rated the cost of irrigation because they did the irrigation themselves. As a result they did not quantify or put monetary value on their own labour. The respondents (59 percent) did not engage labour for this cultural practice though they claimed it was tedious and time consuming perhaps due to the prohibitive labour cost involved. The study by Danso, Drechsel, Wiafe-Antwi and Gyiele (2002) that field irrigated with pumps are expensive due to the cost of hiring these pumps which is estimated between US$ 40-70 per dry season is consistent with the findings of this study. They further indicated that manual irrigation is even more expensive per volume of water delivered.

Investment Cost of Agro-Chemicals Used by Respondents

The study results revealed that more than half (53.3 percent) of the respondents used both inorganic and organic sources of fertilizers as soil

fertility amendments in their production. The respondents (75 percent and 25 percent) claimed they sourced these fertilizers from various poultry farms and input dealers respectively in the metropolis. The majority (98.7 percent) of the respondents also admitted sourcing other agro-chemicals (pesticides, fungicides, nematicide and herbicides) from input dealers for use on their vegetable farms. Presented in Table 15 is the total cost of agro-chemicals used by the respondents per season on their farms. The results revealed that between ¢51.00 and ¢100.00 was dispensed on agro-chemicals per season by 31 percent of the farmers on their farms. The results again showed that 26.7 percent spent an amount of ¢50.00 or less on agro-chemical per season. Twenty-four percent and 18.3 percent claimed they spent over ¢150.00 and between ¢101.00 and ¢150.00 respectively on agro-chemicals per season on their production.

The farmers (83 percent) also rated the cost of agro-chemicals used per season on their farms as 'high'. The high cost of agro-chemicals reported by the respondents suggests that the farmers purchased them in bits thereby attracting no discount from these input dealers. The amount of money dispensed on agro-chemicals was inconsistent among the farmers perhaps because of varied farm sizes coupled with the different vegetable crops cultivated. This is because some of the vegetable crops cultivated especially the leafy ones are more susceptible to insect-pests attack and therefore require frequent application of pesticides. This findings fall in line with the report of Drechsel, Giordano and Gyiele (2004) that significant number of vegetable growers use soil fertility amendments and pesticides. Obuobie *et al.* (2006)

also shared similar views that farmers used various means in checking crop diseases and pests including the use of agro-chemicals.

Table 15: Investment Cost of Agro-Chemicals Used by Respondents

Cost of agro-chemicals (¢)	Frequency	Percent	Cum %
≤ 50.00	80	26.7	26.7
51.00- 100.00	93	31.0	57.7
101.00 -150.00	55	18.3	76.0
≥ 150.00	72	24.0	100.0
Total	**300**	**100.0**	

Source: Field Survey Data, 2010

Urban Vegetable Productivity by Respondents

Vegetable productivity estimates on all the cultivated vegetables were also investigated and the results presented in Table 16. The total vegetable production covered an area of about 114ha as against 41ha reported by Cornish and Lawrence (2001) for only dry season farming. The significant difference in land area may be due to the fact that the study was conducted in the major wet season. During this period a lot of people might have been attracted into the industry because manual irrigation which probably deter prospective farmers due to its tediousness and time consuming nature at this period of the season was minimal if not absent. The results again revealed that the farmers were more into leafy vegetable (lettuce, cabbage and spring onions) production with recorded land area of 39.7 ha, 28.8ha and 27.6ha respectively. This result confirms the findings of IMWI (2006) that the most common cultivated vegetables were the leafy ones. The highest land area recorded under lettuce could be attributed to the shorter gestation period of the

crop hence yields frequent income to the farmer. This study results fall in line with the findings of Cornish and Lawrence (2001) that about 95 percent of the lettuce produced in Kumasi comes from urban farms.

Furthermore, the three (3) leafy vegetables (lettuce, cabbage and spring onions) have high market preference probably because of factors such as increase in hospitality industry, influx of expatriates and increase in food joints in the metropolis. These findings are buttressed by Drechsel, Graefe, Sonou and Cofie (2006) report that short duration crops such as lettuce and spring onion are generally preferred for quick cash returns and also in view of the farmers' insecure tenure situations. The seasonal average productivity of land/ha presented in Table 16 ranges from ¢300.00 to ¢16,350.00 for okra and carrot respectively. The seasonal average productivity figure of approximately ¢9,200.00/ha reported by Abaidoo *et al*. (2009) is higher than all the seasonal average productivity figures revealed by this study except for carrot and kenaf.

Carrot registered a higher seasonal average productivity figure probably because of its' less susceptibility to insect/pests attack and also has a high plant population/unit area resulting from its intimate planting distance. In general, the findings of this study revealed that the farmers were seriously under-producing perhaps due to their ignorance about modern and scientific technologies and agronomic practices. This may be due to the absence of agricultural extension information, lack of or inadequate training programmes and Farm Based Organisations (FBOs). Productivity generally might have been affected by both natural and environmental factors such as pests and diseases, lack of resources, droughts and floods (Folke *et al*, 2002). The total

land area for the individual crops is arranged in descending order of land sizes (hectares).

Table 16: Urban Vegetable Productivity by Respondents

Vegetable crops	Total land area for individual crops (ha)	Seasonal average productivity of land/ha (Gh¢)
Lettuce	39.7	7, 394.96
Cabbage	28.8	3,142.36
Spring onions	27.6	9, 088.04
Pepper	4.6	8,750.00
Jute mallow	4.1	4, 098.54
Cucumber	2.9	1, 175.86
Tomato	1.8	5, 347.22
Spinach greens	1.4	8, 752.86
Cauliflower	0.7	4, 527.14
Garden eggs	0.7	9, 285.71
Okra	0.6	300.00
Carrot	0.6	16, 350.00
Kenaf	0.5	11, 650.00
French beans	0.4	2, 150.00

Source: Field Survey Data, 2010

Marketing of Vegetable Produce by Respondents

One of the consistent challenges or constraints to urban vegetable production is marketing. The marketing of urban vegetables have been monopolised by middle men who also control market prices. The results of the investigation on marketing channels, mechanisms and pricing of farm

produce revealed that the respondents marketed their farm produce through middle men (97.3 percent) and at farm gate (97.7 percent) level. The sale of vegetable produce directly to traders at farm gate level suggests that the farmers were more vulnerable to cheating and manipulation in the market pricing of their produce by middle men due to the absence of effect FBOs which champion their welfare. This might have adversely affected the farmers' livelihoods. On the pricing of farm produce, though the respondents (64.7 percent) claimed it was their prerogative, the influence of middle men cannot be ignored. Though, these farmers are unaware how much these middle men sell their produce, they are certain that they are not being paid a fair price. The findings of Obuobie *et al*. (2006) that significant amount of vegetable produced in the city is sold at farm gate level is consistent with this study results.

Respondents' Vegetable Farming Experience

Experience in vegetable production is very important because it leads to increase in production efficiency. The results of vegetable production experience presented in Table 17 showed that 56 percent out of the 300 respondents had been producing vegetables between 1 and 6 years. Whilst vegetable farmers with production experience between 7 and 9 years constituted 22.3 percent, those with 10 to 13 years and above 13 years production experience formed 12.7 percent and 9 percent of the respondents respectively. The number of years that farmers had been in production was less perhaps due to the youthful nature of their age structure. This also suggests a greater potential and efficiency of the vegetable industry. The

findings of Abaidoo *et al*. (2009) that the respondents (76.3 percent) had less production experience due to their youthful age structure concur with the results of this study. The findings by Ojo, Connaughton, Kintomo, Olajide-Taiwo and Afolayan (2010) in both Lagos and Abeokuta that farmers (48 percent) and (58 percent) had over 10 years vegetable production experience is at variance with this research findings. The implication is that vegetable production experience may vary from country to country and even within a given country or city. The mean farming experience of respondents was 2.4 years with a standard deviation of 1.26. The minimum and maximum farming experience was 1year and 27 years respectively.

Table 17: Respondents' Vegetable Farming Experience

Years of experience	**Frequency**	**Percent**	**Cum %**
1-3	84	28.0	28.0
4-6	84	28.0	56.0
7-9	67	22.3	78.3
10-13	38	12.7	91.0
>13	27	9.0	**100.0**
Total	**300**	**100.0**	

Mean = 2.4 SD =1.26 Minimum = 1yr Maximum = 27yrs

Source: Field Survey Data, 2010

Ratings of Vegetable Production Challenges Faced by Respondents

Investigation was also conducted on the vegetable production challenges faced by respondents and how they rated these challenges. The results (see Appendix 2) revealed that 46.6 percent of the respondents rated

input cost of vegetable production as ‘extremely severe’. Whilst some respondents (26 percent) rated it as ‘very severe’, 14 percent mentioned that it was ‘severe’. About 7.7 percent and 3.7 percent also rated it as ‘moderately severe’ and ‘slightly severe’ respectively. Only few (2 percent) of the farmers rated input cost as ‘not severe’. Production challenges of pests and disease incidence was also rated by 31 percent and 25.3 percent as ‘severe’ and ‘moderately severe’ respectively. Again, 14 percent rated it as ‘very severe’ and 13.3 percent as ‘slightly severe’. Whilst 8.7 percent indicated that the incidence of pests and diseases was ‘not severe’, 7.7 percent on the contrary, believed it was ‘extremely severe’. Poor soil fertility as a production challenge was ranked by 31.3 percent of the respondents as ‘not severe’. Whilst 24 percent rated it as ‘slightly severe’, 15.7 percent each mentioned that it was ‘moderately severe’ and ‘very severe’. About 8.7 percent and 4.7 percent rated poor soil fertility as ‘severe’ and ‘extremely severe’ among the production challenges respectively. Twenty-six percent of the respondents rated inadequate water as ‘slightly severe’ production challenge. In addition, 21.7 percent and 21.3 percent rated it as ‘moderately severe’ and ‘not severe’ respectively. Nine percent and 7.7 percent of the respondents, respectively rated water inadequacy as ‘extremely severe’ and ‘very severe’.

The challenge of crops irrigation was rated by 27.7 percent and 24.7 percent as ‘not severe’ and ‘slightly severe’ respectively. About 18.3 percent and 11.3 percent also rated it as ‘moderately severe and ‘extremely severe’ respectively. Nine percent each rated the challenge of crops irrigation as ‘very severe’ and ‘severe’ respectively. Lastly, lack of credit facilities as a production challenge was rated by 28.7 percent, 24.3 percent, 20.3 percent and

12.7 percent of the respondents as ‘very severe’, ‘severe’, ‘extremely severe’ and ‘moderately severe’ respectively. This suggests that generally, respondents were varies in their opinion regarding the rating of the vegetable production challenges. The implication is that different respondents rated vegetable production challenges differently according to their perceived severity level.

Management of Vegetable Production Challenges Faced by Respondents

Management of production challenges was also investigated. The results of the investigation revealed that high input cost was rated as ‘very severe’ of the production challenges. Out of the 300 respondents, 46.7 percent indicated that they had no option than to purchase these inputs irrespective of their prices. In addition, 33.7 percent and 19.6 percent of the respondents admitted purchasing only what they could afford and cutting down on production respectively as their intervention measures. Lack of credit facilities was also rated as ‘very severe’ among the production challenges. The respondents (86.7 percent) mentioned the intervention measure as depending on their own meagre resources. Pests and diseases incidence was rated as ‘severe’.

The respondents (56.3 percent) claimed they used agro-chemicals (fungicides and pesticides) to manage these challenges. Inadequate water for irrigation was also rated as ‘moderately severe’. Whilst, 47 percent did not consider water inadequacy as a challenge, digging of extra wells was employed by 36 percent of the farmers and 17 percent reduce their farm size to contain the situation. Poor soil fertility challenge was ranked as ‘slightly

severe'. As a remedial measure, the respondents (55.3 percent) applied both inorganic and organic fertilizers as soil fertility amendments. To the majority (81.7 percent) of the respondents, irrigation of crops was a minor challenge that needed any intervention. Most of the intervention measures implemented by the respondents could have been resolved through the formation of FBOs. This is because a group has the strong ability to access certain facilities including credits, extension services, inputs and marketing than individuals.

