

**UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES**

**ADAPTATION OF URBAN VEGETABLE FARMERS TO URBAN
CHANGE IN THE GREATER ACCRA METROPOLITAN AREA**

BY

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
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DECLARATION

I, MICHAEL TUFFOUR, the author of this thesis, declare that with the exception of the references, which are duly cited, I solely conducted this thesis, which is titled ‘Adaptation of Urban Vegetable Farmers to Urban Change in the Greater Accra Metropolitan Area’ in the Institute of Statistical, Social, and Economics Research (ISSER) from 2014 to 2018. This thesis has never been presented either in part or completely for the award of a degree in this University or elsewhere.

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We, the undersigned supervisors, certify that this is an original work, which we supervised the candidate to produce. We are also convinced that this thesis meets all required standards set by the University of Ghana for an award of a Doctor of Philosophy Degree.

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DEDICATION

I dedicate this work to my wife, Damaris Ama Adela Tuffour.

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ABSTRACT

Ghana's urban change has been intense and rapid on several fronts over the past years. This has affected several economic activities within the urban space of which one is urban agriculture. Urban agriculture has over the years attracted attention in research due to its significance in the urban space. Notwithstanding the attention given in research, the assessment of urban farmers' adaptation to the effect of the rapid urban change has not been given a detailed attention in literature. This study, which had an overarching question of how urban farmers are adapting to the effects of urban change on their farming activities within the context of institutional frameworks and roles, was situated in change, resilience and behaviour theories. Using a collective case study design and pragmatist research approach, the study adopted an exploratory sequential mixed method, which had qualitative as the leading research approach and with quantitative following. The sources of the qualitative data used were interviews from farmers, interviews from institutional representatives, and institutional policy documents that influence urban agriculture. The quantitative data was from a survey of 251 farmers, and rainfall, humidity and temperature data from the Ghana Meteorological Agency (GMA). In examining the importance of institutional frameworks and roles in urban agriculture, the effect of urban change on urban farmers' activities and the adaptation strategies farmers use with respect to urban change, content and thematic analyses of the interviews conducted and government policy documents were mainly used, with some descriptive statistics supporting. In estimating the factors that determine urban farmers' adaptation to urban change, a quantitative approach, which combined principal component analysis and ordinary least squares was used. The following findings were made based on the analyses. Institutional actors are involved in urban agriculture promotion through the training of farmers, provision of logistics and land for production, notwithstanding the fact that the changing urban environment makes it difficult for them to help the farmers. The institutions, which provide lands to the farmers do not have any official agreement with the farmers and sometimes abuse them even though they are a tremendous source of support to farmers. While some of the urban changes have brought only positive or only negative effects to urban farmers, others have brought both to them. The study could not conclude on which set of effects of urban change was more significant. While some adaptation strategies targeted an effect, others targeted more than one effect, which was positive or negative. The ordinary least square estimates proved that production adaptation can be predicted more than marketing and finance adaptation, by personal and farm characteristics of urban farmers in the context of urban change. The study recommends the drafting of a comprehensive urban agriculture policy in Ghana, which focuses on the provision of land and water for urban agriculture, training of urban vegetable farmers and the strengthening of the institutions whose operations affect urban agriculture in the area of coordination, cooperation and promotion of urban agriculture. In the absence of a comprehensive UA policy, MMDAs should consciously make room for UA especially in their spatial planning decisions. Government and urban dwellers as well should also see urban expansion as an opportunity to create urban employment and a way to improve the welfare of city dwellers and this should be integrated into city planning. Institutions must use multi-faceted and targeted strategies in helping farmers to adapt to the positive and negative effects of urban change, and farmers must be encouraged to transfer their knowledge and skill in adaptation to other farmers.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACCCRN	Asian Cities Climate Change Resilience Network
ADMA	Adenta Municipal Assembly
AMA	Accra Metropolitan Assembly
ANOVA	Analysis of Variance
APSIM	Agricultural Production Systems Simulator
ASHMA	Ashaiman Municipal Assembly
BARA	Biotechnology and Nuclear Agriculture Research Institute
BLUE	Best Linear Unbiased Estimator
BNARI	Biotechnology and Nuclear Agriculture Research Institute
CAPI	Computer-Assisted Personal Interviewing
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CBD	Central Business District
CENCOSAD	Centre for Community Studies, Action, and Development
CSIR	Centre for Industrial and Scientific Research
DAAD	German Academic Exchange Service
FAO	Food and Agricultural Organization
FASDEP	Food and Agriculture Sector Development Policy
FBO	Farmer Based Organization
GACL	Ghana Airports Company Limited
GAEC	Ghana Atomic Energy Commission
GAMA	Greater Accra Metropolitan Area
GAP	Good Agricultural Practices
GEMA	Ghana East Municipal Assembly
GBC	Ghana Broadcasting Corporation
GCAA	Ghana Civil Aviation Authority
GHAIP	Ghanaian Italian Petroleum Company
GHS	Ghana Health Service
GIDA	Ghana Irrigation Development Authority
GMA	Ghana Meteorological Agency

GPS	Geographical Positioning System
GRIDCo	Ghana Grid Company Limited
GSS	Ghana Statistical Service
GWCL	Ghana Water Company Limited
ICT	Information Communication Technology
IFPRI	International Food Policy Research Institute
ISSER	Institute of Statistical, Social and Economic Research
IWMI	International Water Management Institute
JHS	Junior High School
Korle-Bu	Korle – Bu Teaching Hospital
KKMA	Kpone Katamanso Municipal Assembly
LADMA	La-Dadekotopon Municipal Assembly
LANMMA	La Nkwantanang Madina Municipal Assembly
LUSPA	Land Use and Spatial Planning Authority
METASIP	Medium Term Agriculture Investment Plan
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
MPPACC	Model of Private Proactive Adaptation to Climate Change
MSWR	Ministry of Sanitation and Water Resources
MWRWH	Ministry of Water Resources, Works, and Housing
NGO	Non- Governmental Organization
OFY	Operation Feed Yourself
OLS	Ordinary Least Square Estimate
PCA	Principal Component Analysis
PMT	Protection Motivational Model
RUAF	Resource Centres on Urban Agriculture and Food Security
SAP	Structural Adjustment Programme
SCM	Social Cognitive Model
SHS	Senior High School

TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TMA	Tema Metropolitan Assembly
UA	Urban Agriculture
UDS	University of Development Studies
UG	University of Ghana
UN	Habitat-United Nations Habitat
UN	United Nations
UNESDA	United Nations Economic Social Development Agency
USA	United States of America
WHO	World Health Organisation

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Urban agriculture (UA) is an essential component in the development of agriculture in many countries. It is vital in supporting urban food security, greening urban spaces, creating jobs in urban areas, and also serving as a source of income for many urban dwellers (Cornish & Aidoo, 2000; Smit, Nasr & Ratta, 2001; Mougeot, 2006; Arku, Mkandawire, Aguda & Kuuire, 2012). Its importance in agriculture has led to an increase in its research and the formation of policies and strategies that affect it in many countries of the world (Arku et al., 2012; Martellozzo, Landry, Plouffe, Seufert, Rowhani & Ramankutty, 2014).

Urban agriculture basically operates within the urban space (Arku et al., 2012); which goes through changes (Smit et al., 2001; Satterthwaite, 2007; Satterthwaite, McGranahan & Tacoli, 2010). These changes within the urban space where urban agricultural activities take place have been intense, rapid, huge, complex and significant in many cities and countries of the world. The rapid urban change in the world is more pronounced in countries and cities in Asia and some parts of Africa (United Nations, 2012; Masters, Djurfeldt, De Haan, Hazell, Jayne, Jirström & Reardon, 2013).

One of the most important drivers of this intense urban change (urbanisation) is urban population growth (United Nations, 2009; Satterthwaite et al., 2010; Deshmukh, 2015; Jain, 2018). The urban population growth rate of the world during the past four decades has been phenomenal and it is estimated that about 3.2 billion new residents will be added to the global urban population between the years 2000 and 2050, a figure which will exceed the world's population during the 1950s. It is also estimated that by the year 2050,

the urban population in the world will reach 6.25 billion, with about 80% of these urban centres situated in the regions of Asia and Africa. Africa alone is likely to have over a billion of its population in its urban centres by 2050; a figure which will be 60% of its total population (United Nations, 2013). By the year 2050, 20 of Africa's cities will be part of the 100 largest cities in the world, with cities such as Kinshasa in the Democratic Republic of Congo (DRC), Lagos in Nigeria, Dar-es-Salam in Tanzania, Luanda in Angola and Cairo in Egypt (UN - Habitat, 2010) being at the forefront as the most populous. In Ghana, the proportion of the urban population has swelled from 26% in 1960 (Ghana Statistical Service, 2005) to 50.9% in 2010 (Ghana Statistical Service, 2012) and it is projected to hit 65% by 2030 (UN-Habitat, 2012). This is a clear indication the rapid growth in the world's urban population will continue without interruption in the foreseeable future.

Urban change, with population growth as its key driver is also determined by changes in social, economic, political, administrative and cultural factors. Also, factors such as globalisation, Western influence, neoliberal economic policies and ideologies on urban centres also contribute to the urban change (Satterthwaite, 2007; Van Ginkel, 2008; Satterthwaite et al., 2010; Early, Howden - Chapman & Russell, 2015; Apostolopoulou & Adams, 2017). When there is urban change or urbanisation, it is mostly characterised by an increase in residential housing, road networks, social services availability and economic growth (United Nations, 2009). It is also characterised by infrastructural development and general urban expansion (Satterthwaite, 2007; Cobbinah, Erdiaw-Kwasie & Amoateng, 2015).

When a geographical area goes through urban transformation, it experiences pollution, climate change, a reduction in the land availability, transformation in production and marketing technologies used and change in the labour market dynamics (UN-Habitat,

2014; Early et al., 2015; Zhang & Xu, 2017). The urban transformation also affects urban agriculture, an important economic activity which serves as a source of livelihood to some urban dwellers (Arku et al., 2012). Urban agriculture is farming which takes place within the city or urban area (Zezza & Tasciotti, 2010). When there is a change in an urban centre, the production and other aspects of urban agriculture, which interact with the urban environment, are affected. As the urban space changes for example, urban resources such as land, water and labour, which are used for urban agriculture, are affected. This is because urban agriculture competes with other economic and social activities which use these urban resources (Mougeot, 2000; Van Veenhuizen, 2006; Satterthwaite, 2007; Satterthwaite et al., 2010).

Ghana has experienced a significantly high level of urbanisation, especially in the past thirty years of its socioeconomic history (Ministry of Local Government and Rural Development, 2012). As the World Bank (2015), puts it, “Ghana’s urban transformation has been momentous” (p.1). Its urbanisation has been characterised by a significantly high socioeconomic transformation in its urban areas (Songsore, 2009; Hitimana, Heinrigs & Trémolières, 2011; United Nations Department of Economic Social Affairs (UNDESA), 2012) and a relatively high urban population growth rate. The most urbanised part of the country has been its capital city, Accra (Ghana Statistical Service, 2005, 2012; UN-Habitat, 2012). The high level of urbanisation in Ghana’s capital, Accra, will mean that the activities of urban farmers will be affected and therefore they will have to adapt to the change since aspects of the change will affect their farming activities.

1.2 Statement of the Problem

The dynamics and relevance of urban agriculture in urban centres of Ghana has attracted a lot of interest in research. These studies in literature cut across land use trends and

dynamics in urban agriculture, urban farming systems and marketing, institutional attitude and actions toward urban farmers and the effects of the activities and functions of urban agricultural farmer organisations on urban agriculture. Other studies have centred on wastewater use in urban farming, health risks associated with urban vegetable production, the contribution of urban agriculture to urban food security and the effects of urban agriculture financing on urban farming activities. The various aspects of urban agriculture studied is indicated in table 1.

With respect to land use trend and dynamics, areas that have been covered include tracing urban farmland boundaries with the use of alternative and advanced mapping technology, the general description of urban farming sites in Ghana and the nature of the various farming systems employed by farmers with respect to land use. Areas covered under urban farming systems in urban agriculture include irrigation and water use systems, labour use, crops grown in the light of the land tenure concerns, soil management practices and the changing of production and marketing methods to fit changing urban trends. On the front of urban agriculture marketing, the focus has been on the benefits that urban farmers obtain when they sell their goods in urban areas and on how vegetables are handled from the farm gate to the table of the consumer.

Table 1.1: Literature on urban agriculture in Ghana

Area of Study: Land use pattern and farming systems			
No	Title	Author(s) and Year	Objective/Focus
1	Urbanisation and changing patterns of land use in the peri-urban zone along the Airport-Ayimensah transect of Accra, Ghana.	Kufogbe and Surveyors (1996)	It looks at the effect of land use for residential purposes on urban and peri – urban farmers in the Greater Accra Region of Ghana.
2	Urban and Peri-Urban Agriculture in Developing Countries Studied using Remote Sensing and In Situ Methods	Appeaning Addo (2010)	The study reviews the various ways of using remote sensing technology in developing an integrated urban farmland use monitoring systems, which lead to sustainable policies for urban agriculture land use and development.
3	Urban Vegetable Farming Sites, Crops and Cropping Practices	Danso,Drechsel,Obuobie,Forkuor and Kranjac-Berisavljevic (2014)	The study mainly gives a description of the major sites where open space urban agriculture takes place in the main cities of Ghana. It also describes the principal cropping systems, the types of crops grown, land tenure issues involved and the other characteristics of irrigated vegetable farming.
4	Land and planning for urban agriculture in Accra: sustained urban agriculture or sustainable urbanisation?	Allen,Apsan Frediani and Wood-Hill (2014)	The study looks at the various changes and contestations that have occurred in the use and ownership of land for urban agriculture due to urbanisation, the various challenges of farmers and the farming strategies they are employing in farming in the city of Accra.
5	Irrigation and soil fertility management practices	Keraita and Cofie (2014)	The focus of the study is on the different irrigation methods and soil nutrient practices used in urban vegetable farming in three urban centres in Ghana, which are Kumasi, Accra, and Tamale.

Area of Study: Urban agriculture marketing			
No	Title	Author(s) and Year	Objective/Focus
6	Urban market gardens in Accra	Centre for Community Studies, Action and Development CENCOSAD (1994)	The study's focus is on the concerned issues when it comes to the marketing of the produce of urban agriculture. It focuses on the activities of producers and consumers of urban agricultural produce and observes some benefits that come to them in trading in urban farm produce.
7	Marketing Channels for Irrigated Exotic Vegetables	Henseler and Amoah (2014)	This study looks at the marketing channels of lettuce produced in Accra and Kumasi from the farm to the table (consumer). It also looks at the various ways of marketing and places lettuce produced are consumed.
Area of study: Official attitude and Policy towards Urban Agriculture			
8	Changes in Official Attitudes Towards Urban Agriculture in Accra	Obosu-Mensah (2002)	The study focuses on the negative attitude of public officials towards urban agriculture and the factors' influencing their attitudes.
9	Urban cultivation in Accra: an examination of the nature, practices, problems, potentials and urban planning implications	Asomani-Boateng (2002)	The study argues that there was lack of reliable information in literature on urban agriculture in Ghana. It therefore examined the status of urban agriculture in Accra, Ghana and reviewed previous studies done in urban agriculture by looking mainly at its history, nature, farming, potential, practices, problems, and implications for its planning in cities in Africa.
			The study looks at the attitude of policy makers towards the development of urban agriculture in the context of food security the city of Accra, in the midst of drastic urban change, globalization, and neoliberal economic policies. It

10	Africa's Quest for Food Security: What is the Role of Urban Agriculture?	Arku et al. (2012)	also looks at the challenges and potential of urban agriculture in the city of Accra and the policy support it requires.
11	Governmental and Regulatory Aspects of Irrigated Urban Vegetable Farming in Ghana and Options for its Institutionalization	Dreschsel,Obuobie,Adam-Bradford and Cofie (2014)	This study examines institutional factors that are vital to the survival and sustenance of irrigated agriculture in Ghana. It also looks at the various policies, laws, and strategies adopted to promote urban agriculture and to reduce the risk involved in the use of urban wastewater in urban agriculture.
12	Urban and Peri-Urban Agriculture: Towards a Better Understanding Of Low-Income Producers' Organizations"	Egyir and Ackah-Nyamike (2006)	The study looks at the potentials and constraints of urban agriculture in its contribution to urban food security and draws recommendations for the formation of urban and peri – urban producer organisations for sustainable livelihoods of poor, low – income and small-scale producers.
Area of Study: Environmental and health issues, compost and water use in urban agriculture			
13	Estimating the demand for municipal waste compost via farmers' willingness-to-pay in Ghana	Danso,Drechsel,Fialor and Giordano (2006)	The study discusses the use and willingness of farmers to pay for compost waste for urban agricultural for their production.
14	The potential of using composited municipal waste in agriculture: the case of Accra, Ghana	Hofny-Collins (2006)	The study mainly focuses on the preferences and differences in using two main forms of urban waste in urban farming. These are waste from the compost plants and waste from chicken manure. The study also looks at the potential environmental, economic, socio-cultural, and political factors that influence the choice of these wastes for urban agriculture.

15	Irrigated Vegetable Farming in Urban Ghana: A Farming System between Challenges and Resilience	Drechsel,Adam-Bradford and Raschid-Sally (2014)	It is an introductory chapter to a book and provides brief information on the role of urban agriculture in an urbanising Ghana, where the use of polluted wastewater for agriculture is common and significant. It gives an overview of the changes that have occurred in the urban centres in Ghana and the challenges it brings to the urban farmers.
16	Urban agriculture in the Greater Accra Metropolitan Area	Armah-Klemesu and Maxwell (1998)	The study focuses on how urban agriculture has affected the food security and nutritional status of families. The relationship it has with the environment as well as the changing dynamics of land rights and ownership.
17	Quality of vegetables in Ghanaian urban farms and markets	Amoah,Lente,Asem-Hiablie and Abaidoo (2014)	The study looks at the microbiological content and other forms of contaminants on vegetables produced in Accra, Tamale, and Kumasi, from the farm gate and ending at market centres, where they are bought for consumption.
18	Human health risks from wastewater-irrigated vegetable farming	Drechsel,Keraita,Seidu and Abaidoo (2014)	The study focuses on the human health risks factors that prevail in the production of vegetables in urban centres in Ghana as well as the marketing and consumption of these contaminated vegetables.
19	Health risk perceptions of stakeholders in irrigated urban vegetable Farming	Obuobie,Keraita,Hope and Agodzov (2014)	The study looks at the perception of the various actors on the value chain of irrigated vegetable production as well as that of government officials when it comes to the health risk in its marketing and consumption.
20	Health risk management for safe vegetable irrigation	Drechsel,Keraita,Amoah and Karg (2014)	The study looks at the various approaches used to reduce the risk encountered in the use of wastewater for irrigated urban agriculture in Ghana.
			The study focuses on the various factors that have shaped the use of agrochemicals by urban farmers in Ashiaman,

21	Urban agriculture and political ecology of health in municipal Ashiaman, Ghana	Nyantakyi-Frimpong, Arku and Baah Inkoom (2016)	Ghana. It further assesses how these applications of chemicals affect the health of farmers with respect to their gender.
22	Quality of irrigation water used for urban vegetable production	Keraita, Silverman, Amoah and Asem-Hiablie (2014)	The study looks at the quality of water used for irrigated urban agriculture in Accra, Kumasi, and Tamale. This was done by taking water samples to the lab to check for the microbiological, chemical, and other emerging contaminants in the water used for urban agriculture.
23	Financial and Economic aspects of urban agriculture	Danso, Hope and Drechsel (2014)	The study explores some financial and economic dimensions of urban agriculture in Ghana. It looks at the contribution urban agriculture makes to urban food supply and compares it to the negative externalities it makes to the environment.
Area of Study: Urban agriculture and gender			
23	Characteristics of Urban Vegetable Farmers and Gender Issues	Obuobie and Hope (2014)	The study looks at the characteristics of farmers involved in irrigated urban agriculture and the gender disparities of both farmers and sellers (retailers), and looks at the reason behind the disparities.
24	Farmers, not gardeners. The making of environmentally just spaces in Accra.	Allen and Apsan Frediani (2013)	The study looks at the differences in the gender responses (reactions) among urban farmers to the ever-changing land use dynamics in a fast changing city of Accra. It looks at how this marginalised group (farmers) is able to claim urban spaces for farming.

Area of Study: Urban agriculture, farmer based organization and urban agriculture financing			
25	Strengthening urban producer organizations	Larbi,Cofie,Amoah and Van Veenhuizen (2014)	This research looks at the results of the implementation of a Resource Centre on Urban Agriculture and Food Security (RUAF) project, which was aimed at strengthening farmers' organizations involved in irrigated vegetable farming and marketing. The study assesses the training given which was in the form of food safety and minimisation of risk in wastewater usage in urban farming as well as the marketing strategy.
26	Options for local financing in urban agriculture	Egyir,Cofie and Dubbeling (2014)	This study assesses the financial practices that are made available for urban farmers. It also assesses the various challenges and opportunities available in financing urban agriculture.

Most of the studies that have been conducted on the actions of institutions that influence urban agriculture have focused on the official attitude towards urban agriculture and the factors that determine the actions of institutions influencing urban agriculture. The other institutional studies have looked at the various laws and policies of government and other organisations that influence urban agriculture in Ghana and the actions they take in helping farmers.

With respect to environmental, soil and health concerns in urban agriculture, aspects captured in research include willingness to pay for processed compost by farmers, the possibility of using waste as compost for urban farmers, and how the changing phase of urban centres has affected food security and urban families. Environment and health risk studies have also included an observation of contamination levels of urban vegetable produced from the farm gate to the table of consumers, analyses of the views of consumers and government institutions on the health risk of the vegetables produced in Ghana, and analyses of the actions taken to by institutions to reduce the health risk of urban agriculture produce. The health effects of agrochemical use on farmers and the factors underlying their use have also been studied under the environmental and health aspect of urban agriculture research.

With respect to gender issues on urban agriculture, studies have looked at the common characteristics that are found in urban resource use among males and females and the gendered roles played in the various facets of urban agriculture in the presence of the changing urban space. With respect to research in the financial aspect of urban agriculture, studies have looked at the financial benefits farmers gain from engaging in urban agriculture, the availability of financial support to farmers and the challenges urban farmers face in obtaining financial support for their farming activities.

Even though several studies have been conducted under urban agriculture in Ghana, gaps continue to remain, especially in the linkages between urban change, its effect on urban agriculture and urban farmers' adaptation and more importantly the other important issues and nuances that evolve from these linkages. The ongoing urban change in the Greater Accra Metropolitan Area (GAMA) is likely to affect its dwellers who have been engaging in farming as their main source of livelihoods under some peculiar circumstances. These circumstances of farmers within the changing urban space are such that they are highly vulnerable to the changing urban environment because most of them do not own the lands they farm on (Allen et al., 2014; Egyir et al., 2014) and most of them are classified under the low-income bracket group within GAMA. Besides, they are operating on lands in the city, which are not necessarily under the jurisdiction of city authorities and also earmarked for urban agriculture. Under these circumstances, there is also no comprehensive urban agriculture policy in Ghana or GAMA, which is set out to regulate and promote urban farming activities, except the different and piece meal policies, which come from the various concerned government institutions and departments, intergovernmental organizations, and non-governmental organizations (NGOs). Some of these government institutions and departments are the Ministry of Local Government and Rural Development (MLGRD), Ministry of Food and Agriculture (MoFA) and Ministry of Sanitation and Water Resources (MSWR). The others are Land Use and Spatial Planning Authority (LUSPA), and the various Metropolitan, Municipal and District Assemblies (MMDA).

The several studies conducted are devoid of clear and in-depth linkage between urban change, its effect on UA and farmers' adaptation. The ones that have looked at aspects of urban change and urban agriculture have concentrated more on the negative effects of urban change on UA

and not given much attention to the positive effects. In addition, these studies have used data restricted to popular farming sites such as Dzorwulu, Ghana Atomic Energy Commission (GAEC) and Korle –Bu and not unpopular sites such as Ghana Grid Company (GRIDCo) and Ashongman. These studies have mainly used qualitative research methods to study adaptation and not considered quantitative methods. They have also not explored the other significant aspects of urban change effect on UA such as farm labour dynamics, security of farmers on present lands and financial and market dynamics. Based on the various gaps identified in literature, the following were set out to be filled by the study:

- i. Establishing a clear and an in-depth linkage between urban change, its effect on UA and farmers' adaptation.
- ii. Properly identifying and linking specific aspects of urban agriculture, which have been affected by specific aspects of urban change.
- iii. Going beyond land and water as the key resources, which have been affected by urban change, and considering other equally important economic resources such as labour, finance and market factors.
- iv. Considering the effect of urban change on urban agriculture not only from a negative perspective of the farmer but also from the positive perspective.
- v. Indicating how farmers are specifically adapting to specific and various effects of urban change on urban agriculture.
- vi. Using quantitative analysis to understand the factors that affect urban farmers' adaptation to the effect of urban change.

- vii. Increasing the coverage of urban farm sites in Accra and Tema beyond the popular and established ones in urban agriculture research and adding other equally important but unpopular sites to the research sample.
- viii. Shedding more light on the common actions and roles of the institutions, which influence urban agriculture, and relating them to the stipulated national and institutional laws and policies that concern urban agriculture in Ghana.

These gaps in research bring an opportunity for a study to be conducted in urban agriculture in Ghana by asking the central research question which is: How are urban farmers adapting to the effects of urban change on their farming activities within the context of institutional frameworks and roles? This central research question can be divided into these specific questions:

- i. How are the institutional frameworks and roles influencing urban agriculture within the context of urbanisation?
- ii. How does urban change affect urban farmers' on-farm decisions and actions?
- iii. What strategies are urban farmers using in adapting to the effect of urban change?

1.3 Objectives of the Study

The objectives of the study are divided into main and specific.

1.3.1 Main Objective

To investigate how these farmers organise their production, marketing and finance related activities to the effect of urban change within the framework of existing roles and frameworks of formal institutions.

1.3.2 Specific Objectives

Specifically, the study intends to look at the following:

- i. To examine how roles and frameworks of formal institutions influence urban agriculture within the context of urban change.
- ii. To assess the effect of urban change on urban farmers' farm on farm decisions and actions.
- iii. To assess the strategies urban farmers use in adapting to the effect of urban change.

1.4 Justification of the Study

The support and interest shown concerning the development of urban agriculture in the form of research, finance, and technical support in Ghana and Africa in particular is acknowledgeable. Notwithstanding the effort made in urban agriculture research, there still is an opening for in-depth research to be conducted with respect to how urban farmers are affected by rapid urbanisation especially under the circumstances of their vulnerability to urban change, lack of important urban farming resources such as land and an absence of a comprehensive urban agricultural policy. This study will add to the literature of urban change effect on farmers and by bringing a new perspective of urban agriculture research in Ghana and Africa, which looks at the resilience of urban farmers in the midst of a rapid urban change. Urban farmers are been confronted with several issues as the urban environment is changing rapidly. In the midst of this change, some opportunities and serious challenges beckon them (Azunre, Amponsah, Peprah, Takyi & Braimah, 2019). The study will also serve as means of broadening and deepening the debate on the effect of urban change on urban agriculture, not only on its negative effects to urban vegetable farmers but also on its positive effects to them.

This is because most studies have focused on the challenges farmers face in the urban centres and given little attention to the benefits they enjoy by being in the cities. Among some of the obvious challenges are the continuous reduction of land spaces for urban agriculture and its likely environmental problems. Notwithstanding the challenges, farmers have been farming for years. The findings of the study will reignite the debate on the essence of supporting and paying attention to urban agriculture in Ghana and Africa's cities. It will also bring to the fore the relevance of formulating a comprehensive policy that regulates and promotes urban agriculture due to the realised advantages it will bring to the cities. The findings of the study will cause organizations such as Ministry of Food and Agriculture, Ministry of Local Government and Rural Development and the now Land Use and Spatial Planning Authority to regularly consider UA in cities in Ghana and acknowledge the benefits the farmers will derive from it when it comes to their farming decisions and activities. These policies will cover spatial planning for UA and the introduction of advanced farming technology in UA among other benefits.

The findings in this study will bring to the limelight other dimensions of the debate of urban vegetable farmers' opportunities, survival, and resilience in the midst of rapid urbanisation. It will also help in appreciating the various adaptation strategies employed by these farmers in order to take advantage of the benefits that the change bring to them and minimise the challenges it brings to them. This in the end might call for a multifaceted approach by institutions directly involved in the promotion of urban agriculture to be adopted in view of an urban change in order to reduce the negative effect of urban change on UA and take advantage on the benefits. Experiences of farmers on urban agriculture adaptation realised

through this research can be used as a training manual for the training of other farmers in other cities of Ghana and Africa where a comprehensive policy is lacking and or where the farmers are vulnerable with respect to land use for UA in the midst of an intense urban change. Satterthwaite (2007) asserts that poor knowledge of factors that underpin urban change will continue to encourage the formulation of poor, ineffective, and inappropriate policies by governments and international agencies. Therefore, a good knowledge on how urban farmers adapt to the change in urban centres will give the stakeholders involved in urban agriculture a deeper insight into their activities. By this, better policy options can be formulated in promoting urban agriculture.

Urban agriculture continues to provide essential food supplements to urban dwellers and also serves as a source of extra income to some of them (Egyir & Ackah-Nyamike, 2006). The findings of the study on the positive effects of urban change to urban farmers will prompt policies makers to draft policies that will factor in urban agriculture as one of the essential approaches to solving the problem of urban food security and unemployment. This will go a long way to help draw practical and realistic policies, which will improve the livelihood of many urban dwellers through employment. This action will in the end reduce urban crime and at the same time improve urban food security.

1.5 Structure of the Study

The thesis is organised into eight chapters. The first chapter, chapter one, contains the background of the study, statement of the problem, research questions, objectives of the study, justification of the study as well as the structure of the study. The second chapter, two, is titled 'urbanisation and its interaction with urban agriculture: Ghana's experience'. It

discusses in detail the changes in the cities of Ghana and how they have affected urban agriculture. Chapter three explains the study's concepts and shows how they are linked to its conceptual and analytical frameworks as well as the theories. Chapter three also reviews literature on the theories of the study. Chapter four explains the methodology of the study. This involves the philosophical underpinning, research design, the data collection procedure, methods of data analysis for achieving the objectives of the study, as well as the study's ethical considerations. Chapters five, six, and seven present the empirical results of objectives one, two, and three respectively. Chapter eight, which is the final chapter, summarises the study, makes conclusions, provides policy recommendations, indicates the study's contribution to knowledge and makes suggestions for future research.

CHAPTER TWO

URBANISATION AND ITS INTERACTION WITH URBAN AGRICULTURE: GHANA'S EXPERIENCE

2.1 Introduction

This chapter gives a trajectory of Ghana's urbanisation and its outcomes that are relevant in affecting urban agriculture in Ghana. This is because the study acknowledges that the extent of urban transformation can significantly affect urban agriculture and since it is within the context of Ghana, tracing this trajectory will give an insight into the prevailing issues of urban change on urban agriculture as well as give meaning to the empirical findings of this study. The chapter also gives the history of Ghana's urban agriculture, its main characteristics and the frontier of its research in Ghana.

2.2 Ghana's Urban Transformation and its outcomes

Ghana's urbanisation process has been very rapid and significant (Songsore, 2009; Yankson & Bertrand, 2012; World Bank, 2015, 2015). Its urban population, for instance, has tripled between 1984 and 2013. In 1984, its urban population was 29% but increased to 51% in 2013 (World Bank, 2015; Ghana Statistical Service, 2014). Songsore (2009) categorises Ghana's urban transformation trajectory into five different transitional periods. They are the 'pre-colonial' which preceded the coming of the Europeans, the 'colonial', which witnessed the presence of the Europeans, the 'post-colonial' which was after the colonial rule, the 'economic crisis and structural adjustment' and the 'post structural adjustment' period.

The precolonial period was in two phases. The first phase of the pre-colonial period (Songsore, 2002) occurred between the 13th and 14th centuries (Adi, 2012). The urban towns,

which were known in ‘Ghana’, were mostly in the inlands. The vibrancy of these urban centres was mainly based on their significance as trade routes and centres to the Western Sudan Empire. Some of these towns were Yendi, Wa, Salaga and Kumasi (Dickson, 1970, in Songsore, 2009, 1971, in Songsore, 2009). The second phase of the ‘precolonial’ period, was when towns and villages turned to urban centres due to their interaction with European traders (Songsore, 2002) who mainly traded in humans, gold, and other materials (Hymer, 1969). Towns in the coastal portions of ‘Ghana’ such as Cape Coast and Elmina gained popularity and significance because trading at that time had shifted from the inner parts of Ghana to the coast during the arrival of the Europeans. Even though the coastal towns gained more predominance to be classified urban, towns such as Akwamu and Kumasi which were inland also grew due to their significance in trade during the period (Hymer, 1969). Even though population figures during that period are difficult to estimate, Hymer (1969) asserts that Kumasi, which was surrounded by numerous villages had a population of between 30,000 and 40,000.

The ‘colonial’ period experienced the movement of the capital of the then Gold Coast, Cape Coast, to Accra in 1877 (Grant & Yankson, 2003). Towns during that period had grown in numbers, become larger, more urbanised and at the same time become administratively and economically significant. Some of these were Takoradi, Kumasi, and Accra (Songsore, 1979 in Songsore, 2009, 1989 in Songsore, 2009). By 1950, Accra, which was formerly a town, had turned into a city and was then the centre for trading in cocoa, gold and timber as well as banking in addition to its administrative activities (Grant & Yankson, 2003). It was during this period that the concept of urbanisation began to gain grounds although there were few towns in the country. As at 1941, ‘Ghana’ had 41 urban settlements with a total population of

about 570, 600 people (Ghana Statistical Service, 2005 in Songsore, 2009). Even though Ghana's towns were becoming urbanised, most towns in the northern part of the country were urbanising at a slower pace with some not urbanising at all. This was mainly due to the unevenness in the pace of development within the country in general and the fact that the various towns pace of development were mainly based on their significance in trade. Trade had mainly turned its focus to the 'South' and made the Northern part of Ghana the preserve for labour recruitment for trade and production centres in the South (Songsore, 1983 in Songsore, 2009; Songsore & Denkabe, 1995, in Songsore, 2009). The towns in the southern parts of Ghana experienced more expansion in rail and road infrastructure between 1945 and 1957, especially in the cocoa growing and gold mining areas. This was because the colonial government had a plan to modify Ghana's infrastructural development before it gained independence (Hopkins, 1973, in Songsore, 2009). This also led to the labour migration from the rural areas to the urban centres. It is argued that rural-urban migration was the main source of urbanisation from 1948 to 1960 in Ghana (Benneh, Nabila, Songsore, Yankson & Teklu, 1990, in Songsore, 2009).

At Ghana's independence in 1957, the precedence for Ghana's urbanisation had already been set by the colonial administration. This urbanisation period is termed as the post-colonial (Songsore, 2009). The already urbanised towns such as Accra continued to be further urbanised due to their significance as trade hubs in the colonial era (Songsore, 1979 in Songsore, 2009). The industrialisation agenda of Kwame Nkrumah, Ghana's first president, made these already urbanised towns more important in trade and industry. Some of these towns were Accra-Tema, Kumasi, and Sekondi-Takoradi, which were called the 'big three' (Songsore, 1989 in Songsore, 2009). This situation increased, causing intense urbanisation

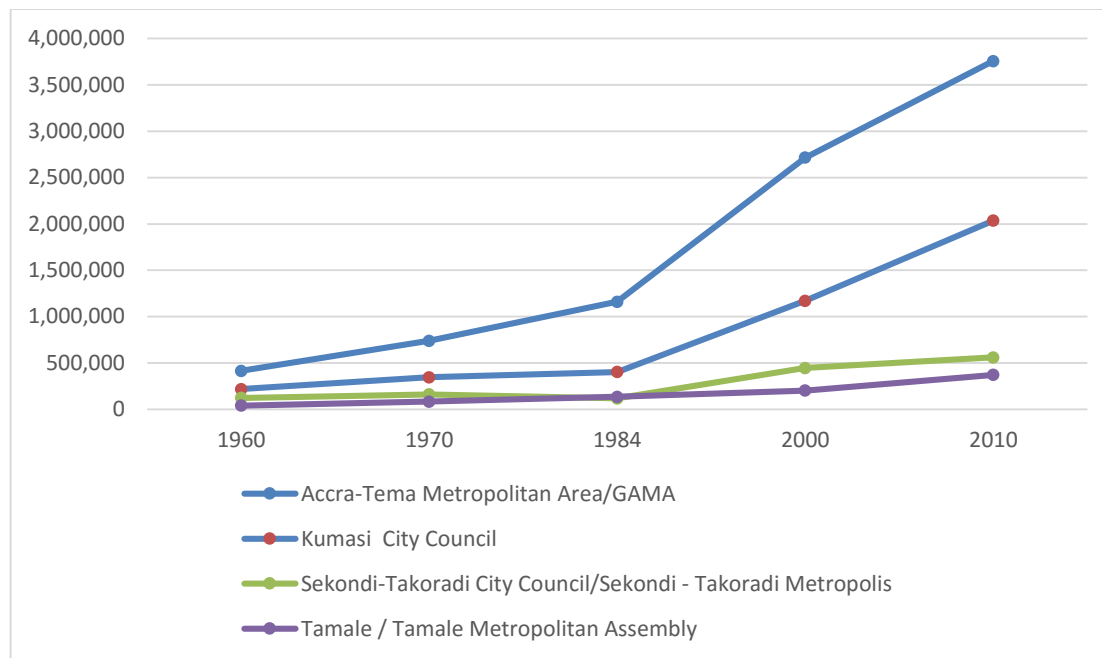
in most parts of the southern portion of Ghana, leaving the northern portion of the country less urbanised (Songsore, 1979 in Songsore, 2009). Songsore (2009) argues that Ghana's urbanisation after its independence did not see the addition of new cities or towns apart from the ones that already existed. Those ones expanded and turned to cities, which pulled people and other resources from different parts of Ghana to them. Kumasi, for instance, served as an industrial and commercial hub for almost the whole of the Ashanti, Brong Ahafo, and Northern Regions. Accra-Tema also served as a hub for the Central, Eastern, Volta, and Greater Accra Regions whereas Sekondi-Takoradi served as a hub for both the Central and Western regions. During this period, these cities had become significant in internal trade (Songsore, 2009).