Ranking of Urban Vegetable Production Challenges by Respondents

Urban vegetable production challenges were ranked according to the level of severity using Kendall's Coefficient of Concordance analysis. The results from Table 18 showed that there was 51.8 percent agreement among the farmers on the ranking of the vegetable production challenges they encountered. The coefficient of concordance (W) was significant at 5 percent. Whilst high input cost and lack of credit facilities were ranked as 'very severe', incidence of pests and diseases were ranked as 'severe' among the production challenges. Inadequate water was ranked as 'moderately severe'. Poor soil fertility and crops irrigation challenges were also ranked as 'slightly severe' among the production challenges. The vegetable production challenges are arranged in order severity of mean ranking by respondents. Whilst high input cost was ranked as 'extremely severe' of the production challenges, crops irrigation was ranked as not 'severe'. This results deviate partly from that of Obuobie *et al.* (2006) who indicated that input cost, crop diseases and inadequate water were very important production challenges faced by urban

farmers. They further indicated that lack of credit facilities and soil fertility were ranked as less important.

Table 18: Ranking of Urban Vegetable Production Challenges by Respondents

Production challenges	Mean Ranking	Rank
High input cost	2.09	1
Lack of credit facilities	2.27	2
Incidence of pests and diseases	2.91	3
Inadequate water	3.93	4
Poor soil fertility	4.65	5
Irrigation of crops	5.16	6

n = 300; W = 0.518; df = 5, significance at 0.05 percent; Scale: 1 = Extremely severe; 2 = Very severe; 3 = Severe; 4 = Moderately severe; 5 = Slightly severe; 6 = Not severe; Source: Field Survey Data, 2010

Ratings of Vegetable Marketing Challenges Faced by the Respondents

The majority of the respondents (refer to Appendix 3) rated the urban vegetable challenge of lack of cold transport and storage facilities (50.7 percent) and fluctuating demand (56.7 percent) as 'not severe' and 'very severe' respectively. On postharvest losses, whilst some (36.7 percent) of the respondents rated it as 'severe', 22.7 percent and 22 percent rated it as 'very severe' and 'moderately severe' respectively. Furthermore, 14.3 percent indicated 'not severe' whilst 4.3 percent mentioned that it was 'very severe'. On the challenge of female dominance 33 percent rated it as 'slightly severe' and 'not severe' by 27.7 percent of the respondent. In addition, 16.3 percent

rated it as ‘moderately severe’, 12.7 percent (severe) and 10.3 percent rated it ‘very severe’ marketing challenge. Thirty-six percent of the respondents’ rated low price offer as ‘severe’. Whilst 25.7 percent rated it as ‘moderately severe’, 25.3 percent rated as ‘very severe’ marketing challenge. Low price offer was further rated ‘moderately severe’ by 7.3 percent and ‘not severe’ by 5.7 percent of the respondents. This suggests that the farmers were different in their ratings of the marketing challenges except for lack of cold transport and storage facilities and fluctuating demand. The findings of Drechsel and Kunze (1999) that both fluctuating demand and lack of cold transport and storage facilities are marketing challenges are consistent with the results of this study. However, this study rated the latter as ‘not severe’ a production challenge.

Management of Urban Vegetable Marketing Challenges Faced by Respondents

Lack of cold transport and storage facilities was rated as ‘not severe’. The respondents (80.7 percent) indicated that they do not need these facilities since they readily dispose of their produce. Fluctuating demand was also rated as ‘very severe’ of the vegetable marketing challenges. Various reasons were offered by the respondents for the management of this challenge. About 56.7 percent mentioned price reduction as an intervention measure to this challenge. The respondents (100 percent) could not assign any intervention measures to the postharvest challenge which was ranked as ‘severe’. Female dominance was rated as ‘moderately severe’ of all the marketing challenges. Sixty-one percent were not bothered about this marketing challenge. The male respondents mentioned that they sometimes infiltrated the market but often

incurred the displeasure of market women who have monopolised the sale of these produce. About 53 percent of the respondents indicated that they had no option but to accept the low price offered them by middle men. This portrays the extent of vulnerability confronting these farmers. Middle men therefore ceased the opportunity to exploit these innocent farmers to their advantage. These adversely affected the farmers' livelihoods in particular and food security in general.

Ranking of Urban Vegetable Marketing Challenges by Respondents

Urban vegetable marketing challenges were ranked according to the extent of severity. From the results revealed in Table 19, about 40.8 percent of the vegetable farmers basically agreed on the rankings of the urban vegetable marketing challenges using Kendall's Coefficient of Concordance analysis. This implies that the respondents were different in opinion regarding their ranking of the marketing challenges. The coefficient of concordance (W) was significant at 5 percent. The findings of this study revealed that fluctuating demand and low price offer were ranked as 'severe' and 'moderately severe' marketing challenges respectively. Whilst postharvest losses was ranked as 'moderately severe', 'female dominance' and lack of cold transport and storage facilities were both ranked as 'slightly severe'. Though, the respondents were different in their opinion regarding the most important marketing challenges, the results from Kendall's coefficient of concordance analysis tagged fluctuating demand, low price offer and postharvest losses as the most important vegetable marketing challenges. This result partly agree with that of Cornish, Aidoo, Ayamba (2001) and Drechsel and Kunze (1999)

who indicated that fluctuating demand and lack of cold transport and storage facilities were the most important marketing challenges confronting urban vegetable farmers. Though, the results of this study found fluctuating demand to be the most important marketing challenge, lack of cold transport and storage facilities was however the least important among the marketing challenges.

Table 19: Ranking of Respondents' Urban Vegetable Marketing Challenges

Marketing challenges	Mean Ranking	Rank
Fluctuating demand	1.64	1
Low price offer	2.62	2
Postharvest losses	2.95	3
Female dominance	3.74	4
Lack of cold transport and storage facilities	4.05	5

n = 300; W = 0.408; df = 4, significance at 0.5 percent; Scale: 1= Very Severe; 2 = Severe; 3 = Moderately Severe; 4 = Slightly Severe; 5 = Not Severe

Source: Field Survey Data, 2010

Farmers' Perceived Level of Effect of Urban Vegetable Production on their Livelihoods

The examined farmers' livelihoods have been subscaled into six (6) groups including natural, information, financial, human, social and physical capitals.

Farmers' Perceived Level of Effect of Urban Vegetable Production on their Natural Capital

Natural resources (land and water) are integral to farmers' livelihoods and most agricultural programmes. Presented in Appendix 4 are frequencies and percentages of the respondents who confirmed that vegetable production has improved various dimensions of their natural capital and those who adventure that there was 'no improvement'. It can be observed that whilst some of the respondents (45 percent) indicated that vegetable production had 'no improvement' on their natural capital through increase in land size for production, 36.7 percent were of the opinion that its impact was 'high'. About 8.3 percent, 7.7 percent and 2.3 percent of the respondents also reported that vegetable production impacted 'very high', 'low' and 'very low' respectively on their land sizes for production. On the increase access to water for irrigation, 43.7 percent of the respondents indicated that vegetable production's influence was 'high'. Thirty-nine percent of the respondents also perceived that there was 'no improvement' on their access to water for irrigation. Access to irrigation water was further perceived to be 'low' (8.7 percent), very high' (6.7 percent) and 'very low' (2.3 percent) by the respondents. Lastly, the respondents (78.3 percent) perceived that vegetable production impacted 'high' on their natural capital through yield increment.

Table 20 indicates the mean perceived level of impact of vegetable production on the various indicators of farmers' natural capital. The result showed that the impact of vegetable production on greater aspects of the respondents' natural capital was perceived to be 'high' for yield increment ($\overline{X}$ = 2.85), 'low' for increase access to water for irrigation ($\overline{X}$ = 1.77) and land

size for production ($\overline{X}$ = 1.61). The mean of the natural capital indicators ranges from 1.61 to 2.85. The respondents also perceived that the effect on their natural capital as a whole was 'moderately high' ($\overline{X}$ w = 2.07, SD = 1.23). The standard deviation values for the various aspects of the farmers' natural capital revealed that the respondents were varied in their views on the level of contribution of vegetable production to their natural capital. On a whole, the standard deviation value also showed differences in famers' opinions on the level of contribution. The results of the various aspect of the respondents' natural capital are organised in descending order of means of responses.

Table 20: Mean Perceived Level of Contribution to Farmers' Natural Capital

Natural capital	**n**	**$\overline{X}$**	**SD**
Increase in yield	291	2.85	0.68
Increase access to water for irrigation	184	1.77	1.49
Increase in land size for production	165	1.61	1.54
Weighted Mean ($\overline{X}$w)		**2.07**	**1.23**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1 = Low (L)

Source: Field Survey Data, 2010

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Information Capital

Information access and its diffusion among farmers play an important role in the realisation of increased agricultural productivity. Appendix 5 shows

frequency distribution of farmers' perceived level of contribution of vegetable production to the various facets of their information capital. Whilst 24 percent of the respondents perceived that vegetable production's level of contribution to their' information capital in terms of awareness of land and water resources management was 'high', 23.3 percent on the contrary thought it had no impact (no improvement). Again, 13.3 percent perceived the level of influence to be 'low' and 9 percent mentioned that the level of impact was 'very low'. Only few (3.7 percent) of the respondents however, perceived that vegetable production impacted 'very high' on their awareness of land and water resources management.

In addition, the majority (79 percent) of the respondents perceived that increase in the level of their decision making ability resulting from their vegetable production was 'high'. Furthermore, over half (55.3 percent) of the respondents' perceived that vegetable production had 'not improved' their access to services from change agents. Again, the results (see Appendix 5) revealed that 86.6 percent indicated that vegetable production had 'not improved' their awareness level of Information and Communication Technology (ICT) to information access. Similarly, 85.3 percent indicated that vegetable production had not impacted on their access to credit facilities (no improvement). Fifty-five percent of the respondents mentioned that their awareness level of farmer's association result from the vegetable production was 'moderately 'low'. The results further revealed that 53.3 percent of the respondents perceived that vegetable production contributed nothing (no improvement) to their level of access to marketing avenues of their information capital.

Table 21 also shows the mean perceived level of contribution of vegetable production to the various aspects of famers' information capital. The mean of responses are also arranged in descending order. The results indicated that the level of contribution of vegetable production to the respondents' various aspects of their information capital was 'high' for decision making ability ($\overline{X}$ =2.74). Whilst awareness of farmer association ($\overline{X}$=1.80) recorded 'low', 'very low' was registered for awareness of land and water resources ($\overline{X}$ =1.22), increase access to marketing avenues ($\overline{X}$ = 1.18) and increase access to services from change agents ($\overline{X}$ =1.11). Increase access to credit facilities ($\overline{X}$ = 0.37) and awareness of ICT to access information ($\overline{X}$= 0.35) also recorded 'no improvement' from the vegetable production.

The mean of the various aspects of information capital ranges from 0.35 to 2.74. The standard deviation also showed that the majority of the respondents' held similar opinions regarding the level of contribution of vegetable production to their information capital. However, respondents' differ in their views on awareness of land and water resources management (1.37), increase access to marketing avenues (1.35) and services from change agents (1.34). The respondents also perceived the level of contribution of vegetable production to their information capital in general as 'low' ($\overline{X}$ w = 1.25, SD = 1.09). The views of the respondents on the contribution of vegetable production to the various aspects of their information capital in totality showed variations in their opinions as shown by the standard deviation value (1.09).