The period of 'economic crisis and structural adjustment' as Songsore (2002) puts it, happened between the years 1983 and 1992 (Bawumia, 1998). The period saw Ghana's economy go through a major and significant transformation (Songsore, 2009). One profound economic policy that was introduced in Ghana's economy was the reduction in several forms of government subsidies. Some of these were subsidies on fertiliser and agricultural produce. Another economic policy introduced during the period was the promotion of a high-level trade liberalisation regime. These two economic policies caused the importation of cheap agricultural produce into Ghana to compete with the locally produced ones and this came as a big blow to food production, which was mainly found in the rural areas of Ghana. This led to the mobility of a large number of rural labour to the urban centres to find work to do. The rural migrants in the cities of Accra, Tema, and Kumasi mainly engaged in the trading of cheap imported manufactured goods from Europe and America. The large number of people in these already urbanised cities became secured markets for these imported goods. Accra,

Tema, Kumasi, and Takoradi, which were the most urbanised cities in Ghana at the period served as hubs for the marketing of these imported goods, attracting a large population from the rural areas for employment (Songsore, 2009; Yankson & Bertrand, 2012).

According to Songsore (2002), the 'recent period' of Ghana's urbanisation history came after the implementation of the SAP, which was arguably after 1990. UN-Habitat (2014) argues that Ghana experienced a rapid urbanisation between 2000 and 2010. Between that period, each of the four main cities' population had increased by at least 30% (See Figure 2.1). The Greater Accra Metropolitan Area (GAMA), which was about 2,700,000, had increased to 3,700,000 and that of Kumasi had increased from about 1,100,000 to 2,000,000 at the same period (Ghana Statistical Service, 2012). As at the year 2000, there were nine urban towns in Ghana that had a population of more than 50,000 but the number of towns increased to 36 as at 2010. Within the period of the Songsore (2002)'s 'recent era', Accra, which was about a quarter of Ghana's urban population (24.4%), had its share of urban population reduce to 16.6%. Towns such as Techiman, Nkronza, Sunyani, Anyinam, Ho, Hohoe, and Swedru had become urban towns within the period (Ghana Statistical Service, 2010). Some of the clear features of Ghana's urban transition during this period were uncontrolled spatial expansion, pushing of urban centres beyond its fringes, high cost of living, deplorable transport infrastructure, and an upsurge in the general infrastructure base (World Bank, 2015).

Figure 2.1: Population Trend of Leading Urban Centres in Ghana since 1960



Source: Ghana Statistical Service (2010, 2012)

Another significant feature was the presence of neoliberalism, westernisation, and modernisation in the economy during the period (Moller-Jensen & Knudsen, 2008; Songsore, 2009; Yankson & Bertrand, 2012). Even though the ‘structural adjustment’ period was characterized by a surge in Ghana’s urbanisation (Songsore, 2009), the ‘recent’ period was characterised by a significant change in the political, sociocultural, economic and environmental dynamics in most of its big urban centres (Yankson & Bertrand, 2012).

In all these six phases, the main factors that influenced the growth of these urban centres were population, internal migration from smaller towns and cities to urban centres, and trade (Songsore, 2002) but the time which witnessed a significant turnaround in Ghana’s urban surge was in the mid-1980s (World Bank, 2015).

Ghana's urbanisation processes have resulted in opportunities as well as challenges in the socioeconomic, cultural, physical, environmental and political dimensions of its cities (Songsore, 2009; Songsore, Nabila, Yangyuoru, Avle, Bosque-Hamilton, Amponsah & Alhassan, 2009; Adarkwa, 2012; Yankson & Bertrand, 2012; World Bank, 2015; Fraser, Leck, Parnell & Pelling, 2017). The economic challenges faced by urban dwellers are broad, complex and intertwined, and cover a wide range of issues; which are from high cost of living to infrastructural challenges (World Bank, 2015; Agyemang, 2017). The social challenges include housing and health difficulties (Institute of Statistical Social Economic Research (ISSER), 2016). Some of the cultural challenges are the breakdown of the culture of the local people and blindness in following the Western culture (Aboagye, 2015). The physical challenges include poor spatial planning and structural development of cities (Cobbinah et al., 2015; World Bank, 2015; Avogo, Wedam & Opoku, 2017) and weak implementation of institutional laws and policies on spatial issues (Grant & Yankson, 2003; Frick-Trzebitzky, Baghel & Bruns, 2017; Poku-Boansi & Cobbinah, 2018). The physical challenges also include land use and availability difficulties (Uwe, 2003, in Yankson & Bertrand, 2012; Owusu, 2008, 2013; Appiah, Bugri, Forkuor & Boateng, 2014) for housing, transportation and building of infrastructure for social services for city dwellers (Cobbinah et al., 2015; World Bank, 2015; Frick-Trzebitzky et al., 2017). The environmental challenges include indiscriminate waste disposal, flooding, high level of pollution and climate change (World Bank, 2015, 2015; Cobbinah, Poku-Boansi & Pephrah, 2017; Frick-Trzebitzky et al., 2017; Poku-Boansi & Cobbinah, 2018).

Notwithstanding the numerous challenges urban dwellers face as a result of urbanisation, there are benefits that come with it (Njoh, 2003). Some of these benefits are better access to

education and health services, improvement in living standards, access to relatively better jobs and other livelihood opportunities (Njoh, 2003; Awumbila, 2015). Afutu-Kotey, Gough and Yankson (2017) argue that Accra has opportunities in the area of informal employment and start-up of personal and small businesses especially among the many young migrants. The cities are sure avenues and focal points for the many migrants from the rural areas who use the former (Awumbila, 2015; Afutu-Kotey et al., 2017) as a springboard for improving their livelihoods. Over the years, these cities have become important avenues for building strong social networks and associations which serve as safety nets for migrants in times of disaster (Oteng-Ababio, Sarfo & Owusu-Sekyere, 2015). Afutu-Kotey et al. (2017) add that the use of modern technology has been one of the main advantages of urbanisation to residents and businesses in Accra. Accra has, over the years, also experienced a high-level of improvement in its transport and industrial sectors and this has also led to an increase in opportunities for businesses (Yankson & Bertrand, 2012).

2.3 Relationship between Urban Change and Urban Agriculture in Ghana

Even though there is an obvious relationship between urbanisation and agriculture in Ghana, linking these two concepts have not been clearly established in extant literature. But some studies have asserted that Ghana's urbanisation results in land use and availability challenges and this negatively affects urban agriculture (Asomani-Boateng, 2002; Owusu, 2013; Appiah et al., 2014). Population increase for example which is a key feature of urbanisation results in the spread of housing in the cities (Owusu, 2013), a situation which results in the intense competition for lands for farming (Allen et al., 2014; Danso et al., 2014; Mackay, 2018).

Population increase also results in environmental challenges which lead to the use of contaminated water for UA (Danso et al., 2014; Drechsel et al., 2014; Keraita et al., 2014).

Other studies have also suggested that the interaction between urbanisation and urban agriculture brings opportunities to urban farmers in the form of increase in marketing opportunities for urban agricultural produce. This leads to an increase in income generated by urban farmers and also creates other employment opportunities for many urban dwellers who are on the value chain of urban agriculture. Through the marketing of urban agriculture produce for instance, men mainly gain from producing more vegetables whereas women mainly gain from the marketing of more vegetables (Henseler & Amoah, 2014; Mackay, 2018).

2.4 History of Urban Agriculture in Ghana: Vegetable Production in Perspective

The whole concept of growing vegetables in Ghana was introduced by the British during the era of the colonial administration (La Anyane, 1963). Asomani-Boateng (2002) asserts that the growing of exotic vegetables in Ghana was the preserve of the European residents who were very few. The places where vegetables were grown were around the castles, forts, and residences of civil servants and other colonial administrators. The growing of vegetables intensified in Accra during the peak of World War II when the ‘allied forces’ who stayed in Ghana (previously the Gold Coast) had to be fed using exotic vegetables. This was mainly purposed to meet the growing demand of the allied forces for exotic vegetables. Even though the growing of exotic vegetables reduced significantly after World War II, it continued in Accra. One of the reasons which accounted for that was the prevention of the growing of indigenous staple crops and rearing of livestock and poultry in the cities by the colonial

administration. This, however, continued even after Ghana's independence in 1957, making the growing of vegetables more popular in the cities than the growing of the indigenous crops. For example, the health inspectors in the cities were asked to destroy any indigenous crops that had been grown in the cities and also to kill any livestock which was found roaming in their streets.

The Government of General Kutu Acheampong in the 1970s had attractive policies for urban agriculture, which brought a new boost to urban agriculture in Ghana. Harsh economic realities had hit Ghana during the period because of the poor handling of its huge external debts coupled with devaluation of its currency and an unexpected nationwide drought. These caused the government to curtail the importation of food, which resulted in a serious food shortage crisis. These among others called for a desperate implementation of agricultural programmes and strategies which would take Ghana out of its food crisis and engender food sufficiency (Asomani-Boateng, 2002). The "Operation Feed Yourself (OFY)" which was Ghana's most ambitious agricultural programme in its post-independence history gave urban agriculture a major boost between 1972 and 1976. The programme encourage the growing of vegetables and rearing of animals in towns and cities. Even though the main target of the programme was rural agriculture, the holistic nature of its implementation brought a spill over effect on urban agriculture. The stringent laws and policies on urban agriculture by the colonial government were relaxed and this gave way for urban dwellers to farm without fear of their animals being killed or crops destroyed (Hansen, 1987, in Asomani-Boateng, 2002).

The implementation of the SAP in the 1980's also affected UA in two major ways. The policies of diversification and neoliberalism, which were the bane of the Structural Adjustment Programme implementation in the 1980 and 1990s, resulted in the mass layoff of

public and formal industrial sector workers (Obosu-Mensah, 2002; Yankson, 2006, in World Bank, 2015). Many of these unemployed workers who did not have alternative employment skills turned to urban farming as an alternative source of employment (Obosu-Mensah, 2002). The several opportunities that urbanisation brought to urban farming caused several farmers to continue their farming activities in the cities in spite of the challenges (International Water Management Institute (IWMI), 2014).

2.5 Decentralisation Policy and Urban Agriculture Support in Ghana

The decentralization policy of Ghana clearly asserts the administrative and financial devolution of the various metropolitan, municipal and district assemblies (MMDAs). Based on this assertion, these assemblies are given the opportunity to take important decisions on issues that concerns them at their local levels (Constitution of the Republic of Ghana, 1992). In accordance with the provision made in the constitution and the support of the Ministry of Local Government and Rural Development (MLGRD), these assemblies are allowed to take decisions in various aspects of governance within the physical and policy space. These policies and legal frameworks make it possible for ministries, departments and agencies at the national level to have its sub-units at the various assemblies of the local government. Some of these respective sub-units are for health, finance, sports and agriculture (Friedrich Ebert Stiftung, 2010; Ministry of Local Government and Rural Development (MLGRD), 2010).

In the area of agriculture for example, the decentralization policy has allowed for the several district, municipal and metropolitan directorates under the mechanisms of the national secretariat of the Ministry of Food and Agriculture (MoFA) to work in a coordinated manner to promote agriculture. Some of these directorates are the Ghana Irrigation Development

Authority (GIDA), Agricultural Extension Services Directorate and Women in Food and Agricultural Development Directorate. These divisions and directorates at the local assemblies in the urban areas undertake various activities to promote urban agriculture. Some of these activities are the provision of training, extension and technical services in the areas of planting and harvesting, and marketing and financing of agriculture. They also include the provision of the needed logistics for urban agriculture such as seeds, seedlings, agricultural machines and fertilizer. Besides these units help in the implementation of the various programmes from the central government and its respective agencies, and also stimulate the collaboration of these various governmental and non-governmental institutions and agencies in promoting the course of urban farmers and agriculture in general (MoFA, 2007, 2010). These roles of the MoFA offices in these MMDAs directly affect farmers' on-farm factors such as adaptation techniques in production concerning water and soil conservation practices (International Food Policy Research Institute (IFPRI), 2018).

The decentralization policy of government has made it possible for the staff of these various directorates under MoFA in the MMDAs to be part of the main stream employees of the MLGRD even though they are technically under the control of MoFA (Dreschsel et al., 2014; International Food Policy Research Institute (IFPRI), 2018). The various policies on food and agriculture in Ghana also recognises the importance of these assemblies within the local government structure in playing key roles in the implementation of these policies. Some of these policies include the Food and Agriculture Sector Development Policy (FASDEP I & II), Medium Term Agriculture Sector Investment Plan (METASIP) and National Irrigation Policy, Strategies and Regulatory Measures and the Ghana National Spatial Development

Framework among others (MoFA, 2007, 2010; Government of Ghana, 2015; International Food Policy Research Institute (IFPRI), 2018).

Notwithstanding the structure of Ghana's decentralization system to support urban agriculture, the local government within its same administrative structure, actions, inactions and existing byelaws to an extent also serve as an impediment to the growth of urban agriculture. Some of these factors that limit farmers especially in the area of production are with respect to their decisions and actions on water and land use. For example, farmers are not supposed to use drainage water, which is unsafe for farming according to the AMA byelaws. The byelaws also prohibit farmers from farming close to river bodies within the city and prevent the use of poor farming practices in the city (Accra Metropolitan Assembly, 1995). These byelaws also frown on activities of residents and industries that pollute these water bodies within GAMA.

Even though these byelaws are good and in line with the laws of the central government, the administrative inactions of most of these MMDAs within GAMA for example results in the pollution of the water bodies and lands as well. In addition, this policy of the provision of buffer zones for farmers is non-existent, making farmers not having reserved government lands for farming. These issues for example make it very difficult for farmers to operate comfortably within the urban space with respect to the use of clean water and sufficient land for farming. The non-enforcement of these byelaws by city authorities on sanitation causes farmers to use polluted water for their farming (Obosu-Mensah, 2000; Dreschsel et al., 2014).

2. 6 Characteristics of Urban Vegetable Farming in Ghana

The characteristics of Ghana's urban agriculture as discussed under this section include land use dynamics, farming systems, gender dynamics, labour migration and urban vegetable farming, institutional policies and actions on urban agriculture in Ghana and frontier of urban agriculture research in Ghana. These characteristics generally define Ghana's urban vegetable farming.

2.6.1 Land Use Dynamics

Land has always been a key factor in the urban/peri-urban agriculture economy at the global level. And this is more pronounced in developing countries where there is a continuous change in land use dynamics as a result of rapid urbanisation (Satterthwaite et al., 2010; Aubry, Ramamonjisoa, Dabat, Rakotoarisoa, Rakotondraibe & Rabeharisoa, 2012; Vermeiren, Adiyia, Loopmans, Tumwine & Van Rompaey, 2013; La Rosa, Barbarossa, Privitera & Martinico, 2014; Salvati, 2014; Badami & Ramankutty, 2015; Recasens, Alfranca & Maldonado, 2016). The situation is not different in Ghana (Naab, Dinye & Kasanga, 2013; Appiah et al., 2014); where land is one of the most important resources in its urban agriculture economy (Cofie, Larbi, Danso, Abraham, Kufogbe, Henseler, Schuetz & Obiri-Opareh, 2005; Allen et al., 2014). There is an ever-increasing competition for the use of land for other economic activities in cities such as Accra, Tema, Kumasi, Sekondi-Takoradi and Tamale. These other economic activities include the building and construction of roads, schools, markets, administrative and industrial centres. In addition, factors such as globalisation, economic liberalisation policies and the different forms of immigration into the cities have equally contributed to the high demand for land. This intense demand and competition for

land has led to the commercialisation, privatisation, and individualisation of land which has also led to land scarcity in the major cities of Ghana (Owusu, 2008, 2013). Before Ghana's urban spaces experienced a surge in its population, there was a relatively larger space for large scale urban agricultural production (Owusu, 2008, 2013) even though farming in the urban centres in general was widely subsistence in terms of technology, size, market and skill required to begin (Asomani-Boateng, 2002).

Several studies in Ghana have suggested that land availability in Ghana's urban agriculture has also been greatly affected by its prevailing land tenure systems and laws governing land ownership, rights, management and administration in general. These factors have more often than not led to poor spatial planning in the cities and poor coordination between landowners, administrators and city planners. These circumstances have given more power to the forces of the free market economy to operate in Ghana's land economy rather than the operation of the State as the administrator and controller of land in the cities. The poor management and administration of lands has resulted in land grabbing which has pushed land ownership to many individuals and real estate owners. This has made it difficult for many urban farmers to obtain reliable and secured lands for farming (Allen et al., 2014). The availability land challenge for urban farmers in Accra for instance has been exacerbated by the intention of city authorities to make Accra a 'Millennium City', an idea that has no plans for making urban agriculture an integral part of its future. Such intention for urban agriculture by city authorities implies there are no plans to allocate lands to urban farmers who are already finding it difficult to obtain land for farming within the city. Besides there are conflicts and contestations concerning some farm sites in Accra (Allen et al., 2014; Mackay, 2018). All these factors have led to a situation where most lands in Accra and Tema for farming, for instance, are owned

by government. In situations where the farmland belongs to private individuals, farmers serve as security persons for owners whose lands are under the threat of being taken over by encroachers (Allen & Apsan Frediani, 2013; Allen et al., 2014; Mackay, 2018).

2.6.2 Locations of Farms in Cities in Ghana

In Ghana, cities have well known sites where vegetables are produced though not necessarily earmarked for urban agriculture. In the cities of Accra and Tema, for instance, farmers are found in Ashiaman, Tema Motorway, La, Korle-bu, Dzorwulu-Roman Ridge-Plant Pool and the University of Ghana, Legon. Other farm sites in Accra are at Marine Drive near the 'independence square', the Council for Scientific and Industrial Research (CSIR), which is close to the Airport Residential Area and the Ghana Broadcasting Company (GBC). Some farmers are also at the East side of the Kotoka International Airport (KIA), and on the Ghana Atomic Energy Commission Lands (GAEC) (Caradonna, Cheng, El - aama, Hafiz, Isaacson, Pretell& Reinig, 2013; Danso et al., 2014).

In the cities of Cape Coast and Sekondi-Takoradi farms, much land is not dedicated to urban agriculture. Farms in Cape Coast are located at the University of Cape Coast, areas near Ameen Sangari Office and areas in the Cape Coast District. In Sekondi-Takoradi, farms are located at Takoradi Air Force Strip, Takoradi Polytechnic, Pioneer Tobacco Company area, Airport Ridge and Kwesimintsim near the Obiri Lotteries building. In the Western Region where Sekondi-Takoradi is located, it is perceived that the total land size dedicated to urban agriculture was six hectares as at 2008 (Danso et al., 2014).

In the Ashanti and Brong Ahafo Regions of Ghana, the popular cities where farming takes place are Kumasi and Techiman respectively. In Kumasi, the popular areas known for crop

production are the Agriculture College Farms and Kumasi Campus of the University College of Education in Kwadaso, the Danyame and Georgia Hotel area at Nhyiaso, Buokrom B and E-Line at Manhyia, and Sawaba New site at Asawasi. Farms are also located at North Gyenase on the Kwame Nkrumah University of Science and Technology land in Oforikrom, and the suburbs of Kyirepatare, Gyenase, Ahensan, and Quarters, which are all found at Oforikrom (Danso et al., 2014). Other sites known for urban agriculture production as indicated by Afrane, Klinkenberg, Dreschsel, Owusu - Daakua, Garmsand Krupp (2004) in Kumasi include Bantama, Krofrom, Fanti New Town, Ashtown, Adum, Airport and Ayigya and Ayeduase. In Techiman in the Brong Ahafo Region, farms can be found in areas such as Tanoso and Akumadan (Danso et al., 2014).

In Tamale in the Northern Region of Ghana, there are some popular sites for crop farming. Some of these are Builpela, which is about two kilometres south of the centre of Tamale; Sangana, which is about two kilometres south-east of Tamale; and Water Works/Gumbihene, which is also in the mid-western part of Tamale. The others are Zagyuri, a site near Kamina Barracks which is at the northern part of Tamale, Dabokpa, which is at the south-eastern part of Tamale and Choggu which is north-west of the centre of Tamale (Drechsel et al., 2014).

2.6.3 Urban Farming System in Ghana

The various aspects discussed under this section include the type of crops grown, types of water and technology used, and marketing strategies employed by urban farmers in Ghana.

2.6.3.1 Types of Crops Grown

Crops grown under urban farming in Ghana are many and can be classified as food crops, vegetables, and spices. One unique feature of these crops is that most of them are exotic vegetables even though they are not new to the Ghanaian consumer. They also take a short time to mature and have a high perishability rate (International Water Management Institute (IWMI), 2013). The food crops which are mainly grown are cocoyam, cassava, plantain and maize, the local vegetables are okra, garden eggs (aubergines), tomato, pepper, ‘alefu’ and ‘ayoyo’ and the popular foreign crops grown across Ghana are lettuce, spring onions, cabbage, cauliflower, green pepper, carrot, spinach, and radish (Danso et al., 2014).

In Accra, the crops grown are mainly exotic vegetables with few sites such as La-Dadekotopon specialising in food crops and local vegetables (Caradonna et al., 2013; Danso et al., 2014). In Kumasi, the main vegetable crops grown are cabbage, lettuce, spring onion, pepper, tomato and okra while the main food crops grown are maize and plantain (Gyiele, 2002). In Tamale, the leading crops grown are cabbage, lettuce, “ayoyo”, and tomatoes (Danso et al., 2014). Techiman is also famous for growing of food crops such as cassava, maize and yam in addition to the local and exotic vegetables but the specific crops grown in Cape Coast and Takoradi are not really known.

2.6.3.2 Irrigation Systems and Water Use

The main source of water supply for urban farmers is irrigation. Irrigation systems in Ghana can be classified into two: conventional and emerging. The conventional methods are the old, usual and popular irrigation systems which do not attract much investment interest. Emerging methods on the other hand are the relatively newer irrigation systems, which are evolving and

normally attract new investment interest. The conventional irrigation systems in Ghana, which are popular to vegetable farmers, include the public surface irrigation systems, domestic wastewater, storm water irrigation and traditional shallow groundwater irrigation. Some of the emerging irrigated water systems used include groundwater and river lift irrigation systems. Even though both categories of irrigation systems are used in vegetable production, the most popular among urban farmers are the private and group (communal) systems, which fall under the emerging irrigation systems category (Namara, Horowitz, Kolavalli, Kranjac-Berisavljevic, Nambu Dawuni, Barry & Giordano, 2010).

Keraita et al. (2014) outlined the several forms of water used in the three most famous cities (Accra - Tema, Kumasi and Tamale) known for urban vegetable farming in Ghana. In Accra and Tema, water used mainly come from drains and already existing streams. These two forms of water are normally polluted by waste generated from residence and industries close to them. Notwithstanding the many farmers who use contaminated water, few farmers in Accra, especially those around Dzorwulu use pipe-borne water for their farming activities (Keraita et al., 2014). In Ashiaman, for instance, farmers use the dam of the Irrigation Scheme (Allen et al., 2014). Similar to the situation in Accra, farmers in Kumasi also use water from polluted streams for their irrigation activities. Other farmers also use water from dug wells, which are normally from shallow surfaces. Tamale has different water sources too and these are water from open drains, dysfunctional sewage systems and in some rare cases, pipe borne water, which is normally expensive. But due to its long periods of drought, quite a number of farmers in Tamale use water from reservoirs and dugout wells for production (Keraita et al., 2014).

2.6.3.3 Gender Dynamics

Males have always dominated the production aspect of urban agriculture in Ghana (CENCOSAD, 1994; Armah-Klemesu & Maxwell, 1998; Asomani-Boateng, 2002). Even though there was male dominance in the production of urban agriculture in the 1970s and 1980s, the number of females who were involved were high. This was accounted for by some reasons. One of them was the economic settings and conditions during the period did not encourage women to engage in high earning jobs. There was also opposition to women working in formal employments, which were normally found in urban areas (Obosu-Mensah, 2002). Besides, the Structural Adjustment Programme (SAP), which was implemented to restructure Ghana's economy, caused the laying-off of several women from formal sectors of employment especially in Accra and Tema. This caused many women in the urban areas to resort to farming (Barwa, 1995; Obosu-Mensah, 2002; Yankson & Bertrand, 2012).

Other factors have also contributed to the male domination in urban agriculture in Ghana. One of such is the work culture dynamics. Urban farming in Ghana is fundamentally labour intensive and due to the high energy demand during cultivation, it discourages several women from getting involved. Women on the other hand dominate in the selling or marketing of the urban farm produce rather than get involved in farming. This is because, they find the marketing to be easier, less stressful and very profitable (Asomani-Boateng, 2002). Danso, Cofie, Annang, Obuobie and Keraita (2004) assert that gender, as a factor in urban agriculture, is very similar to how household roles are gendered in Ghana. While men take up physically demanding roles women take less of such roles. Therefore, in urban farming, men normally take the responsibility of land preparation, a task which is physically draining and requires a lot of energy to undertake. Danso et al. (2014) indicate that several women who are

themselves farmers hire male labourers at the land preparatory stage. In the area of urban agriculture marketing, many studies on the other hand have indicated that women dominate it (Armah-Klemesu & Maxwell, 1998; Flynn-Dapaah, 2002; Obuobie,Drechsel,Danso & Raschid-Sally, 2004).

2.7 Urban Vegetable Farming, Migrant Labour and Labour Opportunities in GAMA

In the urban towns of northern Ghana, urban agriculture is mainly undertaken by the indigenes but in cities such as Accra and Tema, the farm owners and labourers are mainly migrants. Asomaning-Boateng (2002), for instance, asserts that the migrants who dominate UA activities are internal and normally hail from the three Northern Regions with the others coming from the Eastern, Ashanti, and Volta regions of Ghana. Other migrants are cross border and are mostly from Burkina Faso and Mali (Okrah, 1984 in Asomani-Boateng, 2002; Asomani-Boateng, 2002). Ghana's economic history has played a key role in the cross border migration influence on urban agriculture labour. The Alien Compliance Order implemented by the then Busia Government in 1969 led to the deportation of many illegal foreign migrants and this led to a reduction in migrants influence on urban farming activities (Asomani-Boateng, 2002). In the 1980s, for instance, Ghana experienced one of the most difficult economic periods in its history. Most of its major macroeconomic indicators were not favourable but showed a high level of pessimism in its economic prospects (Barwa, 1995). The period made it unattractive for many foreign migrants to settle in Ghana for economic purposes. Therefore, migration into Ghana from the other West African countries for urban farming reduced drastically (Asomaning- Boateng, 2002). However, the introduction of the SAP in the 1980s brought a positive twist to Ghana's economic prospects (Kilmister, 2004)

with urban farming having its fair share of the prosperity in terms of it serving as a source of employment and income for many urban dwellers and migrants. Currently in Ghana, urbanisation has created opportunities for production and marketing in urban agriculture because it leads to the generation of income for urban dwellers (Grant & Yankson, 2003; Awumbila, Owusu & Teye, 2014 in Awumbila, 2015).

In the cities of Accra and Tema, most of these migrants are low-income earners who live in slums and undeveloped areas (Awumbila et al., 2014 in Awumbila, 2015). This is because the high cost living in these cities makes it easier for these low income-earning farmers to find it cost effective to live in slums. Besides, most of these farmers in these cities do not own the lands they farm on creating a high level of uncertainty on these lands (Allen et al., 2014).

Even though farming is an important source of livelihood to migrants and urban dwellers in general, there are equally other important sources of employment that compete with farming. These employment opportunities, which cut across various sections of mostly the informal sector, do not require much education and skill in engaging in them to earn a living. Some of these include street hawking or vending, cleaning and petty trading. Others are artisans, refuse and waste collectors among others. The nature of these jobs is such that they have low protection for workers, low incomes, highly unstable, more apprenticeship based and use low and rudimentary technologies. Even though some of these sections of city dwellers are engaged in formal sector work, the numbers are very few. Examples of such are security and cleaning (Haug, 2014; Awumbila, 2015; Anyidoho & Steel, 2016; Ghana Statistical Service, 2016).

2.8 Frontier on Urban Agriculture Research in Ghana

Urban agriculture research in Ghana has covered areas such as water use and irrigation (Kufogbe & Surveyors, 1996; Appeaning Addo, 2010; Allen et al., 2014; Keraita et al., 2014), land use and land use challenges due to urbanisation, marketing (Henseler & Amoah, 2014), labour use and migration. Others have looked at farming systems employed and crops grown (Danso et al., 2014), policies and official attitude towards urban agriculture (Obosu-Mensah, 2002; Arku et al., 2012; Dreschsel et al., 2014) and financial issues on urban agriculture (Danso et al., 2014; Egyir et al., 2014). Some studies have also focused on environmental issues, chemical use and health among farmers (Drechsel, Keraita, Amoah & Karg, 2014; Drechsel et al., 2014; Obuobie et al., 2014; Nyantakyi-Frimpong et al., 2016). Others have also looked at the use of compost as fertiliser in urban agriculture (Danso et al., 2006), gender issues and disparities in urban agriculture (Allen & Apsan Frediani, 2013; Obuobie & Hope, 2014). Some studies have also looked at the role of governance and farmer organisations in urban agriculture (Egyir & Ackah-Nyamike, 2006; Larbi, Cofie, Amoah & Van Veenhuizen, 2014).

Most of these studies carried on urban agriculture have been mainly qualitative. The very few that are quantitative have mainly been on chemical and contamination levels of water and crops which have been mainly analysed at the laboratory. Therefore, this calls for an opportunity for a study, which considers how urban farmers are adapting to urban change and at the same time uses both qualitative and quantitative approaches in analysing its objectives.

2.9 Conclusion

Ghana's urbanisation trajectory has been phenomenal and it has significantly resulted in outcomes that have affected the activities of urban farmers in production, marketing and other areas. Ghana's urban agriculture is characterised by peculiar land ownership issues, dominated by vegetable crops, uses different sources of water for planting and has many migrants who serve as farm owners and labourers. Notwithstanding the fact that decentralization structures have been put in place to support urban agriculture, the support is not comprehensive and beset with serious challenges. Even though several studies have been conducted in urban agriculture, gaps remain and the quest to fill these gaps give way to this study.

CHAPTER THREE

CONCEPTUAL, THEORETICAL AND ANALYTICAL FRAMEWORKS, AND EMPIRICAL REVIEW

3.1 Introduction

How a study is conceptualised and the theories that explain it are very important in determining its analyses and conclusions. This chapter, therefore, provides the key concepts of the study such as urban, urban agriculture, urban change and farmers' adaptation. It also presents the conceptual framework by showing how the concepts are connected. The theories which explain the conceptual and analytical frameworks are also indicated in this chapter. In addition, how these theories have been used in urban agriculture and other fields of study are also provided.

3.2 Key Concepts of the Study

The key concepts of the study are the term urban, urban change and its indicators, drivers of urban change, effects of urban change, urban agriculture, and the effect of urban change on urban agriculture.

3.2.1 *Urban*

Martellozzo et al. (2014) define urban as “places which consist of predominantly human-made surfaces, have high concentrations of people, and are the hub of economic activity” (p.2). Notwithstanding the definition given by Martellozzo et al. (2014), the conceptualisation of the term ‘urban’ has been highly challenging, complex, difficult, and largely controversial (Montgomery, 2008; McGranahan & Satterthwaite, 2014; Qin & Zhang, 2014; Potts, 2017). Different bases have been used` in the conceptualisation of urban and the debate gets

complicated because the factors considered in the definition of ‘urban’ keep on changing (Potts, 2017). The focus of some studies in the classification of an urban area are as follows: largeness of the land surface a population covers, the density of a population with respect to the land size, the concentration of administrative offices, the high level of employment in the non-agricultural sector, high concentration of educational facilities and infrastructural base (McGranahan & Satterthwaite, 2014). Potts (2017), after carefully examining the various ways of conceptualising the term ‘urban’, asserted that appreciably, an urban centre must meet the following criteria: high population within a specific area, high population density per land size, significant economic development, a predominantly non-agriculture employment structure, have administrative significance and have an appreciable level of infrastructural development. This assertion is not much different from that of McGranahan and Satterthwaite (2014).

The Ghana Statistical Service (2014) for instance, notes that ‘Ghana has over the years defined an urban area to include all localities with 5,000 or more population’(p.3). Even though it admits that the definition is simplistic and has weaknesses in its conceptualisation, it continues to use it as a definition in Ghana. Ghana’s urbanisation literature has not limited the concept of urban to only a population of 5000 and beyond but considers other important factors in its definition. These are population size (which is far more than 5000), land coverage, level of infrastructure, and the level of industrialisation among other factors (Songsore, 2009). Therefore, within the context of this study, an urban centre will be classified within the broader, common and general context of McGranahan and Satterthwaite (2014), Potts (2017) and Martellozzo et al. (2014) view of what an urban centre is.

3.2.2 Urban Change and its Indicators

Banzhaf, Kabisch, Knapp, Rink, Wolffand Kindler (2017) (p.403) defines urban change as ‘fundamental, multi-dimensional changes in urban land-use patterns, population developments, infrastructure, governance regimes as well as established values, norms and behaviours’ (p.403) in an urban area. McGranahan and Satterthwaite (2014) indicate that urban change goes beyond population growth. It includes changes in the composition of urban employment, availability of developed social and economic facilities and infrastructure. When there is an urban change, there is also a significant demand for land for residential, commercial, industrial, and infrastructural purposes (Seto, Fragkias, Burak & Reilly, 2011).

When urban change occurs, its economic, political, cultural, demographic, physical and environmental structures, dynamics and patterns change (United States Geological Survey, 1999; Satterthwaite, 2007). The economic changes include change in employment patterns, change in the type of products demanded, change in prices and marketing of goods, and change in the types of businesses formed (Sassen, 2012). The physical and environmental changes include change in settlement patterns, change in land use, the swallowing of peri-urban and rural centres by metropolis, change in water and soil quality in urban centres, change in waste generation and management (Lubowski, Bucholtz, Claassen, Roberts, Cooper, Gueorguieva & Johansson, 2006; Leulseged, Gete, Dawit, Fitsum & Andreas, 2012; UN-Habitat, 2014), and also change in the climatic conditions (Revi, Satterthwaite, Aragón-Durand, Corfee-Morlot, Kiunsi, Pelling, Roberts & Solecki, 2014). The political changes include change in policies, laws, and political and institutional orientation within the urban space (Kessides, 2006). The demographic change includes change in housing units and change in the distribution of the urban population and size (UN-Habitat, 2014). Nwaubani (2017)

asserts that urban change is generally characterised by a change in economic activities, change in how and where people live within the urban space.

The conceptualisation of urban change suggests that several changes in the urban space in terms of its political, economic, cultural, social, and environmental dynamics and patterns also affect how these components and elements relate among themselves when the same space changes.

3.2.3 Drivers of Urban Change

As already indicated, increase in population is one of the key drivers of change in the urban space. There is also a complex range and combination of other factors that result in an urban change in addition to population increase. These factors are economic, sociocultural, administrative and political. The economic drivers of urban change are specifically improvement, increase, and expansion in production, industrialisation, and trade as well as change in income disparities within an economy. The social drivers are expansion in the transportation network, educational facilities, and other important services. The cultural drivers are change in norms, values, and preferences of urban residents over a period. The political and administrative drivers are the increase in the prevalence of key public services and facilities as well as the influence of globalisation on the urban space (Satterthwaite, 2007; Van Ginkel, 2008; Satterthwaite et al., 2010; Early et al., 2015).

Satterthwaite (2007)'s main argument is that urban change is caused by two main sets of drivers, which are the internal and external. The internal drivers are those within the country whereas the external drivers are those outside the borders of a country. Some of the internal factors are the macroeconomic policy of government, distribution of transport and

communication investments and the restructuring of government. The other internal drivers are the use and attraction of the natural resource endowments, change in the structure of the demography of the urban centre, the availability of good public institutions in the urban centre, and rural-urban migration. The external factors include the effect of globalisation, modernisation and international migration on the urban centre, the effect of wars from the countries close to the urban centre, and effect of colonial rule on the urban centre. These external driving factors outlined by Satterthwaite (2007) are in line with the assertion of Sassen (2012), Satterthwaite et al. (2010), and Surya (2016).

3.2.4 General Effects of Urban Change

The effect of urban change is complex, numerous and broad (Kessides, 2006; UN-Habitat, 2014) but can be viewed within four broad themes (UN-Habitat, 2014). These themes are economic, social, environmental, and political. With respect to the economic context, some of the key effects are the high level of land scarcity and cost, the emergence of a large labour market, increase in innovative marketing and production strategies (UN-Habitat, 2014). Some of the social effects are the extreme diversity in society, unequal income and resource distribution, and social segregation (UN-Habitat, 2014; Surya, 2016). Some of the environmental effects are high carbon emissions (Zhang & Xu, 2017), ground water depletion, perilous water shortages, sanitary pollution and climate change (Oram, 2011; Revi et al., 2014; UN-Habitat, 2014; Early et al., 2015; Arfanuzzaman & Atiq Rahman, 2017). The political effects include the formation of new policies and regulations, change in the governance structure, planning and physical structure of urban centres (UN-Habitat, 2014). Urban change affects numerous economic activities in the urban centres. Some of them are construction, trading, production, manufacturing, transportation, and telecommunication (Kessides, 2006;

UN-Habitat, 2014). Kessides (2006) stated that ‘urbanisation is an opportunity as well as a challenge’(p.1), a view also shared by Early et al. (2015) and Sridhar (2016).

3.2.5 Urban Agriculture

Urban agriculture is one of the livelihood and income generating activities of many urban dwellers (Smit et al., 2001; Arku et al., 2012). It entails the cultivation of crops, rearing of animals and other farming activities (Obosu-Mensah, 2002; de Zeeuw, 2014). Even though urban agriculture is broad in itself, it is sometimes interchanged with urban farming (de Zeeuw, 2014). Obosu-Mensah (2002) defines urban agriculture as farming that is practised within the confines of a city or town. In de Zeeuw (2014)’s definition of UA, he extends its borders to farming in spaces around the city or town. Van Veenhuizen (2006) also defines urban agriculture as an agricultural activity which ranges from subsistence to commercial production and involves the growing of plants and rearing of animals mainly for the purposes of food and other important uses within and around the fringes of cities and towns. UA involves the production and delivery of agricultural inputs and the processing and marketing of farm produce. Urban agriculture is also defined as the production of crops and rearing of animals within the limits of a city (Zezza & Tasciotti, 2010; Ernwein, 2014). Its scope and nature vary from city to city across the world. In the city of Gampaha in Sri Lanka, for instance, home and family business gardens are regarded as part of urban agriculture (Amerasinghe, Gammanpila, Kodikara & Mahindapala, 2011). In Mexico city, Mexico, backyard family orchards in cities are classified under urban agriculture (Lima, Sánchez & García Uriza, 2000). In Shanghai, China, urban farms are sometimes found on large tracts of land covering several hectares (Yi-Zhong & Zhang, 2000). In London in the United Kingdom,

urban farms include horticultural farms and public space gardens (Petts, 2001), while in San Francisco, United States of America (USA), UA involves the use of rooftop gardens, use of community schools and residential edible gardens. In urban agriculture, the farmer is the key player or actor, even though there are other actors (de Zeeuw, 2014). Obosu-Mensah (2002) views an urban farmer as a farmer who has a farm in a city and resides in the city or town where he farms.

3.2.6 Effects of Urban Change on Urban Agriculture

Urban agriculture is one of the numerous economic activities that urban change affects. This is because urban agriculture is directly affected by the change in the socioeconomic, political and ecological concerns within the urban space such as change in planning, laws and policies, land use and availability, infrastructure, pollution levels and food security (Heimlich & Barnard, 1992; Satterthwaite, 2007; Satterthwaite et al., 2010). UA also uses urban resources such as land, labour, market, technology and water for production, which become highly competitive when the urban space goes through a transformation (Mougeot, 2000; Van Veenhuizen, 2006).

3.3 Concept of Adaptation

The concept of adaptation has no standard definition. It is, therefore, viewed from multiple perspectives even though Smit and Pilifosova (2003) define it as ‘the process of adapting and to the condition of being adapted’ (p.882). In the social science definition of adaptation, Smit and Pilifosova (2003), citing Hardesty (1986) and Denevan (1983), defined it as ‘adjustments by individuals and the collective behaviour of socioeconomic systems’ (p.882). In the context

of climate change, which is one of the most popular areas where adaptation has been used, Smit and Pilifosova (2003) define it as ‘the adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts’ (p.879). In the general sense, adaptation is defined as the reaction of economic agents to the changes that occur in their environment. It includes the changing of policy, the introduction of new ideas and change in how things are done by institutions in dealing with a concerned phenomenon (Zilberman, Zhao & Heiman, 2012).

The concept of adaptation in agriculture is very broad, detailed, and varied in its application. In agriculture, one of the famous areas adaptation has been well applied is climate change (Below, Mutabazi, Kirschke, Franke, Sieber, Siebert & Tscherning, 2012; Bahinipati & Venkatachalam, 2015; Mussa & Mjemah, 2015; Tambo, 2016; Yin, Olesen, Wang, Öztürk, Zhang & Chen, 2016; Thamo, Addai, Pannell, Robertson, Thomas & Young, 2017). Other areas where adaptation is applied are in general farming systems, use of newer and specific technologies (Ribeiro, Santos, Santana, Reino, Beja & Moreira, 2016; Andersen, 2017; Eastwood, Klerkx & Nettle, 2017) and urban agricultural systems (Heimlich & Barnard, 1992; Pribadi & Pauleit, 2015; Recasens et al., 2016). General farming systems adaptation is characterised by the use of crop rotation, mixed cropping, use of improved inputs, and adaptation to the nature of the land farmers are using (Ribeiro et al., 2016; Andersen, 2017). In UA adaptation, some of the strategies used are intensification, mixed cropping, high use of labour and input and changing crop production to meet current demand trends in the urban space (Heimlich & Barnard, 1992; Pribadi & Pauleit, 2015).

In climate change, for example, adaptation is classified under several sections (Zilberman et al., 2012). The most common is the classification of adaptation into private, joint, anticipatory

or proactive, planned and reactive (Zilberman et al., 2012; Shongwe, Masuku & Manyatsi, 2014; Milman & Warner, 2016). Climate change adaptation measures in agriculture is generally characterised by water conservation, shifting cultivation, mixed cropping and farming, change in planting date, use of different soil tillage and crop protection practices, crop diversification and irrigation (Panda, Sharma, Ninan & Patt, 2013; Wossen, Berger, Swamikannu & Ramilan, 2014; Bahinipati & Venkatachalam, 2015; Yin et al., 2016; Thamo et al., 2017). Other adaptation measures farmers embark on for climate change are micro-migration and growing of drought resistant crops (Mussa & Mjemah, 2015). Altieri and Koohafkan (2008) note that during the 1991-1992 drought in parts of Southern Africa, some Zimbabwean local farmers adopted several methods to mitigate the effects of the drought. Among them were water-harvesting, permaculture, use of filtration pits, use of storerooms and the use of drought resistant crops. Below, Atner, Siebert and Sieber (2010) study on 'Micro-level Practices to Adapt to Climate Change for African Small-scale Farmers' categorised farmers' adaptation practices into five main forms. They are farm management and technology, farm financial management, diversification on and beyond the farm, government interventions in rural infrastructure, the rural healthcare services and risk reduction for the rural population and knowledge management, networks and governance. What these adaptation strategies aim to solve are soil conservation and fertility techniques, crop diversification and growing of different varieties, and management of pests and diseases (Bahinipati & Venkatachalam, 2015).

The adaptation of farmers, whether triggered by climate change, use of new technology or urbanisation, aims at improving their production, marketing, and finance activities (Martin, Martin-Clouaire & Duru, 2013 in Andersen, 2017).

3.3.1 Intensity of Adaptation

In the estimation of adaptation intensity and the factors that influenced it, some studies have used nominal data while others have used count variables as their dependent variables. Some studies have used models such as probit, multivariate probit, logit and multinomial logit for estimating their regression models (Hassan & Nhemachena, 2008; Deressa, Hassan, Ringler, Alemu & Yesuf, 2009; Alemayehu & Bewket, 2017; Boansi, Tambo & Müller, 2017). Others have measured adaptation intensity index as a continuous variable and have used multiple linear regression models or multivariate probit to estimate the factors that influence adaptation (Below et al., 2012; Uddin, Bokelmann & Entsminger, 2014).

Uddin et al. (2014) estimated the intensity of adaptation using a four scale rating point, which represented the importance of an adaptation strategy by farmers to their farming activity. If an adaptation was of no, low, moderate and high importance, it was assigned zero, one, two and three respectively. The total adaptation intensity index for the i th farmer was estimated as the summation of the various adaptation strategies multiplied by their respective importance. In all 14 adaptation strategies were used with the highest in terms of rank being irrigation and the least being crop insurance. With respect to Below et al. (2012) estimation of adaptation intensity index, the activity-based adaptation (AAI) was used. With this approach, farmers were asked to rank a number of adaptation strategies presented to them. The most important strategies were given the highest number and the least important were given the lowest

number. After, the various frequencies of the adaptation strategies of these farmers were given weights and these weights were used to estimate the activity- based adaptation indexes. These respective activity-based adaptation indexes were used as the dependent variables to estimate the multiple linear regression model.

3.3.2 Factors Influencing Farmers' Adaptation and Adaptation Intensity

3.3.2.1 Institutional

The key institutional factors that have affected farmers' adaptation are access to extension services (Hassan & Nhemachena, 2008; Deressa et al., 2009; Obayelu, Adepoju & Idowu, 2014; Bahinipati & Venkatachalam, 2015), access to information that affect their production (Hassan & Nhemachena, 2008; Obayelu et al., 2014; Bahinipati & Venkatachalam, 2015; Burnham & Ma, 2017) and involvement in cooperatives (Uddin et al., 2014). Other equally important institutional factors that influence farmers adaptation are access to credit (Deressa et al., 2009; Obayelu et al., 2014), support from development agencies and membership in different political organisation (Bahinipati & Venkatachalam, 2015; Adimassu & Kessler, 2016). Raymond and Robinson (2013) also indicated that the communication and engagement processes between formal institutions and community members is key to climate change adaptation. Also, infrastructure availability, institutional entitlements and nature of the educational system are also institutional factors that influence farmers' adaptation (Below et al., 2010; Burnham & Ma, 2017).

3.3.2.2 Non-Institutional

With respect to farmer, household and farmer characteristics that influence adaptation, several linkages have been established. Factors such as number of people in a household working on a farm, experience in farming and availability of funds and off-farm income influence farmers adaptation (Bahinipati & Venkatachalam, 2015). The type of occupation, stability, favourability of inputs and output prices, and availability of agricultural market and services played a crucial role in influencing farmers' adaptation (Stanturf, Warren, Charnley, Polasky, Goodrick, Armah & Nyako, 2011 in Darko and Atazona, 2013; Shongwe et al., 2014). Other factors such as accuracy of information, age, gender, level of education, availability of technology, property rights, and savings are also crucial factors that influence farmers' adaptation to climate change (Hassan & Nhemachena, 2008; Bryan, Deressa, Gbetibouo & Ringler, 2009; Deressa et al., 2009; Apata, 2011). Jayne, Chamberlin and Headey (2014) outlined a number of factors that determine farmers' adaptation when there is land scarcity. Some of these were farm size, soil quality and access to market by farmers. Others were the cost of acquiring land, migration cost, farmers' capabilities, purchasing power of the farmers' household and expected returns from non-farm income.

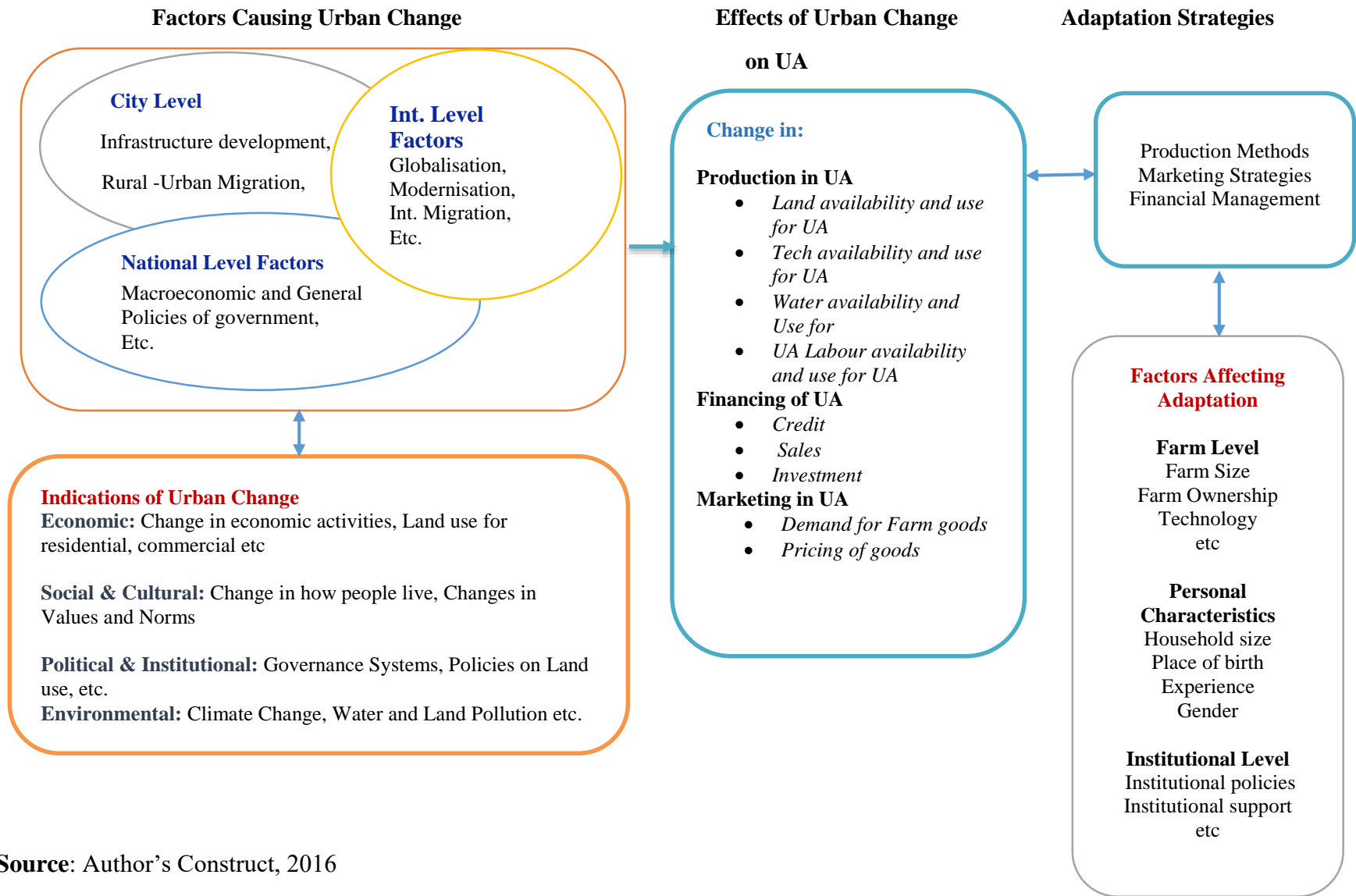
Even though the factors that influence farmers' adaptation have been classified into institutional and non-institutional, the non-institutional factors can be categorised into personal, farm and other characteristics. The personal factors include age, level of education and gender, farm, include availability of technology, soil quality and farm size while the other factors include access to market, availability and favourability of inputs.

3.3 Conceptual Framework of Urban Farmers' adaptation to Urban Change

The conceptual framework is diagrammatically presented as Figure 3.1, which shows how urban change affects urban agriculture and how farmers adapt to the effects of the change. In other words, the framework describes how the drivers of urban change cause urban change and the indicators of urban change that can affect urban agriculture. It also shows the effect of urban change on urban agriculture, the various adaptation strategies urban farmers' use in adapting to the effects of urban change and the factors that influence urban farmers' adaptation to the effect of urban change.

Urban change is driven by several factors but these can be broadly categorised into three interactive levels, which are city, national and international. Some of the city level factors are infrastructural development, rural-urban migration, quality of public institutions available and change in the demographic structure of the urban centre. Some of the national level factors are macroeconomic and general policies of government. The international factors include the effect of globalisation, modernisation, colonization, international migration on the urban centre and the effect of wars in the countries close to the urban centre (Satterthwaite, 2007; Van Ginkel, 2008; Satterthwaite et al., 2010; Sassen, 2012; Surya, 2016). The change in the urban centre, which is caused by the city, national and international level factors has clear indicators that can be broadly classified into economic, socio-cultural, political and institutional, and environmental. Some of the economic indicators are change in economic activities, and change in land use for residential and commercial purposes (UN-Habitat, 2014). Some of the socio-cultural change indicators are change in people's lifestyle, values and norms (Popkin, 1999; Hubacek, Guan, Barrett & Wiedmann, 2009; Cockx, Colen & De Weerd, 2018).

Figure 3.1: Conceptual Framework on Urban change and its effect on urban farmer' adaptation



Source: Author's Construct, 2016

Some of the political and institutional change indicators are change in the governance systems and change in policies on land and water use (UN-Habitat, 2014) while some of the environmental change indicators are on climate change, and water and land pollution (Oram, 2011; Revi et al., 2014; Early et al., 2015; Arfanuzzaman & Atiq Rahman, 2017; Zhang & Xu, 2017). Even though these indicators are grouped into sections, there is a strong interaction among them and therefore disentangling them is almost impossible.

Urban farming and management activities in general can be classified under production, marketing and finance. Production management entails planting, farming systems, land management, use of labour, water and farm resources. Marketing involves customer management, pricing of the goods, and packaging and handling of farm produce. Finance is concerned with the income and profit from sale, credit, investment, funding and financial planning of the farm (Food and Agricultural Organization (FAO), 2007; United States Environmental Protection Agency (US EPA), 2011; Kahan, 2013). The interactions of the drivers of urban change can affect the three categories of urban farm management. The effect could be positive or negative. In other words, the change could be a benefit or a challenge to the urban farmer (Early et al., 2015; Sridhar, 2016). The farmer being a rational economic agent would definitely develop adaptation strategies to minimise the negative effects and rather enhance the positive effects of urban change on their farming activities. These adaptation strategies employed by the farmer could be broadly classified under production methods, marketing strategies and financial management (Mougeot, 2000; Van Veenhuizen, 2006). The adaptation of the urban farmer to the effect of urban change can be influenced by some factors and these factors can be broadly categorised into three. These are personal characteristics of the farmer, farm characteristics and the underlying institutional factors. The personal characteristics of the farmer include sex, age, experience, place of birth, years involved in farming and level of education. The farm

characteristics include land size and the technologies employed in farming. The institutional factors include institutional policies influencing urban agriculture and farmers' access to institutional support.

3.4 Theoretical Framework and Review

The theories underpinning the study are focused on two main aspects of the study. They are the general theories of the study (which are focused on urban change (urbanisation) and its effects) and the behaviour theories (which are focused on adaptation). These two sets of theories have a direct link with the study's conceptual framework.

3.4.1 General Theories of the Study

The general theories underpinning this study are two: the modernization theory relating to urbanisation and the theory of resilience. The modernisation theory relating to urbanisation gives the theoretical basis to the idea of urban change. The theory explains the underlying factors that bring about a change in an urban area and the possible outcomes of the change. These outcomes could be political, social, economic, or cultural. Though the theory does not mention urban agriculture, it indirectly suggests that an economic activity such as urban agriculture will be affected when there is an urban change. The other theory, resilience, explains how systems get back to their original forms of operation, function and essence after they go through a transformation. In this study, the theory of resilience explains that when an urban centre goes through a change (which has already been explained by the modernisation theory), urban agriculture, which is an economic activity within the urban space also goes through a change in terms of production and other equally important activities. The theory of urban resilience suggests that when there is an urban transformation, urban agriculture changes but continues to function with respect to its production, marketing and other importance activities.

3.4.1.1 Modernization Theory relating to Urbanization

Peng, Chen and Cheng (2000) argue that modernisation is one of the key theories that explain urban change among the endogenous urbanisation and dependency theories. They view the modernisation theory as one of the theories of urbanisation which takes its origin from the human ecology theory. The human ecology, which comes from the strand of evolutionist theory, was first termed and used by Robert Park and Ernest Burgess in 1927. They defined human ecology as ‘the study of the spatial and temporal organization and relations of human beings with respect to the selective, distributive, and accommodative forces of the environment’ (Lawrence, 2011, p.5). In simple terms, the human ecology theory argues that there is an interrelationship between humans, living and non-living resources in the environment. This relationship involves several components in the human ecosystem, which includes its biology, ecology, and culture. The meaning given to it gave the basis to many to study the interaction of human population and their environment in the urban areas (Lawrence, 2011). The question is, how does the theory of modernisation from the perspective of human ecology explain the concept of urban change? Peng et al. (2000) applies the human ecology theory to the city of Chicago, an urban centre in the USA, and assumes there is a strong interaction between ‘population dynamics, market competition, material technology (e.g., transport infrastructure) and the built environment in making and remaking the urban life (Hawley, 1981; Orum & Chen, 2003)’ (Peng et al., 2000, p.5).

Modernisation, therefore, provides the factors that underpin the various changes that occur in urban centres. Thus, Peng et al. (2000) note that the theory is driven by the fact that urban centres in developing countries change through industrialisation, advancement in technology, penetration of information and cultural diffusion in the urban centres. Modernisation, which became prominent in the 1950s and 1960s, views the transformation

of a society from a mainly traditional setting to a modern one. This transformation is characterised by a change in the society's structure (economic, social, political and others), institutional structures and cultural features (Deutsch, 1961 in Eisenstadt & Leer, 2010). Modernisation basically posits that as societies transform, there are new ways and forms of political and socioeconomic features and structures and these result in new markets, new institutional frameworks and 'modern' capitalist tendencies (Eisenstadt & Leer, 2010).

Modernisation from the perspective of the 'growth stages' of Rostow is a process. It is a process which involves the movement of economies from the 'traditional society' to the 'precondition' stage, to the 'take-off' stage, then, to 'drive to maturity', and finally to the 'age of mass consumption' (Todaro & Smith, 2009) . The traditional society stage is characterised by the 'pre-Newtonian science and technology, family and clan connexions, fatalism' and the dependence on agriculture. The take-off stage and drive to maturity stages are characterised by 'building of an effective centralised national state', the springing up of 'banks and institutions for mobilising capital', showing of a 'new form of enterprising men', appearance of 'new industries', and the acceptance of 'modern science'. The age of high mass consumption is also characterised by high 'income, urban' population 'working in offices', and the presence of 'durable consumer goods' such as 'automobiles' (Rostow, 1960 in Reubi, 2016). This clearly suggests that modernisation is an important feature in the urbanisation process because as places become urbanised, one of these stages shows up at a point in time.

Reubi (2016) adds that modernisation shows and explains the processes or stages of human progress and development of economies. It shows how nations move from the stages of underdevelopment to development. The World Bank associates development with the key

features of modernisation which are “ ‘economic growth’, ‘industrialisation’, ‘improvement in transportation’, communications and electric power’, a ‘dynamic entrepreneurial class’ ... ‘greater urbanization’ ” (World Bank, 1978 in Reubi, 2016, p. 139); which are important traits of urbanisation. Modernisation has been seen to be an ‘American’ or ‘European’ concept in modern times where societies that are fashioned like theirs are seen as modernised. Others view modernisation as a process which is irrevocable and unrelenting and once a developing country is exposed to the West, its society becomes modernised (Tipps, 1973). It is also seen as a long and a transformative process which leads to change in a social system (Huntington, 1976).

3.4.1.2 Resilience Theory

Resilience is defined as the tendency of a system to ‘retain’ its way of operation, structure and productivity after it has been disturbed. Resilience has more to do with how a system is sustained after it goes through a process of change or affected by external factors (Holling, 1973). Palekiene, Simanaviciene and Bruneckiene (2015) contend that resilience, in its broad form, can be defined as ‘a return to an original state’. The resilience theory basically posits that when every system is externally influenced or affected, the system is caused to adjust or adjusts by itself. In the cause of its adjustment, new patterns form or emerge. This is because the new environment or system that is created will call for new ways of functioning and this requires new adjustments in order for it to be sustained (Lin, 2011). That is why Holling and Walker (2003) asserted that ‘the amount of change the system can undergo and still retain the same controls, function and structure’ (p.1), is one of the main characteristics of the definition of resilience. Its root is taken from the Latin word ‘resilio’ or ‘resilire’, which means ‘to jump back’ (Klein, Nicholls & Thomalla, 2003). Sabatino (2016) observes that the definition of resilience is in three main

perspectives. These are engineering, ecological, and adaptive, a definition slightly different from Kim and Lim (2016), who classified resilience from the ecological, engineering and evolutionary perspectives. From the view of engineering, resilience is the ease in terms of period with which a system can return to its equilibrium state of functioning after it has been caused to change. In terms of ecology, it is a system's ability to absorb a disruption without having its structure, nature and relevance to change. The adaptive perspective as Perrings (2006) puts it, is 'the ability of the system to withstand either market or environmental shocks without losing the capacity to allocate resources efficiently'(p.418). Sabatino (2016) notes that engineering focuses on the time the system returns to its equilibrium, the ecological focuses on how stable the system is and the adaptive focuses on the changing 'economic geography' of the system.

Carpenter, Walker, Anderies and Abel (2014) argue that resilience has mostly to do with the 'adaptive capacity' of the system when it changes. The adaptive capacity is the component of the resilience theory that reveals how a system learns when it is externally affected or disturbed (Gunderson, 2000). When it comes to the issue of sustainability, resilience in some instances is used interchangeably with adaptive capacity but adaptive capacity in simple terms shows how a system can learn in terms of behaviour after it is disturbed and later restored (Holling & Walker, 2003).

Carpenter et al. (2014) assert that the resilience model has become diverse and it is used in several areas and disciplines in academia, especially where there is an interaction between people and the natural environment. They argued that there are three properties of the resilience model. The first is the extent of change a system can undergo without compromising its space of attraction when compared with its original state. The second is the extent to which the system is able to organise or reorganise itself after an external

pressure is exerted on it and the third has to do with the degree to which a system can build itself to learn and adapt after it goes through a change.

The resilience theory was originally used in the field of ecology but it is now applied in the social ecological. It is also very important and popular in the area of policy and many scientific discussions. It is characterised by a change of system dynamics, which involves a broad range of social, economic, and ecological interactions. System dynamics in the resilience theory is also characterised by unpredictability and adaptability (Holling, 1973; Carpenter et al., 2014; Darnhofer, Lamine, Strauss & Navarrete, 2016).

The concept of resilience is multidimensional and has been applied in numerous scientific disciplines (Palekiene et al., 2015). Examples of these are urban and peri-urban change (Thapa, Marshall & Stagl, 2010), disaster (Klein et al., 2003; Parsons, Glavac, Hastings, Marshall, McGregor, McNeill, Morley, Reeve & Stayner, 2016), and climate change (Brown, 2016; Tyler, Nugraha, Nguyen, Nguyen, Sari, Thinpanga, Tran & Verma, 2016). Others are infrastructural use and interdependency (Nan & Sansavini, 2017), water quality and use (Li, Degener, Gaudreau, Li & Kappas, 2016), regional development and general economic issues (Palekiene et al., 2015; Sabatino, 2016) and farming systems and agriculture (Darnhofer et al., 2016; Hodbod, Barreteau, Allen & Magda, 2016). Its application in agriculture has been enormous and extensive. Some of the areas in agriculture where it has been applied are farming systems (Darnhofer et al., 2016), urban and peri-urban agriculture (Thapa et al., 2010), crop diversification (Lin, 2011), organic farming (Milestad & Darnhofer, 2003), climate change (Lin, 2011; Brown, 2016) and water use among farmers (Barthel & Isendahl, 2013).

One of the popular models or frameworks used in the concept of resilience in farming systems is the adaptive cycle in the context of social-ecology (Gunderson & Holling, 2002 in Darnhofer et al., 2016; Darnhofer et al., 2016). The adaptive model in the resilience theory brings to the fore the crucial phases of resilience, their elements and respective characteristics. The phases in the adaptive cycle are exploitation, conservation, release, and reorganisation. The exploitation phase is when the farming system gets in tune with the environment and makes efficiency its aim. The conservation phase is when the system finds it very difficult to change after it has adapted to changes in its environment. At this stage, the system changes when it is triggered by a disturbance, which is adequate to cause a change. The next phase, release, is when all the interconnections in the system are broken, conservatism is lost, and the various resources are released for a possible reorganisation (the final phase). At the final phase, interconnections are built, processes of farming are fine-tuned and the system becomes stable again (Burkhard, Fath & Müller, 2011, in Darnhofer et al., 2016; Darnhofer et al., 2016).

Taking a cue from Weis (2010) and Scott (2013), Darnhofer et al. (2016) asserted that resilience offers two forms of thinking in the research space. They argue that one, change is unavoidable and sometimes unpredictable and two, there exists an interdependent relationship between ecological and social processes. Under 'change' in the resilience thinking, the stability, processes, equilibrium, and efficiency of the existing agricultural system are affected and the system is expected to adapt to the change. With respect to the socio-ecological interrelations, changes in the farming system affect the ecosystem within which the farming takes place and vice versa. This relationship goes a long way to affect the resilience of the farming system.

Darnhofer et al. (2016), after observing several studies in terms of theories, philosophies, and research styles used, classified the concept of resilience under three main perspectives in farming. They are the structure, which mainly looks at the farms, the social actors which mainly focuses on the farmers, and the relations, which mainly focuses on the farming (interrelationship between the farm, farmers, and environment of the farming system). These three perspectives are based on the mode of enquiry and their interpretations of the concept of resilience.

The resilience theory has also been applied in agriculture and climate change in cities. Kim and Lim (2016), for instance, used the framework to indicate changing cities' resilience and adaptation to climate change. Coming from the thinking of evolution, they conceptualised that city resilience goes beyond the view of ecology or engineering but can be also analysed from a socio-political view. They concluded that when city resilience to climate change is also analysed from the socio-political perspective, it is easier to create better plans for climate change adaptation in cities. Tyler et al. (2016) used the concept of resilience to understand how cities in some Asian countries adapted to climate change by looking specifically at the indicators that show their adaptation. They concluded that the indicators for climate change resilience help in developing plans and strategies in developing climate change resilience.

Lin (2011) reviewed studies conducted on agriculture from the perspective of resilience towards climate change and observed that the climate change resilience based on crop diversification was focused on the reduction of diseases. His study concluded that building climate change resilience is challenged from the two main fronts, which are policy and technology. Darnhofer et al. (2016) studied the resilience of family farms within the European Union in the context of social and ecological change. The study argued that

studying the relations that existed between structures and actors in the farming business when it comes to change and resilience of farms was key in providing a comprehensive approach in understanding family farm resilience. Poulton, Dalgliesh and Roth (2016) studied the resilience of lowland rice farming in the context of climate change. The study did an evaluation of how the adaptation strategies meant to support a new farming system in the low land region of Cambodia due to climate change helped. They also observed that production in rice could improve in the study area in the midst of climate change by 2030 and this can be achieved by using the right technology and proper irrigation systems.

With respect to this study, the underlying argument is that changes in the urban settings bring about a change in the economics of urban agriculture. These changes, which could bring about a benefit or challenge, affect the marketing, production, and financial decisions of the farmer. This means that the farmer, who is part of the urban system, is supposed to adapt to the changes the urban system goes through. In other words, the farmer must become resilient and adapt to the new changes in the urban environment. One shortcoming of this theory with respect to this study is that it does not really show the rationale behind the farmers' adaptation to the new or changing urban environment.

3.4.2 Behavioural Theories

The adaptation of urban farmers to the changes that occur in the urban space suggests that the relevant behavioural theories must be used to provide a better understanding of the conceptual framework of the study. Zarzuela and Antón (2015) note that such behavioural theories fall under the social psychological theories called 'the expectancy-value' theories. The expectancy-value theories employed in this study are the Protection Motivation Theory (PMT), the Theory of Planned Behaviour (TPB) and the Social Cognitive Theory (SCT).

3.4.2.1 Protection Motivation Theory

The Protection Motivation Model (PMT) is an adaptive behavioural model. This model was basically used in understanding behaviour which responds to fear (Rogers, 1975). This theory, which was developed through the framework of communication that arises from fear, argues that the fear a person encounters or presumes makes him or her behave in a particular way. This mainly happens when fear is communicated to the person. If becomes aware of fear for instance, it causes him or her to put up a behaviour that will reduce the fear. If such behaviour is beneficial in reducing the fear, it is continued, pursued, and reinforced by them. On the other hand, if the behaviour does not contribute to the reduction of the fear, it leads to developing some maladaptive coping strategies such as denying the existence of the threat or trying to avoid hearing the information that brings about the fear (Boer & Seydel, 1999). While some argue that there exists a non-linear relationship between the communication of fear and the adoption of an adaptive behaviour (Janis, 1967 in Boer & Seydel, 1999), others (Sutton, 1982 in Boer & Seydel, 1999) on the other hand believe that there exists a linear relationship between the two. The non-linear relationship is assumed to be a parabolic function and it is such that if the fear is at a medium level, behaviour that comes from advice are maximal and more pronounced than cognitive behaviour. This situation usually leads to maladaptive coping strategies such as denial of fear. On the other hand, the linear relationship suggests a direct relationship between the level of fear evoked and the adaptive behaviour a person will put up which comes from advice (Boer & Seydel, 1999).

The initial constructs of the PMT were three (3) but later became four (4). The three (3) were a person's perceived severity, perceived risk or vulnerability and perceived efficacy of their response (Rogers, 1975). Self-efficacy was the fourth construct that was added to the theory (Maddux & Rogers, 1983). Perceived severity is how serious a person sees the

threat; perceived vulnerability is how susceptible one thinks he is at risk to the threat; and perceived efficacy is how effective and efficient the intended behaviour or attitude is in avoiding the threat. Self-efficacy on the other hand is how effective one is capable of dealing with the threat (Cox, Koster & Russell, 2004). The PMT influences a person's behaviour through four (4) processes, which are selection, motivational, affective and cognitive (Bandura, 1997, 2011).

There are two forms of responses to a threat in the PMT. These are adaptation and maladaptation. The adaptation response leads to the prevention of damage and enhances the benefit in the action while maladaptation responses are the actions that cause a person to avoid dealing with a threat. Examples of such threats are denial, fatalism and wishful thinking (Burton, 1996 in Grothmann and Patt, 2005).

The Protection Motivation Theory has been applied in several areas of research. One of such major areas is health (Flyod, Prentice - Dunn & Rogers, 2000). In the area of health, for example, the PMT predicted the hearing of a fear-invoked disease that may increase a person's perceived severity or vulnerability to the disease. With the two PMT health studies reviewed in this study, the PMT uses two processes in evaluating a maladaptive behaviour to a health threat. Under this circumstance, the PMT activates two risk cognitive processes in a person when they faced a threat from their environment. They are the process of threat appraisal and coping appraisal (Maddux & Rogers, 1983; Boer & Seydel, 1999). The threat appraisal studies the components that are more important in assessing the threat (perceived severity and vulnerability) of the disease. In other words, the threat appraisal assesses the severity of the event which is considered threatening, and how vulnerable one is to the threat. The coping processes evaluate the important components that are used in studying the coping responses. In simple terms, it assesses how confident

one is in dealing with the threat or in preventing it. These appraisal processes are mainly centred on removing the threat and also embarking on an approach that can successfully help in dealing with the threat (self-efficacy) (Boer & Seydel, 1999).

The PMT has also been applied in agriculture. Though not directly and entirely used, Ung, Luginaah, Chuenpagdee and Campbell (2015) used the fourth construct of the PMT, self-efficacy, to assess the adaptation to climate change in Coastal Cambodia, Asia and found that areas whose main form of livelihood was agriculture were more sensitive to climate change and were significantly less likely to undertake both better anticipatory and reactive adaptation measures compared to the non-farming areas. Grothmann and Patt (2005) adopted the PMT to create a socio-cognitive model called the Model of Private Proactive Adaptation to Climate Change (MPPACC) which incorporated the importance of psychological factors in determining climate change adaptation. They discovered that farmers' inability to adapt to climate is largely explained by psychological factors and recommended that socio-cognitive factors should be strongly factored into policy on climate change adaptation. Keshavarz and Karami (2016) used the PMT to study the factors that influenced farmers' pro-environmental behaviour under the circumstance of drought in the Fars province of southwestern Iran. They discovered that response efficacy, perceived severity and response costs significantly influenced farmers' pro-environmental behaviour. Perceived vulnerability, self-efficacy, income, and social environment had a strong relationship with pro-environmental behaviour when it comes to drought.

In applying the PMT to this study, the underlying assumption is that the farmer encounters fear or challenge because of urban change. The urban vegetable farmers may see the change in the urban centre as a phenomenon which brings challenges to them. They, therefore, adapt to these challenges based on some important constructs found in the PMT.

Here, perceived severity is how serious the farmers see the challenge or negative effect of urban change with respect to their farming activities and perceived vulnerability is how vulnerable they see the threat of urban change to their farming activities. Perceived efficacy is how the farmers think they can efficiently and effectively deal with the challenges or negative effects of urban change on their farming activities. Self-efficacy is the capability the farmers think they have to adapt to deal with the negative effects of urban change. Examples of self-efficacy and perceived efficacy factors are years of experience in farming, age, sex, extra income and level of education.

The theory has limitations with respect to its application to this study. First, the theory considers the threat (challenges or negative effects) of urban change and not the benefits or positive effects of urban change on urban farmers' activities. This limitation calls for the use of the theory of the planned behaviour (TPB). Second, it does not look at the external factors, which can influence the farmers' ability to deal with the threat such as the institutional factors and prevailing policies of government but is focused on the farmers' self-efficacy. This also calls for the use of the social cognitive model.

3.4.2.2 Theory of Planned Behaviour

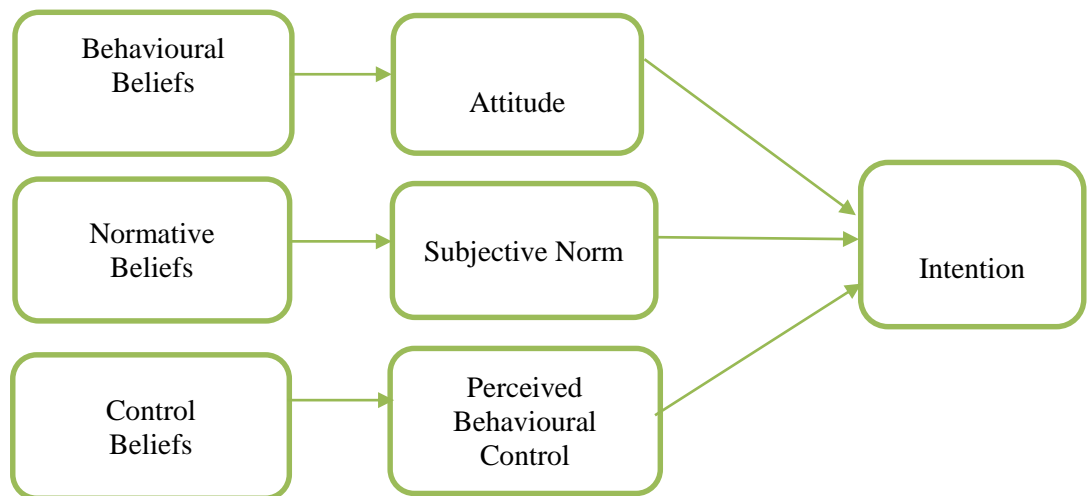
The Theory of Planned Behaviour (TPB), which is believed to be among the most popular of the social cognitive models was mainly postulated by I. Ajzen (Yazdanpanah & Forouzani, 2015) . It is believed to be an extension of the Theory of Reasoned Action (TRA) (Ajzen, 1991). The TRA has two constructs, which are a person's attitude towards a behaviour and their subjective norms (Fishbein & Ajzen, 1975). When a person's behaviour has a particular course of action or focus, the application of the TRA is limited in its use, hence the need to use the TPB. The TPB has another (a third) strand to the behavioural intentions of the person which is called 'behavioural control'. This third strand

makes behaviour more intense and direct (Ajzen, 1991). Under the TPB, Ajzen (1991) argues that people's behaviour at a specific place and time are planned and it is determined by their 'behavioural intentions', which are influenced by three main factors. These are the individual's attitude towards a behaviour, their subjective norms and perceived behavioural control (the control they think they have over that behaviour) (Fishbein & Ajzen, 1975; Ajzen, 1991). The behavioural intentions here are a proxy for behaviour under this theory. This is because the theory assumes that a person's intention leads them to behave in that exact way (Yazdanpanah & Forouzani, 2015). The 'attitude towards behaviour' factor of the TPB explains the feelings a person has towards behaviour; which could be positive or negative. This feeling is embedded in the outcome of the behaviour the person puts up. The subjective norm factor has more to do with how they think people will interpret the behaviour they put up. In other words, it is how the perception people have about an individual's behaviour affects their decision to take an action. This is because people will have their perception about a behaviour a person puts up and this affects that person (Ajzen, 1991). Behavioural control is concerned with how difficult or easy a person can perform a behaviour. This depends on the resources available to the person, their self-efficacy or confidence and knowledge an individual has in the putting up that behaviour (Ko, Feng, Chiu, Wu, Feng & Pan, 2008). The TPB has been diagrammatically explained in Figure 3.2.