Table 21: Mean Perceived Level of Contribution to Farmers' Information Capital

Information Capital	n	$\overline{X}$	SD
Increase your decision making ability	287	2.74	0.76
Awareness of farmers association	262	1.80	0.99
Awareness of land & water resources management	150	1.22	1.37
Increase access to marketing avenues	140	1.18	1.35
Increase access to services from change agents	134	1.11	1.34
Increase access to credit facilities	40	0.37	0.95
Awareness of ICT to access information	44	0.35	0.91
Weighted Mean ($\overline{X}$ w)		**1.25**	**1.09**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1 = Low (L)

Source: Field Survey Data, 2010

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Financial Capital

The respondents (78 percent) who claimed that vegetable production influenced their financial capital through increase in their income level also perceived that the level of influence was 'high' (see Appendix 6). Whilst 48 percent perceived that the level of impact was 'high' on savings, about 30.7 percent perceived that it had no influence (no improvement). Again, 17.3 percent of the respondents perceived the level of contribution to be 'low' whilst 2 percent each perceived 'very low' and 'very high' contributions to

their savings. The respondents (44 percent) admitted that vegetable production contributed to a decrease in their level and that the level of contribution was 'high'. Thirty-two percent and 11.7 percent claimed that there was 'no improvement' and 'low' impact respectively on their debt level as far as vegetable production is concerned. In addition, whilst 9 percent perceived the effects to be 'very high', 3.3 percent held a contrary view of 'very low' effects on their debt level. Lastly, the respondents (approximately 87 percent) perceived that there was 'no improvement' on their access to financial facilities as a result of the vegetable production.

Table 22: Mean Perceived Level of Contribution to Farmers' Financial Capital

Financial Capital	**n**	**$\overline{X}$**	**SD**
Increase in income level	289	2.78	0.71
Decrease in debt level	204	1.94	1.45
Increase in savings	208	1.88	1.34
Increase access to financial facilities	40	0.61	1.12
Weighted Mean ($\overline{X}$w)		**1.80**	**1.15**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1 = Low (L)

Source: Field Survey Data, 2010

Table 22 shows that mean perceived level of contribution of vegetable production to the various indicators of farmers' financial capital was 'high' for increased income level ($\overline{X}$ = 2.78), 'low' for decrease debt level ($\overline{X}$ =1.94) and the level of savings ($\overline{X}$ = 1.88).

For access to financial facilities ($\overline{X}$ = 0.61) vegetable production impacted 'very low'. The level of effect of vegetable production on their

financial capital in totality was 'low' (**$\overline{X}$**w = 1.80, SD = 1.15). The standard deviations for the various financial capital indicators indicate that the respondents were diverse in their opinion regarding the level of contribution of vegetable production to their financial capital. Similarly, the standard deviation for the financial capital in totality (1.15) showed that the farmers were different in their views about the level of effect of vegetable production on their financial capital.

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Human Capital

The majority of the respondents' also perceived that the vegetable production impacted 'high' on their human capital through increase access in knowledge and skill levels (82.7 percent) (refer to Appendix 7). Vegetable production was perceived to make 'no improvement' on farmers' increase level of access to health facilities (67 percent), training (60 percent) and labour (62 percent).

Table 23 shows mean perceived level of effect of vegetable production on the various aspects of famers' human capital. The result indicated that the level of effect of vegetable production on the respondents' various aspects of human capital was perceived to be 'high' ($\overline{X}$ = 2.88) for increase in knowledge and skill levels. Increase access to training ($\overline{X}$ = 1.01), labour ($\overline{X}$ = 0.84) and health facilities ($\overline{X}$ = 0.67) were perceived by the respondents to be 'very low'. The mean of the various aspects of the respondents' human capital ranges from 0.67 to 2.88. The standard deviation also showed the respondents' held varied opinions on the level of contribution of vegetable production to their

human capital. The respondents also perceived that the level of contribution of vegetable production to their human capital in totality was 'low' ($\overline{X}w$ = 1.35, SD = 1.06). The standard deviation also indicates that the respondents shared varied views on the level of contribution of the vegetable production to their human capital in totality. The mean of responses of respondents' human capital are arranged in descending order from.

Table 23: Mean Perceived Level of Contribution to Farmers' Human Capital

Human Capital	**n**	**$\overline{X}$**	**SD**
Increase in knowledge/skill levels	290	2.88	0.68
Increase access to training	120	1.01	1.33
Increase access to labour	114	0.84	1.19
Increase access to health facilities	99	0.67	1.06
Weighted Mean ($\overline{X}w$)		**1.35**	**1.06**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1= Low (L)

Source: Field Survey Data, 2010

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Social Capital

Appendix 8 shows the frequency distribution of farmers' perceived level of contribution of vegetable production to the various aspects of their social capital. The results revealed that 80.3 percent each of the respondents perceived that the vegetable production did not influence (no improvement) their social capital through membership and support received from the association. The support from other individual farmers was perceived to be

'high' according to 47.7 percent of the respondents. Whilst 21.3 percent perceived the level of impact to be 'low', 16.7 percent on the contrary, thought it was 'very high'. Thirteen percent and 1.7 percent perceived that the vegetable production did 'not impact' and impacted 'very low' on the level of support received from other individual farmers respectively.

Whilst the majority of the respondents claimed that the level of care for the household (69.3 percent), payment of school fees (54.7 percent) and the level of support offered other family members (57.7 percent) were 'high', 59.7 percent perceived that it was 'very low' when it comes to the level of support offered friends. Again, the results revealed that the level of contribution of the vegetable production was 'very low' (28.3 percent), 'low' (27.3 percent) and 'high' (27 percent) for the payment of funeral dues and other levies. In addition, whilst 13.3 percent perceived that the vegetable production did not impact on their payment of funeral dues and other levies, 4 percent on the contrary, believed it impacted 'very high' on their social capital.

Table 24 further shows mean farmers' perceived level of contribution of vegetable production to the various aspects of their social capital. The various facets of farmers' social capital are also set out in descending order of mean of responses. The results showed that the level of impact of vegetable production on the various aspects of respondents social capital was 'high' for care for the household ($\overline{X}$ = 2.69), payment of school fees ($\overline{X}$ = 2.56) and support from other individual farmers ($\overline{X}$ = 2.54). The level of contribution was also perceived to be 'low' ($\overline{X}$ = 2.49, 1.80) for support to other family members and payment of funeral dues and other levies respectively. It was again perceived to be 'very low' for support offered friends ($\overline{X}$ = 1.30), membership to

association ($\overline{X}$ = 0.63) and support from the association ($\overline{X}$ = 0.51) with the mean ranging from 0.51 to 2.69. The standard deviation for the various aspects of the respondents' social capital indicates that the respondents were varied in their opinions regarding the level of contribution of the vegetable production to their social capital.

Table 24: Mean Perceived Level of Contribution to Farmers' Social Capital

Social Capital	**n**	**$\overline{X}$**	**SD**
Care for the household	264	2.69	1.10
Payment of school fees	241	2.56	1.37
Support from other individual farmers	262	2.54	1.17
Support other family members	279	2.49	0.90
Payment of funeral dues and other levies	260	1.80	1.10
Support friends	262	1.30	0.91
Membership to association	59	0.63	1.32
Support from association	59	0.58	1.21
Weighted Mean ($\overline{X}$ w)		**1.82**	**1.14**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1 = Low (L)

Source: Field Survey Data, 2010

The respondents perceived that the level of contribution to their total social capital in general was 'low' ($\overline{X}$w = 1.82, SD = 1.14). The standard deviation for the various aspects of the respondents' social capital in totality also shows that there were divergent opinions on the level of impact of vegetable production on their social capital.

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Physical Capital

The results (see Appendix 9) showed that 32.7 percent of the respondents perceived that the level of contribution of the vegetable production to their physical capital through their ability to buy irrigation pump was 'high'. The respondents (14 percent), (13 percent), (11.3 percent) and (10.3 percent) perceived 'low' 'no impact' 'very low' and 'very high' impact levels of vegetable contribution to their physical capital. Also, 32.7 percent of the respondents who indicated that vegetable production influenced their ability to buy sprinklers also perceived the level of influence to be 'high'. On the contrary, 31.3 percent claimed that it had no influence on their ability to buy sprinklers. The rest of the respondents also admitted that the level of contribution of the vegetable to their ability to purchase sprinklers was 'low' (15 percent), 'very low' (10.7 percent) and 'very high' (10.3 percent).

Furthermore, a little over half of the respondents representing 51.3 percent perceived that the level of influence on their ability to buy watering cans was 'high'. On the ability to buy knapsack sprayers, 49.7 percent and 44.7 percent of the respondents reported that their vegetable production's level of impact was 'high' and 'very high' respectively. Whilst 2.3 percent did not perceive any impact, 2 percent on the contrary, perceived the level of contribution to be 'low'. Only about 1.3 percent of the respondents claimed that vegetable production impacted 'very low' on their ability to buy knapsack sprayers.

The respondents perceived that their ability to buy motor cycle/bicycle (52.7 percent), vehicles (67.3 percent) and build a house (54 percent) as result

of their vegetable production was ‘high’ and had ‘no influence’ on both (their ability to buy vehicles and build a house) respectively (see Appendix 9). Whilst 38 percent claimed that the vegetable production did not impact’ on their access to irrigation pump, 27.7 percent and 23.3 percent perceived that the level of influence was ‘very high’ and ‘high’ respectively. In addition, ‘low’ (6 percent) and ‘very low’ (5 percent) impacts were reported by the respondents as the contribution of vegetable production to their physical capital. The impact of vegetable production to the respondents’ ability to access sprinklers was ‘high’ (43.3 percent), ‘very high’ (26 percent) and ‘no impact’ (19.3 percent). The respondents also admitted that though there was influence on their ability to access sprinklers, such influence was perceived to be ’moderately high’ (6 percent) and ‘low’(5.3 percent). The respondents perceived that access to watering cans (59.7 percent), knapsack sprayers (58.7 percent) and motor cycle/bicycle (52 percent) was ‘very high as a result of the vegetable production’. Whilst 33.7 percent of the respondents claimed that the level of impact was ‘very high’, on the contrary, 32.7 percent reported that it did not influence their access to vehicles. Furthermore, the respondents also perceived the level of impact to be ‘high’ (22.3 percent), ‘low’ (6.3 percent) and ’very low’ (5 percent) on their physical capital. Lastly, the respondents (66.3 percent) perceived as ‘high’ the level of influence of vegetable production on their ability to rent a house.

Table 25 also shows mean perceived level of impact of vegetable production on the various aspects of farmers’ physical capital. The various aspects of farmers’ physical capital are also arranged in descending order of mean of responses. The results show that the level of impact of vegetable

production on the various aspects of the respondents physical capital was 'very high' ($\overline{X}$ = 3.53) for each of their ability to access watering cans and knapsack sprayers. The contribution was also perceived to be 'high' on their ability to buy watering cans ($\overline{X}$ = 3.43), ability to buy knapsack sprayers ($\overline{X}$ = 3.33), access to motor cycle/bicycle ($\overline{X}$ = 3.15), ability to rent a house ($\overline{X}$ = 3.11) and ability to buy motor cycle/bicycle ($\overline{X}$ = 2.96). In addition, the level of contribution was perceived to be 'low' for their ability to buy irrigation pump ($\overline{X}$ = 1.78), sprinklers ($\overline{X}$ = 1.80), ability to access irrigation pump ($\overline{X}$ = 1.97), access sprinklers ($\overline{X}$ = 1.89) and access to vehicles ($\overline{X}$ = 2.19). Vegetable production was again perceived to have impacted 'very low' on farmers' ability to buy vehicles ($\overline{X}$ = 0.59) and build a house ($\overline{X}$ = 1.02). The mean physical capital ranges from 0.59 to 3.53 and the standard deviation for the various aspects of respondents' physical capital indicates that the respondents were varied in their opinions regarding the level of impacts of vegetable production on the various facets of their physical capital. The respondents perceived that the level of contribution to their total physical capital as a whole was 'moderately high' ($\overline{X}$ w = 2.44, SD = 1.21). The standard deviation for the various aspects of the respondents' physical capital in totality (1.21) implies that the farmers had divergent opinion regarding the level of contribution of vegetable production to their physical capital.