Notwithstanding the enormous use of the TPB in psychosocial and other areas of research, it has been criticised because of its insufficiency in considering other constructs which are very significant to human behaviour (Arvola, Vassallo, Dean, Lampila, Saba, Lähteenmäki & Shepherd, 2008; Yazdanpanah & Forouzani, 2015). This has, therefore, called for the inclusion of other constructs. Two of such constructs are moral norms and self-identity. These additional constructs, it is believed, will make the TPB better in

predicting human behaviour (Arvola et al., 2008). Moral norm is the right or wrong conviction a person has in taking an action irrespective of the consequences. The concept of moral norms has been used interchangeably in literature with personal norms and personal obligation (Manstead, 2000 in Arvola et al., 2008). How the key constructs of the TPB work together to exhibit behavioural intention is indicated in Figure 3.2.

Figure 3.2: Diagram of Theory of Planned Behaviour



Source: Adapted from Borges, Tauer and Lansink (2016)

TBP has been applied in several areas of psychosocial research. These include the understanding and prediction of nutrition and consumption behaviours (Sun, Guo, Wang & Sun, 2006; Riebl, Estabrooks, Dunsmore, Savla, Frisard, Dietrich, Peng, Zhang & Davy, 2015). Some examples of research in nutritional choices are predicting the use of sugar in infant diet by mothers (Beale & Manstead, 1991) and the attitude towards the lowering of fats in diets among UK consumers (Lloyd, Paisley & Mela, 1993). It has also been used in the choice of and demand for organic food (Arvola et al., 2008; Yazdanpanah & Forouzani, 2015). In the area of health, it has been used to predict pregnant women's intention to partake in regular exercise (Lee, Chiang, Hwang, Chi & Lin, 2016), to predict smoking behaviours (Guo, Johnson, Unger, Lee, Xie, Chou, Palmer, Sun, Gallaher & Pentz, 2007; Hoie, Moan & Rise, 2010), and predict women's attitude towards taking hormone

replacement therapy (Quine & Rubin, 1997) among others. In the field of Information Communication Technology (ICT), it has been used to predict customer satisfaction in the use of e-services (Liao,Chen & Yen, 2007) and predict the behaviour towards the use of online services and social media by adults (Madden, 2010). It has also been used to predict gambling behaviour (Martin, Usdan, Nelson, Umstatt, LaPlante, Perko& Shaffer, 2010) and also in predicting the choice between online and traditional courses of study (Robinson & Doverspike, 2006).

The TPB has also been applied in agriculture. Meijer,Catacutan,Sileshi and Nieuwenhuis (2015), used the TPB to examine the attitude of 200 farmers towards tree planting in the Chiradzulu and Mzimba districts in Malawi. Borges et al. (2016) used the TPB to identify key beliefs that underlined the intention of cattle farmers in Biome Pampa in Rio Grande do Sul, Brazil, to use improved natural grassland for farming. Out of the three constructs, it was discovered that attitude towards behaviour had the strongest impact on intention to use natural grassland for farming with subjective norms and perceived behavioural control as second and third respectively. Farmers' attitude towards behaviour was predicted by increase in the number of animals per hectare, prevention of soil erosion, and the weight gained of the cattle; normative beliefs was influenced by the use of improved natural grassland while perceived behavioural control beliefs were influenced by sufficient knowledge and availability of qualified technical assistance. Chin,Choong,Alwi and Mohammed (2016) use of TPB to explore intention of smallholder oil palm planters to supply oil palm residues at their plantations in Malaysia adopted and added three attitudinal belief factors to the three main constructs of the TPB which were perceived production benefits, perceived environmental benefit and perceived ecological impact. The three main constructs: attitude towards behaviour, subjective norm, and perceived behavioural control predicted their intention to supply oil palm residues in addition to two adopted constructs of perceived production benefit and environmental benefit. Laple and

Kelley (2013) examined the decision of conventional dry stock Irish farmers to change from non-organic farming to organic farming. The study measured the constructs of the TPB (attitude towards behaviour, and subjective norm) mathematically. The study used principal component analysis (PCA) and a non-linear regression to estimate the different factors that predicted the behavioural intentions of farmers, and found out that attitude towards behaviour was predicted by farmers based on their differences in their beliefs and the constructs of the TPB provided.

The main reason for the use of this theory in this study is that the change in the urban space affects urban farmers and this effect causes farmers to adapt. Here, the three constructs (attitude towards behaviour, subjective norm, and perceived behavioural control) of the TPB can be well placed within the study's context. In adapting to urban change, for instance, there are certain factors that influence the behaviour (actions) of the farmer. With respect to the 'attitude towards behaviour' a farmer will adapt to a positive or negative effect of urban change when he or she feels the returns to adapting to a positive effect will be more rewarding and a negative effect will lead to a reduction in the problem. More importantly, the consideration of the positive effect of urban change brought in the application of the TPB is mainly to fill the omission of the PMT which mainly looks at the response to the negative aspect of an issue and not positive. In addition, the study's philosophical orientation allows the subjective views of the farmers on such issues to be heard and this means how they express their views on adaptation can be assessed. Since farmers have been raised within a community and a broader society, the 'subjective norm' construct of the theory will indicate what influences farmers to use a particular adaptation strategy due to the urban change. Perceived behavioural control will make the farmers use an adaptation strategy because of their self-efficacy (also found in the PMT) and the knowledge they have in the reward on that adaptation strategy. This theory augments the PMT because of its constructs of attitude towards behaviour which looks at the benefits

farmers are going to obtain from urban change, based on which they are adapting. The subjective norms explains the circumstances surrounding the farmers that will make them adapt in a particular way.

3.4.2.3 Social Cognitive Model

This Social Cognitive Model (SCM) is introduced to this study to augment the weaknesses in the PMT and TPB with respect to this study. The main relevance or goal of this theory to this study is its ability to consider the external factors, which influence the farmer's ability to deal with the threat of urban change. Examples of such external factors are institutional and prevailing policies of government.

The SCM is equally important in social behaviour or human psychosocial literature. It basically explains that a person's psychosocial function is understood from a 'triadic reciprocal' causation (Bandura, 1986). Thus a person's behavioural intentions are based on their cognitive, personal, and environmental factors. In other words, a person's behaviour is a combination of their internal psychological factors, the factors surrounding them as well as their individual behaviour. All these factors interact to determine a person's behaviour (Bandura, 1986; Wood & Bandura, 1989). Personal factors are to do with a person's affective and biological dispositions (Bandura, 1997) while the cognitive factors are embedded in a person's self-efficacy and outcome expectations (Thungjaroenkul, Cummings & Tate, 2016). Cooper and Lu (2016) add goal representation to the cognitive factors of the model. The extent to which these factors or components influence behaviour depends on the opportunities, challenges and circumstances in the social cultural settings of a person's environment (Bandura, 1997). The environment in the social sense can be theorised as both virtual and real world concepts (Narayan, 2013 in Boateng et al., 2016). The main constructs of the social cognitive theory are knowledge, self-efficacy, social support, outcome expectations, outcome expectancy and self-regulation (Dong-Hee, Young- Ae & In-Soon, 2007). Self-efficacy determines or predicts

directly the intention of a person as well as their behaviour. It also considers a person's view on their capability of taking an action (Glanz,Rimer & Viswanath, 2008 in Borhaninejad et al., 2016). Outcome expectation is a person's view of the probability of the occurrence of the outcome or consequence of their behaviour (Safari,Shojaei-Zadeh,Ghofranipour,Heydarnia & Pakpur, 2009 in Borhaninejad et al., 2016). Outcome expectations is how a person thinks of the consequences of their actions (Lent,Brown & Hackett, 2000 inThungjaroenkul et al., 2016). In simple terms, what are the likely outcomes of the decisions taken? The social support is the support from social relations and networking like friends and family, which influences a person to take a decision (Williams & Bond, 2002 in Borhaninejad et al., 2016). Self-regulation is the strategies or procedures by which an individual is able to control their actions. Bandura (2001) in Lee et al. (2016) theorized that self-regulation basically implies human beings are themselves active agents who change their attitudes over a period of time and can take control of their actions. Some of the key features of self-regulation are self-monitoring, goal-setting, feedback, self-reward and identification of social support (Safari et al., 2009 in Borhaninejad et al., 2016).

The social cognitive model has been applied in several areas of psychosocial research. In the area of ICT, the model has been used in assessing the factors that determine the adoption of internet banking (Boateng,Adam,Okoe & Anning-Dorson, 2016). It has also been used to assess the various lead factors that predict digital piracy (Lowry,Zhang & Wu, 2017) and examine the social cognitive constructs or factors that influence Singaporean adolescents to visit social network sites (Lee et al., 2016). Other studies include the use of the model to predict the factors in career self-management that influence career exploration and decision making (Lent,Ezeofor,Morrison,Penn & Ireland, 2016). In the area of health, it has been applied in predicting the factors that influence body mass among adolescents (Dong-Hee et al., 2007). It has also been used in predicting the factors

that influence self-care of diabetes among the elderly (Borhaninejad, Iranpour, Shati, Tahami, Yousefzadeh & Fadayevatan, 2016) and applied in the assessment of the factors that predict nurses' desire and willingness to become nurse educators (Thungjaroenkul et al., 2016). In the area of work behaviour, the model has been used to study the predictors and psychology behind work absenteeism and participation (Cooper & Lu, 2016).

The social cognitive model has also been applied in the area of agriculture. One of them is the use of one of its main constructs, self-efficacy, to assess farmers' capabilities to undertake the required actions to achieve specific agricultural goals or targets (Roy, 2009). Another application of the theory in agriculture is its use to assess how the success of the farm-to-school programme, a nutrition and dietary programme which encourages young children to directly eat food from the farm, could be explained by its constructs (Berlin, Norris, Kolodinsky & Nelson, 2008). Grabowski (2012) used the social cognitive theory to analyse the factors that influence smallholder farmers in Southern Africa's ability to learn agricultural skills.

Even though some constructs of the SCM can be found in both the PMT and TPB, the construct in the SCM, which is relevant to the study but cannot be found in the PMT and TPB is social support. This construct indicates that farmers' adaptation is influenced by their social and institutional contacts such as extension services provision, support of farmers' association and the institutions on whose land farmers are. Self-efficacy, outcome expectations, and outcome expectancy of the SCM can be explained by the constructs of the PMT and/or TPB.

3.5 Analytical Framework

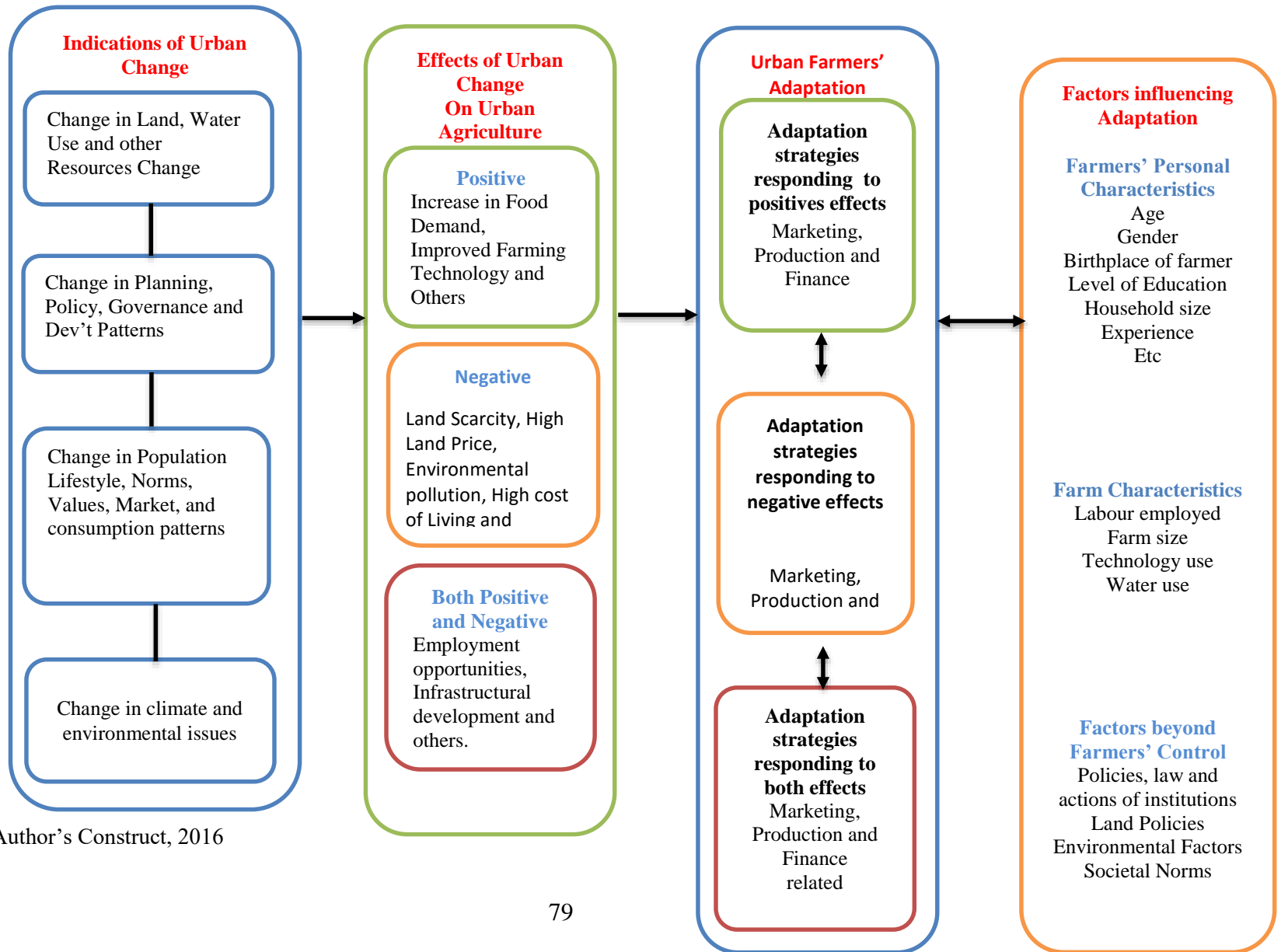
Coral and Bokelmann (2017) assert that the analytical framework of a study 'helps to organize research by linking the theoretical questions to the empirical analysis while serving as a platform for the construction of theoretical explanations, which represent the

flow of knowledge in various contexts and conditions' (p.1). This implies that a study's analytical framework must satisfy the following criteria; first, it must agree with the conceptualisation of the study, second, it must be in sync with the theories of the study, and third, it should lead to the logical analysis of the study's objectives. The analytical framework of this study is indicated in Figure 3.3.

It shows how change in the urban space affects urban farmers' activities and how they adapt to such changes. In addition, it also shows the factors that underlie, influence or predict the adaptation strategies farmers employ. The analytical framework of this study is in four main components and it is well understood when it is traced from left to the right even though there is a backward linkage between the third and fourth components. The first component is on the 'indications of urban change', the second component is on the effects of the urban change on urban agriculture, the third component is on the adaptation of urban farmers to the urban change and the fourth component is on the factors which influence urban farmers' adaption to urban change. In explaining each of the four components of the analytical framework, the study considered their agreement with the following: conceptualisation of the study, theories of the study and the specific objectives of the study.

From the left, the first component shows the indications of urban change that affects urban agriculture. This component is also specifically placed in objective two of the study. It indicates the features or pointers of the urban centre that changes during urbanisation. These pointers among others are economic (examples are change in land, water and other resources use and availability), socio-cultural (examples are change in population, lifestyle, norms and values), environmental (examples are change in climatic and weather patterns) and political (example are change in planning, policy, governance, and laws on urban agriculture).

Figure 3.3: Analytical Framework of Urban Farmers' Adaptation to the Effect of Urban Change on Urban agriculture



Source: Author's Construct, 2016

Even though these changes can be put under several sections, they are interrelated in addressing the objectives of the study. The first component of the framework can be explained by the modernisation theory of urbanisation, which explains why the urban centre changes and the indications of this change.

The second component which also explains objective two indicates how the urban changes affect urban vegetable farming. The effect of these changes can be negative or positive or can be also put into the categories of production, marketing and finance. Even though some of the effects are clearly classified as strictly negative or positive, some can be broadly captured as both. Examples of such effects of urban change that can be classified as clearly positive are increase in food demand and improved farming technology, and those that can be clearly classified as negative are land scarcity, high land prices, environmental pollution and high cost of living. Those that can be classified as both negative and positive are profit level of farmers, employment dynamics in the urban space and infrastructural development. In the second component, the theories, which fit into it, are both the modernisation theory relating to urbanisation and resilience. The modernisation theory posits that urbanisation affects land use, infrastructural development and the urban economy in general. The resilience theory also argues that because the urban centre is a system on its own, changes to it will cause changes to its economic resource availability, economic growth and sociocultural indicators, all of which affect urban farmers. These effects may be negative, positive or both to the urban farmer.

The third component is focused on the first part of objective three, which shows the adaptation strategies urban farmers use in adapting to the effect of urban change. Even though some of the adaptation strategies target more than one effect of urban change, some are specifically targeted at one effect, which could be negative or positive. The adaptation

strategies could be production, marketing or finance related. The fourth component which shows the second part of objective three indicates the factors that influence urban farmers' adaptation to the effect of urban change. Even though these factors influencing farmers' adaptation are linked, the framework separates them into the personal characteristics of farmers, farm characteristics and factors which are beyond the control of the farmer. Examples of the farmers' personal characteristics are age, level of education, gender, household size and marital status. Examples of the farm characteristics are size of farm and type of technology used and those that are beyond the control of the farmer are laws, policies and actions of institutions that influence urban agriculture, environmental factors and societal norms. The fourth component, which is also explained by the resilience theory, is also explained by the behavioural theories of PMT, TPB and SCM. In the third component, for instance, the resilience theory argues that a system can go through a change but in the fourth component it argues that when a system (such as the urban centre) goes through a transformation, its members adapt to the changes it has gone through. The behavioural theories in the fourth component further explain that the adaptation by urban farmers is underscored by some factors which, according to this study, can be separated into the personal, farm characteristics and external, institutional or factors.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter gives a detailed description of the methodology of the study by beginning with its philosophical underpinnings. The chapter also gives a detailed description of the study area (Greater Accra Metropolitan Assembly (GAMA)) and the various farm sites (clusters) within GAMA the study covered. This chapter also describes the research design and the methods of data collection and analyses. It also explains the ethical issues that were considered in the study and ends with a conclusion.

4.2 Philosophical Underpinnings

The philosophy underpinning of the study is pragmatism. This is because the study's epistemology, ontology and axiology are based on finding the most appropriate approach in answering the research objectives (Saunders, Lewis & Thornhill, 2009). In short, the appropriate approach was adopted to answer the specific research questions, whether positivist or interpretivist. With this philosophy, the study's ontology was based on the fact that answers provided for some of the objectives were based on the multiple views (realities). In other words, it accepts the independent views of the respondents (farmers and other stakeholders); whether it is their objective realities (positivism) or their socially constructed and subjective views (interpretivism). The epistemology of the study also admits that knowledge obtained from farmers and other stakeholders which was used to answer the research questions, was both objective and subjective. With respect to the objective knowledge, the study underscores that some questions called for answers with "credible" data or facts from respondents while others (subjective knowledge) called for answers which relied on their subjective meanings and interpretations. Based on this

epistemology, the study used the most appropriate approach to solicit information from the respondents, whether through one or several sources. Specifically, the study allowed the use of personal interviews, structured questionnaires and other secondary sources to solicit data to answer the objectives. The pragmatism stance of the study was also based on the axiology that value was placed on some the views and perceptions of the respondents. This helped in presenting the best of answers to the questions the study raised in the researcher's view (Saunders et al., 2009).

4.3 Research Design

The design of the study is a case study, and specifically, a collective case study. The collective case study is a design which considers multiple cases or situations when conducting a research. A collective case study draws similarities which these cases provide to answer the question in a research (Stake, 1995; Creswell, 2013). Even though the study was limited to GAMA, several farm sites were visited. Again, several farmers and key informants of institutions within it were also talked to. The aim was to obtain answers from several people and places within GAMA which would help answer the research questions. Also, the context of using the collective case study requires that answers to the questions a study raises can call for the use of an exploratory and/or explanatory research approach to collect and analyse data. Therefore, the study mainly used an exploratory approach and less of an explanatory approach to answer its research questions (Yin, 2009; Creswell, 2013). In addition, since the study aimed to gain a richer and deeper understanding of urban change effect and how farmers adapt to it, the designed guaranteed a flexible, diverse, appropriate, and hands-on approach to appropriately collect and analyse data which answers its questions. Therefore, within the context of this collective case study design, the applied methods in the collection and analyses of data were both qualitative

and quantitative methods (Yin, 2009). Based on this premise, a robust foundation for providing an evidence-based research that would contribute to literature in the area of study was assured (Saunders et al., 2009; Farhuqar, 2012).

The study used an exploratory sequential design; a sequential mixed method which first used a qualitative research approach and later, a quantitative approach to support (Creswell & Clark, 2017; Creswell & Creswell, 2017). Tashakkori and Teddlie (2010) noted that there are two advantages of using a mixed method. First, it allows different approaches to be used to answer the research questions of the study and second, it allows the researcher to apply the appropriate method in a sequential manner during the process of data collection and analysis. Though Smith (1981) and Bryman (2006) have argued that the mixed method approach has its own setbacks, it has the advantage of leading to the provision and discovery of a wealth of useful data which are not anticipated at the beginning of a study.

Following the framework adopted by (Caracelli & Greene, 1997, in Cameron, 2009) on sequential mixed method approaches, the study used the complementary approach. Under the complementary approach, one particular method dominates with the other serving as a complement. What this means is that the second approach (in this case quantitative) provides results that clarifies the results already obtained by the first approach (in this case qualitative). The nature and objective of the study called for a qualitative approach to be first used and also lead the study's methodology. This is because the study sets out to investigate the changes in GAMA that have affected urban farmers and how farmers are adapting to it. This meant some dynamics had occurred within the study area and this would affect a mixture of relationship among the variables in the urban space. Some of these are farm resources, farmers, institutions and other stakeholders in urban agriculture

as well as adaptation strategies that are being used. The nature of the study, therefore, called for first an explorative study into the changing relationships and their possible outcomes. This implies that complex and unexpected issues, which the study would not be able to later overlook, may come out. Under such a circumstance, the initial use of qualitative approach is the most appropriate due to its robustness in drawing out the nuances among the relating factors (Najmaei, 2016). The quantitative approach serving as the second and a complement to the qualitative helped to affirm explanations to the results the qualitative approach provided.

4.4 Study Area

The area chosen for the study is the Greater Accra Metropolitan Area (GAMA). The aim of the study was to find out how urbanisation has affected farming activities in Accra (the capital city of Ghana), Tema and its suburbs. Based on this, there was a selection of farming sites within GAMA (Accra, Tema and its suburbs) which were purely within the urban category not peri-urban. GAMA is the largest in terms of land size and population in the Greater Accra Region of Ghana, the region where Ghana's capital city, Accra, is located. GAMA consists of a collection of thirteen (13) districts, municipal and metropolitan assemblies (Ministry of Local Government and Rural Development (MLGRD), 2017). The Accra and Tema Metropolitan Assemblies (AMA and TMA) are the two largest among the 13 assemblies in GAMA (World Bank, 2015). GAMA's total land size is approximately 1080 kilometres square (Ghana Statistical Service, 2005) and contains two extremely important cities in Ghana, which are Accra, the capital city of Ghana, and Tema, Ghana's most industrialised city (World Bank, 2015). Accra is found in the Accra Metropolitan Assembly (AMA) and Tema, in the Tema Metropolitan Assembly (TMA). These two cities in recent times have become very difficult to separate

because it has become an almost one big megalopolis, which is sometimes referred to as Accra-Tema (Stoler, Weeks & Fink, 2012) even though Accra's population is about three times that of Tema (Ghana Statistical Service, 2012).

The total population of GAMA is almost 4 million (World Population Review, 2018). The name Accra, GAMA and AMA are sometimes used interchangeably and synonymously in literature. These three names are mostly referred to as Accra even though Accra in itself is a part of AMA and GAMA in the strictest sense (UN - Habitat, 2009; Afutu-Kotey et al., 2017; Agyemang, 2017). Accra is the most popular in GAMA in terms of economic relevance, infrastructural change and population density. It is based on this that GAMA has become significant in Ghana's urban literature (Agyemang, 2017 in World Bank, 2015). Accra was founded by the Ga ethnic group in Ghana in the late 1600s (UN - Habitat, 2009). It became the economic hub of Ghana after it replaced Cape Coast as the capital town of the then Gold Coast (UN - Habitat, 2009).

Accra's level of development and economic relevance compared to the other towns during the colonial era made it very significant to the colonial administration. This led to an increase in its size and popularity (UN - Habitat, 2009; World Bank, 2010; Yankson & Bertrand, 2012). Grant and Yankson (2003) argue that four main reasons contributed to the expansion of the city of Accra during the colonial era. The first is the well-organised spatial planning attention it received from the colonial administration called for new roads, buildings, and construction of rail lines within it. The second is the creation of the Central Business District (CBD), which served as a hub for business and centre for sale of imported goods. The third is the expansion of traditional markets which led to the development of large informal settlements around it. The fourth is the decision to create a European-like city in Accra by the colonial government for their staff and the European community in

general. The pace of development, general city characteristics, and urban lifestyle in GAMA over the years have made the suburbs same and inseparable (Oteng-Ababio et al., 2015).

Like any popular or capital city in the world, Accra experiences a large inflow of migrants from other parts of Ghana and neighbouring countries. It also experiences a large number of commuters who stream daily from areas within its peripheral, peri-urban suburbs and other regions of Ghana due to its enormous financial, administrative, industrial, and educational significance. Its population density with respect to land size ranges between 1851.7 and 37857.06 (World Bank, 2010). Accra Metropolitan Assembly (AMA) (1999) and Amuzu and Leitmann (1994) in Grant and Yankson (2003) noted that Accra's economy, notwithstanding the fact that it is the most diversified in terms goods and services produced and sold, is also known to have experienced the most expansion in terms of speed and development in Ghana after the introduction of the Structural Adjustment Programme (SAP). Its economic position as the most influenced during the colonial era, the most affected during the implementation of SAP and overall importance to Ghana's economic history has clearly made it the most economically diverse area in Ghana's economy. Another clear feature of the city is that it is characterised by a high level of influence by neoliberal economic policies which are revealed in a mixed up of a high number of foreign and local firms dealing in foreign products.

Accra's primary economic activities are dominated by farming, fishing, and quarrying, with the secondary sectors being manufacturing, construction, water and energy production and the tertiary economic activities include education, trade, hospitality, public administration, health, and communication (UN - Habitat, 2009). The monthly income of the majority of households in Accra ranges from 100 to 500 cedis in a month. The city

records over 21% of its population as having university education, about 45% as having senior high school education, 17% having primary level education and about 6% ending their education at the primary level and not completing, and about 4% with vocational and technical (World Bank, 2010).

The cosmopolitan and modernising nature of the city of Accra has to a large extent affected urban agriculture (International Water Management Institute (IWMI), 2014). Changing and adapting to the modern and western lifestyle in the city is a symbol of Ghana's modernisation, prosperity, and neo-colonial exhibits among the rising middle class. This modern lifestyle in Accra has also raised health concerns of which some are obesity, diabetes, high blood pressure and stress (Ghana Statistical Service Accra (GSS) Ghana Health Service (GHS) and ICF International, 2015). There is, therefore, the need for healthy lifestyle if people are willing to live for longer years. Among some of the healthy lifestyles urban dwellers are embarking on are exercising and healthy eating or dieting. One of the increasing interests in healthy eating shown in Accra is the consumption of vegetables. This has largely contributed to a high demand for vegetables in the city (Food and Agriculture Organization (FAO), 2012). It is estimated that the city of Accra has an exotic vegetable farmer population of between 800 and 1000 (International Water Management Institute (IWMI), 2014). These farmers are mainly residents in the city and have their farms located there as well. On the other hand, the ever-increasing quest for lands for real estates and other infrastructural developments has made it very difficult to obtain land for urban agriculture especially for crop production. This has led to a possible reduction in the number of farmers within the study area. Water for urban farmers in the city continues to be a big challenge for their production activities. This is because city authorities and the Ghana Water Company Limited (GWCL), the company which is mainly in charge of pipe-borne water provision in Ghana, discourage its use for vegetable

farming. Besides, the city experiences one major rainy season throughout the year, which is normally between May and August, which spans an average of 80 days. Urban crop farmers are sustained during the period of the year when there are no rains by depending on the numerous streams in the city which are close to where their farms are located. Though these streams are of immense support to the farmers, they are often contaminated or polluted with household and industrial waste (Obuobie, Danso & Drechsel, 2003; Food and Agriculture Organization (FAO), 2012; Danso et al., 2014).

4.5 Data Collection

4.5.1 Period of Data Collection

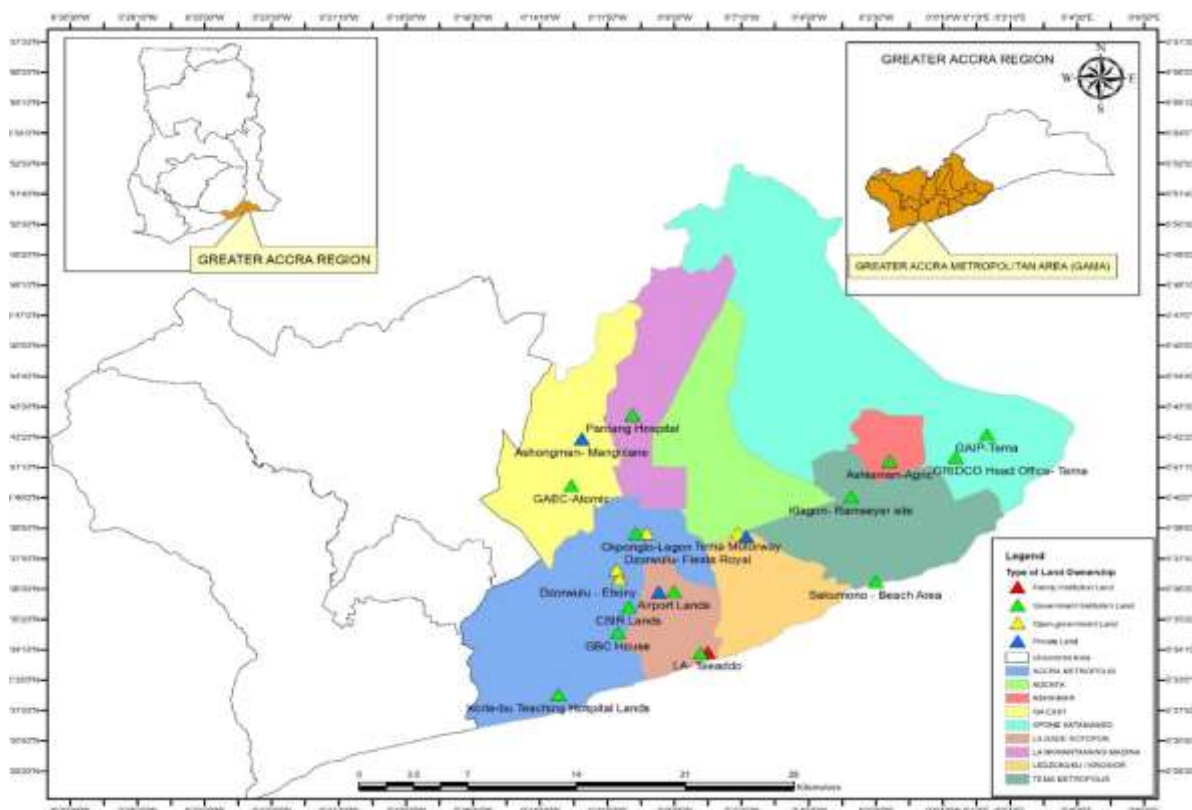
Data was collected from the periods of June 2016 to August 2016 and June 2017 to August 2017. This period of data collection was necessitated by the following reasons. First, the period between June and August is when farming is normally at its peak in GAMA and it is when most of the farmers (whether full time, part time or seasonal) can be found on their farms farming. July is at the end of the raining season in the city of Accra and at this period, water levels for irrigation increases and this makes water available and cheaper for farming. At the period, the soil becomes very moist, soft and has the right temperature for farming. The second reason is that the study first collected the qualitative data and analysed it before collecting the quantitative data. The qualitative data was first collected between June 2016 and August 2016. The analysis of the qualitative data was finished by the end of April 2017. The quantitative instruments which were developed from the qualitative analyses were ready for the second round of data collection by June 2017 and, therefore, the quantitative data was collected between June and July 2017. Data collection from institutions was the last and completed July 2017.

4.5.2 Selected Farm Sites of the Study

Seventeen (17) farm sites were visited within the study area (GAMA) for the collection of both qualitative and quantitative data. With the exception of the assemblies which had no clear urban farm sites, all the nine (9) remaining metropolitan, municipal and district assemblies within GAMA which had urban farm sites were visited. Figure 4.1 shows the urban farm sites visited and their respective assemblies within which they were located.

Korle-Bu Teaching Hospital (KATH): It is located within the Accra Metropolitan Assembly (AMA) (Accra Metropolis) and part of the capital city, Accra. This farming site (land) is on the premises of the Hospital (KATH) and, therefore, its ownership falls under what the study categorises as institutional government land. It covers a surface area of about 0.16km sq. with about 40 individual farm plots on it.

Figure 4.1: Map of Study Area with Vegetable Farming sites



Source: Generated by the Department of Geography, University of Ghana, 2017

LA-Tseaddo: It is located within the LA Dadekotopon Municipal Assembly (LADMA). The farm sites are located at two main areas. One section is at La, between the back of the Ghana Trade Fair Company Limited site and the residential buildings of the Ghana Army with the other section at the outskirts of the Tseaddo area. Parts of the lands where the farms sites are located are owned by families and others are owned by the Ghana Army. There are periodic conflicts between the families of the indigenes of La-Tseaddo and the Ghana Army on some of the lands since there are unresolved land demarcation issues. There are about 20 farmers on the site.

Ghana Broadcasting Company (GBC) Land: This site is located at Kanda specifically at the frontage of GBC. It covers a total surface area of about 0.08km sq. with about five individual farm plots. Since it is owned by GBC, it is categorised as a government institution land. Like Korle-bu, this site is within the AMA and is classified as part of Accra.

Centre for Scientific and Industrial Research (CSIR) Land: This site is located within the CSIR premises. It covers a total land surface of about 4km sq. and has about 12 individual farm plots. Its ownership is also classified under government institution land since it is for the CSIR. Similar to GBC, it falls under the AMA.

Dzorwulu Ebony and Fiesta Royal: This one of the oldest farm sites in Accra. It stretches from the Fiesta Royal Hotel across the George Bush Motorway to Ebony near the Plant Pool Company in Dzorwulu. Farmers on this stretch are located under the pylons which carry the electrical cables of Ghana Grid Company Limited (GRIDCo). The individual farm sites are six (6) at Fiesta Royal while the farm site at Ebony has about 25 individual

farmers with each land size approximating 0.0004km sq. Similar to CSIR, this farm site can be found within the jurisdiction of the AMA.

Okponglo-Legon Lands: These farm sites are mainly in two different places on the same land. They cover the Okponglo portion of the University of Ghana (UG) Lands and the GRIDCo pylons in Okponglo. One section is under the GRIDCo pylons while the other side is on the lands owned by the University of Ghana. The farm sites under the GRIDCo pylons are classified as open government lands just as in the case of Dzorwulu and the sections that belong to the University of Ghana are classified as government institution lands. There are four individual farmlands under the GRIDCo pylons and about ten on the UG lands. This farm site also falls under the jurisdiction of AMA.

Ghana Atomic Energy Commission (GAEC) Lands: This is one of the largest farm sites of the study area (GAMA). It covers an area of about 36km sq. It also has one of the largest concentrations of urban vegetable farmers. Since the land belongs to GAEC, its ownership is classified under government institution lands. The farm sites fall under the jurisdiction of the GA-East Municipal Assembly (GEMA) of GAMA.

Ashongman Mango lane: This is the only farm site which is strictly owned by private individuals. Most of the farm sites have been walled with some having buildings occupying them. Even though the farms are in the same suburb, they are a little scattered since buildings which are already occupied can be found between some of the farmlands. Due to the fragmented nature of the farm lands, having the total land area is very difficult but the farmers are estimated at 21. Farms on this site fall under the jurisdiction of GEMA.

Pantang Hospital Land: This farm site belongs to one of the major psychiatric hospitals in Ghana, the Pantang Psychiatric Hospital. Its ownership falls under the government institutional land. Farmers on this site are using lands that are yet to be used by the hospital. The land covers about 9km sq. and has 10 individual farms on the land. It also falls under GEMA.