Table 25: Mean Perceived Level of Contribution to Farmers Physical Capital

Physical Capital	n	$\overline{X}$	SD
Ability to access watering cans	295	3.53	0.69
Ability to access knapsack sprayers	297	3.53	0.68
Ability to buy watering cans	298	3.43	0.60
Ability to buy knapsack sprayers	293	3.33	0.78
Ability to access motor cycle/bicycle	276	3.15	1.19
Ability to rent a house	295	3.11	1.70
Ability to buy motor cycle/bicycle	273	2.96	1.16
Ability to access vehicles (cars, trucks, tractors)	202	2.19	1.70
Ability to access irrigation pump	186	1.97	1.70
Ability to access sprinklers	242	1.89	1.70
Ability to buy sprinkler	206	1.80	1.43
Ability to buy irrigation pump	205	1.78	1.44
Ability to build a house	138	1.02	1.28
Ability to buy vehicles (cars, trucks, tractors)	98	0.59	1.01
Weighted Mean ($\overline{X}$ w)		**2.44**	**1.21**

n = 300 Scale: 3 = High (H); 2 = Moderately High (MH); 1 = Low (L)

Source: Field Survey Data, 2010

One -Way ANOVA of Farmers' Livelihood Assets

One-way analysis of variance was computed to ascertain whether statistically significant differences existed among the farmers' perceived effect of urban vegetable production on their mean livelihood assets in the study area. The results shown in Table 26 revealed that statistically significant (sig 0.000) differences existed among farmers perceived level of contribution of urban vegetable production to their mean livelihood assets at 0.05 alpha level. This suggests that differences in the farmers' perceived level of effect of urban vegetable production on their mean livelihood assets were not due to chance. Therefore, the null hypothesis of the study which stated that 'there are no significant differences in the farmers' perceived level of effect of urban vegetable production on their livelihoods was rejected. The alternate hypothesis was however, accepted.

Table 26: ANOVA of Farmers' Mean Livelihood Assets

Livelihood capitals	Mean	SD	F- test	Sig.
Physical Capital	2.44	1.21	93.37	0.000
Natural Capital	2.07	1.23		
Social Capital	1.82	1.14		
Financial Capital	1.80	1.05		
Human Capital	1.35	1.06		
Information Capital	1.25	1.09		

n= 300 $p<0.05$ Scale: 3 = High (H); 2 = Moderately High (MH); 1= Low (L)

Source: Field Survey Data, 2010

Levene's test of homogeneity of variance was used to determine the appropriate post-hoc multiple comparisons to indicate exactly where the

significant differences occurred among the mean livelihood assets since the F-test showed significant differences.

Table 27: Tamhane's T2 Post-Hoc Multiple Comparisons of Farmers' Livelihood Assets

Livelihood Assets		Mean Difference		
A	**B**	**(A-B)**	**Std Error**	**Sig**
NC	IC	0.867*	0.067	0.000
NC	FC	0.153	0.073	0.424
NC	HC	0.207	0.073	0.068
NC	SC	0.121	0.067	0.663
NC	PC	- 0.488*	0.071	0.000
IC	FC	- 0.715*	0.060	0.000
IC	HC	- 0.660*	0.053	0.000
IC	SC	- 0.746*	0.057	0.000
IC	PC	-1.355*	0.066	0.000
FC	HC	0.054	0.066	1.000
FC	SC	- 0.031	0.059	1.000
FC	PC	- 0.641*	0.064	0.000
HC	SC	- 0.086	0.059	0.917
HC	PC	- 0.695*	0.064	0.000
SC	PC	- 0.609*	0.057	0.000

n = 300 $p<0.05$ Source: Field Survey Data, 2010

NC= Natural Capital HC = Human Capital FC = Financial Capital

SC = Social Capital IF = Information Capital PC = Physical Capital

Eta squared value = 0.2

The results revealed that variances that existed among the mean livelihood assets were highly significant. This suggests that equal variances are not assumed among the mean livelihood assets. Tamhane's T2 test (Table 27) was therefore chosen as the appropriate post-hoc multiple comparisons for the mean livelihood assets based on the Levene's test result.

Table 27 shows Post-hoc multiple comparisons of mean livelihood assets of farmers using Tamhane's T2 test. The results revealed that mean differences among farmers' natural ($\overline{X}$ =2.07; SD = 1.23), information ($\overline{X}$ = 1.25; SD = 1.09), financial ($\overline{X}$ = 1.80; SD = 1.15), human ($\overline{X}$ = 1.35; SD = 1.06), social ($\overline{X}$ = 1.82; SD = 1.14) and physical capitals ($\overline{X}$ = 2.44; SD = 1.21) were statistically significant with one another at 0.05 alpha level. This suggests that the significant differences among the mean livelihood assets were as a result of the farmers' urban vegetable production. The results also revealed that natural and physical capitals which were the most affected and recorded 'moderately high' means according to the scale of measurement, were significantly higher than information, financial, human and social capitals. The result is not surprising as it is partly consistent with the findings of Bosompim (2006) that farmers are likely to invest profits accrued from their farms in the purchase of inputs and other equipment that will assist them maintain their farms than investing it in other aspects of their livelihoods. The findings of Akaba (2008) that urban vegetable contributed 'high' to farmers' natural capital and 'low' to their financial and human capitals further agree with this study result.

On the contrary, the 'high' impact recorded on farmers' social capital and 'low' contribution to their physical capital by Akaba are at variance with

this research result. Generally, vegetable production in the study area significantly improved on farmers' natural and physical capitals compared to their information, financial, human and social capitals.

To find the strength of association statistics (magnitude of the differences between means) of farmers' livelihood assets, Eta squared was calculated based on the formula below:

$$\text{Eta squared} = \frac{\text{Sum of squares between groups}}{\text{Total sum of squares}} = 0.2$$

The value (0.2) suggests large effect size of mean livelihood assets of farmers using Cohen (1988) conversion guideline (see Appendix 10). The Eta squared value (0.2) implies that the differences among the mean livelihood assets are statistically and practically significant.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

General Overview

This chapter presents the summary, conclusions and recommendations of the study. It also suggests areas that future studies should be focused.

Summary

Increase in urban poverty is accompanying urbanisation process and poverty is gradually creeping into the urban areas the world-over. Unemployment, high prices of food commodities and food insecurity are but a few of the effects of the urbanisation challenges. Many of these urban dwellers as a remedy to these challenges have taken to all kinds of income generating activities especially vegetable production due to its potential profitability. Vegetable production offers opportunities to city dwellers nutritionally; it also improves the socioeconomic development of these producers. Unfortunately, the benefits of the vegetable production in terms of its effects on farmers' livelihoods have not been empirically examined in the areas where these vegetables are cultivated in the Kumasi metropolis.

The study broadly examines urban vegetable production and its effects on farmers' livelihoods in the Kumasi Metropolis in the Ashanti region of Ghana. The study was guided by the following specific objectives:

1. describe the demographic characteristics of urban vegetable farmers in the Kumasi Metropolis.
2. describe farm related characteristics of urban vegetable farmers in the Kumasi Metropolis.
3. determine production and marketing challenges of urban vegetable farming.
4. examine farmers' perceived level of effect of urban vegetable production on their livelihoods.
5. determine whether there are significant differences in the farmers' livelihood assets as a result of their urban vegetable production.

Based on the specific objectives of the study, structured and validated interview schedule was used to elicit information from 300 vegetable farmers in the study area. Measures of central tendency, descriptive statistics, cross-tabulations, Kendall's coefficient of concordance, multiple response and Analysis of Variance (ANOVA) were the statistical tools used to analyse the data. The summary of the major findings included the following:

Sex Distribution of the respondent revealed that men dominate the vegetable production industry generally. Marketing of urban vegetable produce is however the prerogative of women.

The age distribution of the respondents also revealed that the majority of them were youth. Members of this age structure are expected to be active and stronger than the ageing and the aged.

On the educational status of respondents, the study results revealed that about 60 percent of the farmers had either primary or Junior High School (JHS) education.

The greater proportion (114.0 ha) of land available to the respondents was put to vegetable production. The majority of the respondents were also small scale producers who cultivated land belonging to either the government or private individuals.

The study result revealed that the majority of the farmers sourced their irrigation water from both dug- out wells and streams. The use of watering cans was the irrigation method employed by 78.3 percent of the farmers

The majority of the respondents sourced their agricultural extension information from colleague farmers and input dealers rather than agricultural extension agents. Farmers (87 percent) also have limited access to credit facilities from financial institutions and training on vegetable production.

The results of the study also indicated that the cost of planting materials and agro-chemicals were high.

The total land area under vegetable production was 114.0 ha with farmers cultivating more leafy vegetables. Generally, the seasonal average productivity of land/ha for the majority of the cultivated crops was low.

Vegetable farmers market their farm produce through middle men and at farm gate level leading to the due to the exploitation by prospective buyers.

The study results revealed that there was agreement among a little over half (51 percent) of the farmers on the ranking of vegetable production challenges they encountered. On the contrary, 59.2 percent disagreed on the ranking of the vegetable marketing challenges they faced.

Generally, farmers' perceived level of effect of urban vegetable production on their livelihoods was 'low' except for natural and physical capitals which recorded 'moderately high' impact.

The results indicated that there were statistically significant differences among the mean livelihood capitals of the farmers at 0.05 alpha level. The magnitude of association (eta squared) value (0.2) further revealed that these differences were of much practical importance.

Conclusions

From the findings of the study, the following conclusions are drawn:

1. Urban vegetable producers in the Kumasi metropolis are predominantly male youth with basic level of education.
2. Vegetable production in the Kumasi metropolis is done mainly on small scale and usually on government and or private lands.
3. The greater proportion of the available land to farmers is put to vegetable production
4. The majority of the farmers' source irrigation water from dug-out wells and steams. Farmers also depend on watering cans for irrigation.
5. Generally, vegetable producers in the metropolis have limited access to agricultural extension information, credit facilities and training on vegetable production.
6. The cost of planting materials and agro-chemicals is expensive to the vegetable farmers
7. The seasonal average productivity (yield/ha) of urban vegetable farmers in the study area is generally low.
8. The majority of the vegetable farmers market their farm produce through middle men and at farm gate level.

9. The most important production challenges faced by vegetable farmers in the Kumasi metropolis are high input cost, lack of credit facilities and incidence of pests and diseases.
10. The level of contribution of urban vegetable production to the farmers' livelihoods in the Kumasi metropolis is generally 'low'. However, it impacted 'moderately high' on their natural and physical capitals.
11. Through vegetable production, farmers in the Kumasi metropolis can improve on their natural and physical capital assets more and significantly than information, financial, human and social capital assets.

Recommendations

Based on the study results, the following recommendations are suggested:

1. Farmers should form Farmer Based Organisations (FBOs) such as production and consumer co-operatives. The formation of these farmer associations is a mechanism by which several interventions could be established. These associations should be effective and strengthened to provide farmers with varied opportunities such as assisting them to save money towards bulk purchasing of farm inputs to benefit from discounts and also sell their farm produce collectively. This would enhance their bargaining power and protect them against exploitation from prospective buyers. FBOs would help address common challenges confronting members

including high input cost, lack of credit facilities and inadequate marketing avenues. This is because a group's ability to access certain facilities such as agricultural extension services, inputs, credits and marketing is usually stronger than individual.

2. The functions of the Farmer Based Organisations (FBOs) should be diversified to include training of its members on new technologies, innovations and modern agronomic practices to increase productivity for more income and better livelihoods for its members. The training must also encompass ways to use their existing physical capital more effectively and efficiently (information capital), or shared with other farmers (social capital) for increased productivity. Farmers' associations are very important sources of new technologies and also provide the platform for their diffusion.
3. Financial capital should be made easily accessible to farmers through formal and informal farmer based associations to improve the incomes and businesses of members and also offer them the opportunity to invest in physical capital to increase their scale of production.
4. Agricultural Extension Agents (AEAs) of the Ministry of Food and Agriculture (MoFA) should endeavour to develop and improve contacts with farmers by strengthening Research-Extension-Farmer Linkage to bridge the existing agriculture extension information gap. This will enable farmers to adequately access agricultural

extension information to update their knowledge and skill levels, increase their productivity levels and better their livelihoods.

5. The government through MoFA and other stakeholders should design specific training programmes such as Farmer Field Schools (FFS), Farmer Field Days (FFD) and Workshops targeted especially at vegetable farmers aimed at updating them on new agronomic packages leading to change in knowledge, attitude, skills and aspirations of the farmers towards increased production and food security.

Suggestions for Future Research

Whilst the objectives of the study were well realised, it is suggested that future research should be directed towards:

1. The effective and efficient use of farmers' livelihood capitals in terms of natural, information, financial, human, social and physical capitals.
2. Replication of the study in the study area after a period of time to assess the trend of impact of urban vegetable production on farmers' livelihoods.

REFERENCES

Abaidoo, R.C., Keraita, B., Amoah, P., Drechsel, P., Bakang, J., Kranjac-berisavljevic, G., *et al*. (2009). Safeguarding Public Health Concerns Livelihoods and Productivity in Wastewater Irrigated Urban and Periurban Vegetable Farming.

Adam, M. (2001). Definition and Boundaries of the Peri-urban Interface: Patterns in the Patchwork. In: P., Drechsel, & D., Kunze (eds) Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Cycle in Sub-Saharan Africa. CABI Publishing, Wallingford, pp. 193-208.

Altieri, M.A., Companioni, N., Canizares, K., Murhpy, C., Rosset, P., Bourque, M., et al. (1999). The greening of the 'barrios': urban agriculture for food security in Cuba. *Agriculture and Human Values* 16 (2): 131-140.

Amis, P. (2002). Thinking About Chronic Urban Poverty. Chronic Poverty Research Centre (CPRC) Working paper No.12. University of Birmingham, United Kingdom

Akaba, S. (2008). Household food security and perceived improvement in livelihood benefits of vegetable producers in the Ketu District of the Volta Region of Ghana

Armar-Klemesu, M. & Maxwell, D. (1998). Urban Agriculture in Greater Accra Metropolitan Area. Project 003149. Final report to IDRC. Nouguchi Memorial Institute for Medical Research, University of Ghana.

Ary, D., Jacobs, L.C. & Razavieh, A. (2002). Introduction to Research in Education. Sixth ed. Belmont CA: Wadsworth.

Bailkey, M & Nasr, J. (2000). 'From Brownfields to Greenfields: Producing Food in the North American Cities.' Community Food Security News Fall/Winter: pp 6-8.

Baud, I. S. A. (2000). Coping with globalization. The need for research concerning the local response to globalization in developing countries. Den Haag, RAWOO.

Best, J.W. & Kahn, J.V. (1995). Research in Education. Prentice- Hall of India Private Limited, M-97, Connought Circus New Delhi- 110001.

Blake, B. & Kasanga, K. (1997). Kumasi Natural Resources Management Research Project, Inception Report; NRI, National Resource Institute, The University of Greenwich, U.K and University of Science and Technology, Kumasi, Ghana.

Borg, W.R. & Gall, M.D. (1989). Educational research: An introduction. (5^{th} ed.) New York: Longman.

Bosompim, M. (2006). Cocoa farmers' perceived Impart of the cocoa high technology programme on their livelihoods in the Eastern Region of Ghana.

Bourquier, P. (2004). 'Analyzing Urbanization in Sub-Saharan Africa'. In Tony Champion and Graeme Hugo,eds., New Forms of Urbanization. Beyond the Rural-Urban Dichotomy. Aldershot, UK: Ashgate Publishing, pp 133-150.

Braman, S. (1989). 'Defining Information: An Approach for Policy Makers', *Telecommunications Policy*, Vol. 13 No. 3. Pp. 233-242 A

Brooks, N. (2003). 'Vulnerability, risks and adaptation: A conceptual framework'. Working paper 38, Tyndall Centre for Climate Change Research. University of East Angelia: Norwich.

Butler, L. & Marone, D.M., (eds) (2002). Urban and agricultural communities: Opportunities for common ground. Council for Agricultural Science and Technology. Ames Iowa.

Cepal, D. (1999). Panorama Social de America Latina, LC/G. 2050-P, Santiagode Chile.

Chambers, R. & Conway, G. (1992). Sustainable Rural Livelihoods: Practical Concepts for the 21st century, Brighton, Institute of Development Studies Discussion Papers, No. 296. Cambridge.

Cofie, O.O, van Veenhuizen, R., & Drechsel, P. (2003). Contribution of urban and peri-urban agriculture to food security in Sub-Saharan Africa. Paper presented at the Africa Day of the 3rd WWF in Kyoto, 17-3-2003.

Cohen, L. & Marion, L. (1995). Research Methods in Education. London: Routledge.

Cohen, J. (1988). Statistical Power Analysis for the Behavioural Sciences, Hillsdale, NJ: Erlbaum

Coleman, J. S. (1990). Foundations of Social Theory, Cambridge, Mass: Harvard University Press.

Colosi (n.d.). Social Research Methods. . Retrieved September 29, 2010 from: http://www.socialresearchmethods.

Cornish, G. A. & Aidoo, J. B. (2000). Informal Irrigation in peri-urban areas of Kumasi, Ghana. Findings from an initial questionnaire survey: Report 0D/TN 97 March 2000. HR Wallingford, UK, 41 pp.

Cornish, G.A, Aidoo, J. B. & Ayamba, I. (2001). Informal irrigation in the peri-urban zone of Kumasi, Ghana. An analysis of farmer activity and productivity. Report OD/TN 103, February 2001.DFID's Water KAR Project R7132.HR Wallingford, UK, 39 pp.

Cornish, G.A. & Lawrence, P. (2001). Informal irrigation in areas: A summary of findings and recommendations, DFID's Water KAR.

Danso, G., & Drechsel, P. (2003). The marketing manager in Ghana. *Urban Agricultural Magazine* 9: 7.

Danso, G., Fialor, S.C. & Drechsel, P. (2002) Perceptions of organic agriculture by urban vegetable farmers and consumers in Ghana. *Urban Agricultural Magazine* 6: 23-24.

Danso, G., Drechsel, P., Wiafe-Antwi, T & Gyiele, L. (2002). Income of farming system around Kumasi, Ghana. *Urban Agriculture Magazine* 7: 5-6.

Danso, G., Drechsel, P., Akinbolu, S. & Gyiele, L. (2003). Review of Studies andLiterature on the Profitability and Sustainability of Urban and Peri-urban Agriculture. Final Report (PR 25314) submitted to FAO, IWMI, Accra. Danso, G., Drechsel, P., Wiafe-Antwi, T., Gyiele, L. 2002a. Income of farming systems around Kumasi, Ghana. *Urban Agriculture Magazine* 7: 5-6.

Das, S.K. (1997). Socio economics factors affecting the adoption of livestock technologies by farmers in West Bengal India. *Veterinary Journal*.74 (3)233-236.

Denninger, M., Egero, B., & Lee-Smith, D. (1998). Urban food production: a survival strategy of urban Households. Report of a Workshop on East and Southern Africa. RELMA Workshop series 1. Regional Land Management Unit (RELMA). Mazingira Institute, Nairobi.

DFID (1999). Sustainable livelihoods guidance sheets. Retrieved March 30, 2010 from http://www.livelihoods.org

DFID (2000). Sustainable livelihoods guidance sheets, London: Department for International Development.

Drechsel, P. & Kunze, D. (1999). Synopsis from International Workshop on Urban and Peri-urban Agriculture: Closing the Nutrient Cycle for Urban Food Security and Environmental Protection, Accra, august 1999. Retrieved June 28, 2010 from http://www.CityFarmer.org

Drechsel, P., Danso, G. & Keraita, B. (2002). Soil nutrient depletion versus environmental pollution: the dilemma of intensive urban agriculture. Paper for ISCO 2002, Beijing, 26-31 May.

Drechsel, P., Giordano, M. & Gyiele, L. (2004). Valuing Nutrients in Soil and Water: Concepts and Techniques with Examples from IWMI Studies in the Developing World. IWMI Research Report 82, Colombo.

Drechsel, P., Graefe, S., Sonou, M. & Cofie, O.O. (2006). Informal irrigation in Urban West Africa: An Overview. IWMI Research Report (in press).

Drechsel, P., Graefe, S. & Fink, M. (2007). Rural-urban food, nutrient and water flows in West Africa, IWMI Research Report (in preparation).

Drechsel, P., Giordano, M. & Enters, T. (2005). Valuing Soil Fertility Change: Selected Methods and Case Studies. In Natural Resources Management in Agriculture: Methods for Assessing Economic and Environmental Impacts, ed. B. Shiferaw, H.A. Freeman & S.M. Swinton. Wallingford: ICRISAT-CABI. pp. 199-221.

Eaton, D. (2003). Recycling Urban Waste in Agriculture. Final Report. APUGEDU project.

Egyir, I.S. & Beipuo, E.N. (2009). Strategic Innovations in Urban Agriculture, Food Supply and Livelihood Support System performance in Accra, Ghana.

Elashoff, J. (2000). nQuery Advisor Release 4.0, Statistical Solutions, Cork, Ireland, Software for MS-DOS system.

Ellis, F. (2000). Rural livelihoods and Diversity in Developing Countries, Oxford, Oxford University Press.

Erenstein, O., Moussa, M., Oswald, A. & Keijzer, P. (2004). Characterization of peri-urban lowland use along an ecological and market access gradient in West Africa. Abidjan, Cote d'Ivoire: West Africa Rice Development Association (WARDA) –The Africa Rice Center.

Ezedinma, C. & Chukuezi, C. (1999). A Comparative Analysis of Urban Agricultural Enterprises in Lagos and Port Harcourt, Nigeria.

Ezgiabher, A.G., Lee-Smith, D., Maxwell, D.G., Memon, P.A., Mougeot, L.J.A., & Sawio, C.J. (1994). Cities Feeding People. An Examination of Urban Agriculture in East Africa.

FAO (2002). Inter-agency Experiences and Lession. From the Furum Operationilising Sustainable Livelihoods Approaches. Pontigano (Siena) 7-11 March, 2000. FAO.

FAO (1998). Urban and peri- urban agriculture: policy issues and FAO's role. COAG 99/13. Rome: FAO.

Faruqui, N. I. Niang, S. & Redwood, M. (2004). Untreated wastewater use in market gardens; a case study of Dakar, Senegal. In Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities (ed). C., Scott, N.I., Faruqui, L., Raschid. Wallingford: IWMI- IDRC-CABI. pp. 113-125.

Few, R., Ahern, M., Matthies, F & Kovats, S. (2004). Floods, Health and Climate Change: A Strategic Review, Working Paper No. 63. Tyndall Centre for Climate Research. University of East Anglia, Norwich, Norfolk, 24 pp

Flynn-Dapaah, K. (2002). Land negotiations and tenure relationships: Access land for urban and agriculture in the Sub-Saharan Africa. CFP Report Series 36. IDRC: Ottawa.

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C.S., & Water, B. (2002). "Resilience and sustainable development: building adaptive capacity in a world of transformation". Ambio 31, No.5.

Freeman, D.B. (1999). A city of farmers: informed urban agriculture in the open-spaces of Nairobi, Kenya. Montreal: Mc Gill-Queen's University Press.

Freeman, D.B. (1991). A city of farmers: informal urban agriculture in the open spaces of Nairobi, Kenya. McGill-Queens University Press, Montreal, QC, Canada.

Frey, W.H. & Zimmer, Z. (2001). Defining the city. In: R. Paddish (Ed) *Hand book of Urbook Studies* (pp14-35). London: SAGE Publications.