Tema Motorway Site: This farm area has the largest stretch out of the 17 farm sites visited. It begins from one end of the Tema Motorway to the other end, covering about 15km. The whole Tema motorway stretch is not covered with farms because first, farmers compete with squatters, refuse dump sites and encroachers. Second, the source of water for farming does not cover one end of the motorway to the other making farmers site their farms only close to the streams, which are found there. There are two types of land ownership on this land: the first are the open government lands which are mainly on the immediate sides of the motorway and which have not been used yet by government, and the privately-owned lands which have not been developed by private individuals and companies yet. There are about 60 farmers on this land and they fall under the jurisdiction of both TMA and La Nkwantanang Madina Municipal Assembly (LANMMA)

Ashiaman Agric: This farm site belongs to the Ministry of Food and Agriculture (MoFA) and therefore falls under the category of government institution land. It has about 30 farms and covers a land surface of about 3 km sq. The farm site is within Ashiaman and Adjei-Kojo, arguably the two most popular suburbs in the Ashaiman Municipality Ashaiman (ASHMA).

GRIDCo: This farm site is specifically located at the head office of the Southern Sector of GRIDCo. The farms are under the pylons located on the head office grounds. The site

has about 15 individual farms with each farm size averaging about 2.5 acres. The total land area is about 0.6km sq. GRIDCo is classified under government institution lands since it is located on their premises. Similar to the Klagon Ramseyer site, it falls under TMA.

GHAIP: This farm site is found on the Ghanaian Italian Petroleum Company (GHAIP) land at Tema and therefore classified under institutional government land. It has about 16 individual farms and covers about 0.5 km square. Similar to GRIDCo, it falls under TMA.

Klagon Ramseyer Site: This is located within the jurisdiction of the TMA. It is arguably the largest farm site of the study area with a total land size of about 100km sq. It has the largest land per farm size ratio in the study area with each farmer having an average of about 5 acres. The total number of farmers on the land is about 15. Since the land is meant for the purpose of conserving some endangered wildlife species by the Ghana Wildlife Society, it falls under TMA and categorised as open government lands under this study.

Sakumono Beach: This farm site covers an area of about 2km sq., which falls under the TMA. It is located on the Ghana Maritime Academy land and therefore classified under government institution land. There are about five individual farms on the land.

4.5.3 Qualitative Method Used in Data Collection

The qualitative approach used data from two main sources: primary and secondary. The primary data were collected from urban farmers, farm sites and the institutions which influenced urban farming activities within the study area. With respect to the secondary data, policy documents related to urban agriculture were also used.

4.5.3.1 Qualitative Sampling Methodology

The study used various non-probability sampling methods for soliciting the qualitative data. The study first selected the farm sites after which it selected the farmers from the various farm sites. Generally, there is a lot of homogeneity among farm sites in GAMA in terms of their characteristics, rate of marketing of farm produce, cost of inputs, farming technology used, accessibility and cost of farm inputs used, and type of water used by farmers, among others. The main difference among the farm sites is their type of land ownership and locations. The aim of this study was to look for the similarities among the urban farmers in terms of the effect of urban change on their farming activities and how they adapt to the effect of the urban change; therefore, the study used the homogeneous sampling method to select farmers from different sites (Patton, 2002). For the collection of data for qualitative analysis, 10 sites were selected. They were Legon-Okponglo, Dzorwulu-Fiesta Royal, Dzorwulu-Ebony, Tema Motorway, GBC, Korle-Bu, CSIR, GRIDCo, GAEC and La-Tseaddo.

In selecting the farmers at the various farm sites for the qualitative data, the various differences such as age, experience in farming, and place of birth, which were prevailing among the farmers were considered. This was because the study was interested in the common experiences and views of the farmers on the effect of the urban change on them and the common adaptation strategies they were using. Therefore, the heterogeneous sampling method was used in choosing the farmers (Patton, 2002). Among the 29 farmers interviewed in the 10 farm sites for the qualitative data, two were key informants. While some farm sites had more farmers interviewed, others had fewer farmers interviewed. The differences in the number of farmers interviewed across the different sites are as follows: the initial farm sites visited for the interviews, the differences and similarities among farmers on the sites, the willingness and ease with which the farmers granted the interviews

and the newness of the information farmers gave concerning what the study wanted. Specifically, sites where the interviews started had more farmers interviewed compared to sites where the interviews ended. This was because most of the information added by farmers interviewed as sites visited increased was few and in some cases zero. In addition, sites which had larger farmers with differences in background in terms of age, years in farming, place of birth and others, had relatively larger numbers chosen compared to sites which had less differences. This was because sites with farmers of different backgrounds were richer in the diversity of information given. In addition, sites that had farmers who were open and willing to talk to the interviewers of the study had more people interviewed and vice versa. More importantly, the interviews came to an end when the point of saturation for the study was reached. The saturation point was when additional information given by the farmers were not of extra relevance to the study (Creswell, 2013).

The sites and their respective farmers chosen as Table 4.1 shows were as follows: GAEC (Atomic), 10, Legon-Okponglo, 1, Dzorwulu Junction, 2, Dzorwulu Ebony, 2, GBC, 1, and La-Tseaddo 3. The remaining were Tema Motorway, 6, Korle-Bu, 1, CSIR, 2 and GRIDCo, 1. One of the two key informants was from GAEC and the other was from Dzorwulu Ebony. GAEC and Tema motorway had larger numbers because they had multiple sites under the same cluster, covered a very large land size and were at the initial points of the interviews. Even though a site such as Korle-bu had a lot of farmers, only 1 farmer was chosen from there. This was because it was the last place visited for the interviews and the point of saturation had been reached when the last farmer was interviewed there. Appendix Table 1 in the appendices section shows the profile of the farmers who were selected during the collection of the qualitative data.

Table 4.1: Sites visited for quantitative data collection

No	Farm Site or Cluster	Number Interviewed
1	GAEC (Atomic)	10
2	Legon-Okponglo	1
3	Dzorwulu Junction	2
4	Dzorwulu Ebony	2
5	CSIR	2
6	GBC	1
7	La-Tseaddo	3
8	Tema Motorway	6
9	GRIDCo	1
10	Korle- Bu	1
Total		29

Source: Field Data, 2016

Out of the 29 farmers interviewed, the youngest of the farmers was 24 years and the oldest was 76 years. The farmer with the highest years of experience in farming in Accra was 48 years while the least was 6 years. Out of the 29 farmers, only two grew only one type of crop but the remaining 27 grew multiple crops. Most of the farmers interviewed (15) were from the Upper East Region of Ghana while those born in Accra were five. Out of the 29 farmers interviewed, the youngest of the farmers was 24 years and the oldest was 76 years. The farmer with the highest years of experience in farming in Accra was 48 years while the least was 6 years. Out of the 29 farmers, only two grew only 1 type of crop but the remaining 27 grew multiple crops. Most of the farmers interviewed (15) were from the Upper East Region of Ghana while those born in Accra were five.

With respect to collecting data from institutions related to urban farmers, two groups of institutions were interviewed. The first group were those who had granted farmers their lands for farming and the second group were those who were mainly established to support urban farmers in their activities. In selecting the two categories of institutions, the heterogeneous sampling was also used. This was because, even though some of these institutions were different in nature in terms of structure, purpose, ownership and location, there were some common grounds in which they related to the farmers. For example, even though GRIDCo is for power transmission, CSIR is for research in general and GAEC is for nuclear research, they all provide lands to farmers for farming as what they have in common in relating to the farmers. There were also some differences among the institutions which were established to promote urban agriculture in the form of ownership (some government, NGOs and inter-governmental) but they provided similar support in promoting the activities of urban farmers. For example even though IWMI and MoFA have differences in terms of ownership, they provided some common support in helping urban farmers. In all thirteen (13) key informants from eight (8) organisations were interviewed. Some of them were heads of departments of organisations while others were found in the middle level management positions but were very familiar with the issues needed to answer the objective of the study such as ways they promote urban farmers' activities. The government organisations interviewed were the MoFA units at the various district and municipal assemblies, health and planning departments of some municipal assemblies, and the LUSPA Planning units of the Greater Accra Region. The international organisation involved in the promotion of urban agriculture interviewed was the International Water Management Institute (IWMI) in Ghana. The organisations interviewed whose lands were used for farming were the Centre for Scientific and Industrial Research (CSIR) at Airport, Biotechnology and Nuclear Agriculture Research

Institute (BNARI) of the Ghana Atomic Energy Commission (GAEC) at Atomic and the Ghana Grid Company (GRIDCo) at Tema. Appendix Table 2 in the appendices shows the number of organisations whose personnel were interviewed and the aspect of urban agriculture in GAMA they are of much relevance.

In addition to the data obtained from the farm sites, farmers and institutions, policy documents which were relevant for the objective of the study were also used. These documents included the National Irrigation Policy, Strategies and Regulatory Measures, Food and Agriculture Sector Development Policy (FASDEP II) (MoFA, 2007), Ghana National Urban Policy Action Plan (Ministry of Food and Agriculture (MoFA), 2011), Medium Term Agriculture Sector Investment Plan (METASIP) (MoFA, 2010) and the National Water Policy (Ministry of Works Housing and Water Resources (MWHWR), 2007).

4.5.3.2 Qualitative Data Collection Instruments

Interview guides were used to solicit data for all the interviews conducted during the collection of the qualitative data whether from farmers, or key informants who were farmers or who were from institutions. All the three interview guides were mainly generated through the reviewing of literature and after having initial interactions with some farmers on the field. They were designed in such a way that they were flexible and allowed for issues on the field which were not initially considered but relevant to the study to be factored in (Patton, 2002). The interview guide for the farmers were designed to solicit data on their views of the changes that had occurred in the study area since they started farming, the negative and positive effects these changes had brought to them and how they were developing or had developed adaptation strategies to deal with the change. The interview guide of the farmers also focused on how they related with the institutions whose actions affected them in the process of the urban change. The interview guide for the key

informants was used to ascertain the responses the other farmers and institutions gave on the issues raised in the interviews. The interview guides of the institutions focused on the roles they played in promoting farmers activities, how they made sure the laid down policies for urban agriculture development by government were followed and their official stance with respect to the use of their lands by farmers.

The language that was used for the data collection among the farmers was mainly Twi since it is the language widely spoken by people in Accra (Huber, 2004 in Kirkham & Nance, 2017). However, a farmer who preferred to speak in English or any other language was given the opportunity to do so. For languages that the researcher did not understand (with the exception of English, Twi or Ga), interpreters were used when the need arose, though such situations were rare. In conducting the qualitative interviews, digital recorders were also used to record and store the voice data. In addition to the electronic recorders, digital cameras, electronic tablets, and mobile phones with features for recording videos and taking pictures were used to take videos and pictures when the need arose. In addition, field notebooks and pens were used to record other important information such as reflections on field experiences and other issues which unfolded during the data collection. This was used to augment the data provided by the voice recordings and pictures (Phillippi & Lauderdale, 2018).

The interviews with the farmers lasted between 15 minutes to 1 hour with about 8 out of 10 of them going beyond 30 minutes. The interviews of the institutions, which were 13 in all, lasted between 15 and 45 minutes with about 4 out of 5 going beyond 20 minutes.

4.5.3.3 Qualitative Data Analysis

The voice data and memos for the qualitative data analyses were first transcribed directly if they were in English. The non-English language data were translated and transcribed at the same time. As much as possible the data transcribed were in a ‘pure verbatim protocol’ (Mayring, 2014) after which they were reviewed by making corrections to them before the creation of codes and the drawing of themes for the study (Gibbs, 2013). After the data were reviewed, they were uploaded into Atlas.ti, a Computer-Assisted Qualitative Data Analysis Software (CAQDAS) (Cope, 2009) for the creation of codes and themes.

In analysing the data, the four stage content analysis of Venkatesh, Andrews, Parsekar, Singh and Menon (2016) was followed. These four stages were the creation of a coding plan, formulation of the codes, creation of the themes and, finally, the consolidation of themes in line with the objectives of the study.

The coding of the data was in two levels: primary and secondary coding. With the primary coding, in vivo, value, and initial coding methods were used. In vivo coding, the codes are made by giving direct meaning to the respondents’ own words. This means that in vivo coding helps in analysing the data by using the farmers’ own words concerning the objective of the study. Value coding is a process of coding respondents’ values, beliefs and subjective views. Value coding captured the views and perceptions of the farmers and institutional representatives interviewed. The initial coding is a process of coding which creates the data provided by the respondents into categories and this helps in putting the issues concerning the objectives of the study into perspectives. These primary codes helped in setting the qualitative analysis right for the secondary coding methods to be applied. The secondary methods coding employed were focused and pattern. Focused coding is the process of coding which brings the primary codes together to put them under

key categories and concepts which are directly linked to the objective of the study. Pattern coding is the process of coding which also puts the primary codes into major units of analyses and sets the analysis toward the creation of themes which are in line with the objectives of the study. These secondary coding methods helped in the thematic analyses of the study by placing the findings of the study under the set objectives. Specifically, in this study, the focused and pattern codes helped classify the primary codes into the categories. These were the legal and policy frameworks and actions of institutions which influence urban agriculture, the effect of urban change on farmers and the adaptation of urban farmers to urban change (Saldana, 2009 ; Miles, Huberman & Saldana, 2013).

Examining the frameworks and role of institutions that influence the activities of urban farmers in the context of urban change

This objective was analysed with the use of qualitative data, which were both primary and secondary. Primary data was mainly collected from key informants of the institutions and the rest came from the farmers. The secondary data was also taken from policy and legal documents from the Government of Ghana which affected urban agriculture. The data from the interviews of the institutions and was analysed using content and thematic analysis (King, 2004 in Saunders et al, 2009; Mayring, 2014).

The content and thematic analysis made use of codes and themes from the data (interviews) that were well linked to this objective of the study. Even though both inductive and deductive approaches were employed in the analysis, the emphasis was more on the deductive since the analyses were mainly drawn from the data given (King, 2004 in Saunders et al, 2009; Mayring, 2014). Literature from the policy and legal documents which concerned the objective was used to augment the findings from the interviews.

Assessing the effect of urban change on urban farmers' farm decisions and actions

This objective was addressed using data from the transcribed interviews of farmers and some photographs taken at the farm sites. Similar to the analysis of the transcripts of interviews in objective one, a content and thematic analysis was conducted to bring out the various codes and themes required to answer the objective. In analysing the data for this objective, the various changes which have occurred in GAMA were linked to the specific effects on farmers' farm activities within GAMA. Some descriptive statistics were employed to complement the explanations from the interviews analysed.

Assessing the strategies urban farmers use in adapting to the effect of urban change

A part of this objective was analysed using qualitative data which came from transcriptions of the farmers interviewed. Similar to the analysis of objectives one and two, codes and themes were drawn from the interviews. The analysis was linked to the various adaptation strategies that farmers used due to the various effects of urban change on farming activities. Similar to objective two, descriptive statistics were used to augment the explanations given by the quantitative analysis.

4.5.4 Quantitative Method Used in Data Collection

The quantitative data collected was mainly in two forms. They were data obtained directly from the farmers and secondary data obtained from the Ghana Meteorological Agency (GMA). The quantitative data was mainly taken to augment the results of the qualitative analysis. The quantitative data was used to analyse the demography of farmers and their farm characteristics, the effect of urban change on urban farmers and the factors that influenced farmers' adaptation.

The GMA data was on rainfall, temperature and humidity and was taken to analyse the changes in climatic patterns in the study area over the past 31 years (from 1986 to 2016, 1986 inclusive), a period when it is asserted that the study area was opened to rapid urbanisation (Songsore, 2009). The GMA data used for the analysis was not sampled but had every period of it used for the analysis. In other words, all the days and months within the 31 year period were used.

Obtaining the population of urban vegetables farmers within the study area was very difficult since the respective district, municipal and metropolitan assemblies these farmers fell under could not provide the respective populations of farmers there. The closest information on population was IWMI estimates which put the population of famers in Accra and Tema in 2008 at 1000 (International Water Management Institute (IWMI), 2014). Interestingly, when IWMI estimated the farmers in the study area, they did not indicate whether they were farm owners only or were a combination of farm owners and farm labourers (who also called themselves farmers). This means IWMI's estimates may have been bloated if that same number (1000) was to be used as population for this study. Therefore, the actual population for this is likely to reduce due to two reasons: first, farm labourers were part of the estimated population of 1000 that the IWMI gave and second, the continuous loss of lands for urban agriculture between years 2008 and 2016 may have reduced the number of farmers within the study area.

Since the population was envisaged to have reduced by an appreciable figure, sampling these farmers might result in a situation where the number used for the quantitative analysis might be small. Therefore, the possibility of soliciting data from all the farmers within the study area was considered and followed. The clusters that were already known in literature were identified and those which were not known were discovered through snowball sampling during the collection of the qualitative data. The number of clustered

farm sites known in literature in the study area was about twelve (12). They were Legon-Okponglo, Dzorwulu- Fiesta Royal, Dzorwulu-Ebony, Tema Motorway, Ashiaman, Korle-bu, CSIR, GAEC, Marine Drive, Cantonment (near Togo Embassy) and La-Tseaddo (Danso et al., 2014; Nyantakyi-Frimpong et al., 2016). The other clustered farm sites discovered during the collection of the qualitative data were seven (7) clusters (sites): GHAIP, GRIDCo, Klagon Ramseyer Site, Sakumono Beach Area, Airport Lands, Ashongman Mango lane and Pantang Hospital. Apart from the GBC (which was already covered in the qualitative), Marine Drive and Cantonments which were not visited due to their negligible numbers with respect to the sampled farmers, all the other 16 sites were visited.

The farm owners in all the 16 individual clusters were listed at their respective sites and for data to be collected from them. Even though the study tried to solicit data from all the farmers, it was not possible. This was because some farmer owners were not willing to talk to field enumerators due to their experience of research response fatigue. Also some farm owners were not available on their farms after three visits to their farms by field enumerators. With the farmers who were not ready to talk to the field enumerators (the problem of non-respondent), the study employed the suggestions of Groves (2006) in dealing with it. According to Groves (2006), if a researcher finds himself in such a situation, he could first collect other forms of data such as qualitative data to support the responses given, and then develop extra patience with respondents during the data collection. Again, he can increase the sample size (which the study did). The sites visited, their respective MMDAs, the number of farmers captured and their respective total numbers per site have been indicated in Table 4.2.

Table 4.2: Sites visited for quantitative data collected

MMDA	Site	Number Reached	Total Number of farmers	Percentage Reached	Proportion of Sample
	Airport	6	8	75	2.39
LADMA	La-Tseaddo	9	20	45	3.59
	Dzorwulu - Fiesta Royal	5	6	83	1.99
	Dzorwulu Ebony	18	25	72	7.17
AMA	CSIR	8	12	67	3.19
	Okponglo	9	15	60	3.59
	Korle-bu	28	42	67	11.16
	Ashongman	15	21	71	5.98
Ga East	GAEC	26	35	74	10.36
LAN MA	Pantang	18	24	75	7.17
ASMA	Ashaiman	23	32	72	9.16
ADMA	Tema Motorway	52	61	85	20.72
TMA	Klagon	7	11	64	2.79
	Sakumono Beach Road	3	5	60	1.20
KKMA	GHAIP	12	16	75	4.78
	GRIDCo	12	15	80	4.78
Total		251	348		

Source: Field Data, 2016

The minimum proportion of farm owners covered per cluster was 45% of total farmers and the maximum was 85%. In all, 251 farm owners out of the listed 348 farmers were captured with the 16 farm sites visited. This covered 72% percent of the estimated farmers within GAMA. With respect to the validity of the minimum number of farmers covered in the survey, the criteria of De Vaus (2002) was followed. De Vaus (2002) argues that to obtain a required minimum sample size of a survey, the adjusted minimum sample size (n^*) is used. In short the lowest number that can be used in a survey with respect to the population is n^* , which is expressed as:

$$n^* = \frac{n}{1 + \left(\frac{n}{N}\right)} \dots\dots\dots (1)$$

Where N is the population in (1). In obtaining n^* , n must first be estimated. n here is expressed as:

$$n = k \times s \times \left(\frac{l}{m}\right)^2 \dots\dots\dots (2)$$

Where n is the minimum sample size required, k is the proportion of farmers captured from the field farm sites visited, s is the proportion that was not captured from the sites visited, l is the level of confidence of the sample size, and m is the margin of error of the confidence interval. Applying the data from field in (2), k was 72%, while s was 28%. The z-score of 95% gave l as 1.96 and m as 5%. The estimated n from equation (1) makes n approximately 309. Substituting the results obtained for n from (2) into (1), it implies n^* , which is the adjusted minimum sample is approximately 163. It could, therefore, be concluded that the sample size of 251 obtained for the study exceeded the minimum required sample of 163 by 88.

The study compared the validity of the sample size obtained with respect to the population per De Vaus (2002)'s criteria to other studies. One of such comparison was with Glenn (1992), where the sample size of 251 of this study passed per its standard. Glenn (1992) prescribes a minimum sample size of 187 with a 5% margin of error with a population of 350. The other comparison to Bartlett, Kotrlik and Higgins (2001) also passed the sample size of 251 of this study. According to Bartlett et al. (2001), if a population is 400, the minimum number of selection for a continuous data at a significance level of 1% and margin of error of 3% is 137 and 196 for a margin of error of 5% and p and t values of 0.50 and 1.96 respectively.

4.5.4.1 Quantitative Data Collection Instrument

The study employed a close-ended structured questionnaire to collect the quantitative field data. Since the research design is a sequential mixed method, the questions on the questionnaire were mainly teased out of the qualitative analysis with a few coming from existing literature. The structured questionnaire was first created in a Microsoft word format and later transferred to a Computer-Assisted Personal Interviewing (CAPI) (a digital mobile device) format in order to make sure data collected and used for the analysis was accurate, easier to collect and clean.

4.5.5 Method of Data Analysis of Quantitative Data

The quantitative data were used to analyse the second part of objective three, which assessed the factors that influenced urban farmers' adaptation to the effect of urban change.

4.5.5.1 Assessing the strategies urban farmers use in adapting to the effect of urban change

In analysing the quantitative data under this objective, three steps were followed. The first step was the use of a point score for each adaptation strategy used by a farmer. In creating the point score, each adaptation strategy a farmer used was assigned the value one and zero if the farmer did not use that adaptation strategy. The adaptation strategies were grouped into three which were those relating to production, marketing and finance.

At the second stage of the analysis, the Principal Component Analysis (PCA) was used to assign weights to the various adaptation strategies in the various groups. The weights provided by the PCA gave the relative importance of each adaptation strategy in each group. For example, if the production related adaptation strategies group had strategies A,

B and C, and the weights assigned to them were 0.54, 0.67 and 0.12 respectively. This implies that strategy B was the most important per the response of the farmer and the C is the least. After the weights were obtained with the PCA, they were multiplied by the respective score of each farmer and this gave the index of each farmer with respect to each adaptation strategy. Later, the values of the individual adaptation strategies obtained in the form of scores were summed up to obtain a total index for each farmer for each group (whether production, marketing or finance related). This implies that each farmer had a total index for each group of adaptation and this indicated his or her intensity of adaptation when it came to the group. The explanation of the total indexes is further indicated in Equations 1 and 2 using the production related adaptation strategies category.

$$W_p ProAdap_i = W_p \times ProAdap_i \dots \dots \dots (1)$$

ProAdap_i is the score obtained for using production related adaptation strategy *i*.

W_{pi} represents the PCA weight obtained for production related adaptation strategy *i*.

W_pProAdap_i is the weighted value for a farmer who used production adaptation *i*.

$$TotProAdap_i = \sum_1^n W_p ProAdap_i \dots \dots \dots (2)$$

Where *TotProAdap_i* is the total index for production related adaptation strategy for the *i*th farmer. Therefore *TotMktAdap_i* and *TotFinAdap_i* are total indexes for marketing and finance related adaptation strategies respectively for the *i*th farmer.

In the third step, a linear model was used to indicate the relationship between the intensity index of an adaptation strategy (for example production) and the factors that influenced it. This is indicated in equation 3.

$$y = \alpha_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots \delta_1 x_9 + \delta_2 x_{10} + \dots \alpha_1 x_{16} + \varepsilon \dots \dots \dots (3)$$

The following are the meanings of the variables expressed in equation 3:

y = the total adaptation intensity index for any of the three categories

α_0 = intercept of the model

x_i = the i th independent variable which could be farmers' personal characteristic, farm characteristic or the factors beyond the farmers' control.

β_i = coefficient of farmers' demographic characteristic

δ_i = coefficient of farmers' farm characteristic

α_1 = coefficient of institutional factor

After the linear model was created, the Ordinary Least Squares (OLS) was used to estimate the relationship between intensity of adaptation for each category (for example production) and the factors that influence them. In using the OLS, all the assumptions which makes the OLS the Best Linear Unbiased Estimator (BLUE), the other assumptions of the error termed as well as the independent variables were considered and applied (Gujarati, 2009).

The study chose three sets of categories as independent variables which were personal characteristics of farmers, their farm characteristics and a factor beyond the control of the farmer (use of institutional land). Table 4.3 explains how the independent variables were measured.

Years in farming in Accra: this was a continuous variable and was measured as years a farmer has spent in farming in Accra.

Sex: this was in two forms, which were male and female and was dummied. One was assigned to male and zero was to female.

Table 4.3: Description of independent variables

Socioeconomic Characteristics			
No	Name of Variable	Representation	Measurement
1	Years in farming	x_{1i}	Years
2	Sex	x_{2i}	Dummy
3	Level of education	x_{3i}	Dummy
4	Level of farm engagement	x_{4i}	Dummy
4	Region of birth	x_{5i}	Dummy
5	Household size	x_{6i}	Count
6	Places farmed in Accra	x_{7i}	Count
Farm Characteristics			
No	Name of Variable	Representation	Measurement
1	Total and size	x_{8i}	Count
2	Total labour employed	x_{9i}	Dummy
3	Weedicides use	x_{9i}	acres
4	Pumping machine use	x_{10i}	Count
5	Organic fertilizer use	x_{11i}	Dummy
6	Ploughing machine use	x_{12i}	Count
7	Vegetable crop intensity	x_{13i}	Count
Institutional Factors			
No	Name of Variable	Representation	Measurement
1	Open Government Land Use	x_{14i}	Dummy

Level of Education: this variable was originally classified into six. They were no education, primary, junior high school (JHS) or middle school, secondary or technical or vocational school, tertiary, and non-formal but it was dummied during the analysis. Those with primary education were assigned one and those otherwise were assigned zero.

Level of farm engagement: this was a dummy variable and if the farmer was full time, one was assigned to him and zero if otherwise

Region of Birth: this was a dummy variable and where a farmer was born in Accra he was assigned one and zero if he was born in any other place.

Household size: this was measured as a count variable. They were the number of people who shared their resources and income together as a unit in a particular farmer's house including the children.

Places farmed in Accra: this was a count variable and it was simply the number of places a particular farmer had farmed within GAMA.

Total land size: this was how big a farmer's land was. It was a continuous variable which was measured in hectares.

Total labour size: this variable was how many workers were employed on the farm during the one-year period. It was a count variable.

Weedicides use: this variable was dummied. One was assigned to a farmer using weedicides and zero was assigned to a farmer not using it.

Pumping machine use: this variable was dummied. One was assigned to a farmer using a pumping machine and zero was assigned to a farmer not using it.

Organic fertiliser use: this variable was dummied. One was assigned to a farmer using organic fertiliser and zero was assigned to a farmer not using it.

Ploughing machine use: this variable was dummied. One was assigned to a farmer using a ploughing machine and zero was assigned to a farmer not using it.

Vegetable crop intensity: this variable measured the frequency with which farmers planted vegetable crops in a year (June 2016 to July 2017). The number of times a crop

was grown was counted. It means the total number of vegetables grown represented the vegetable crop intensity of a farmer.

Open Government Land Use: there were five main categories under this variable. They were self-ownership, private ownership (not farmer), family, native, or communal, institutional lands, and open government lands. It was dummied and open government lands was assigned one and all the other categories assigned zero.

4.5.5.2 Testing for Differences in Adaptation Intensity among Sites

In testing whether there were significant differences in production, marketing and finance adaptation intensity among the 16 sites (clusters), the chi-square was used. The chi-square formula is indicated in equation (4) as :

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} \dots\dots\dots (4)$$

Where χ^2 is the chi-square statistic, O_i is the number of cases observed in category i and E_i is the expected number of cases in category i (Lind, Marchal & Wathen, 2012; Aron, Coups & Aron, 2013). Applying to this study, the O_i is the adaptation intensity index (whether production, marketing or financial) with respect to a cluster and E_i is the expected adaptation intensity index with respect to production, marketing or finance.

In affirming the findings from the chi-square test on the adaptation intensity, the Analysis of Variance (ANOVA), which tested the differences in means among the various clusters (sites), was also conducted. The one-way ANOVA conducted has interest in two issues. First, the test of means between the farm sites and second the test of means within the farm sites with respect to production, marketing and finance adaptation. Equation (5) shows the formula for the test of means between the farm sites with respect to adaptation intensity while equation (6) is indicating the differences of the means within the farms sites.

$$\text{Differences between clusters} = \sum_{k=1}^n n_i (\bar{x}_i - \bar{x}) \dots\dots\dots (5)$$

$$\text{Within Clusters} = \sum_{i=1}^k \sum_{j=1}^{n_i} n_i (x_{ij} - \bar{x}) \dots\dots\dots (6)$$

From equations (5) and (6), n is the number of observations which is 251, k is the number of clusters which is 16, x_i is the i th cluster and x_{ij} is the intensity index of a particular adaptation (for example finance) of j th farmer within the i th cluster (Lind et al., 2012).

4.5 Ethical Considerations

The study went by the required standards of ethics in social scientific research. Ethics were applied at the various stages of the study, including the formulation of the topic, the research design as well as the data collection. It was also applied in the data storage, processing and writing of research findings as advised by Saunders et al. (2009).

This was how ethical standards were applied at each stage of the research. In the formulation and clarification of the research topic, the study was not compelled by its sponsor, the German Academic Exchange Service (DAAD). When it came to designing the research and gaining access to participants on the field, the following were considered. The researcher had the right not to be coerced by the gatekeepers. The participant and/or gatekeeper had the right to be fully informed about the research. The participants also had the right to their privacy in the research. When it came to the collection of data, the following ethical issues were considered. Again, the right of the researcher to avoid the coercion of the sponsor or gatekeeper was maintained. The researcher's right to safety on the field was enhanced. The right of the participants to have an informed consent and also to withdraw from taking part in the study at any time was allowed. The participants were not deceived in any form and had the right of confidentiality and anonymity. Organisations involved in the study also had the right to confidentiality and anonymity. With respect to processing and storing of data, the participants had the right as individuals to have access

to their full personal data of the study at any time when they were needed. During the analyses of the data and writing of the results of the work, the researcher had the right not to be coerced by sponsors or gatekeepers and maintained the confidentiality and anonymity of the participants and any organisation involved in the study. The general quality of the research was maintained as far as the sponsors, gatekeepers and participants were concerned (Saunders, 2009).

4.6 Limitations of the Study

Like many other studies, the study had some limitations. One of the major challenges of this study was the difficulty in obtaining the population of farmers. Obtaining reliable data from the MoFA was not possible. Not even the leaders of the farmers' associations could provide reliable data on their membership. This was because the records were not even there. Based on this, the study had to initially depend on the estimates of farmers by the International Water Management Institute (IWMI) (2014), which were not reliable considering the time the data was taken. In dealing with this limitation, the study had to first visit the respective clusters to check for the number of farmers on the field rather than rely on the estimated data by IWMI which was very difficult to achieve. Second, farmers were visited during the peak period of farming within the study area because it was the period most farmers were found on their farms. This could not have really given a true picture of the average population of farmers throughout the year because those who did not farm during the dry season may not be known. In addition, the study should have captured other institutional factors such as extension services, membership farmer cooperatives and organisation and access to credit, which could influence farmers' adaption to urban change but did not. The institutional factor was land which was not the best approach even though land was arguably the most important institutional factor in farmers' adaptation to urban change.

CHAPTER FIVE

FRAMEWORKS AND ROLES OF INSTITUTIONAL ACTORS INFLUENCING URBAN AGRICULTURE

5.1 Introduction

This chapter presents and discusses the first objective of the study which analyses the legal and policies frameworks, and actions of the various institutions that influence the activities of urban agriculture in the context of urban change in GAMA. The similar roles of the institutions that support the activities of urban farmers within GAMA and how they factor policies in their support to urban farmers are discussed. The chapter also discusses how some of these institutions which function as de facto landlords to farmers relate with the farmers and also the challenges farmers face in dealing with these institutions which serve as landlords to them. As the first empirical chapter of the study, the first section of this chapter discusses the demography of farmers and their farm characteristics.

5.2 Demography of Farmers Surveyed

Table 5.1 gives a summary of the demography of the 251 farm owners used in the survey. The youngest farmer was 19 years while the oldest was 82 years. The mean age of the farmers was 41.40 years with a standard deviation of 15.01 years. This suggests that the majority of the farmers were in their prime ages, a stage in life where farmers are relatively stronger and energetic to farm.

Table 5.1: Demographic of farmers surveyed

Variables	Mean	Standard Deviation	Median	Mini-mum	Maxi-mum
Age	41.40	15.01	40	19	82
Household size	5.21	3.30	5	1	27
Years of Farming in Life	20.51	13.91	20	1	70
Years of Farming in Accra	15.08	12.48	11	1	53
Places of farming in Accra	1.47	0.73	1	1	4
Gender	Frequency	Percentage			
Male	236	94.02			
Female	15	5.98			
Marital Status	Frequency	Percentage			
Married	184	73.31			
Not Married	67	26.69			
Level of Education	Frequency	Percentage			
None	84	33.47			
Primary	41	16.33			
JHS/Middle School	65	25.90			
Sec/ Tech/Vocation	43	17.13			
Tertiary	8	3.19			
Non - Formal	10	3.98			
Farming as First Job in Accra	Frequency	Percentage			
Yes	151	60.15			
No	100	39.85			
Lifetime in GAMA	Frequency	Percentage			
Yes	71	28.29			
No	180	71.71			

Source: Field Data, 2017

Table 5.1 also indicates that farmers had spent an average of 15.08 years in farming in GAMA with a standard deviation and median of 12.48 and 11 respectively. The average

years of farming experience of farmers is similar to the findings of Drechsel, Adam-Bradford and Raschid-Sally (2014) where they observed that 70% of urban farmers had spent between 10 and 20 years in farming. The maximum years of experience which is 53 is in line with the findings of Danso et al. (2014), where they observed that some farmers had been farming in Accra for 50 years when reference is to La Anyane (1963)'s study. This implies that the majority of the farmers have had first-hand experience of the various changes that have occurred in GAMA. In addition, farmers on the average have farmed in 1.47 different places within GAMA with some as many as 4.

Table 5.1 further indicates that the farmers had an average of 5.21 members per total household with a standard deviation of 3.30. Males constituted 94.02% while females constituted 5.98% of the sample, an indication that males continue to dominate urban agriculture in GAMA. This observation is in line with the findings made by International Water Management Institute (IWMI) (2014) where they observed that males constituted between 80 and 90% of farmers in Ghana's cities. The observations made by this study could mean that the high physical requirements of working on urban farms have resulted in the domination of males in urban farming while women had dominated urban agriculture marketing (Obuobie et al., 2004; Adeoti, Oladele & Cofie, 2011).

Farmers who were married were 73.31% and those not married were 26.69%. This observation was also made by Obuobie and Hope (2014), where they discovered that the majority of urban farmers were married. Under the educational level of farmers, Table 5.1 indicates that the majority (33.47%) had no formal education while those with tertiary education were 3.19%. Even though the majority of urban farmers in Ghana do not have formal education (International Water Management Institute (IWMI), 2014), more than 60% of the farmers in this study had at least primary education. Out of the 251 farmers

surveyed, 60.15% had farming as their initial employment in GAMA while 39.85% had other forms of employment as their first before they decided to go into farming. Also, 28.89% of farmers had spent their entire lifetime in the Greater Accra Region (the region where GAMA is located) while the remaining 71.71% have spent their lives outside the Greater Accra Region (the remaining 9 regions in Ghana). This could mean that some of the migrants who came to GAMA from other regions of Ghana probably decided to go directly into agriculture when they arrived while others waited for some time before entering into it. Danso et al. (2014), observed that urban agriculture in Ghana normally experiences high levels of migrants from the other parts of Ghana and even some from other parts of West Africa.

5.3 Farm Characteristics from Survey Data

The summary of the farm characteristics of the 251 farmers surveyed is presented in Table 5.2. The mean farm size was 3.29 acres with a standard deviation of 3.55. Farmers on the average hired 7.32 labourers during the major raining season and 4.37 labourers during the dry season. The difference in the labour use during the two seasons was minimal and this could be due to the fact that farmers used irrigation systems throughout the year to water their plants. Besides, water is mostly available and therefore farmers would hire a few more when they want to take full advantage of the rainy season. This finding suggests that the dry season does not necessarily prevent farmers from farming all year round since they use irrigation systems from other sources apart from the rains (Keraita and Cofie (2014), Drechsel et al. (2014) and Namara et al. (2010)).

Table 5.2: Farm characteristics from survey data

Variables	Mean	Standard Deviation	Mini mum	Maxi mum
Farm size	3.29	3.55	0.01	24.9
Labour During Rainy Season	7.32	9.22	0	55
Labour During Dry Season	4.37	5.14	0	48
Types of Farming	Frequency	Percentage		
Only Full Time	182	72.51		
Only Part time	56	22.31		
Only Seasonal	4	1.59		
Seasonal & Part time	9	3.59		
Land Ownership	Frequency	Percentage		
Farmer	2	0.8		
Private but not Farmer	31	12.35		
State Owned Organisation	143	56.97		
Family / Communal	12	4.78		
Open Government	63	25.10		
Main Water Source During Dry Season	Frequency	Percentage		
Clean Stream	61	24.30		
Gutter/Dirty Stream	103	41.04		
Dug well	38	15.14		
Natural Pool	21	8.37		
GWCL	28	11.16		
Other Crops Grown	Frequency	Percentage		
Food	109	43.43		
Fruits	29	11.55		

Source: Field Data, 2017

Table 5.1 also indicates that a majority (72.51%) of the farmers were engaged as full time and least (1.59) were seasonal farmers. The assertion made by the study is in line with the observation made by Asomani-Boateng (2002) and Mackay (2018) where most of the

farmers worked as full-time employers in Accra and Techiman respectively. With respect to the type land ownership these farmers use, public lands which constituted both state owned organisations (56.97%) and open government lands (25.10%) combined amounted to 82.07%. The least number in land ownership was private which constituted 0.8% (2). This means the majority of the farm sites were owned by government. This observation made concerning land ownership affirms the observation made by some studies in Ghana (Bancheva, Brandt, Jones, Doria, Ferro, Ordonez & Segura, 2013; Allen et al., 2014; Mackay, 2018) and outside Ghana (Vermeiren et al., 2013; Recasens et al., 2016) where they observed that the majority of the lands that farmers use are owned by government.