Gbireh, Z. A. (1999). Development of urban and peri-urban irrigation for food security within and around Accra Metropolitan Area: FAO Technical Report (unpublished).

Gerstl, S. (2001). The economic cost and impact of home gardening in Ouagadougou, Burkina Faso. PhD dissertation, university of Basel, Switzerland. Retrieved July 31, 2010 from http://www.sti.unibas.ch

Ghana Statistical Service (2002). *2000 Population and Housing Census, summary report of final results*. Accra, Ghana: Ghana Statistical Service

Ghana Statistical Service (2008). Report of the Fifth Round of the Ghana Living Standards Survey (GLSS). September.

Glass, G.V. & Hopkins, B.K. (1984). Statistical Methods in Education and Psychology (2nd ed.), New York: Prentice-Hall.

Gockowski, J. & Ndoumbé, M. (2004). "The Adoption of Intensive Monocrop Horticulture in Southern Cameroon", Agricultural Economics, Vol. 30, pp. 195–202.

Hasna, M.K. (1998). NGO Gender Capacity in Urban agriculture: Case study from Harare (Zimbabwe), Kampala (Uganda) and Accra (Ghana). Cities feeding people series. Report 21.

Hintze, J. (2000). PASS 2000, Number Cruncher Statistical System, Kaysville, UT, Software for MS-DOS system.

Huerta, J.M., & Lugo, D. (1996). FCL Program Impact on Extension Volunteers and Leaders in Puerto Rico. Impact Evaluation of Family Community Leadership Conference San Juan, Puerto Rico: pp. 1-11

International Agency for Research on Cancer (2003). *Handbooks on Cancer Prevention.* Vol. 8: Fruit and Vegetable. Lyon, France: IARC Press.

Institute of Statistical Social and Economic Research (2002). The State of Ghanaian Economic. The Institute of Statistical Social and Economic Research (ISSER).University of Ghana, Legon. University Press.

International Water Management Institute (2006). Irrigated Urban Vegetable Production in Ghana. Characteristics, Benefits and Risks. IWMI-RUAF-CPWF.

Jacobi, P., Amend, J., Kiango, S. (2000). Urban agriculture in Dar es Salaam: providing for an indispensable part of the diet. In Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda, ed. N. Bakker, M. Dubbeling, S. Gündel, U. Sabel-Koschella and de Zeeuw, H. Deutsche Stiftung für Internationale Entwicklung (DSE). Feldafing/ Germany: Zentralstelle für Ernährung und Landwirtschaft. pp. 257-283.

Kamara, S. & Denkabe, A. (1993). Gender in development. Freedom puplications. Accra, Ghana. 35pp.

Kay, M. (2001). Smallholder irrigation technology: prospects for sub-Saharan Africa. International Programme for Technology and Research in Irrigation and Drainage, Knowledge Synthesis Report No.3. Rome, IPTRI/FAO.

Keraita, B. (2002). Waste water use in urban and peri-urban vegetable farming in Kumasi, Ghana. Unpublished Msc. Thesis. Wageningen University, The Netherlands.

Keraita, B., Danso, G. & Drechsel, P. (2003). Urban irrigation methods and practices in Ghana and Togo. *Urban Agriculture Magazine* 10: 6-7.

Keraita, B., Drechsel, P., Huibers, F., & Rachid-Sally, L. (2002). Wastewater use in informal irrigation in Urban and Peri-Urban areas of Kumasi, Ghana. *Urban Agricultural Magazine* 8: 11-13.

Keraita, B., Drechsel, P. & Konradsen, F. (2007). Safer options for irrigated urban farming. *LEISA Magazine* 23(3) 26-28. September 2007.

Keraita, B., Drechsel, P. & Amoah, P. (2003). Influence of urban wastewater on stream water quality and agriculture in and around Kumasi, Ghana. *Environments and Urbanisation* 15(2): 171-178.

Keraita, B., Drechsel, P. & Raschid-Sally, L. (2002) Wastewater use in informal irrigation in urban and peri-urban areas of Kumasi, Ghana. CTA/ETC-RUAF/CREPA, Atelier International sur la Réutilisation des Eaux Usées en Agriculture Urbaine. 3-8 June 2002, Ouagadougou. Final Report, p. 124-141.

Kessler, A., Streiffeler, F. & Obuobie, E. (2004). Women in Urban Agriculture in West Africa. *Urban Agriculture Magazine* 12: 16-1.

KNRMP (1999). Kumasi Natural Resources Management Research Project, KNUST/NRI/DFID.

Kumasi Metropolitan Assembly (2006). Retrieved September 29, 2010 from: http://www.kma.ghanadistricts.gov.gh/

Kyessi, A. (1997). City Expansion and Urban Agriculture in Dar es Salam: Lessons for Planning. In: *Journal of Building and Land Development.* Dar es Salaam, Tanzania, Vol. 4, No. 2: 28-37.

Lee-Smith, D., Manundu, M., Lamba, D., & Gathuru-Kuria, P. (1987). Urban food production and the cooking fuel situation in urban Kenya- National report: results of a 1985 national survey. Nairobi: Mazingira Institute.

Lepar, M.L.A & Ehui, S. (2003). Adoption of dual-purpose forages: some policy implications. *Tropical Grasslands* 37:284-291.

Lewu, F.B. & Assefa, Y. (2009). Farmers Knowledge in the cropping systems of northern KwaZulu- Natal South Africa. Current challenges and solutions for sustainable future food production. *African Journal Research* 4 (11):148-153.

Macfarlane, T. (2003). Sample size determination for research projects (Editorial). *Journal of Orthodontics*. 30(2): 99-100.

Machlup, F. & Mansfield, U. (Eds) (1983). The Study of Information: Interdisciplinary Messages. New York: Wiley.

MacMillan, J.J. & Schumacher, S. (1989). Research in education: A conceptual introduction. New York: Harper Collins.

Madden, J. P. & Chaplowe, S.G. (ed) (1997). 'For All Generations: Making world Agriculture more sustainable'. Glendale: O.M. Publishing.

Martin, W. J. (1995). Global Information Society, Aldershot, Aslib Gower. 233p.

Maxwell, D. (1998). The political Economy of Urban Food Security in Sub-Saharan Africa. FCND Discussion paper No. 41, IFPRI, Washington.

Mbiba, B. (1994). Institutional responses to uncontrolled urban cultivation in Harare: *Prohibitive or accommodative? Environment and Urbanization* 6 (1):188-202.

Moustier, P., Moumbélé, M. & Huat, J. (2004). La gestion concertée et durable des filières maraîchères urbaines. In Développement durable de l'agriculture urbaine en Afrique francophone. Enjeux, concepts et méthodes, (ed.) O. Smith, P. Moustier, L.J.A. Mougeot & S.A. Fall, CIRAD, Montpellier and IDRC, Ottawa, pp. 79-113.

Mougout, L. (1993). "Urban Food Self-Reliance: Significance and Prospects," in *Farming in the City: The Rise of Urban Agriculture.* Reports Vol.21, No.3. Ottawa: IDRC.

Nabila, J.S. (1988). Urbanization in Ghana, Accra: Population Impact Project (PIP). Legon: University of Ghana

Nugent, R. (1999). A framework for measuring the sustainability of urban agriculture. In: Koc M. et al. (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 95-99.

Nwana, O.C. (1992). Introduction to educational research for student teachers: Designing the study. Nigeria: Heineman Educational Books (Nig.) PLC.

Obosu-Mensah, K. (1999). Food Production in Urban Areas. A study of Urban Agriculture in Accra, Ghana. Ashgate, Publishing Aldershot, UK, England. 227pp.

Oboubie, F., Drechsel, P., Danso, G., & Rachid-Sally, l. (2004). Gender in open-space irrigated urban vegetable farming in Ghana. Urban Agricultural Magazine 12: 13-15.

Obuobie, E., Keraira, B., Danso, G., Amoah, P., Cofie, O.O., Raschid-Sally, L., et al. (2006). Irrigated urban vegetable production in Ghana: Characteristics, benefits and risks. IWMI-RUAF-CPWF, Accra,Ghana: IWMI, 150 pp.

Obwona, M. B. (2000). Determinants of Technical Efficiency Differentials among Small and Medium Scale Farmers in Uganda: A case of Tobacco Growers. Final Report, AERC Workshop, Kenya.

Ojo, O.D., Connaughton, M., Kintomo, A.A., Olajide-Taiwo, L.O. & Afaloyan, S.O. (2010). Assessment of irrigation Systems for dry season vegetable production in urban and peri-urban zones of Ibadan and Lagos, Southwestern Nigeria.

Okorley, E.L. & Kwarteng, J.A. (2002). An investigation into the use of pesticides by urban vegetable growers in the central region of Ghana. Conference paper: SADAOC Conference Internationale de Bamako les 9-11 September 2002.

Pallant, J. (2001). SPSS Survival Manual: A Step-by Step Guide to Data Analysis Using SPSS for Windows (version 10). Crow's Nest, New South Wales: Allen & Unwin, Autralia. Project R7 132, Report OD 144, HR Willingford, Willingford, UK, 54pp.

Poate, C.D. & Daplyn, P. F. (1993). *Data for Agrarian Development*. Wye Studies in Agricultural and Rural Development, Cambridge. Cambridge University Press.

Postel, S. (2001). Growing more food with less water. *Scientific American,* February 2001, pp 34-37.

Rakodi, C. (1999). Poverty in the Peri-urban Interface. Natural Resources Systems Programme (NRSP) Research Advances No. 5. London: DFID.

Simon, D., McGregor, D. & Thompson, D. (2006). Contemporary perspectives on the peri-urban zones of cities in developing countries. In: *The Peri-urban Interface*: Approaches to sustainable natural and human resource use (ed). D. McGregor, D. Simon & D. Thompson London: Earthscan. pp. 3-17.

Smit, J., Ratta, A. & Nasr, J. (1996). Urban Agriculture: food, jobs, and sustainable cities. Publications Series for Habitat II, Vol. 1. New York: United Nations Development Programme (UNDP).

Stren, R. (1989). "Urban Local Government in Africa," In: R. Stren & R. White (eds.). African Cities in Crisis: Managing Rapid Urban Growth. Boulder: West-view Press.

Tallaki, K. (2005). The pest control systems in the market gardens of Lome, Togo. In: Mougout, L. (ed.). AGROPOLIS. The social, political and environmental dimensions of urban agriculture. IDRC, Ottawa, Earthcan, London, p. 51-67.

Tandia, M. (2002). Urban farming in a context of water scarcity. The case of the Tel Zaatar market gardening site in Nouakchott (Mauritania). African Cities (Special Issue), December 2002: 11-12.

United Nations Development Programme (UNDP). (1996). Urban Agriculture: Food, Jobs and Sustainable Cities. Publication for Habitat II Series, Vol.1. New York, USA.

United Nations Centre for Habitable Settlement (UNHCS) (1999). Global Urban Indicators Database, Best Practice and Local leadership Programme, Nairobi, Kenya.

U N C H S (2001).United Nations Centre for Human Settlement. The state of the World's Cities.

United Nations Population Division (2004) World Population Prospects: The 2003 Revision. Department of Economics and Social Affairs of the United Nations Secretariat, New York, USA

United Nations (1995).World urbanization prospects: the 1994 revision. New York.

Van den Berg, L. (1997). Market gardening, urban growth and sustainable use of income generation on the Jos plateau, Nigeria. Scientific Report Submitted to Netherlands-Israel Development Research Program, The Netherlands.

Van den Berg, L. (2002). Urban agriculture between allotment and market gardening: contributions to the sustainability of African and Asian cities. In: The Sustainable City II. Urban Regeneration and Sustainability, (ed). J.F. Brebbia, Martin-Duque & L.C. Wadhwa, Southampton, Boston: WIT Press, pp. 946-959.

Wilbers, J. (2003). Urban Agriculture and Gender: Some key issues. Discussions paper 1RUAF, ETC. 15pp.

World Bank (2000). Entering the 21st Century. World Developing Report 1999/2000. New York: Oxford University Press for the World Bank.

World Health Organisation (WHO) (2007). Guidelines for the safe use of wastewater, excreta and greywater. Vol. 2: Wastewater use in agriculture. World Health Organisation, Geneva, Switzerland.

Zakaria, S., Lamptey, M. G., & Maxwell, D. (1998). Urban Agricultural in Accra: A Descriptive Analysis. In: M. Armar-Klemesu & D. Maxwell (eds). Urban Agriculture in Greater Accra Metropolis Area. Financial Report to IDRC.

Zalle, D.T. (1997). Le maraichage intra-urban á Bamako. Thèse de Doctorat. Universitė du Mali, Institut Superieur de Formation et de Recherch Appliquėe.

Zibrilla, I. & Salifu, A.A. (2004). Information gathering from urban and communities with potential land areas for vegetable production. Report submitted to Urban Agriculture Network- Northern Ghana. 30th June 2004, 16 pp. (mimeo).

APPENDICES

Appendix 1

Reliability Coefficient of Scales and Subscales of the Instrument

Scales/Subscales	No. of items	Cronbach's alpha Coefficient
Access to agric Information	10	0.807
Production Challenges	6	0.817
Marketing challenges	5	0.839
Natural Assets	3	0.914
Information Assets	7	0.689
Financial Assets	4	0.648
Human Assets	4	0.804
Social Assets	8	0.743
Physical Assets	14	0.843
Overall livelihood Assets	40	0.815

n=20 Source: Field Data, 2010

Appendix 2

Rating of Vegetable Production Challenges Faced by Respondents

Production challenges	Percentage Ratings					
	1 %	**2** %	**3** %	**4** %	**5** %	**6** %
High input cost	46.6	26.0	14.0	7.7	3.7	2.0
Incidence of pests & diseases	7.7	14.0	31.0	25.3	13.3	8.7
Poor soil fertility	4.7	15.7	8.7	15.7	24.0	31.3
Inadequate water	9.3	7.7	14.0	21.7	26.0	21.3
Irrigation of crops	11.3	9.0	9.0	18.3	24.7	27.7
Lack of credit facilities	20.3	28.7	24.3	12.7	7.0	7.0

n = 300 1= Extremely Severe; 2 =Very Severe; 3 = Severe; 4 = Moderately Severe; 5 =Slightly Severe; 6 = Not Severe; Source: Field Survey Data, 2010

Appendix 3

Ratings of Urban Vegetable Marketing Challenges Faced by the Respondents

Marketing challenges	Percentage Ratings				
	1 %	**2** %	**3** %	**4** %	**5** %
Lack of cold transport and storage facilities	3.7	4.7	11.0	30.0	50.7
Fluctuating demand	56.7	24.3	11.3	6.7	1.0
Postharvest losses	4.3	22.7	36.7	22.0	14.3
Female dominance	10.3	12.7	16.3	33.0	27.7
Low price offer	25.3	36.0	25.7	7.3	5.7

n = 300 1 = Very Severe; 2 = Severe; 3 =Moderately Severe; 4 = Slightly Severe; 5 = Not severe; Source: Field Survey Data, 2010

Appendix 4

Farmers' Perceived Level of Effect of Urban Vegetable Production on their Natural Capital

Perceived Contribution to Natural Capital	NI		VL		L		H		VH	
	f	%	f	%	f	%	f	%	f	%
Increase in land size for production	135	45.0	7	2.3	23	7.7	110	36.7	25	8.3
Increase access to water for irrigation	116	38.7	7	2.3	26	8.7	131	43.7	20	6.7
Increase in yield	9	3.0	3	1.0	32	10.7	235	78.3	21	7.0

n= 300 Scale: 300 4 = Very High (VH); 4 = High (H); 2 = Low (L); 1 = Very Low (L); 0 = No Improvement (NI). Source: Field Survey Data, 2010

Appendix 5

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Information Capital

Perceived contribution to Information Capital	NI		VL		L		H		VH	
	f	%	f	%	f	%	f	%	f	%
Awareness of land & water resources management	150	23.3	27	9.0	40	13.3	72	24.0	11	3.7
Increase your decision making ability	13	4.3	10	3.3	29	9.7	237	79.0	11	3.7
Increase access to services from change agents	166	55.3	19	6.3	35	11.7	75	25.0	5	1.7
Awareness of ICT to access information	256	85.3	8	2.7	12	4.0	22	7.3	2	0.7
Increase access to credit facilities	260	86.6	5	1.7	9	3.0	23	7.7	3	1.0
Awareness of farmers' association	38	12.7	49	16.3	165	55.0	29	9.7	19	6.3
Increase access to marketing avenues	160	53.3	12	4.0	44	14.7	80	26.7	4	1.3

n = 300 4 = Very High (VH); 4 = High (H); 2 = Low (L); 1 = Very Low (L);

0 = No Improvement (NI). Source: Field Survey Data, 2010

Appendix 6

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Financial Capital

Perceived Contribution to Financial Capital	**NI**		**VL**		**L**		**H**		**VH**	
	f	%	f	%	f	%	f	%	f	%
Increase in income level	11	3.7	4	1.3	38	12.7	233	77.7	14	4.7
Increase in savings	92	30.7	6	2.0	52	17.3	144	48.0	6	2.0
Decrease in debt level	96	32.0	10	3.3	35	11.7	132	44.0	27	9.0
Increase access to financial facilities	260	86.7	10	3.3	6	2.0	23	7.7	1	0.3

n = 300 4 = Very High (VH); 3 = High; 2 = Low (L); 1 = Very Low (L);

0= No Improvement (NI). Source: Field Survey Data, 2010

Appendix 7

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Human Capital

Perceived Contribution to Human Capital	NI		VL		L		H		VH	
	f	%	f	%	f	%	f	%	f	%
Increase in knowledge/skill levels	10	3.3	4	1.3	17	5.7	248	82.7	21	7.0
Increase access to health facilities	201	67.0	26	8.7	47	15.7	22	7.3	4	1.3
Increase access to training	180	60.0	14	4.7	33	11.0	68	22.7	5	1.7
Increase access to labour	186	62.0	23	7.7	50	16.7	34	11.3	7	2.3

n = 300 4 = Very High (VH); 3 = High (H); 2 = Low (L); 1 =Very Low (L); 0 = No Improvement (NI). Source: Field Survey Data, 2010

Appendix 8

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Social Capital

Perceived Contribution to Social Capital	NI		VL		L		H		VH	
	f	%	f	%	f	%	f	%	f	%
Membership to farmer association	241	80.3	1	0.3	6	2.0	30	10.0	22	7.3
Support from association	241	80.3	2	0.7	10	3.3	36	12.0	11	3.7
Support from other individual farmers	38	12.7	5	1.7	64	21.3	143	47.7	50	16.7
Care for the household	36	12.0	5	1.7	12	4.0	208	69.3	39	13.0
Payment of school fees	59	19.7	4	1.3	9	3.0	164	54.7	64	21.3
Support other family members	21	7.0	8	2.7	85	28.3	173	57.7	13	4.3
Support friends	38	12.7	179	59.7	45	15.0	29	9.7	9	3.0
Payment of funeral dues and other levies	40	13.3	85	28.3	82	27.3	81	27.0	12	4.0

n = 300 4 = Very High (VH); 3 = High (H); 2 = Low (L); 1 = Very Low (VL); 0 = No Improvement (NI). Source: Field Survey Data, 2010

Appendix 9

Farmers' Perceived Level of Contribution of Urban Vegetable Production to their Physical Capital

Perceived Contribution to Physical Capital	NI		VL		L		H		VH	
	f	%	f	%	f	%	f	%	f	%
Ability to buy irrigation pump	95	13.0	34	11.3	42	14.0	98	32.7	31	10.3
Ability to buy sprinklers	94	31.3	32	10.7	45	15.0	98	32.7	31	10.3
Ability to buy watering cans	2	0.7	1	0.3	3	1.0	154	51.3	140	46.7
Ability to buy knapsack sprayers	7	2.3	4	1.3	6	2.0	149	49.7	134	44.7
Ability to buy motor cycle/bicycle	27	9.0	7	2.3	26	8.7	158	52.7	82	27.3
Ability to buy vehicles (cars, trucks, tractors	202	67.3	44	14.7	36	12.0	9	3.0	9	3.0
Ability to build a house	162	54.0	38	12.7	44	14.7	44	14.7	12	4.0
Ability to access irrigation pump	114	38.0	15	5.0	18	6.0	70	23.3	83	27.7
Ability to access sprinklers	58	19.3	16	5.3	18	6.0	130	43.3	78	26.0
Ability to access watering cans	5	1.7	1	0.3	1	0.3	114	38.0	179	59.7
Ability to access knapsack Sprayers	3	1.0	4	1.3	3	1.0	114	38.0	176	58.7
Ability to access motor cycle/bicycle	24	8.0	12	4.0	15	5.0	93	31.0	156	52.0
Ability to access vehicles (cars, trucks, tractors)	98	32.7	15	5.0	19	6.3	67	22.3	101	33.7
Ability to rent a house	5	1.7	3	1.0	20	6.7	199	66.3	73	24.3

n = 300 Scale: 4 = Very High (VH); 3 = High (H); 2 = Low (L); 1 = Very Low (VL); 0 = No Improvement (NI). Source: Field Survey Data, 2010

Appendix 10

Cohen's Interpretation of Strength of Association (eta squared)

Magnitude of Association	Description
1. 0.14	Large Effect
2. 0.06	Moderate Effect
3. 0.01	Small Effect

Source: Cohen, J. (1988). Statistical Power Analysis for the Behavioural Sciences. Hillsdale. N.J: Erlbaum.

Appendix 11

UNIVRSITY OF CAPE COAST

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

URBAN VEGETABLE FARMING AND ITS EFFECTS ON FARMERS' LIVELIHOODS IN THE KUMASI METROPOLIS OF ASHANTI REGION OF GHANA

STRUCTURED INTERVIEW SCHEDULE FOR FIELD DATA COLLECTION

Any information you provide will be kept strictly confidential. It is mainly for academic purposes and only pooled results will be reported or published to improve the vegetable enterprise in the Kumasi Metropolis.

INSTRUCTION: Please tick **[√]** in the boxes provided or write your answers where applicable to answer the questions.

SECTION A – BACKGROUND INFORMATION

1. Community Name . . . . . .
2. Sex: Male [ ] Female [ ]
3. Please indicate your age at your last birthday in years . . . . . .
4. What is your highest level of formal education?
   No formal education [ ] Primary education [ ] Junior High School [ ]
   Senior High School [ ] General Certificate of Education [ ] Tertiary [ ]
   Others (specify) . . . . . .
5. Marital status: Single [ ] Married [ ] Divorced [ ] Separated [ ]
   Widowed [ ]
6. What is your ethnicity? . . . . . .
7. What is the size of your household dependants? . . . . . .

8. How long have you been growing vegetables?

1-3years [ ] 4-7years [ ] 8-11years [ ] 12-15years [ ]

Above 16 years [ ]

9. Do you belong to a farmer association?

Yes [ ]: Give the name . . . . . No [ ]

10. If 'Yes' to Q 9 what major benefit(s) do you receive for belonging to this association?

Farm inputs [ ] Credit [ ] Transport services [ ]

Marketing of produce [ ] None [ ] Others (specify) . . . . . .

SECTION B: FACTORS OF PRODUCTION

A. Land

11. What is your land tenure?

Family land [ ] Own land [ ] Lease land [ ] Private land [ ]

Government land [ ] Stool land [ ] Others (specify) . . . . . .

12. What is the tenancy agreement on the land you are using for the vegetable production?

Rental payment [ ] Abunu [ ] Abusa [ ] No tenancy agreement [ ]

13. How easy or difficult it is to acquire land for vegetable production in your Community?

Very difficult [ ] Difficult [ ] Easy [ ] Very easy [ ]

14. What is the total land available (acres) to you or household for farming?.

. . . .