Table 5.2 also shows the major sources of water that farmers use during the dry season. It was discovered that the majority (41.04%) used gutter or streams and this form of water was normally polluted with waste water coming from residential houses and factories close to the farms. Natural pool has the lowest number (8.37%) as their source of water supply. Even though the specific percentages of farmers who used these specific types of water for farming is hardly found in literature, the findings of this study are similar to those of several studies (Amoah, Drechsel, Schuetz, Kranjac-Berisavjevic & Manning-Thomas, 2009; Danso et al., 2014; Drechsel et al., 2014) in terms of water use in Ghana where they realised that the majority of the water used by farmers in the urban areas come from polluted streams. With respect to the 251 farmers, those who grew food crops (which were mostly maize) in addition to the vegetables were 43.43% while those who grew fruits (which is only watermelon) were 11.55%. This observation made by the study is similar to findings made on types of crops grown by urban farmers in Ghana (Bancheva et al., 2013; Obuobie & Hope, 2014) and other parts of the world (Zezza & Tasciotti, 2010; Poulsen, McNab, Clayton & Neff, 2015) even though urban land dedicated to the growing

of cereals globally far outweighs lands allocated to the growing of vegetables (Martellozzo et al., 2014).

5.4 Roles of Institutions that Support Urban Farmers

Under this section, the study considered the similar roles of the institutions that were involved in supporting urban agriculture, whether a government, intergovernmental or non-governmental. These roles were in two forms and they were those that were common to these institutions and those that were exclusive to them. The roles of these institutions in terms of promoting urban agriculture were as follows: motivate and build capacity of farmers; collaborate, consult and coordinate with institutions and farmers; promote and influence policies laws on good farm practices; monitor farm practices and set production regulations; and plan and regulate farmland use. The themes and codes for this section are indicated in Table 5.3.

5.4.1 Motivate and Build Capacity of Farmers

With the exception of the LUSPA unit, all the institutions interviewed played a role in building the capacity of farmers. These institutions mainly build the capacity of these farmers through training. One of the activities is the provision of general extension services which are mainly provided by MoFA. In the provision of the extension services, they introduce new technologies to the farmers and also engage them in field trials. This is how some officials of MoFA expressed their activities in extension services:

“As the department of agriculture, our main job is extension work, imparting knowledge, new technology, and improved technology to farmers. For now that is we do. Our extension officers help them to use the right seeds with the right chemicals and practice the right agronomic practices. If they have harvesting problems, we go there, if they have marketing problems, we go there to help, to advice. For now that’s it... it is more of capacity building and extension”.

(MoFA Office of a Municipal Assembly, Personal Interview, July 2017)

Table 5.3: Themes and Codes of Institutional Roles for UA Promotion

Theme	Code
Motivate and build capacity of farmers	Building farmer capacity
	Providing general extension services
	Introducing new technologies
	Engaging in field trials
	Training in land intensification & planting
	Training & advice in alternative livelihood
Provision of production and marketing logistics	Providing awards schemes
	Providing clean water
	Introducing and selling of compost
Collaborate, consult and coordinate with institutions and farmers	Providing vegetable sales points
	Providing shed for washing vegetables
	Stakeholder consultations & engagements
Promote and influence policies, laws on good farm practices	Collaborating with farmers
	Inter-institutional collaborations
	Coordinating UA policy formulation
Monitor farm practices and set production regulations	Influencing AMA water law
	Promoting good soil practices
	Monitoring manure use
	Monitoring production method
Plan and regulate farm land use	Monitoring water use
	Testing water quality
	Regulating farm land use
	Preventing illegal buildings
	Creating the strategic zoning plan

Source: *Analysed Qualitative Field Data, 2017*

“When they first came, they were using watering cans to water. Even the training we told them that no, watering cans will not help, it’s true... so they should find a means of..., I mean applying water. Using small scale trickling irrigation technology, so we introduced to them to deep irrigation ...so we made them aware that, in Accra here, for you to grow vegetables, you need to have a constant source of water, and a best time to grow vegetables, is during the dry season. That is when you get good price for the produce so if you have a little bit of water and you apply the water effectively...

(Government Organization Serving at Landlord, Personal Interview, July 2017)

As land reduction continues to be a serious challenge to many farmers due to urban change, these organisations also train farmers in land intensification, a situation where farmers maximise their output with a small land available to them. This is how a MoFA official expressed it:

“Now for us here, there has been in changes recent times and urban agriculture is almost getting lost, however the interest of farmers, is still there. Therefore, what our department is basically doing is that we try to encourage the farmer that no matter how small your area of production is or place of land is you must grow to make something out of that. Quite recent, there has been this land issue and so the size of farmers’ farming area has greatly reduced. However, those who are still in the farming business, for example if you own an acre of land, or if you are working on an acre of land, we try to put in measures that will help these farmers get most out of that. What are these measures? ...For example, we try to educate them on good agricultural practices.”

(MoFA office of a Municipal Assembly, Personal Interview, July 2017)

The role of government as a key institution in the provision of extension services is enshrined in its key agriculture development policy documents. FASDEP II, for instance, clearly indicates the need to enhance government extension services in good agricultural practices (MoFA, 2007, p.39). Drechsel et al. (2014), observed that several of the extension services MoFA provided to urban farmers are not urban agriculture specialised but rather a rural farming method based. Extension officers are generally trained to provide general farming advisory services to farmers who are mostly rural base and not urban (Danso et al., 2014). Therefore, the support of other organisations to urban agriculture is a very good source of complement for building the capacity of urban farmers. In other parts of the world, government provides urban farmers with the needed technical support and training. Examples are London (Garnett, 2000), Mexico City (Dieleman, 2017) and Copenhagen (Halloran & Magid, 2013).

Keraita and Cofie (2014), noted that extension services for urban farmers continues to be a problem in Ghana, especially training farmers in the area of specialized irrigation. The assertion that extension services in general poor is supported by Obuobie et al. (2014). There have been similar inadequacies and difficulties in urban agriculture support in other cities in the world (Armah-Klemesu & Maxwell, 1998; Mougeot, 2000); an example is Dar-es-Salaam in Tanzania (Halloran & Magid, 2013).

The changing face of land availability for urban agriculture requires that farmers diversify their farming activities. The FASDEP II document, for instance, stipulates the need to train farmers in undertaking some diversified farming activities in the form of rearing of small ruminants and poultry (MoFA, 2007, p.27). These organisations which help in building the capacity of farmers, especially MoFA, are providing farmers with training in alternative livelihood and income in other areas of agriculture. Some of these areas are training in grass cutter and rabbit rearing. This is how two MoFA officials expressed it in two municipal/metropolitan assemblies visited:

“We have changed our way of educating the farmers. We encourage them to use any available land in their houses or in their locality for farming purposes, because we realised that if a farmer can do something small in his in her house, he may not go to the market to buy some vegetables that he or she may need. So some farmers took it, so we introduced them to alternative livelihood that is grass cutter rearing, rabbit rearing, snail farming, backyard gardening and all that”.

(MoFA Office of a Municipal Assembly, Personal Interview, July 2017)

“We also tell them to try and then use plastic bottles, lorry tyres so that they can do this farming and also to carry out livestock rearing and small-scale livestock rearing. If you have some few two goats that you can keep them, sheep you can do so. So people are having those animals, precisely in community 3. People have those animals because at times they take them to the Ramsar site where they graze... so that one is also being done”.

(MoFA Office of a Metropolitan Assembly, Personal Interview, July 2017)

From time to time, farmers are motivated through the general provision of some production logistics and yearly awards especially during their annual Farmers Day celebrations. These awards come mostly in the form of inputs and certificates. The most popular are the Farmers Day awards, which government uses to honour and recognise exceptional farmers by providing them with certificates and inputs which will be needed for farming . This is how a MoFA office expressed it:

“You know that when you are recognised by higher bodies or when you come to the front line on farmers’ day and you are called upon as the person who did very well in this particular category, it is something else. It’s a prestige that the farmers honour (appreciate) a lot, apart from that, I think it encourages the farmers...to know that the work they are doing is being recognised by the government... because certificates are signed by the Minister and are presented in the municipality by the MCE. So if an MCE should call you and congratulate you for the work done, I think it pushes you on to do more than you did the previous years.”

(MoFA Office of a Municipal Assembly, Personal Interview, July 2017)

...Apart from that too, we give them some materials to help them more in their domestic work and then their farm works as well. These prizes are in a range of wheelbarrows, chemicals, farm implements and household appliances that will help them. I think that is encouraging enough to push them on to do more.”

(MoFA Office of a Municipal Assembly, Personal Interview, July 2017)

According to Obosu-Mensah (2002), the Government of Ghana’s support for urban agriculture in terms of logistics was massive during the famous Operation Feed Yourself (OFY) programme. This was because it was one of the key focuses of the then Acheampong government to promote agriculture to its highest level. Even though support for urban agriculture remains, government support hardly matches the expectations of urban farmers in Ghana (Bancheva et al., 2013). However, studies have also proven that non-government institutions continue to provide vital support to urban agriculture. This support includes training of farmers in crop production, fertiliser application and water use. Some of these institutions are IWMI, Kwame Nkrumah University of Science and Technology (KNUST), FAO, and UDS (Drechsel et al., 2014). The support given to urban

farmers by non-government institutions is also popular in several countries and cities in the world. In Colombo, Sri Lanka, UA is supported by IWMI (International Water Management Institute (IWMI), 2013), in Manila, Philippines, it is supported by “One Peso for Pasig River and Vegetable and Flower Gardening Group” (Campilan, Boncodin & De Guzman, 2001), in Rosario, Argentina, it is supported by the National University of Rosario, Centro de Estudios de Producciones Agroecológicas (CEPAR) and Centro de Estudios del Ambiente Humano (CEAH) (Guénette, 2006) and in Dar-es-Salaam, Tanzania, supported by Sustainable Cities International and German Technical Cooperation (GTZ) (Halloran & Magid, 2013).

5.4.2 Provide Production and Marketing Logistics

The institutions which are concerned with the promotion of UA provide logistics in the area of marketing and production to farmers. These supports are mostly done at no or low cost to the farmers. With respect to production, the institutions provide the farmers with clean water sources for farming, and sell processed compost to them at a lower cost. Even though these services are not provided to all farmers and by all organisations, they are very crucial for farmers and some farmers in GAMA gain from it. This is how some institutions involved expressed it:

“We also introduced them to these things...compost. Therefore, if you go there, a good number of them are using our compost”.

(Government Organisation Serving as Landlord, Personal Interview, Accra, July 2017)

“...what the farmers were doing was that they were using the polluted water to wash on the farm before they take them to the market so, what we did was that we provided clean water (pipe-borne water) to all the three sites, they were at Plant Pool, Dzorwulu and Roman Ridge... we gave them pipe water”.

(Inter-governmental Organisation, Personal Interview, Accra, July 2017)

Since farmers continue to face challenges in the marketing of their produce, these organisations provide support for them in that direction. The most prominent is IWMI who were very much interested in making sure farmers produced and sold their crops in the safest and the most hygienic conditions. IWMI, apart from providing farmers with training in the area of the marketing of their goods, have provided vegetable sale points to farmers. They have also provided sheds for washing their vegetables when they are ready for the market. This is how they expressed it:

“You see! If you (a farmer) produce following our methods that we have introduced on the field, then you can sell there (at the stand), that was the plan, so the farmers were supposed to follow those plans and then they would be allowed to sell at that particular place. We were going to take care of them. We built one (market shed) at Legon, (University of Ghana Campus), one at the Ministries and a third one ... to be built at Agyirigano (East Legon, Accra). We even raised sheds where they can take the vegetables after harvesting and wash on the field before they take them to the market”.

(Inter-governmental Organisation, Personal Interview, Accra, July 2017)

The continuous support by institutions to farmers in the area of production and marketing has been established in literature. The goal of this is to expose farmers to the modern ways of farming and selling of their produce. This is intended to improve their incomes and livelihoods as well (Mougeot, 2000).

5.4.3 Collaborate, Consult and Coordinate with Institutions and Farmers

Almost all the four categories of institutions in this study indicated that they consulted, coordinated and collaborated with other organisations and farmers to promote urban agriculture in GAMA. In working together with these institutions and farmers, they hold stakeholder meetings as well as open fora. Sometimes, some of the institutions met at their level (inter-institutional meetings) and later get the farmers involved, and on some occasions, some of the institutions singularly met the farmers without consulting the other

institutions. The activities of these institutions in promoting UA border on marketing of farm produce, use of improved and efficient production methods and healthy and environmentally friendly methods of farming. This is how some of them expressed it:

“We used to work with IWMI, and yes, they were helping with compost production and all that. Now, we are trying to expand; we are expanding the plan so that we produce”.

(Governmental Organization, Personal Interview, July 2017)

“As a department of agriculture... we see to the coordination and implementation of national policies. Yes... but we usually, the assemblies or the municipalities have byelaws that regulates some activities with regard to urban agriculture in general”.

(MoFA office of a Municipal Assembly, Personal Interview, July 2017)

“We have organised series of meetings here and there and you know all our work...we do not start from just engaging the farmers; we also look at the stakeholders who should be involved.”

(Inter-Governmental Organization, Personal Interview, July 2017)

In the FASDEP II and the National Irrigation Policy documents, MoFA recognises the need to collaborate with the concerned agencies and organisations in the provision of services on the efficient use of agricultural resources especially water (MoFA, 2007, p.39; MoFA 2011, p.4). In addition, Dreschsel et al. (2014) assert that governmental and non-governmental institutions contribute to the promotion of urban agriculture in Ghana through collaboration and consultations. In GAMA, these collaborations are not well coordinated compared to a city such as Manilla in the Philippines where institutional collaboration efforts to promote urban agriculture tends to be more solid and purposeful because support for farmers is more formalised, the city authorities are directly involved and are committed to it (Campilan et al., 2001). When these collaborations are not well formalised and coordinated, farmers do not make the best out of the efforts of these institutions.

5.4.4 Promote and Influence Policies and Laws on Good Farm Practices

All the institutions which indicated that they participated in the promotion and influence of good agricultural policies were involved in this role. The UA policies and laws they contribute to mainly cover farm production activities, which centre on water and soil use. This is because urban change has resulted in the pollution of the water bodies which are used for UA. Therefore, if more effective policies and laws are not formulated, it will lead to the inappropriate use of water and other farm resources. This is how some of the institutions expressed it:

“We decided to change the policy (water policy)... that byelaw. We organized series of meetings we tried to reframe it... went through the process, the normal process, the byelaw was actually changed, but the final approval had to come from AMA.”

(Inter-governmental organisation, Personal Interview, July 2017)

In addition, FASDEP II asserts the need to make sure urban farmers are provided with the best of information on farm practices that lead to land and environmental sustainability (MoFA, 2007, p.31). The National Water Policy also stipulates government’s intention to promote efficient and quality use of water for irrigation (Ministry of Works, 2007, p.18). This implies that when environmental sustainability is encouraged and maintained, the water sources used for farming, for instance, will not be polluted and farmers can be assured of using water with an acceptable quality to farm.

5.4.5 Monitor Farm Practices and Set Production Regulations

With respect to this role, the institutions involved were MoFA, some of institutions whose lands the farmers were occupying and the intergovernmental organisations. They see to it that farmers comply with the laws, rules, and policies which regulate the activities of these urban farmers. They monitor manure, fertiliser and water use. With respect to manure use,

these agencies try as much as possible to make sure that the acceptable manure and fertiliser levels and types are applied during the period of vegetable production. In the area of water use, they make sure the World Health Organisation (WHO) standards are met. They do this by visiting the farms to monitor the type of water, manure and fertiliser used by farmers. Most of these institutions normally monitor the water use of the farms closer to their office locations. For example, the School of Hygiene at Korle-bu concentrates on the farmers at the Korle-bu Teaching Hospital; CSIR concentrates on farmers on their lands and IWMI on Dzorwulu farmers. This is how one of these institutions voiced their enforcement activities:

“For crops where we find ourselves the only byelaw is related to the use of waste water and as well as human excreta. Some years back, they dump it. Farmers allowed those who go for those waste to dump it on their farms...so now all these things have stopped. Some years back, farmers on the quiet without you knowing will tell “them” to bring the discharge; you see the wastewater (water with faeces), will stand somewhere, and pump it. They do that during off seasons to get those things onto the farm so that when the major season comes, they plough and see that their lands are well fertilised. However, thank God, we have been able to educate them for a while, all those things have stopped... you also must report those things to the environmental unit to chase those tanker services that come around. So sort of a task force that was all around to prevent them from doing that... so when they see any tanker, they ask you questions... what you want to do. Where are you going? So if you are going to do that, they drive you away.”

(Environmental Office of a Municipal Assembly, Personal Interview, July 2017)

“When, it comes to agriculture, for instance, these gardeners, let’s say these vegetable growers within Accra Metropolis. If it falls within our jurisdiction, what we critically look at is the type of water they use for watering the crops...because that grows more than any other thing that they use in terms of production of food. For example, when you talk of chemicals, that one it is not continuous as compared to water. They use water right from the beginning of the crop production; the planting until harvesting period, so that is what we look at. Therefore, we look critically at the type of water they use. ”

(Environmental Office of a Municipal Assembly, Personal Interview, July 2017)

“Because we do a lot of work on the farm...that is we took various water samples from various urban vegetable production sectors then we analysed them to say the water is bad”.

(Inter-governmental organisation, Personal Interview, July 2017, Accra)

Notwithstanding the efforts made, the regulation of urban agriculture activities by government continues to be difficult. Observations made on field indicate that water used by many of these farmers are polluted. Other studies also indicate that the chemicals used by urban farmers in Accra and Tema are not well regulated (Danso et al., 2014; Keraita et al., 2014). Mougeot (2000) also observed that many countries do not regulate chemical use by urban farmers. In the United States of America (USA), for instance, Meenar, Morales and Bonarek (2017) assert that there are still loopholes in UA regulations notwithstanding the efforts that have been made. This means making sure farmers adhere to the set regulations in chemical use is very difficult even if all the rules have been properly put in place and continuous efforts are made to enforce them. This implies farmers have their own ways of food production rules and regulations provided by government.

5.4.6 Plan and Regulate Farm Land Use

The planning units of the municipal and metropolitan assemblies and LUSPA mainly play this role. Among some of the actions they professed, they had taken included the regulation of the use of farmlands by private developers and prevention of the siting of illegal buildings on farmlands. In addition to that, efforts have been made to rezone the areas of Accra and Tema in such a way that where farms are supposed to be located, buildings and other structures are prevented from being located there. The increase in population, a feature of the urban change, has resulted in the increase of buildings for residential and commercial purposes. This situation has resulted in the spread of physical structures into places earmarked as green spaces. Therefore, such a role helps in the prevention of the

building of structures on lands earmarked for farming. This is how some of the institutions described it:

“I can say that over the years we have been able to... you know redefine, rezone some of the lands, or perhaps stop some of the developments. An example is the Teshie Lagoon, some farmers’ farm along the fringes of the lagoon. And individuals who wanted to encroach on it or use it for properties... we’ve been able to stop those developments.”

(Development and Planning Division of a Municipal Assembly, Personal Interview, July 2017)

“If I recall in 1992, the government came up with a strategic plan for the whole of Greater Accra, which we call GAMA (Greater Accra Metropolitan Area) comprising AMA and the then rural Accra and Tema. Now you can have about 16 metropolitan/municipal assemblies within the same enclave. The purpose of it is to really contain Accra and make sure... a very big buffer zone which we call the Green Belt was earmarked at the Akuapem Ridge... the mountains going to Aburi, the whole of...after Adenta Barrier. The whole of that place is supposed to be a green belt. This was a strategic plan.”

(LUSPA Office of a Metropolitan Assembly, Personal Interview, July 2017)

The decision of government to regulate land use and create zones for farming is embedded in some of its policy documents. FASDEP II and METASIP indicate that as part of efforts by government to make lands available for UA, the government will see to it that lands are clearly made available for UA and this is going to be done through the various local authorities within the urban areas of Ghana (FASDEP II, MoFA, 2007, Page 30 & METASIP, MoFA, 2010, p.42).

Even though the institutions claim they have created places in GAMA as green belts and farm zones, the green belts are almost non-existent. The pressure on existing lands in GAMA is enormous and their use for purposes they are meant for is generally very difficult due to land tenure complications and weak institutional regulations among other factors (Owusu, 2013; Allen et al., 2014). But this is not the case in cities such as Gampaha in Nepal, Rosario in Argentina and Shanghai in China where specific public spaces have

been reserved for urban agriculture and the strict adherence to such policies have not been compromised for any other economic or social activity (Yi-Zhong & Zhang, 2000; Guénette, 2006; Amerasinghe et al., 2011). Even though claims have been made by city and government authorities that a green belt is allocated for urban agriculture in Accra and Tema, the so-called green belt is really non-existent. This shows that government support for urban agriculture in terms of land use has not materialised. This observation has been made in other studies on Accra and Tema (Caradonna et al., 2013; Allen et al., 2014). Other cities outside Ghana have also witnessed a disregard for space for urban agriculture though it has been discussed on paper. Some are Pakistan (Peerzado, Magsi & Sheikh, 2018) and Nairobi in Kenya (Prain & Dubbeling, 2011). Unlike Accra and Tema, the cities of San Francisco, Detroit, Chicago, and Milwaukee have lands allocated by city authorities for urban agriculture and these demarcations are strictly adhered to (SPUR, 2012). Even in the USA, Meenar et al. (2017) noted that some cities continue to experience land use challenges for urban agriculture.

5.5 Policies and Laws of Institutions Acting as Landlords to Urban Farmers

This section discusses how institutions which own the lands farmers use relate with the farmers who use their lands for their farming. It is concerned with their stipulated policies with regard to the use of the land by farmers. The institutions which functioned as landlords to the farmers were as follows: GAEC, CSIR, University of Ghana, GRIDCo, GHAIP and Pantang Hospital. The theme of discussion under this section is no official agreement on the use of land and this is indicated in Table 5.4 with its respective codes.

Table 5.4: Theme and Codes on Laws and Policies of Government Institutions Acting as Landlords

Theme	Code
No Official Agreement on Land Use	No official commitment
	No official engagement
	No Permanent Status of farmers
	No Farming under Pylon Plans & Policy
	No Official Relationship with Farmers

Source: Analysed Qualitative Field Data, 2017

5.5.1 No Official Agreement on Land Use

Almost all the institutions which had farmers on their lands indicated clearly that they did not have any official agreement with the farmers when it came to use of their lands. Even if there were any agreement, they were just verbal which were not guaranteed. Based on this, almost all the institutions interviewed stressed that the farmers who occupied their lands did not have any permanent land status and the farmers' stay on their lands were just temporal. This means, the farmers could be asked to leave the lands at any time when the latter are needed for institutional projects. This is how some institutions expressed their policy on their relationship with the farmers:

“We (the organisation) used to clear there (now farm lands) on our own...so when they came, we allowed them to farm on the land. The whole thing started with some of the labourers and former labourers who were working with us as cleaners... and then some of them while they were here... they also took advantage of the land and used it. All I can say is...anytime we want to evict them, we can just ask them to leave. So that is it”.

(Government Organization Serving as Landlord, Personal Interview, Accra, July 2017)

With an organisation like GRIDCo, farmers' ha their farms under the pathway of their pylons but they stated that they did not have a policy or agreement with farmers to farm

there though they were helping them to clear the pathway of the pylons which should have been at their cost. This is how they expressed it:

“As for these farmers’ thing, we do not have any relationship with them. There is no relationship... but we admire what they are doing. You know because it’s like somebody who is practically doing your work for you. So I wish that they would do that for us (clearing their land of weeds), and still taking care of our affairs (farming).”

(Gov’t Organisation, Personal Interview, Accra, July 2017)

The findings made by this study is slightly different from the findings of Allen et al. (2014), where it was found that some institutions had some informal agreements with the farmers who used their lands. Even though this observation was made with GAEC and a private company such as Zoomlion (on the Tema Motorway stretch) by the study, GRIDCo and CSIR clearly stated there were no even informal agreements with farmers who use their lands. Even though they see the farmers on their lands, they sometimes pretend they are not there because giving the farmers such recognition makes the former feel they have given the latter some level of official acceptance.

5.6 Challenges Faced by Farmers from De facto Landlords

This section shows the narration of farmers concerning the challenges they face from institutions who own the lands they farm on. The only theme under this section is disrespect and abuse to farmers and this is indicated in Table 5.5 with its respective codes.

Table 5.5: Themes and Codes of Challenges De facto Landlords

Sub Theme	Code
Disrespect to and Abuse of farmers	Disrespect attitude of Institutional officials
	Mixed Institutional Attitude
	Eviction threats
	Military Abuse & Land Invasion

Source: Analysed Qualitative Field Data, 2016

5.6.1 Disrespect to and Abuse of farmers

The urban change has caused most of these farmers to move to institutional lands since most farmers have lost land through the increasing presence of structures in GAMA which have taken over their farmlands. Even though most of the institutions have given these farmers places to farm, some of their personnel do not treat these farmers very well. Some of them talk to the farmers anyhow and destroy their farms when they need the lands for projects without sometimes considering the opinion of the farmers on how their eviction should be one. These institutions from time to time threaten to take their lands from them.

This is how the farmers who have witnessed it voiced it:

“Oh yes, as for them. Some of the staffs are very difficult ... Some will mistreat you and warn you it is government land if you stay there you would build a house there. How can you build a land there in this waterlogged site? Because they don’t want to give it to you or maybe it is for political reasons, I don’t know”.

(Anonymous Farmer, Personal Interview, June 2016)

“That is why we the farmers here have decided to form an association to that effect... so that if any damaged is caused we have a united front to submit our problems to the authorities. But the things they have damaged are many and they have gone scot-free”.

(Anonymous Farmer, Personal Interview, June 2016)

The abuse of farmers by some officials of a government institution is peculiar to farmers in La. Farmers there mostly claim the lands were bequeathed to them by their ancestors

but they later found that a government institution was also claiming the same land. This has resulted in a situation where the farmers from time to time have squabbles with the officials of that institution. Currently, there are still unresolved issues on the ownership of the land and this has become even more complicated with some of the elders of the La Township aiming to sell the lands to private developers. This is how a farmer expressed his frustration:

“And I have planted okra, that is what I do and then all of a sudden they come ... they don't tell you nothing. They said 'soldier land', how is it soldier land? I don't understand. Soldiers do not have lands, soldier are given some parcels of land for their soldier work. Ok? This land is not soldiers land but all of a sudden, soldiers came to grade that land. It does not sound well”.

(Anonymous, Personal Interview, June 2016)

5.7 Conclusion

The chapter indicates that there are similar functions performed by several institutions aimed at promoting urban agriculture but some of such activities are not well coordinated. Even though there are laid down procedures and laws which regulate the farming practices under UA they are not followed due to weak institutional collaboration and control. Institutions, though crucial in the provision of land to urban farmers, have not shown any commitment to farmers by giving them an assurance of their permanent use of their lands. With all the indispensable support institutions are providing to farmers in terms of land use, some of their officials show disrespect to these famers they have given their lands to.

CHAPTER SIX

URBAN CHANGE AND ITS EFFECT ON URBAN FARMING ACTIVITIES

6.1 Introduction

This chapter identifies the various changes that have occurred in GAMA in the past years and discusses how these changes have directly affected urban farming. It also provides a detailed discussion on the ways in which these changes in GAMA have affected farming activities in various ways. The changes under discussion are physical, climatic, economic, and environmental and their effects are seen on the production, economic, and marketing aspects of urban agriculture.

6.2. Changes in Climatic Patterns

When the farmers were interviewed, they expressed that they had seen significant changes in the climatic patterns. The changes include the reduction and unpredictability of rainfall in the past years. Farmers also stated that they had been realising higher temperature levels and extended heat periods in recent years. These extreme heat periods are mostly felt during the dry seasons and farmers reported they are very high compared to the previous years. The respective codes of this theme can be found in Table 6.1. This is how the farmers expressed these observations:

“Formerly, formerly...when you planted the crops...anytime you planted, you could plant because it grew well but nowadays, if you don’t take care, you will plant the crops and the sun will burn everything”.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

Table 6.1: Themes and Codes for Urban Changes that affect Urban Agriculture

Theme	Code
Changes in Climatic Patterns	Changed Weather Pattern
	Increased Heat
	Unpredictable Rainfall
Changes in Population and Lifestyle Dynamics	Increase in Urban Population in General
	Increase in the Population of Foreigners
	Changed Dietary Habits of Population
	Increased Health Awareness among Population
Changes in Vegetable Market Dynamics	High Prevalence of Western Culture among Population
	Increase in Demand Vegetable
	Increased Traders in Vegetables
Changes in the Built Environment	Increased Restaurants, Hotels & Supermarkets
	Increase in Buildings
	Bushy Spaces Occupied by Physical structures
Changes in Farm Land Ownership	Increased Roads
	Encroachment of Native Farm Lands
	Farming on unused Government Lands
Increase in General Price Level	Reduced Private Ownership Land Use
	Farming on unused open lands
	Increased Labour Cost
	Increased Fertilizer & Chemical Prices
Changes in Available Technology	Increased Water Pumping Cost
	Increased Seed Prices
	Presence of Advanced Farming Technology
	Presence of Mobile Phones

Source: Analysed Qualitative Field Data, 2016 & 2017

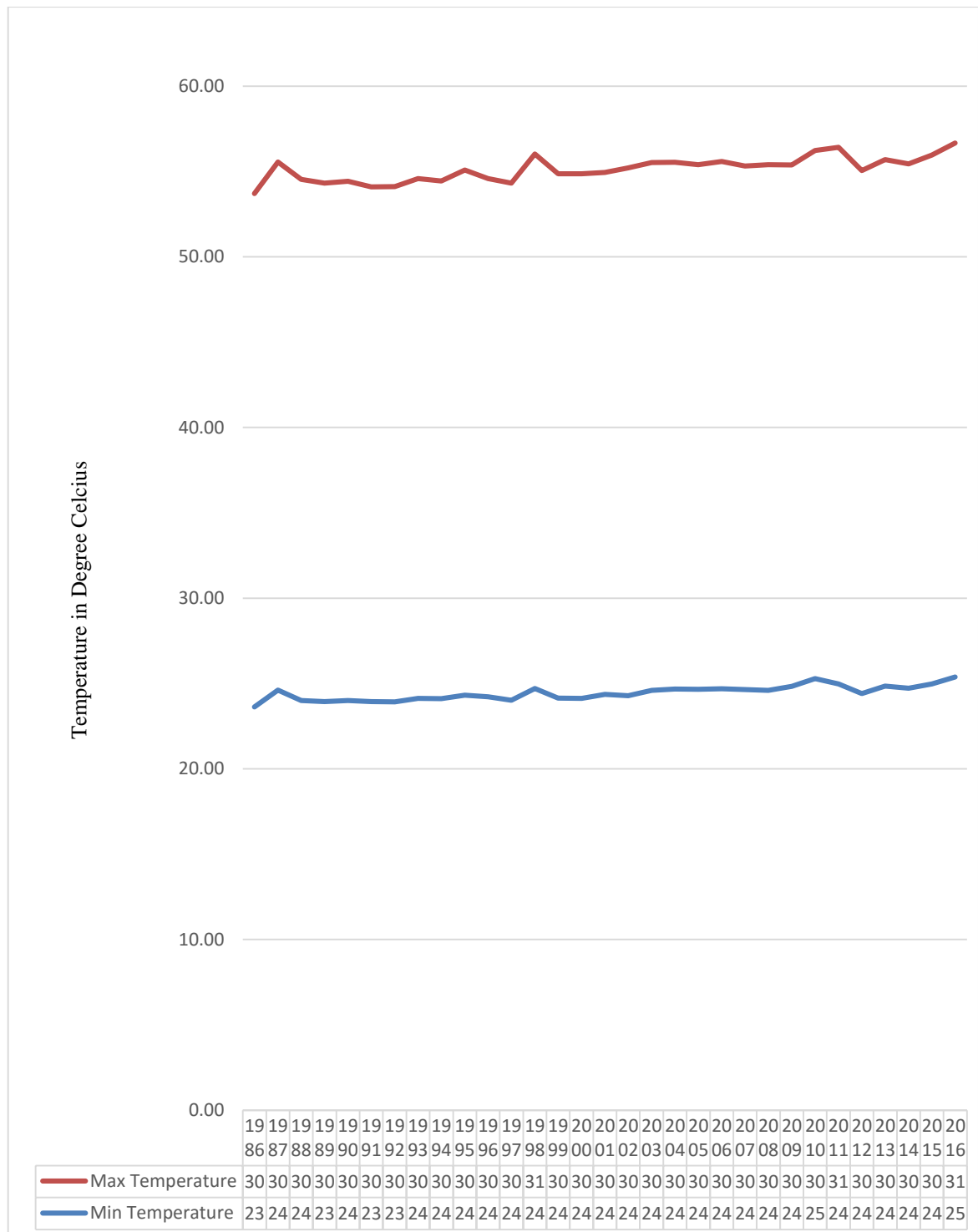
“Yes, it (the weather) has (has changed) because the level of rain has currently dropped and predicting the rain pattern is difficult. I am saying this because sometimes I don’t predict the rains well and I spray on the vegetables, suddenly, after spraying, you will find it rains and that washes the fertilizer away”.

(Mumuni, 24 years of farming, Personal Interview, GAEC, June 2016)

To confirm the narratives of the farmers on the climatic changes, the study used data from the Ghana Meteorological Agency (GMA) on rainfall, temperature and humidity patterns in the GAMA for the past 31 years. These are indicated in figures 6.1, 6.2, and 6.3.

With respect to rainfall patterns, Figure 6.1 indicates that average yearly rainfall patterns over the past 31 years have been highly unstable. Figure 6.2 also indicates a gradual and consistent increase in both the average minimum and maximum temperature for the past 31 years. Figure 6.3 also indicates that humidity levels over the past 31 years have reduced. These observation in climatic variability and instability have been corroborated by Cobbinah et al. (2017) when they asserted that climate change is one of the key challenges associated with urbanisation in Ghana. Poku-Boansi and Cobbinah (2018) also concluded that climate change in the midst of rapid urbanisation is one of the biggest threats to Ghana's urbanisation.

Figure 6.2: Average Minimum and Temperature in GAMA (1986 to 2016)



Source: Ghana Meteorological Agency (2017)

6.3.1 Positive effect of Changes in Climatic Pattern on Farming Activities

There was only one positive effect some farmers realised under changes in climatic patterns. This was the opportunity from reduced rainfall. This is indicated in Table 6.2 with its respective code.

6.3.1.1 Opportunities from Changed Rainfall Patterns

Farmers said the unpredictability and low rainfall pattern in GAMA which has been labelled as changes in climatic patterns, has brought some opportunities to them. According to some of them, when there is a general decline in rainfall, some farmers in the peri-urban areas are not able to grow vegetables because their farming activities are rain dependent. In such a situation, prices of vegetables increase due to their scarcity on the market. Because most farmers in the study area are close to streams, they use irrigation systems to grow vegetables all year round and this makes them sell at high prices during the period of dryness. This is how a farmer puts it:

It helps in a way that most farmers are not able to do this practice, you understand? If you get the strength and access to irrigate the crops, it will help because the farmers who are not closer to the water bodies cannot afford to practice this method. Which will lead to shortage of tomatoes on the market... so the little I can produce I sell and make money”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, June 2016).

This particular finding contradicts that of several studies because unfavourable climatic change or variability brings serious challenges to farmers (Karimi, Karami & Keshavarz; Dubbeling & De Zeeuw, 2011; Jatta, 2013). This study on the other hand has brought to the fore that climate change does not only affect farmers negatively in urban centres but can sometimes affect farmers positively.

Table 6.2: Themes and codes of positive effects of urban change to farmers

Theme	Code
Opportunities from changed rainfall patterns	Low rainfall benefits
Improved market conditions	Increased foreigners' demand
	Increase in customer demand Market is available
More accessible transportation	Low or no transport cost
	Transport easily available
Improved financial earnings	Increased income flow
	Improved profitability
	Improved vegetable prices Reduced production cost
More reliable source of livelihood	Main livelihood source
	Switching to full time farming
	Extra employment
Improved living standards	Bought a car
	Bought land
	Built houses
	Takes care of family
Freedom and fulfilment to work as entrepreneur	Freedom in farming
	Fulfilment in urban farming
Security and safety on present lands	Peace of mind on land
	Institutional protection
Improvement in production	Time saving in production
	Increase production

Source: Analysed Qualitative Field Data, 2016 & 2017

6.3.2 Negative Effect of Changes in Climatic Pattern on Farming Activities

The negative effect of changes in climatic pattern on farming activities is water use challenges.

6.3.2.1 Water Use Challenges

Due to the unreliability and unpredictability of rainfall in GAMA, water has become very scarce for several farmers. The streams that the farmers depend on are rarely clean and normally polluted. The rainwater which is supposed to flow through the streams is unavailable and therefore during such periods, the water which flows through the streams is rather wastewater from residents and industries which have been channeled into the streams. The farmers, therefore, have no choice but to depend on the polluted streams for their production. This is indicated in Table 6.3.

6.4 Changes in Population and Lifestyle Dynamics

Respondents observed that GAMA had experienced an increase in population and this has resulted in a general change in the lifestyle of city dwellers. They have become more westernised in their eating and now choose to eat more Western foods. One of such evidences is the surge in the presence of vegetables in their diet. According to the farmers, city dwellers have come to love vegetables and this has gone up tremendously. Vegetables such as radish, cabbage, lettuce and green pepper, which used not to be part of their diet, have now become a source of vitamins and protein for them. Respondents perceived that an additional factor such as increasing health awareness is contributing to this increasing demand for vegetables in the diet of many urban dwellers. This is indicated in Table 6.1.

Table 6.3: Themes, Sub-themes and codes of negative effects of Urban Change on UA

Theme	Sub-Theme	Code
Water Use Challenges		Unreliable Rains
		Use of Polluted Water
		High Cost of Pumping Water
Market Unpredictability		Market risk
		Unfair Market Prices
Pressure on Dwindling lands	Competition and Struggle of farmlands' Use	Buildings Take Over Lands
		Military Abuse & Land Invasion
		Struggle Over Landownership
		Land Use Uncertainty
	Reduction in farmland size and farmland quality	Land Scarcity
		Low soil fertility
Disrespect and Abuse on Institutional Land		Threats & Intimidation on Lands
		Mixed Attitude of Land Owners
		Land Eviction threats
		Land Evictions
Reduce Earnings		Reduced Profit
		Low Real Income
Farm Labour Supply Challenges		Labour Scarcity
		Instability in Farm Labour Supply
		Unreliability of farm labour

Source: Analysed Qualitative Field Data, 2016

This is how some farmers expressed it:

“Yes, the people have become many. Formerly, when it is 6pm, you wouldn't see anybody here. They even used to snatch people's bags from here even around 6pm or 7pm. It was a dusty road because there were not much people around but right now even 10pm, there people around. Sometimes, I can work on my farm around 8pm or 9pm”.

(Baaba, years of farming, Personal Interview, Dzorwulu, June 2016)

“Yeah, currently they are eating it because they have come to understand the benefits of eating vegetables. Formerly, they did not know the benefits of vegetables to the body but currently they know and they are all now involved in eating it. Formerly, eating weeds (vegetables) was the food of the white man. If you told a black man to eat weeds, the person will tell you weeds are for sheep. They did not know the benefits of eating it”.

(Kwame, 20 years of farming, Personal Interview, Okponglo, Legon, June 2016)

“This one, it is the doctors...Ahaa! They advise... if go to the hospital... they advise all people to eat vegetables. If you eat vegetables, you see that it is fine. Ahaaa!”

(Malik, 31 years of farming, Personal Interview, GAEC, June 2016)

World Bank (2015a) noted that the cities of Accra and Tema have experienced a tremendous surge in its population, an assertion that is supported by other studies (Ghana Statistical Service, 2012; Obuobie et al., 2014). This observation has been cemented by the findings of this study. Also, several studies have alluded to the fact that the influence of globalisation, westernisation and modernisation has contributed immensely to the change in the sociocultural dynamics in Ghana, especially its cities (Moller-Jensen & Knudsen, 2008; Songsore, 2009; Yankson & Bertrand, 2012).

6.6 Changes in Vegetable Market Dynamics

Another area of urban change which directly affects farmers is the change in the urban vegetable market. The farmers alluded to the fact that the urban vegetable market in Accra and Tema has encountered an influx of vegetables from the rural areas. The increase in the urban population and the desire for vegetables by the urban dwellers have served as avenues for rural farmers to go into vegetable production, especially during the rainy seasons. This has resulted in a competition in the sale of vegetables between urban farmers and non-urban farmers in terms of sale and customer base. As a farmer expressed it:

“It has changed because now the demand for exotic vegetables has increased. And with the marketing, it is the same trend but we have more competitors now because the rural farmers now also grow exotic vegetables unlike the past”.

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

Notwithstanding the presence of competition in the sale of vegetables in urban centres, it has still not overshadowed the massive surge in the demand for vegetables in Accra and Tema in general. This can also be attributed to the fact that there has also been an upsurge in the presence of restaurants, hotels, and supermarkets in Accra and Tema over the past years. As the farmers put it:

“Now I can say we have more buyers because it’s like Ghanaians have understood the importance of these fruits and vegetables and its health benefits so there is a high market demand for the produce”.

(Mumuni, 24 years of farming, Personal Interview, GAEC, June 2016)

“Comparing...now... the market demand is huge because of the numerous fast foods joints, restaurants, supermarkets springing up”.

(Yakubu, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

“The population has increased and currently...a lot of times restaurants are being opened”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

“The demand for vegetables is high due to these restaurants and fast food joints around”.

(Hamza, 20 years of farming, Personal Interview, CSIR, June 2016)

Another interesting phenomenon in the urban market dynamics is the increase in the presence of middlepersons who are mostly women, an observation the farmers themselves have attested to. A farmer expressed this situation thus:

“It is like when we plant the maize they come for it. The women themselves... and when you plant onions too, they come for it”.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

The findings of the study concerning the importance of restaurants and fast food joints and middle persons in the consumption of exotic vegetables in general have been corroborated by other studies in Ghana (Henseler & Amoah, 2014; International Water Management Institute (IWMI), 2014; Mackay, 2018).

6.6.1 Positive Effects of Changes in Population and Lifestyle Dynamics and Change in Vegetable Market Dynamics on Urban Farming

The positive effects of the changes in population and lifestyle dynamics and change in vegetable on urban farming activities include the following: increase customer base and better marketing conditions for farmers, improvement in their financial earnings, and the fact that farming has become a more reliable source of livelihood to them. This theme and its codes are indicated in Table 6.2.

6.6.1.1 Improved Marketing Conditions

The increase in population, which is characterised by an increase in foreigners, entrenched western lifestyle and an increased health awareness among urban dwellers in GAMA has resulted in an increase in the demand for vegetables in GAMA. This means that the market for vegetables produced by farmers in GAMA is readily available. This is how some farmers expressed their observation with regard to the increase in the customer base and improved market conditions:

“You see, our brothers from Togo, Cote D’Ivoire, Liberia, and Nigeria are plenty in town and they love these vegetables. This is because they have a lot of vegetables in their diets and that makes them buy a lot”.

(Amakye, 15 years of farming, Personal Interview, GAEC, June 2016)

“Right now, their (foreigners) coming has led to a steady progress in our business”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

“The market is better than before because...our yields were in small quantities. Now the yields have increased and yet we sell all the vegetables”.

(Abubakar, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

With respect to the survey data in Table 6.4, 97.21% of the farmers indicated that there is market availability for urban vegetables due to changes in the vegetable market, and population and lifestyle dynamics.

Table 6.4: Responses on Market Availability

Positive Effect	Frequency	Percentage
Market Availability	244	97.21

Source: Analysed Field Data, 2017

6.6.1.2 Improved Financial Earnings

The improvement in financial earnings is a direct effect from improved market conditions; which is as a result of change in population and lifestyle, and vegetable market dynamics. The farmers alluded to the fact that urban change has brought about an increase in their income flow and profit in general. This is mainly because of the significant increase in the demand for vegetables in general as well as the increase in the demand for different varieties. This is how the farmers expressed this benefit:

“We gain from it. If I say we do not gain from it then, I am not being truthful. We gain from it... we gain from it”.

(Comfort, 42 years of farming, Personal Interview, La-Tseaddo, June, 2016)

“You can work on a small portion of land and farm at the end of the day (season), make a profit of 25,000 Ghana, 20,000... Ghana, 15,000 Ghana”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, 2016)

Table 6.5: Responses on Improved Financial Earnings

Positive Effect	Frequency	Percentage
Improved Financial Earnings	222	88.45

Source: Analysed Field Data, 2017

Table 6.5 indicates that 88.45% farmers noted that they had experienced an improvement in financial earnings due to the improved market conditions. This is an additional indication that urban change has resulted in the improvement in the profit of farmers. Even though not directly related to urban change as observed by this study, several studies (Obosu-Mensah, 1999; Nkegbe, 2002; Drechsel, Graefe, Sonou & Cofie, 2006; Food and Agriculture Organization, 2007; Obuobie & Hope, 2014) have confirmed that urban farmers see farming in cities of Ghana as very profitable. This assertion is not only limited to Ghana but also in other parts of the world. Factors such as population increase, westernisation, better transport facilities and relatively higher urban incomes are some of the features of urban change which provide urban farmers with the market they require (Food and Agriculture Organization, 2007) to make profit. Farmers in countries such as India (Buechler & Devi, 2002) and Guinea Bissau (Food and Agriculture Organization, 2007) have benefitted for having their farms sited in cities.

6.6.1.3 More Reliable Source of Livelihood

Because urban farmers have witnessed an improvement in their earnings due to urban change, urban farming has become a main source of livelihood for many urban farmers. This positive effect is not for urban farmers who are born in the city alone but also for some migrant farmers who come to Accra make a living. The increased profitability in farming in the city and the high level of unemployment in the city have attracted a number of people, especially those outside the Greater Accra Region who have a good knowledge in farming to take it as their main occupation. This is how some farmers expressed it:

“... it is a village where I was, it was there I was born and raised. And so as it is in life... we said we were coming to the big city to look for work to do but during the struggle, nothing worked. You touch this, it fails, you touch that it fails so I started with farming and it worked out good for us. So we realised it can help and because we have farmed before, we know how it is done. We know the ins and outs of it. But those who do not know too,...they have the opportunity to learn under someone”.

(Ebo, 8 years of farming, Personal Interview, Dzorwulu, June 2018)

“When I came from my hometown, I was idle then I started my farming”

(Yahaya, 18 years of farming, Personal Interview, Tema Motorway, June 2018)

“The truth is that I came in search of work but there was no work so I turned into farming.”

(Mustapha, 18 years of farming, Personal Interview, GBC, June 2018)

The profitability in urban farming in recent times has also provided an avenue for some city dwellers to rely on it as a secondary occupation even though most of them are fulltime farmers. For some, the flexibility of their work allows them to engage in urban farming, which augments the income that comes to them through other engagements. This phenomenon is very common in Korle-Bu, Pantang Hospital and GAEC, where some of the farmers are also workers in the organisations whose lands they are working on. This is how some of the farmers, including Abubakar, shared it:

“The security work,... I slept and thought about it this way... ok you wake up at night to go and sleep and the afternoon too you just sleep... and when evening comes again you go. What benefits can I get from sleeping? So I also decided to roam and see if per chance, I can farm even if it is maize, I can plant and per chance. Now I harvest and I get my wife can use it to prepare ‘Banku’ for the children”.

(Mustapha, 18 years of farming, Personal Interview, GBC June 2016)

“Oooh! When I came, my real work...I was a boxer but it got to a time I did not get help so I turned into farming”.

(Kwame: Male, 20 years of farming, Okponglo, Legon)

“Initially, I used to work as a security and gardener. I couldn’t work for more than three years for the people that employed me in the security profession. This is because I had a little misunderstanding with my bosses and he sacked me. This made me decide to go into farming fulltime”.

(Abubakar, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

Case 6.I: Abubakar’s experience: Urban Farming, more beneficial due to changes in GAMA

Abubakar has been farming in Accra for the past 15 years. He migrated from the Northern part of Ghana to Accra, specifically from Wale Wale in the Northern Region of Ghana. He first started as a gardener working in people’s homes. After sometime, he became a security man working for a security company. The monthly salary was very small and could hardly take care of his needs and those of his family. He, therefore, started doing farming in addition to his security job because the changes in Accra and Tema had brought opportunities which could make him undertake urban farming if only he got a land. After taking up the farming job on a Tema Motorway land, Abubakar realised the earning from the farming was three times better than that of the security job. Even though he found it very difficult to maintain the two jobs, Abubakar persevered them, but after a little misunderstanding with his boss due to his lateness to work, he was sacked. Having found urban farming more profitable than the security work, he stuck to it and has been farming for over 13 years now, something he has never regretted doing.

Source: Analysed Qualitative Field Data, 2016

The observation made by this study confirms the assertions made by several studies (Cornish & Aidoo, 2000; Mougeot, 2000; Smit,Nasr & Ratta, 2001; Arku et al., 2012), which recognise urban agriculture as a main source of livelihood (both partially and fully) for many urban dwellers in many countries of the world, including Ghana. Pribadi and Pauleit (2015) have observed that urban change has contributed immensely to peri-urban farmers’ employment and income based in the Jabodetabek Metropolitan Area in Indonesia.

6.6.1.4 Improved Living Standards

Farmers expressed that the increase in their earnings which can also be linked to farming as an important source of livelihood within the study area has resulted in their ability to equally obtain assets. In their view, urban farming is more reliable in helping them obtain assets than many skilled jobs in GAMA. Not all farmers expressed their ability to obtain assets like cars, lands, and houses but they were able to make farming their main occupation and used it to take care of their families from the income and profit generated from it. This how some of the farmers expressed it:

“It has been helpful. At least I have built my own three-bedroom apartment. It is before Amasaman...which I am moving in before the end of this month (June 2016). I also have a piece of land, which I am developing a five chamber and hall set building on it”.

(Baaba, 28 years of farming, Personal Interview, Dzorwulu, July 2016)

6.6.1.5 Freedom and Fulfilment to Work as Entrepreneur

For some of these farmers, the benefits of increased profits and financial earnings have resulted in them choosing urban farming over other occupations. Their low educational backgrounds and lack of skilled training have placed them in a position where most of the jobs available to them are in the low-income brackets. Therefore, for them, urban farming gives them income, and in addition gives them the dignity and freedom they deserve to work as income earners. They think they are now free from being mistreated and cheated in working for other people in formal and informal organisations. They can now rely on urban agriculture because it has now become very profitable and good for them. The following capture the views of some of these farmers regarding this issue:

“Formally, I was working as a security in the night but now I am no more doing that work again. I chose to concentrate on the farming alone”.

(Hakeem, 15 years in Farming, Personal Interview, Tema Motorway, June 2016)

“Because the highest mark the government will give you is 120 cedis or 150 cedis (per month), but here in a day if I grow okra 12 by 12 and I harvest it. This 12 by 12 if I harvest... I can earn 500 or 600 cedis a day or for every 3 days I can earn it, you get me? With this I would not go to work for me to be marked 150 cedis or 200 cedis. How much am I going to spend on children, light bill, water bill, when the children are sick too, how can I send him or her to the hospital? With this 12 by 12, if I get two sets...even if I don't get anything, every 3 days I will get 200 cedis”.

(Andrew, 10 years of farming, Personal Interview, GAEC, June 2016)

“You see! As for the farm work, if we get, it like this... to me if they give me land and I have been able to make money and there is a white color job and this job (farming), I will choose the farming and leave the white color job. Because with the farming, I can feed myself and there is a lot of money in it than government job.”

(Andrew, 10 years of farming, Personal Interview, GAEC, June 2016)

6.6.2 Negative Effects of Changes in Population and Lifestyle Dynamics and Vegetable Market Dynamics

The negative effects of changes in population and lifestyle dynamics and vegetable market dynamics is market unpredictability.

6.6.2.1 Market Unpredictability

Farmers complained of the high level of risk and uncertainty in the marketing of their produce. They complained that the lack of proper facilities results in a large amount of vegetables perishing when they are produced in large quantities in anticipation of a higher demand. Also, they find it very difficult to maintain favourable prices especially during the peak (rainfall) season. In addition, because the farmers have access to water, available technology and farm resources, most of the vegetables can be grown at any time of the year. Therefore, when farmers think there will be higher demand for their vegetables, they realise in the end that they have produced more than the quantities needed, sometimes making supply exceed demand. During such periods, most of the market women cheat the

farmers by giving them unfavourable prices, which really frustrates the latter. This is how some of the farmers expressed it:

“You know when you take it the market, the women they like cheating, you know Ghanaians like to cheat a lot. In the market, if even they need the products they say things like...ooh ‘I don’t need cabbages. I have a lot in stock’ but she would be lying. They make it in ways such that if you had planned to sell it at 50, if you are not careful you will not be able to sell it even for 20.”

(Kwame, 20 years of farming, Personal Interview, Okponglo-Legon, June 2016)

“With the price, it is sometimes good and other times too not good. The farmers go through a lot than those who come to buy them. When she comes now that he is buying the produce at that moment, he would leave if you do don’t sell it to her and the produce will perish. An example is the okra, after three days if you do not harvest them, they will perish. So when it comes to pricing, if you do not get a customer then it is very frustrating”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, 2016)

“You see, right now, you see sometimes our crops will too scarce. You will not get some to buy and it can become plenty too so you can also get a little (little profit)”.

(Seidu, 19 years of farming, Personal Interview, GAEC, June 2016)

The middle persons who trade in these produce end up getting most of the profit while the farmers get the least. The findings of this study confirm the assertions made by other studies made in agricultural marketing in general in urban Ghana (Obuobie & Hope, 2014; Obuobie et al., 2014) and rural areas (Tuffour & Dokurugu, 2015; Yankson, Owusu & Frimpong, 2016). The finding made with respect to the market uncertainty also confirms findings made on the volatility of urban agriculture produce in other parts of the world (McLaughlin, 2004; Herbon & Khmelnsky, 2017) where it has been discovered that the high perishability of vegetables results in price instability.

6.7 Changes in the Built Environment

Over the years, Accra has witnessed massive changes in its built environment and this has been influenced by factors such as increase in population (population explosion), an increase in commercial and economic activities and the influence of western culture (Owusu, 2013; Aboagye, 2015; Frick-Trzebitzky et al., 2017). Some features of the change in the city's built environment are an increase in the number of buildings, the occupations of bushy spaces by physical structure and an increase in the number of roads. This has resulted in a situation where roads and buildings which hitherto were far away from the farms are now very close to them. Thus the lands surrounding their farms, which were formerly bushy or bare, have been totally taken over by roads and buildings. This is how some of the farmers shared their experiences:

“Even this road, the cars didn't pass like this. It was also occasionally, and the road was not a highway like this. It was one road, it was not double, and these buildings were not here...here was empty. All this place was bush, if you go in it you will be with only animals ... by this time (2.00pm), I would be ‘chatting (there alone) with animals’”.

(Baaba, 28 years of farming, Personal Interview, Dzorwulu, June 2016)

“Because I was here before they constructed this road. I can say Accra has changed in the way of new buildings...”.

(Hamid, 16 years of farming, Personal Interview, CSIR, June 2016)

“That is what I told you. For Accra, it has changed because first, you would not get this building. These houses, you would not have found them. But the next time you will come, am sure all these places... they shall become houses here”.

(Malik, 31 years of farming, Personal Interview, GAEC, June 2016)

The farmers asserted that the change in the built environment in Accra continues and seem not to be slowing down any time soon. Even within the two-year period of data collection in this study, there have been newly constructed roads and buildings which are very close to the farms with some taking over the farms. Figures 6.4, 6.5 and 6.6 show three (3) sites

visited in the study area, which have been taken over by roads and buildings within the two years (2016 to 2017) of data collection. The rapid and continuous change in the built environment is a general phenomenon in several urban centres in the world as noted by several studies (Seto et al., 2011; Leulseged et al., 2012; McGranahan & Satterthwaite, 2014; Banzhaf et al., 2017).

Figure 6.4: Farmland being taken over by the on-going massive Spintex, East Legon and Tema Motorway link Road Project



Source: Field Data, July 2016

Initially a vegetable farm

Figure 6.5: Farmland taken over by the on- going massive Spintex, East Legon and Tema Motorway link Road



Source: Field Data, October 2017

vegetable farm vanished

Figure 6.6: Privately owned Farmland on the Tema Motorway to be used for construction of a building



Source: Field Data, October 2017

6.7.1 Positive Effect of Changes in Built Environment on UA Activities

The positive effect of changes in built environment on farming activities is more accessible transportation.

6.7.1.1 More Accessible Transportation

The change in the built environment has resulted in improved transportation network and has reduced the cost of transportation for UA activities, a situation which has positively impacted on the marketing of vegetables produced in GAMA. Farmers also mentioned that the cost is relatively low in term of transporting inputs to the farm and transporting their finished products out of the farm. This is because the increase in the road network within GAMA has brought farms very close to the road sides. This has made transportation easily available in terms of carrying goods to the market and also reaching out to other customers by middle persons. Besides, several buildings have been constructed closer to their farms and this makes it easier for close residents especially, to easily walk to their farms and buy directly from the farmers. This is how the farmers expressed it:

It (urban change) brought us a lot of benefits. The road here allows cars to come very close to the farm so you can carry your produce over a short distance to the cars. That is the benefit...without the road, you may not be able to carry your produce down there because the car cannot come nearer... so you don't have to waste a lot of energy.

(Seidu, 19 years of farming, Personal Interview, GAEC, June 2016)

“Accra here, you can see we have it easier than the village farming. Here we don't struggle to carry it to the market. The women (middle persons) themselves will come for it. First (formerly), I had to carry it (the produce) myself to Accra to sell”.

(Abanga, 19years of farming, Personal Interview, Tema Motorway, June 2016)

Formerly vehicles did not ply the roads like now. Currently, the vehicles are plenty.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

About ninety one percent (91.24%) of the 251 farmers surveyed noted that they do not experience any cost for transporting their finished to the market. This is because the goods are normally bought on the farms by middle persons and customers. This is indicate in Table 6.6

Table 6.6: Survey Response on Improvement in Transport

Positive Effect	Frequency	Percentage
No Transport Cost	229	91.24

Source: Analysed Field Data, 2017

The assertion of this study is supported by Obuobie et al. (2014) , which noted that two-thirds of the sellers of vegetables in the cities of Accra, Kumasi and Tamale enjoyed the benefits of reduced transport cost, access to fresh vegetables, high turnover and shorter periods in selling their vegetables due to their location in the cities. Ding,Liu and Ravenscroft (2018) outlined the closeness of farms to market centres and residential areas, and better transport systems as some of the benefits of having farms in some parts of the city of Shanghai, China.

6.7.2 Negative Effects of Changes in Built Environment

The negative effects of the changes in the built environment are water use challenges and pressure on dwindling lands.

6.7.2.1 Water Use of Challenges

This is one of the most profound effects of the change in the built environment in GAMA over the past years. GAMA generally has experienced an astronomical growth in houses and population over the past years (Yeboah, 2003; Owusu, 2013; Ghana Statistical

Service, 2014) and this has resulted in a sanitation crisis. The poor drainage systems in the cities and their suburbs have led to the excessive pollution of these streams these farmers use for their farming activities (irrigation). This is because of the many streams in Accra and Tema, which are close to the where these farms are located, have been polluted. The water pollution is mainly caused by the continuous channelling of wastewater from residential and industrial buildings into these streams. These streams, which used to be very clean, have lost their sufficiency and cleanliness, and this is even worse during the dry seasons. Farmers, therefore, face the challenge of having customers doubting the hygienic nature of their produce and therefore losing the overall confidence in the healthy nature of their produce. This is how some of them expressed it:

“You know, in the olden days the gutters (streams) in Dzorwulu did not have buildings near them so the waters in the gutters (streams) were clean”.

(Mustapha, 18 years of farming, Personal Interview, GBC, June 2016)

“In general, we have polluted our water bodies. Because most of our water bodies around have been polluted extremely that it cannot be used to farm anymore.”

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

“Even before this time (about 20 years ago), the gutter water that we are using it was very clean and you can even go, in we had this “cocomakeni” (a food that looks like cocoyam that thrives in water). They are in it but right now all those things... yeah... and people are polluting the water too. Before if you see this water you can even wish to drink it...even water that some people are drinking in some areas ...this water I would say it is even cleaner...”

(Mumuni, 24 years of farming, Personal Interview, GAEC, June 2016)

When farmers were asked about the water challenges they faced in the survey, 37.05% of them said they experienced an unreliable water supply, and 53.39% complained of a high cost of pumping water due to the polluted nature of the streams.

Table 6.7: Responses on Water Use Challenges

Negative Effect	Frequency	Percentage
Unreliable Water Supply	93	37.05
High Cost of Pumping Water	134	53.39

Source: Analysed Field Data, 2017

As already indicated, the negative effect of changed climatic patterns (the unpredictable nature of rainfall and higher temperature in the city) which easily brings about water scarcity is compounded by the negative effect of the change in the built environment on water for urban agriculture. Allen et al. (2014) also noted that the increase in the number of houses in GAMA over the years did not correspond with good drainage systems and this has led several domestic waste findings its way into the streams used by farmers for their farming activities. It has also led to the use of highly polluted water by these farmers for their farming activities, an observation has also been corroborated by some studies which affirm that water use among urban farmers in Accra and Tema though varied, is largely polluted. The situation becomes worse during the dry season where the level of pollution reaches its peak because when there is fresh water from the rains, it reduces the level of bacteria, E.coli, and chemical contamination in the water. The situation has become very serious due to the increasing number of residential areas in GAMA which are very close to these streams farmers use for farming (Obuobie et al., 2003; Amoah et al., 2009; Keraita & Cofie, 2014). The issue of using polluted water from drains in other countries have been noted by Buechler, Mekala and Keraita (2006).

6.7.2.2 Pressure on Dwindling Lands

Another negative effect of the changes in the built environment in GAMA on UA is the pressure on dwindling lands. The pressure on dwindling lands is in two main fronts though they are related. The first is the competition over the farmlands' use and the second is the reduction in farmland size and quality. With respect to competition over the farmland use, farmers complained that their farmlands over the years have been taken over by buildings (both for residential and other purposes) and therefore are continually evicted from their lands by landowners. The continuous pressure on lands in general in GAMA (Owusu, 2008, 2013) has led to contestations for their land ownership. As a result of that, farmers have had to bear the brunt of this struggle over the farm lands. This is how some of the farmers expressed it:

“I left because the landowner asked me to go because he wanted to use the land for his business of which I cannot tell.”

(Yahaya, 16 years of farming, Personal Interview, Tema Motorway, June 2016)

“This is because we are not secured in Accra... We get people coming to evict us within a short period of farming on the lands.”

(Mumuni, 24 years of farming, Personal Interview, GAEC, July 2016)

“We started farming at Okponglo but we were evicted by the landowner because he wanted to use the land for constructing a hotel so we came to Tema motorway area to start our farm.”

(Abubakar, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

“You see the Gas, the Labadi and Teshie people...they are fighting over the lands. It has made all the people here leave.”

(Ndetsi, 22 years of farming, Personal Interview, La-Dadekotopon, June 2016)

Another example is the situation of La-Dadekotopon, where the Ghana Military are fighting with the farmers (the native landowners) over the land. This is how a farmer expressed it:

“Yes, it is mine and have five times of this land in airport area. And I have planted okra, that is what I do and then all of a sudden they come to... they don't tell you nothing. They said 'soldier land', how is it soldier land? I don't understand. Soldiers do not have lands, soldier are given some parcels of land for their soldier work. Ok? This land is not soldiers land but all of a sudden, soldiers came to grade that land. It does not sound well”.

(Odotei, 30 years of farming, Personal Interview, La-Tseaddo, June 2016)

The situation of infrastructure taking over lands together with the contestations has resulted in the sale and loss of large farmlands leading to a significant reduction in land quality, a situation which has made it extremely difficult for many farmers to obtain higher yields on their farms. This implies that farmers who experience relatively lower yields and want high yields require a high level of operational cost because they have to buy a larger amount of fertilizer to maintain their soil quality. Even though it is a general challenge, farmlands at Korle-Bu, Dzorwulu, Tema Motorway, and La-Dadekotopon are some of the most affected areas. Figure 7.4 shows a situation in Korle-Bu where the reduction in farmland has resulted in a farmer planting in an uncompleted building. Case 6.2 further explains the situation in Korle-Bu.

This is how some of the farmers expressed their desperation when it comes to the dwindling lands within GAMA:

“The land is tired. The strength in it has reduced. And currently, that (piece of land) is what I use every time. I don't leave it to rest.”

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

Figure 6.7: Uncompleted Building at Korle –bu Teaching Hospital used for vegetable production



Source: Field Data, 2017

Case 6.2: Peculiar Situation of Korle-Bu Teaching Hospital Farmers

In the 1980s, farmers in the Korle-Bu Teaching Hospital used to boast of the over 100 farmers who had sizeable spaces to farm. The need for the hospital to put up more physical structures to take care of the accommodation needs of staff and other essential needs has led to heavy infrastructural developments on those hitherto farm lands. Farmers recognising the continuous benefits of farming in city and the difficulty in obtaining extra lands are finding it very difficult to leave the Korle-Bu lands, though some farmers have moved to other places. Farmlands have been rather reallocated to farmers with each farmer now having a rather reduced land size. Farming on Korle-bu lands is interesting because even though the lands are smaller, in terms of farming areas in Accra, they have some of the highest concentrations of farmers per land size. Farmers have resorted to farming in the most limited of spaces. Some of them are on the road sides and uncompleted buildings. An example of such is shown in Figure 6.7.

“Right now there is no food in the land (at Dzorwulu), there is salt in the land. This is how it is now and that is why I moved here.”

(Siddiq, 21 years of farming, Personal Interview, GAEC, July 2016)

“All these parts of Korle – bu (pointing to the relatively new staff quarters in Korle-Bu) were formally used by farmers for farming some years ago... but since they needed the lands to build quarters for their staff, they asked us to leave...Our lands have reduced. All those buildings you see there were farmlands”.

(Faurok, 9 years of farming, Personal Interview, Korle-Bu, June 2016)

Results from the survey indicate that 62.95% of the farmers were worried about their certainty on the land use. Even though the majority of the farmers were on open government and institutional government lands, 21.12% said they had experienced eviction before, 10.36% also said they had experienced struggle over the land they farm on, while 14.34% said they had experienced low land productivity. This is indicated in Table 6.8.

Table 6.8: Responses on Dwindling Land Use

Negative Effects	Frequency	Percentage
Uncertainty over Land	158	62.95
Eviction	53	21.12
Struggle over land	26	10.36
Low Land Fertility	36	14.34

Source: Analysed Field Data, 2017

Several studies in Ghana (Kufogbe & Surveyors, 1996; Appeaning Addo, 2010; Caradonna et al., 2013; Naab et al., 2013; Allen et al., 2014; Danso et al., 2014; Keraita & Cofie, 2014) have recognised that lands for farming in urban areas especially within GAMA are experiencing intense pressure concerning their use. Nugent (2000) argues that “land is the factor that urban farmers identify as the most critical to their success” (p.77). Also, some studies in Ghana (Danso et al., 2014; Obuobie et al., 2014) have noted that soil fertility of the various lands in these areas continues to reduce because those lands have

been overused for several years of farming. Studies have proven that there is vast loss of lands for farming in Accra and Tema due to the intense competition for land space for urban agriculture with other socioeconomic activities (Allen et al., 2014; Mackay, 2018). This land challenge faced by urban farmers is not only limited to Ghana but also in other countries and cities. Examples are Kampala in Ugandan (Vermeiren et al., 2013), the Allela region in Barcelona (Recasens et al., 2016) and Hyderabad in Pakistan (Peerzado et al., 2018).

6.8 Changes in Farm Land Ownership

Farmers, as indicated in Table 6.1, have complained that the continuous demand for land in GAMA has affected the availability of land, which has affected its price and more importantly its ownership. The changes in farm land ownership has a relationship with the changes in built environment because the lands purchased are mainly used for housing and other physical developments. Native farmers who were farming on lands belonging to their forebears have their lands leaving their hands either through purchasing by rich individuals or real estate developers or the lands being taken over by other institutions which are claiming ownership. This situation is peculiar to the farmers in La-Tseaddo, whose farmlands they claim have been taken over mainly by a government institution for housing purposes or sold to private developers by other natives or traditional authorities who also claim ownership of the land. This is how one woman expressed her frustration:

“What has changed is, our lands! Our lands! They are taking everything from our hands... taking everything from our hands. When you talk about it, they (traditional leaders and family heads) do not care. We will go there... this chief... we will go and talk to him... he does not care. What will we do? So we are just using what we have but they have taken the lands from many people. So we are just using the little we have in our hands”.

(Comfort, 42 years of farming, Personal Interview, La-Tseaddo, July 2016)

“It was all ...this place up to the motorway. All those were farms. Everybody worked here but it seems to me five or six years ago that the Gas came to sell the lands”.

(Ndetsi, 22 years of farming, Personal Interview, La-Tseaddo, June 2016)

This means that lands which were previously owned by natives have now been shifted to private people. The shift in the land ownership is not only limited to La-Tseaddo, but is also common in almost every part of the study area. Most private landowners on the other hand are not prepared to give their lands to the farmers who themselves cannot afford these expensive lands to farm on. The situation has drastically reduced unused private and native lands available for UA. Farmers, seeing the threat of the change in farmland ownership, have decided to find lands on unused government institutions and open government spaces. Therefore, most lands for farming are now owned by government or government institutions. The figure provided in Table 6.2 on current land ownership indicates that about 82% of the farmers are using government lands for farming. Examples of such institutions are GAEC at Atomic, CSIR, Pantang Hospital, Korle-Bu and GRIDCo. The spare lands of these institutions have not been used for buildings or other projects yet hence temporarily serving as lands for farmers. This was not the situation some years ago when several of the lands for farming were owned by natives, individuals, and chiefs within GAMA. Even though most of the lands farmers are currently using were for government, they were not known lands for urban farming some years ago. Most farmers had not moved to the government lands because they were comfortable farming on the private and native lands, which were not sold or used. This is how some of the farmers expressed it:

“Yes, they are all government lands”.

(Malik, 31 years of farming, Personal Interview, GAEC, June 2016)

“Later, Atomic Energy gave us their land to farm on... so I can now expand. They did that because encroachers were tempering with their lands”.

(Yakubu, 26 years of farming, Personal Interview, GAEC, June 2016)

“The land is owned by GBC and they gave it to us. The place is very helpful...this very place (where my farm is) up to the roadside”.

(Seidu, 18 years of farming, Personal Interview, GBC, June 2016)

“And here too, it was given to me by the military (Ghana Army). That one... it is only this year they gave it to me”.

(Ndetsi, 22 years of farming, Personal Interview, La-Tseaddo, June 2016)

The changed dynamics in land ownership and use due to the rapid urbanisation in GAMA and other urban centres in Ghana have been stressed by several studies (Owusu, 2008; Naab et al., 2013; Owusu, 2013; Allen et al., 2014; Appiah et al., 2014). This is mainly due to the high influence of modernisation, globalisation, and neoliberalism in the cities which has made land a high value commodity and which is normally given to the highest bidder. This situation has placed farmers who cannot afford these lands for farming to evacuate from the privately owned lands to government or public lands. This assertion has attested studies in other countries (Durand - Lasserre & Selod, 2012; Salvati, 2014; Badami & Ramankutty, 2015; Recasens et al., 2016).

6.8.1 Positive Effect of Changes in Farm Land Ownership

The positive effect of changes in the farmland ownership on urban agriculture is security and safety on present lands.

6.8.1.1 Security and Safety on Present Lands

The drastic reduction in the use of private and communal lands for urban farming has led to a situation where farmers have now moved to government lands, which are either open or institutional. On the open government lands, for instance, farmers who move there enjoy a level of security since there is no fear of immediate eviction as compared to the individual or private lands where they can be evicted at any time. Though some form of uncertainty exists for the farmers in terms of the duration on the land, they think it is far better than

being on the private or communal lands. A typical example is the lands used by farmers on the Tema Motorway. Farmers have relocated their farms there and can farm if there is no competition over land use from other farmers or squatters. The farmers know encroachers cannot take over such lands and, therefore, as long as government has not used such lands for any project, they feel secure on it.

With the institutional lands, farmers are enjoying direct or indirect protection from the institutions. This is because most of the boundaries of these institutional lands are themselves secured with proofs of documentation and this makes it difficult for encroachers to take over the land. Though most of these institutions do not have formal agreements with the farmers and so can ask them to leave anytime they want, farmers are still confident and very much at peace on these lands. Experience on the field reveals that some farmers are able to expand their farmlands compared to their previous places of farming since they can spread their farms as long as the lands have not been occupied by other farmers. Under this situation, when some farmers begin to realise that their farmlands are reducing in size, they do not leave entirely from their former lands but rather look for extra lands on these government lands to expand. This how some farmers voiced it:

“Initially the farm size was small, but as you can see, I have extended it to cover the entire plot”.

(Yakubu, 26 years of farming, Personal Interview, GAEC, June 2016)

“Because when I started working here, no one told me anything but I was still working on the land and no one confronted me or attacked me... that’s why I have joy working on the land”.

(Mawutor, 9 years of farming, Personal Interview, GAEC, June 2016)

“We are under their protection, so in case of any issue they would help us out. I can say that the whole of this place (GAEC lands) is for farmers and it is not part of the lands being sold. Therefore, they would stand for us and talk to whoever is claiming ownership”.

(Andrew, 10 years of farming, Personal Interview, GAEC, June 2016)

“So if not for Atomic people who have tried to locate and protect this land we wouldn’t have gotten any land to farm on”.

(Mawutor, 9 years of farming, Personal Interview, GAEC, June 2016)

“I am very happy on the land”.

(Mustapha, Male, 18 years of farming, GBC)

Table 6.9: Positive Effects of Change in Land Ownership on Farming Activities

Positive Effect	Frequency	Percentage
Happy on Land	205	81.67
Government Protection	106	42.23
Low Cost of Production	208	82.87

Source: Analysed Field Data, 2017

Out of the 251 surveyed, 81.67% noted they were happy on their lands, 42.23% said they enjoyed protection from government and 82.87% said they enjoyed low cost of production due to use of ‘free’ lands. Allen et al. (2014) argued that security enjoyed on the government lands by farmers in Dzorwulu and Roman Ridge, for instance, was temporary and may not last. Practically, farmers have been accepted by these institutions because of their role as authorised land users who also prevent encroachers from using their lands. This same observation was made by this study because the farmers can be displaced from the lands at any time since they do not have any binding agreements on the lands with these government institutions. In the Municipality of Teresina in Brazil, for instance, government has succeeded in providing 2300 urban farmers who are poor to use institutional and open government lands indefinitely for their farming activities (Cabannes, 2003).

6.8.2 Negative Effect of Changes in Farm Land Ownership

The negative effects of change in farm land ownership and dynamics on urban agriculture is disrespect and abuse of institutional land.

6.8.2.1 Disrespect and Abuse on Institutional Land

These institutions viewed the permission given to urban farmers to use their lands as a mere show of kindness to them. Even though farmers also provide support to them in the form of fighting against encroachers, they abuse the farmers sometimes. Some farmers complained they do not enjoy the required dignity on the lands they farmlands. This is due to the abuse by some of the staff of these institutions. Others asserted that the attitudes of the institutions toward them were mixed. While staff of these institutions treated them with some level of respect, others treated them with disrespect. Some of the farmers complained that they are faced with continuous eviction threats by these institutions. Almost all the institutions whose lands are used by farmers are not mandated to promote urban agriculture. Though they had given their lands to the farmers, some cared less about urban agriculture as institutions. This is how some farmers voiced their concerns but in this case the names of the institutions and farmers are withheld:

“Oh yes, as for them. Some of the staffs are very difficult but some of them are very good kind to we the farmers. Some will also mistreat you and warn you it is government land if you stay there you would build a house there. How can you build a land there in this waterlogged site? Because they don't want to give it to you or maybe it is for political reasons I don't know”.