15. How many acres of the total land do you put to vegetable production each season? . . . . . .

B. Planting Materials/seeds

16. What is the source of your planting materials/seeds?

Certified seed producers [ ] Input dealers [ ] Market providers [ ]

Other farmers [ ] Extension agent [ ] Seeds saved [ ]

Others (specify) . . . . . .

17. Why did you choose this source?

Reliable source [ ] Proximity [ ] Good quality [ ] Others (specify)

. . . . . .

18. How much do you spend on planting materials per season? **GH¢** . . . . . .
19. Please, indicate how you will rate your total cost of planting material/seed per season?
    Very low [ ] Low [ ] High [ ] Very high [ ]

C. Agro-Chemicals

20. What type of fertilizer do you use on your vegetable production?
    Inorganic fertilizer [ ] Organic fertilizer [ ] Inorganic & Organic fertilizers [ ] None [ ]
21. What are the source(s) of the fertilizers used on your vegetable farm?
    Input dealers [ ] Market providers [ ] Association(s) [ ]
    Livestock farms [ ] Poultry farms [ ] Input dealers & Poultry farms [ ]
    Market providers & Poultry farms [ ]
22. What other agro-chemical(s) do you use on your vegetable farm?
    Pesticides [ ] Fungicides [ ] Nematicides [ ] Herbicides [ ]
    Others (specify) . . . . . .
23. What is the source(s) of the agro-chemicals mentioned above?
    Input dealers [ ] Market providers [ ] Association(s) [ ]
    Input dealers & Market providers [ ]
24. What is the total cost of agro-chemicals used (fertilizers & other chemicals) per season? **GH¢** . . . . . .

Note: Add all the individual cost of agro-chemicals mentioned by farmer plus transport

25. How will you rate the total cost of agro-chemicals per season?
    Very low [ ] Low [ ] High [ ] Very high [ ]

D. Water for Irrigation

26. From which source(s) do you get water to irrigate your vegetable crops?
    Stream [ ] Tap water [ ] Rainfall [ ] Drains [ ]
    Dug- out- well [ ] Others (specify) . . . . . .
27. What methods/ technologies do you employ for irrigating your vegetables?
    Bucket method [ ] Watering cans [ ] Sprinkler irrigation [ ]
    Motorised pump [ ] Water hose [ ] Drip irrigation [ ]

Others (specify) . . . . . .

28. How much does it cost you to irrigate your farm per season (3 months)?
    GH¢ . . . . . .
29. Please, how will you rate the total cost of irrigating your vegetable farm per season?
    Very low [ ] Low [ ] High [ ] Very high [ ]

E. Labour

30. What is the **major** source of labour for the various field operations on your farm?
    Hired labour [ ] Personal [ ] Family labour [ ] Communal labour [ ]
    Others (specify) . . . . . .
31. What **major** farm activities do you hire the services of labour?
    Land clearing [ ] Beds raising [ ] Watering [ ]
    Seeds nursing [ ] Weeding [ ] Fertilising [ ] Harvesting [ ]
    Others (specify) . . . . . .
32. How many times do you weed your vegetable farm per season? . . . . . .
33. How much do you spend on weeding your farm per season (3months)?
    GH¢ . . . . . .
34. Please, how will you rate the total cost of weeding your vegetable farm per season?
    Very low [ ] Low [ ] High [ ] Very high [ ]
35. If labour is hired, what is the total wage rate per season (3 months)
    GH¢ . . . . . .

F. Funds

36. Where do you get funds to support your vegetable production?
    Bank [ ] Self-finance [ ] Market providers [ ]
    Self-finance & Market providers [ ] Bank & Self-finance [ ]
37. Have you ever taken loan for your vegetable production?
    Yes [ ] No [ ]
38. If 'Yes' to Q37, did you pay back the credit on schedule?
    Always [ ] Scarcely [ ] Default [ ] Not at-all [ ]

39. Give reasons for your ability/inability to pay back the credit on scheduled.

. . . . . .

. . . . . .

40. Are there times that you have critical shortage of funds for vegetable production? Yes [ ] No [ ]

41. If Yes, during which months of the year?

Jan-Mar [ ] April-June [ ] July-Sept [ ] Oct-Dec [ ]

42. Give reason(s) for your answer above. . . . . .

. . . . . .

G. Extension Information

43. Please, indicate your easiness or difficulty in accessing information from the various sources under-listed by using the following ratings:

1 = Very Difficult
2 = Difficult (VD)
3 = Moderately Easy (ME)
4 = Easy (E)
5 = Very Easy (VE)

Sources of Information		**Ratings**				
		1 VD	**2 D**	**3 MD**	**4 E**	**5 VE**
i	Agric Extension Agents (MoFA)					
ii	Private Extension Services					
iii	Research Institute					
iv	Fellow Farmers					
v	Input Dealers					
vi	Market Providers					
vii	Print Media					
viii	Television					
ix	Radio					
x	Internet					

44. Have you attended the following on vegetable production before?

ACTIVITY	**RESPONSE (Yes / No)**	**YEAR**
Farmer Field School		
Farmer Field Day		
Workshops on vegetables		
Postharvest demonstrations		

45. What are your three (3) most important information/training needs in vegetable production?

i) . . . . . .

ii) . . . . . .

iii) . . . . . .

SECTION C: PRODUCTION, MARKETING AND INCOME

H. Production

46. What vegetable crop(s) do you cultivate?

Spring onions [ ] Lettuce [ ] Pepper [ ] Okro [ ]

Cabbage [ ] Cucumber [ ] Tomatoes [ ] Garden eggs [ ]

Spinach green [ ] Jute mallow [ ] Others (specify) . . . . . .

. . . . . .

47. What are your reason(s) for cultivating vegetables?

Income [ ] Cash and food [ ] Extra income [ ] Food [ ]

Cash investment [ ] Others (specify) . . . . . .

48. Please, complete the table below to estimate your vegetable production.

Vegetables Grown	**Number of heads/beds/ baskets/or pieces produced per season**	**Price/head/bed/unit/basket**	**Number of times grown in a year**
Cabbage (heads)			
Lettuce (beds)			
Pepper (baskets)			
Spring onions (beds)			
Cucumber (pieces)			
Jute marrow			
Spanish green			
Tomatoes			
Others (specify)			

49. How long does it take you to walk to your vegetable farm on foot (one-way in minutes) from homestead?

20 or less [ ] 21-40 [ ] 41-60 [ ] More than 60 [ ]

50. Please, how will you describe the entire vegetable production process?
    Very difficult [ ] Difficult [ ] Easy [ ] Very easy [ ]
51. Please, how will you rate your productivity per season?
    Very low [ ] Low [ ] High [ ] Very high [ ]
52. How do agricultural policies affect your livelihood in terms of tax trends/ input/output/prices/market developments etc.

    Positive i). .. . .
    ii) . . . .
    Negative i) . . . . . .
    ii) . . . .

I. Marketing

53. How do you sell your produce?
    Middle men [ ] Retail [ ] Middle men and Retail [ ]
54. Where do you sell your produce?
    Urban market [ ] Farm gate [ ] Local market [ ]
    Others (specify) . . . . . .
55. Who fixed the prices of vegetables you sold last season?
    Self [ ] Market providers [ ] Government [ ] Negotiate [ ]
56. What is your most successful year for vegetable production in the past three (3) years? . . . . . .
57. Why is that year most successful? . . . . . .
    . . . . . .

J. Income

58. Which month(s) in the season/year do you usually get high prices for your vegetables?
    Jan-Mar [ ] April-June [ ] July-Sept [ ] Oct-Dec [ ]
    Others (specify) . . . . . .
59. In which month do you have low prices for your vegetables?
    Jan-Mar [ ] April-June [ ] July-Sept [ ] Oct-Dec [ ]
    Others (specify). . . ..

60. How will you rate the income from the sale of your vegetables over the last three years?

Very low [ ] Low [ ] High [ ] Very high [ ]

61. What are your other source(s) of income?

. . . . . .

62. What is your main source of income?

. . . . . .

SECTION D – FARMERS' PERCEPTION ON THE CONTRIBUTION OF VEGETABLE PRODUCTION TO THEIR LIVELIHOODS

63. Please indicate the extent to which the following under- listed aspects of your livelihood have been improved since you started producing vegetables in the Metropolis by using the following ratings**:**

0 = No Improvement (NI)

1 = Very Low (VL)

2 = Low (L)

3 = High (H)

4 = Very High (VH)

Livelihood Assets Indicators		**Ratings**				
		0 NI	**1 VL**	**2 L**	**3 H**	**4 VH**
A	**Natural Capital**					
i	Increase in land size for production					
ii	Increase access to water for irrigation					
iii	Increase in yield					
B	**Information Capital**	**NI**	**VL**	**L**	**H**	**VH**
i	Awareness of land & water resources management					
ii	Increase your decision making ability					
iii	Increase access to services from change agents					
iv	Awareness of ICT to access information					
v	Increase access to credit facilities					
vi	Awareness of farmer association(s)					
vii	Increase access to marketing avenues					

C	Financial Capital	NI	VL	L	H	VH
i	Increase in income level					
ii	Increase in savings					
iii	Decrease in debt level					
iv	Increase in access to financial facilities					
D	**Human Capital**	**NI**	**VL**	**L**	**H**	**VH**
i	Increase in knowledge/skill levels					
ii	Increase access to health facilities					
iii	Increase access to training					
iv	Increase access to labour					
E	**Social Capital**	**NI**	**VL**	**L**	**H**	**VH**
i	Membership to association					
ii	Support from association					
iii	Support from other individual farmers					
iv	Care for the household					
v	Payment of school fees					
vi	Support other family members					
vii	Support friends					
viii	Payment of funeral dues and other levies					
F	**Physical Capital**	**NI**	**V L**	**L**	**H**	**VH**
i	Ability to buy irrigation pump					
ii	Ability to buy sprinklers					
iii	Ability to buy watering cans					
iv	Ability to buy knapsack sprayers					
v	Ability to buy motor cycle/bicycle					
vi	Ability to buy vehicles (cars, trucks, tractors)					
vii	Ability to build a house a house					
viii	Ability to access irrigation pump					
ix	Ability to access sprinklers					
x	Ability to access watering cans					
xi	Ability to access knapsack sprayers					
xii	Ability to access motor cycle/bicycle					
xiii	Ability to access vehicles (cars, trucks, tractors)					
xiv	Ability to rent a house					

SECTION E: PRODUCTION AND MARKETING CHALLENGES

K. Production Challenges

64. Please, list the production challenges you experience in order of severity

6 = Not Severe; **5** = Slightly Severe; **4** = Moderately Severe; **3** = Severe;

2 = Very Severe; **1**= Extremely Severe

Order of Severity	Production Challenges
	High input cost
	Incidence of pests and diseases
	Poor soil fertility
	Inadequate water
	Irrigation of crops
	Lack of credit facilities

65. Please, how do you manage the production challenges mentioned above?

1st Challenge. . . . . .

2nd Challenge. . . . . .

3rd Challenge . . . . . .

4th Challenge . . . . . .

5th Challenge . . . . . .

6th Challenges . . . . . .

L. Marketing Challenges

66. Please, list the marketing challenges that you encounter in order of severity?

5=Not Severe; **4**=Slightly Severe; **3**=Moderately Severe; **2**= Severe;

1= Very Severe

Order of Severity	Marketing Challenges
	Lack of cold transport and storage facilities
	Fluctuating demand
	Postharvest losses
	Female dominance
	Low price offer

67**.** Please, how do you manage the marketing challenges mentioned above?

1st Challenges. . . . . .

2nd Challenges**.** . . . . . .

3rd Challenges. . . . . .

4th Challenges.. . . . . .

5th Challenges . . . . . .

Thank you very much for your information and time.