(Anonymous, Personal Interview, July 2016)

“That is why we the farmers here have decided to form an association to that effect, so that if any damaged is caused we have a united front to submit our problems to the authorities (of the institutions). But the things (produce) they have damaged are many and they have gone scot-free”.

(Anonymous, Personal Interview, June 2016)

Farmers do not own lands and also generally regarded less in society, a situation, which makes them vulnerable to disrespect and abuse. Even though this attitude towards the farmers who use institutional lands prevails, the several studies on urban agriculture have not made this discovery.

6.9 Changes in Available Technology

The farmers noted that they had witnessed a tremendous influx of improved farming technology into GAMA over the past years. These technologies were made available to them through their exposure to western forms of farming during training by intergovernmental, governmental and Non-Governmental Organisations (NGOs). The farmers also copied, learnt and used these existing technologies through their easy access to Information Communication Technology (ICT) equipment such as phones and computers. In addition, the presence of the many modern farm shops which trade in farm implements and technologies from the West and Asia has also contributed to this form of change. Some of these technologies include the use of pipes and tubes for irrigation, improved seedlings and chemicals such as improved pesticides and weedicides for farming. These technologies are very easy to find within GAMA because the shops and firms which trade in them have increased in number. The shops and firms which sold the farm inputs some 20 or 30 years ago were extremely few and also far away from their farms but these shops are now short distances from their farms. This has saved them a lot of time, effort and even money in going for these inputs, a tremendous benefit to their farming activities. These were the views of some of the farmers:

“Right now the ‘whites’ call something technology. In the olden days, we used watering can to water our farms. Formerly, water cans were not even there, you would have to use the big cup to fetch the water to water (water your plants)... Then, when change came...now there is something, we call tube for irrigation”.

(Ebo, 8 years of farming, Personal Interview, Dzorwulu, June 2016)

“Right now, I can say it is easy to access the inputs. This time people have realized that farmers are becoming many so everywhere you pass ...but formerly the whole Accra it was AGRO, which is at where Hearts of Oak training ground is ... everybody came to buy there in the whole of Accra. This time it is not difficult to access. Now you can get some in Madina, Ashiaman...”.

(Kwame, 20 years of farming, Personal Interview, Okponglo, Legon, June 2016)

“First, it was AGRO after Lotteries, opposite COCOBOD. First that was the only place where we bought things but right now the shops are plenty. If you go to Madina, there is one there. Even here, in Dzorwulu somebody just opened one here. Even Pig Farm where I live, a woman has also opened one there. When I was coming yesterday that was where I bought my fertilizers and my medicine and brought them here. Right now, we get it closer. It is nearer and easier to get than before. Formerly, we had to travel far but now it is easy”.

(Baaba, 28 years of farming, Personal Interview, Dzorwulu, June 2016)

“For now we get them, if you stand here and ask for a seed you will get it in no time”.

(Andrew, Male, 10 years of farming, Personal Interview, GAEC, June 2016)

“Right now, our farming has seen a lot of changes. Formerly, we used water can to water but now we use pumping machine”.

(Mustapha, 18 years of farming, Personal Interviews, GBC, June, 2016)

6.9.1 Positive Effect of Changes in Available Technology

The positive effect of changes in available technology on urban agriculture as observed by the study is improvement in production.

6.9.1.1 Improvement in Production

Farmers noted that the used of high tech inputs for production such pumping machine, tubes, and pipes for irrigation, and improved seeds, fertiliser and pesticides has improved their production. These readily available inputs have made it easier for them to water their plants, reduce the maturity period of their plants and also clear pests and diseases from their farms. By this, they save time and become effective and efficient in their ability to

farm all year round. This has made it possible for them to respond easily and rapidly to high market demand compared to some years ago which was not possible. This is how the farmers expressed it:

“Formerly, I had 80 beds and with the water can I used the whole day but with 80 beds and pumping machine, 4 to 5 hours and I would have finished watering”.

(Baaba, 28 years of farming, Personal Interview, Dzorwulu, June 2018)

“...We cultivate more crops and as well make sure we grow quality crops to attract more buyers”.

(Kwame, 20 years of farming, Personal Interview, Okponglo, Legon, June 2016)

Table 6.10: Positive Effects of Technology Change on Farming Activities

Positive Effect	Frequency	Percentage
Time Saving	153	60.96
Inputs Shop Near Farm	227	90.44
Modern Inputs Now Available	239	95.22
Exposure to Modern Farming Trends	209	83.27

Source: Analysed Field Data, 2017

Table 6.10 from the survey data indicates that 60.96% of the farmers said they saved time from using modern inputs, 90.44% agreed that the input shop were near their farms, 95.22% noted the modern inputs now available for their farming activities while 83.27% said they are now exposed to modern farming trends. Egyir et al. (2014) found that even though 100% of urban farmers surveyed used some traditional inputs for farming, 83% of them now use modern methods even though those modern technologies were not specified.

This implies that over the years, urban farmers have embraced current technologies for farming. In this study, for instance, it was found that 81.68 % of farmers surveyed used pumping machines on their farms.

6.10 Changes in Prices of Commodities in the Urban Economy

Farmers admitted that the economy within GAMA in terms of the level of general prices of goods and services has changed. Specifically, the general prices of goods and services over the past years within the study area have increased drastically not only for inputs used for the UA production but goods in general. This is how a farmer expressed his concern about high prices of goods in GAMA:

“...Everything is now expensive....”

(Kwame, 20 years of farming, Personal Interview, Okponglo, Legon, June 2016)

With respect to prices of production inputs, farmers complained they had become generally high over the past years. The high prices have affected inputs use in production such as labour, fertilisers, land, pumping machine and fuel for the pumping machine and chemicals for production such as weedicides and pesticides. Even though these inputs were readily available, farmers complained they were very expensive. This is how some farmers expressed it:

“My only concern is the current prizes of fertilizers on the market is increasing and I pray government can do something about the prize ...if possible reduce it for us”.

(Mumuni, 24 years of farming, Personal Interview, GAEC, June 2016)

“Oh, the farm it is good but just like things are very hard in Ghana especially the seed we are buying them, medicines. Agricultural inputs are very expensive. So it is like if you don't have money it is very hard to farm now”.

(Hamid, 16 years of farming, Personal Interview, CSIR Land, June 2016)

“But currently the medicines; their prices are very expensive. Ahaa! the price of the medicines are very expensive if you go to buy a little amount let me check (looking around for a sample)... an example is this bottle (showing the bottle to me) ...if you go to buy this one it is 8 Cedi. These are also some (searching through some waste and showing it to me)... this own for instance is 280 and this one is 180. This one is also 250 you see too many medicines this is 12 Cedis you see (showing it to me). This is powder... you will mix it with water... it is also 6 Cedis each. This is what we use for the work and so if you don't have these medicines... it is money we need ...this one it is always sold for 250 cedis.”

(Ndetsi, 22 years of farming, Personal Interview, La-Tseaddo, June 2016)

6.10.1 Negative Effect of Changes in Prices of Commodities in the Urban Economy

The study did not observe any positive effect of changes in prices of commodities in the urban economy but it rather observed some negative effects. These are reduced earnings and farm labour challenges.

6.10.1.1 Reduce Earnings

Farmers complained that the high cost of production really reduced the profits gained from the vegetable production. Even though they receive income of high value, their real income (profit) from the sale of vegetables reduces when they factor in the cost. This situation, coupled with the teething problem of financial challenges such as unavailability of funds for farming, makes it more difficult for them in production, and this serves as a very strong disincentive to farmers. Table 6.11 indicates that 78.49% of the farmers were of the view that prices of inputs have increased in GAMA while some (7.57%) also believed they have experienced a drop in their earnings due to the high prices. The low number of 7.57% reported that reduced earning is mainly based on the fact that farmers are able to shift their cost to consumers and can obtain the profit they desire since there is a reliable market for vegetables in GAMA. This is how some farmers expressed their concerns:

“And again the medicines we buy to spray and the fertilizers we use, you will get it but you will again use it to pay debt”.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

“It all dependent on the money for the business. The money is not enough for the work. If there is money for it like I would have been able to grow carrot, cabbage, green pepper all of these things ...like I would have been able to do”.

(Andrew, 10 years of farming, Personal Interview, GAEC, June 2016)

Table 6.11: Responses on Reduced Earnings

Responses	Frequency	Percentage
High Input Prices	197	78.49
Decrease in Income	19	7.57

Source: Analysed Field Data, 2017

The situation where urban change is characterised by high production and financial cost has been established in literature on urban agriculture (Satterthwaite, 2007; Sassen, 2012; Surya, 2016). Other studies have also indicated that one genuine economic difficulty which characterises urban change is the increase in the price of production resources and inputs. This is partly due to the high level of competition for the use of scarce production resources (Nugent, 2000; Kessides, 2006). Nugent (2000) argues that urban farmers find it very difficult when there is high competition for farm resources, an assertion which has also been confirmed by this study under land.

6.10.1.2 Farm Labour Supply Challenges

The continuous increase in the general prices of goods and services in GAMA has affected the cost of rent, food, clothing and health, making the cost of living there generally high. This high cost of living implies that farm labourers also bear the brunt of the tough

economic conditions in GAMA. This means that farmers as well as farm labourers will have to work hard to survive the economic conditions of GAMA by looking for better job opportunities. Many labourers see the urban farm labourer work as a drudgery which does not answer adequately their economic needs because of the meagre earnings it provides to them (Egyir et al., 2014). Besides these labourers are required to stay on the farm the ‘whole day’ as part of their farm work, denying them the opportunity of engaging in extra jobs which will bring them extra income. The economic changes in GAMA has been significantly characterised by the increase in the plurality of jobs, and therefore farm labourers would always want to move to where returns on labour are relatively higher. This makes it very difficult for them to stay on farms as labourers for long and remain committed to farm owners. Farmer owners complained of the increasing unreliability of farm labourers in GAMA. Most of the workers who come to the farms to look for work mainly aim to make money and not to contribute to the growth and success of the farms. In short, they do not think of settling into the farm business and work for the farm owners to make profit but mainly how they (the farm labourers) can obtain quick money. Therefore, the short-term availability makes it very difficult for the farmers to plan their farming activities in a more organised way. This is how some of them shared their frustrations:

“You will not get them (labourers) like formerly, even the Burkinabes, they don’t really like the farm job. If they come, they try finding jobs elsewhere so after they don’t get such jobs then they come and work for you. Even with that after 2 or 3 months and a brother would tell him, I have a job in construction for you then they leave. It is not easy to get them. You have to purposefully look for a young boy or if the labourer or apprentice is around, and the master is not around, and he needs money for food then he comes to finish yours (farm work) very fast for you.”

(Kwame, 20 years of farming, Personal Interview, Okponglo, Legon, June 2016)

“The challenge is that the youth in Accra think farming is a difficult job and because they want quick money, they find it reluctant to engage in farming”.

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

“In Accra you would not get workers... they would always postpone but will never come. They don't like the farm work”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, June 2016)

From the survey data, Table 6.12 indicates that 64.14% of the farmers said they faced the problem of high cost of labour when it comes to hiring labour from their farms while 25.90% of the farmers asserted that reliable labour supply for farming was a challenge in GAMA.

Table 6.12: Responses on Farm Labour Supply Challenges

Water Challenges	Frequency	Percentage
High Cost of Labour	161	64.14
Unreliable Supply of Labour	65	25.90

Source: Analysed Field Data, 2017

Farm labourers find it very difficult to remain loyal to the farm owners. Besides, the unfavourable economic conditions they sometimes face in the cities (Yankson & Bertrand, 2012; Sridhar, 2016) coupled with the ambitions of making it big in the cities (Awumbila et al., 2014 in Awumbila, 2015) (Asomani-Boateng, 2002), hasten their desire to seek better wages elsewhere in the cities. This is because of the continuous widening of the gap between economic opportunities in the urban areas and rural areas (Litchfield & Waddington, 2003; Awumbila, 2015; Cooke, Hague & McKay, 2016) which these farmers aim at bridging when they migrate into the cities.

6.11 Conclusion

This chapter has established that there are real changes that have occurred in GAMA over the years, some of which centre on land use, macroeconomic, technological, population, transportation accessibility, lifestyle and other sociocultural changes. These changes have affected urban agricultural activities in several ways. While some of these changes have mainly led to positive effects on urban agriculture, others have led to negative effects. Other changes have also led to both positive and negative effects. The negative effects border on water use, challenges associated with unreliable labour, unavailability of quality water and reduced urban lands available for urban agriculture. Farmers, however, gained from improvement in production, increased market base and increased profit which have resulted in improved livelihoods and living conditions.

CHAPTER SEVEN

FARMERS' ADAPTATION TO URBAN CHANGE EFFECT ON URBAN AGRICULTURE

7.1 Introduction

The chapter is in two sections. The first section which is findings from the qualitative data discusses the adaptation strategies farmers used with respect to the specific effects of urban change. The strategies which are classified as production, marketing and finance related are supported with descriptive statistics in their explanation. The second section, which is on the factors affecting urban farmers' adaptation to urban change, is obtained from the analysis of the quantitative data. In the second section, the factors affecting adaptation were classified under farmers' personal characteristics, farm characteristics and institutional factors.

7.2 Production Related Adaptation

The themes of the production adaptation strategies that urban farmers use with respect to urban change are indicated in Table 7.1 with their respective codes.

7.2.1 Use of Different Sources of Water

The goal of this strategy is to mainly adapt to the negative effect of water use challenges which are as a result of changed climatic patterns and change in the built environment. When farmers were asked how they strategised to deal with the general difficulties in water use, they specifically said they used different water sources. Among these water sources were natural streams in GAMA which were close to their farms. They also used waste water which mainly flows into poorly or well-constructed drainages popularly known as gutters. These gutters receive water that flows from factories and residents near their farms.

Table 7.1: Themes and Codes of Farmers' Adaptation Strategies to Effects of Urban Change

Production Related Adaptation	
Theme	Code
Use of different sources of water	Use of waste water Use of water from streams Use of rain water Use of GWCL water Use of well water
Intensified and strategic planting	Plant all year round Practice Mixed Cropping Practice Multiple Cropping Plants market driven crops Study Seasons and Times to Plant
Relocation to 'free' and 'cheap' available lands	Relocate to 'High Tension' Lands Relocate to Unused Gov't Lands Relocated to Unused Private Lands Use of Multiple Farms Increase size of present lands
Use of essential farming technology	Use of Inorganic Fertilizer Use of Organic Fertilizer Use of Spraying Machine Use of Irrigation gadgets Use of Tractor
Use and train labour from multiple sources	Use of Migrant Labour Use Family Labour Use Female Labour Train Labourers
Marketing Related Adaptation	
Theme	Code
Customer Management	Maintain Customer Loyalty Serve as Middlemen
Observe Market Trends when Producing	Observe Market Trends Use Mobile Phones to Sell Sell Directly to Consumers Sell to Middle Persons Sell to Market Centres & Restaurants
Finance Related Adaptation	
Theme	Code
Financial Management	Borrow to finance production Practice Contract Farming Practice Financial Planning Self-Financing Reinvest profit

Source: Analysed Qualitative Field Data, 2016

Figure 8.1 shows how a drain has been blocked by some farmers in Korle-Bu Teaching Hospital for the watering of their vegetables. This is how some farmers explained how they used different water sources:

“It is like wastewater from the gutter heading to the sea. We block it and then use pumping machine to pump it into the farm. ”

(Odotei, 30 years of farming, Personal Interview, La-Tseaddo, June 2016)

“All these you are seeing all here is a canteen up till there...the washing bay is far up there. Therefore, when they use their water... it comes here. ”

(Mustapha, 18 years of farming, Personal Interview, GBC, June 2016)

Figure 8.1: Blocked gutter water used by some farmers at Korle-Bu



Source: Field Data, 2017

“Ok, the water I get is from Cocoa Cola Bottling Company. The machine water they use and the water they use to wash the machine is what I use.”

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

The use of waste water in GAMA as a common feature in Ghana's urban agriculture literature is not new (Obuobie et al., 2003; Drechsel et al., 2014; Dreschsel et al., 2014). Wastewater use has also been a feature of urban agriculture in other parts of Africa and the world (Buechler & Devi, 2002; Buechler et al., 2006).

Some of the farmers, though few, depended on the rains. These were mostly old farmers who were into production of food crops. These farmers normally had their farms located in places that were not close to the streams or very reliable sources of water. Notwithstanding this, some farmers who adopted irrigation also indirectly depended on the rains especially during the rainy season. When it rained heavily, they got more water to irrigate their crops and the rains also made their soil very soft and easier to work on. This is how a farmer expressed it:

“If it rains more, we get more water, if the rains stop early then we lose.”

(Mawutor, 9 years of farming, Personal Interview, GAEC, July 2016)

Quite a number of the farmers also use water from the Ghana Water Company Limited. Most of these farmers are in Dzorwulu, which is almost 100% and Korle-Bu which is about 50%. This is how some farmers voiced it:

If you go to places like Dzorwulu-Ebony, Korle-bu that is what they are using pipe borne water.

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

Formerly we use the gutter but they complain about the gutter water. Therefore, for me...I have connected to a pipeline.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

The use of pipe borne water for urban agriculture confirms the assertions of Keraita and Cofie (2014) and Keraita et al. (2014) where they noted that farmers in Accra and Tamale use pipe borne water due to the high level of pollution of the streams used by farmers.

7.2.2 Intensification and Strategic Planting

This adaptation strategy is targeted at both the positive and negative effects of urban change on urban agriculture. The positive effects which this adaptation strategy aims at are improved market conditions, important sources of livelihood, improved financial earnings, improved living standards, improvement in production and security, and safety on present land (see Table 6.2). The negative effects of urban change are pressure on dwindling lands which leads to dwindling fertility of the soil and threatens (reduces) earnings (see Table 6.3). These advantages urban farmers enjoy from urban change spur them on to make the best possible use of the farmlands. For the farmers, intensification means opportunity for profit and earnings. This is because the high customer demand for vegetables has caused them to farm throughout the year and also made sure they use the best possible technology for farming. The strategies they use are mixed cropping and multiple cropping. With mixed and multiple cropping, farmers plant several crops together on the same piece of land at the same time. With the farming all year round, farmers plant other crops immediately a crop is harvested. This helps the farmers to meet the high demand for vegetables they are witnessing even though they are constrained by land. This is how some of the farmers expressed how they adapt in using this strategy:

“For the farm down there I can work on it three times (in a year). What makes me earn enough income is when I sow it for 3months getting to the 4th month I then clear the land and sow another set of crops, then I continue with the cycle again and again ...so that is where I get the income”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, June 2016)

“This year, I have cultivated okra and pepper. My farm is not only here. Over there, I have planted maize there and it is now sprouting up while some are also here”.

(Ndetsi, 22 years of farming, Personal Interview, La-Tseaddo, June 2016)

Table 7.2: Intensification and Strategic Planting Response from Survey

Strategy	Frequency	Percentage
Farm all year round	233	92.83
Multiple Cropping/Mixed Cropping	154	61.35
Plant market driven crops	139	55.38
Study Seasons and Times to Plant	163	64.94

Source: Field Data, 2017

The survey data in Table 7.2 indicates that 61.35% of the farmers practised multiple and mixed cropping while 92.83% planted all year round. The all year planting by farmers has been the main feature of urban farmers in Ghana (Danso, Drechsel & Wiafe-Antwi, 2002; Danso et al., 2014; Keraita & Cofie, 2014), other parts of Africa and the world (Prain & Dubbeling, 2011). Farming all year round is possible because farmers mainly depended on irrigation for farming and not only on rainfall.

Farmers made sure their planting is done strategically so that they can get the best yield and price as they produced. Over the years, several farmers have even changed the type of crops they grow and turned to crops which are rather market driven. This is because they have seen a significant change in the demand dynamics in GAMA and this has affected the types of vegetables consumed. Farmers have also responded to these changes and have, therefore, shifted from concentration on crops like cabbage, carrot, tomato, okra, ‘ayoyo’, ‘gboma’, and cucumber to crops such as green pepper, lettuce, radish, spinach, and

coriander due to their high demand by city dwellers. This is because some crops which they were growing before are no longer supporting the lands they are now farming on.

Some of the farmers expressed the situation thus:

“I started with these local leaves we eat here in Ghana. Something like ‘suurey’ and beans leaves, ‘ayoyo’ and ‘Goma’ but it is when I came here then I started doing lettuce, green pepper, and cabbage among other things. It is here I started the vegetables but there (current farm land) it was only those local leaves”.

(Hamid, 16 years of farming, Personal Interview, CSIR June 2016)

“In 95 when I started, the crop I really started with was cabbage. Then I moved to onion. For onions, it was really my work. I even got the best farmer of Greater Accra in onions. It was really the work I normally do but the way the land have become small (he chuckled), if you use it to cultivate/plant onions at times (he chuckled again), the returns are small. That made me forgot to either plant onions this year... like every year by I have planted or planting onions”.

(Kwame, 20 years of farming, Personal Interview, Okponglo-Legon, June 2016)

The farmers also explained that they studied the weather patterns in terms of sunshine, heat, and rainfall before planting. They also considered festive seasons like Christmas, Easter, and New Year before growing their crops. Besides, farmers also studied the supply and demand trends of various crops before planting them. This is how some farmers expressed this:

“We look at the time and season; we look at the time and strategize. This is because if you don’t plan or strategize and it is the period of the raining season, there will be virtually no market for you because at the time the produce from the hinterlands will arrive. So we have our time, very soon we have to plant. This is around September, October, November, and December, we will plant and then get a very good market when you harvest. The market is better, a little better”.

(Comfort, 42 years of farming, Personal Interview, La-Tseaddo, June 2016)

“Yeah the weather too is one because if you nurse it dry season time the weather is too hot and these particular onions are not the Bawku ones. With the Bawku ones the system is good for dry season time it doesn’t matter. But you can bring the Bawku ones also here if rain beats it, it will spoil. You see! The Bawku is different together from here. So this is “Malbi”, which is coming from Burkina. This is good for rainy season time that is why we normally use this crop”.

(Mawutor, 9 years of farming, Personal Interview, GAEC, June 2016)

“Because at this time it meets Christmas time, so for that I will get a little market. And the onions I have planted after harvesting I shall replace it with okra. The okra also is what will go beyond the Christmas time so after the celebration of the Christmas I will also have crops to also sell to cater for myself”.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

Table 7.2 also indicates that 55.38% of the farmers grow market driven crops while 64.94% study seasons and times to plant. Danso et al. (2014), cited the seasons, market price of goods and purpose of growing crops (whether for subsistence or commercial) as factors influencing the choice of crops among farmers. This study has added other dimensions to the purpose of choosing crops in urban agriculture as an adaptation strategy. These are the nearness of festive seasons and modernity in the trend of vegetable demand.

7.2.3 Relocation to ‘Free’ and ‘Cheap’ Available Lands

This strategy is mainly adopted by farmers to address the negative effects of pressure on dwindling lands (See Table 6.3) and the positive effects of improved market conditions and all the benefits (improved financial earnings, important source of livelihood and freedom and fulfilment to work as entrepreneur among others; See Table 6.2) that come with it. As much as the change in the urban built environment has made the acquisition of land a big challenge to farmers, there are also opportunities and advantages urban farmers enjoy from farming in the city. The urban environment brings a larger market to farmers and because of that they would want to stay in the cities at all cost since it is profitable.

Farmers, therefore, have no option but to adopt a strategy that minimises the negative effect of land reduction and maximises the advantages urban change brings. They do this by relocating to lands under high-tension grid lines, open government lands and unused government institutional lands. Though rare, some of the farmers also relocate to private lands. The charge on almost all government lands (both open and institutional) are almost for ‘free’ for farmers since they do not pay or pay a token amount for their use. The farmers usually belong to the low-income bracket and cannot purchase unused land in GAMA. They, therefore, always relocate to these types of lands when their lands are taken from them. This is how some of the farmers explained their strategy:

“They have sold all those places and they have built houses all over there... if it was not for the sake of the high tension we would not have security/safety to farm”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

“Here, it is government lands...they called us to come and work on it so I came and as God’s gift, they gave some land to me”.

(Siddiq, 21 years of farming, Personal Interview, GAEC, June 2016)

Table 7.3: Intensification and Strategic Planting Response from Survey

Strategy	Frequency	Percentage
Relocate to ‘High Tension’ Lands	55	21.91
Use of Multiple Farms	63	25.09
Relocated	36	14.34
Use Gov’t Land	206	82.07

Source: Field Data, 2017

Table 7.3 indicates that 36% of the farmers had relocated to other lands for farming since they started farming in Accra, 21.91% of them were farming under high tension grid lines while 82.07% of the farmers noted that they farmed on government lands since they are very secure.

Even though Bancheva et al. (2013) stated categorically that urban farmers use the high tension lands as an adaptation strategy. Allen et al. (2014) noted that their use is a coping strategy to the continuous dwindling of lands in Accra. This assertion is in line with the findings of this study.

Some farmers too have not moved to any place for the several years of farming on their lands though their spaces are becoming small. The farmers who do not own lands do not have any spare lands and still use these open government spaces. On the other hand, the indigenous people believe that though there are purported attempts by the local chiefs and government institutions like the Ghana Army in La-Tseaddo to take their lands, they will still not relocate because they are the rightful owners.

There are groups of farmers among these farmers who, they have lands outside GAMA where they can farm and bring their produce to the city, have decided to look for unused lands in the city because of profitability and other market opportunities that city environment brings to their farming activities. Members in this category of farmers have rather expanded their lands by having two or more farms at different farm sites. Many of such farmers can be found at GAEC and Ashongman. Table 7.3 also indicates that 25.09% of the farmers have multiple farms at different locations in GAMA. The extra lands serve as a security for them in case they lose a land or want to produce more. This is how some of the farmers strategised:

“Initially the farm size was small, but as you can see, I have extended it to cover the entire plot.”

(Yakubu, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

“Dzorwulu, the land is small so we were there and Atomic (GAEC) people called us to come and work here”.

(Malik, 31 years of farming, Personal Interview, GAEC, June 2016)

7.2.4 Use of Essential Farming Technology

This form of adaptation is caused by improved and better market conditions, improved financial earnings and security and safety on present lands that are the positive effects of urban change while it is also caused by pressure on dwindling lands as a negative effect of urban change. Farmers asserted that in order to survive and take full advantage of the changing nature of the cities and minimise its negative impact, they use essential farming methods. They further noted that the use of modern and enhanced farming technology helps in meeting the increased market demand which also helps in improving their profit as well as their survival as farmers in GAMA. On the other hand, farmers also realised that they had to make full use of the relatively smaller land sizes by embarking on land intensification practices which required some form of advanced farming technology. Farmers, therefore, used both improved organic and inorganic fertiliser on their farms. They also applied modern forms of pesticides and weedicides on their farms. Again, they employ sprinkler or pipe based irrigation so that they would be able to maximise output throughout the year. Others employed the services of tractors to clear their lands as an activity of land preparation for planting. The following capture the views of some of these farmers about this issue:

“Currently, we have noticed the salt content in the soil has increased and that has affected our yield a lot. Therefore, to increase our yield, we have to use fertilizer a lot...like Ammonia”.

(Abubakar, 15 years of farming, Personal Interview, Tema Motorway, June 2016)

“We normally don’t apply too much fertilizer because if you do that too much the land will become ‘some way’, it won’t be good. So now we use this fertilizer, the manure that we normally use... so it can sustain the land ...so we can farm for longer years because that one helps the land”.

(Mawutor, Male, 9 years of farming, Personal Interview, GAEC, June 2016)

“Some of the recent technology is the pumping machine we are using and we have tubes so as we are talking, I can lay them and they will water the whole farm. I just have to go switch it off when it is done but in 1995, it was the water can to water half or one acre. How much farm can you farm? Technology is what we should be using... there is a medicine called ‘Stop’... it is use to spray weed so you farm even 20 hectares and the rate at which weeds disturb you is reduced to its lowest limit. It controls the weeds for 6 weeks by which time the crops would be long grown. If you don’t have some and you don’t have some but if, you get some it is good”.

(Kwame, 20 years of farming, Personal Interview, Okponglo-Legon, June 2016)

“If you want your work to turn out good, then chicken droppings or the manure is the best. If you apply it to the farm even after two years, it still gives good yield. Just a little fertilizer and it turns out good”.

(Morro, 27 years of farming, Personal Interview, Tema Motorway, June 2016)

Table 7.4: Use of Essential Farming Technology Response from Survey

Strategy	Frequency	Percentage
Use of Inorganic Fertiliser	226	89.64
Use of Organic Fertiliser	221	88.05
Use of Spraying Machine	205	81.67
Use of Tractor	152	60.55

Source: Field Data, 2017

Table 7.4 indicates that 89.64% of the farmers use inorganic fertiliser, while 88.05% use organic fertiliser. The survey also indicates that 81.67% of farmers use spraying machines for the application of weedicides, pesticides and other chemicals while 60.55% use tractors. The use of tractors are common in places like La-Tseaddo, Tema, GRIDCo,

GHAIP and Tema Motorway but not in places such as Korle-Bu, Dzorwulu and Ashongman where the land sizes are relatively smaller. This is how a farmer expressed it:

“Yeah, we use tractors”.

(Morro, 27 years of farming, Personal Interview, Tema Motorway, June 2016)

Ghana urban agriculture has seen the introduction of newer technology and farmers are using it to their advantage. Asomani-Boateng (2002) maintained that few farmers could use hired tractors during his study because even peri-urban land available was extremely low to encourage the use of tractors. From this study, the use of tractors has not been the preserve of farmers with ‘large lands’ but because the technology is at the door step of farmers who want to be efficient as well. They use it to take advantage of the increasing demand of their products.

7.2.5 Use and Train Labour from Multiple Sources

This adaptation strategy mainly aims at dealing with labour supply challenges (See Table 6.3), at the same time taking advantage of the improved market conditions (See Table 6.2) and the related positive effects urban change brings. Farmers asserted that due to the increasing difficulty of having reliable labourers on their farms, they have resorted to using labourers from multiple sources who can appropriately help their businesses grow. They use migrant labourers who mainly come from the northern part of Ghana and those who sometimes come from Burkina Faso. Most of these labourers are people they go for, mostly from their hometowns. Some of these workers are even related to them. This is because the labourers brought directly from the northern part of Ghana are more reliable, hardworking, and committed to the farm business. This is how some farmers expressed it:

“Many of them (labourers) are Burkinabes...how do they called it? “Pagza” or “Losofo”. You see from Burkina to Bawku, it’s all farming...For Accra if you want a child (shaking the head and sucking the teeth)...even if they don’t go to school, they will play the computer, play computer to gain money but he won’t come here to waste his time. We ourselves will not even take a person from Accra. If only we get to know, you are from Accra, we will not employ you”.

(Malik, 31 years of farming, Personal Interview, GAEC, June 2016)

“...difficult convincing people to help in the farming but now when I go to my hometown (Bawku). There are more people seeking for employment”.

(Mumuni, 24 years of farming, Personal Interview, GAEC, June 2016)

“The challenge is the youth in Accra think farming is a difficult job and because they want quick job they find it reluctant to engage in farming. Therefore, we source our labourers and workers from the northern part of Ghana”.

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

Table 7.5: Labour from Multiple Sources Response from Survey

Strategy	Frequency	Percentage
Use of Migrant Labour	72	28.68
Use Family Labour	85	33.80
Use Female Labour	119	47.41
Train Labourers	128	51

Source: Field Data, 2017

The survey results in Table 7.5 indicate that 28.68% of farmers purposely use migrant labour from the northern part of Ghana and Burkina Faso as a strategy to deal with unreliability of labour for farming. The findings of this study confirms the findings of other studies in Ghana where they have observed that migrants from Burkina Faso and Mali sometimes come to Accra to work as farm labourers. These studies have also indicated

that labourers from the northern part of Ghana are very common on urban vegetable farms (Okrah, 1984 in Asomani-Boateng, 2002; Asomani-Boateng, 2002).

There are also situations where labourers who are hired by farmers from Accra show commitment and avail themselves to be trained. Though the training is not formal, farmers train these workers as they work with them. The farm work is very tedious and there is always the need to have extra hands to work with irrespective of the difficulty in finding reliable farm hands. Table 7.5 indicates that 51% of the farmers train new labourers who they find for the farming activities. This is how a farmer expressed it:

“We train them, some do not know how to do it but those coming from the north and the Volta they know they do it there too so they know how to transplant it but those who are in the south they are learning so we teach them”.

(Agyemang, 6 years of farming, Personal Interview, GAEC, June 2016)

Another strategy farmers use is that they use family and female labour, though the family labour use is extremely low. The farmers sometimes work with their brothers, nephews, nieces, and sometimes children though this is very rare. This is because the relatively low wages labourers receive serves as a disincentive for strictly hired labourers but more accepted by relatives who are normally from the same households in the city. Farmers also hire women a lot during the planting and harvesting stages of farming, especially for onions. This is because these women are mostly poor migrants who are partially employed and engaged in temporal jobs such as cleaning and part time selling and this makes them mostly available for use at the farm. This is how a farmer expressed it:

“Women, it is the women who really helped us. The onions we plant here it is the women who planted all of them for us”.

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

Table 7.5 indicate that 33.80% and 47.71% respectively use family and female labour in order to reduce labour cost and meet production demand for vegetables. Even though urban farm owners are dominated by men (Armah-Klemesu & Maxwell, 1998; Asomani-Boateng, 2002) women are seen as key during the growing of crops, an assessment which is in line with the findings of Obuobie and Hope (2014).

7.3 Marketing Related Adaptation

The themes and codes of the marketing related adaptation are indicated in Table 7.1

7.3.1. Customer Management

With respect to customer management, farmers have adapted strategies on how to manage customers in the light of the changing customer demands. The farmers in GAMA have three forms of customers, which are the middle persons (mostly market women) who are the core, hotel and restaurant operators, and direct customers who buy the vegetables directly from the farms for consumption. With the middle persons, farmers make sure they relate well with them and sell their produce to them at reasonable prices. In addition, they also give them the first option to buy when their produce are ready. Based on this, middle persons are also faithful to them especially in difficult times, when their produce are over supplied on the market. This is how some farmers expressed this strategy:

“Always you have to keep your customers so in times of bumper harvest they will be able to buy for you. But if every day they come and buy and it is already sold, next time if you call them they will not come and buy”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

“At times, I call, at times they call. When my produce are ready it is I who calls them ‘my produce are ready come and see’ and at times they call and ask if my produce are ready”.

(Ebo, 8 years of farming, Personal Interview, Dzorwulu, June 2016)

This is a key finding on urban agricultural marketing in Ghana, because this study asserts that customer management and relationship with middle persons and customers is a key strategy urban farmers use in the selling of their produce. Though farmers deal mostly with middle persons and their customer loyalty to the latter is very visible, farmers also show a high level of loyalty to their direct customers and hotel and restaurant operators. Though not a common adaptation strategy, there is a situation where a farmer who had established a good relationship with a hotel sometimes become a middle person and supplies them with vegetables when his produce are finished. This is the story of Hamid, a farmer on the CSIR land as indicated in Case 7.1.

Case 7.1: *Situation of Hamid, a Farmer on CSIR Land*

Hamid is a 30-year-old farmer who has been growing vegetables for 16 years. He is into the growing of varieties of exotic vegetables. Some of the crops he grows are radish, Chinese cabbage, mint and parson in addition to other popular ones. Because his products are peculiar to foreigners, he has quite a large market from both foreigners, and the restaurants and hotels around. His youthful exuberance and understanding of farming as good business in the city has made him both a producer and marketer of vegetables. Hamid even goes outside his farm to buy from other farmers when his clients are demanding vegetables at the time he does not have them. He has been able to maintain a good customer relationship with his clients because he has realised the appreciable benefits urban change brings to his farming activity in the form of increased profitability and earnings. This is how he expressed it:

“Because it is a business that am doing...and you know as for the hotel people to... it is a relationship that you are doing ...by supplying vegetables to them whether it rains or shines you have to get and bring it. The hotel wouldn't have time to go out and buy so anytime that it shorts (limited in hotel's store) or something... he just calls you and says, I need this and this and that”.

(Hamid, 16 years of farming, Personal Interview, CSIR, June 2016)

7.3.2 Observe Market Trends when Planting

This adaptation strategy is a response to the positive effects of improved and better market conditions and its related benefits of improved financial earnings and important source of livelihood. This adaptation strategy on the other hand is in response to reduced earnings and market risk and uncertainty. This is because when farmers use this adaptation strategy, they are able to take full advantage of the market, make profit and also minimise losses and risks. Farmers indicated that as the market dynamics in the city change, they also take note and adapt accordingly. They study market trends and bring the produce which will sell most to the market. This is how some of them expressed it:

“It is like if you go to town. Let us say the market, you know what sells, and what does not sell because you won’t be staying here only, you have to go round and check the market before you do your work because the important thing is about the market...before planting it, you have to know about the market because you cannot cultivate all and only eat it... you are doing it for business to sell so you have to know about the market before planting it”.

(Hamid, 16 years of farming, Personal Interview, CSIR, June 2016)

“What happens is, we study the market and identify what is in demand and grow that one. We were also advised by the local market people to grow other types because of its demand within a particular year.”

(Kangayo, 26 years of farming, Personal Interview, Dzorwulu, June 2016)

In studying the market trends, one strategy farmers use is that they sell directly to consumers. Some years ago, farmers would carry their goods to the market centres and sell them but now this practice is no more as most of the farmers sell their produce from their farms directly to customers without using any middle persons when the need arises. They sell to the middle persons or directly to the hotels and restaurants when they are supposed to. This is how some farmers expressed it:

“Market people, those from homes all of them, they all come.”

(Mustapha, 18 years of farming, Personal Interview, GBC, June 2016)

“Most of the okra, they (customers) come here (to the farm) to buy it.”

(Ndetsi, 22 years of farming, Personal Interview, La-Tseaddo, June 2016)

Direct sale to farmers and use of middle persons for restaurants and hotels and traditional markets have been attested in other studies on urban agriculture in Ghana (Egyir et al., 2014; Henseler & Amoah, 2014; Obuobie & Hope, 2014).

Farmers have also adopted the use of ICT in the marketing of their produce. This is mainly through the use of mobile phones. Even though Egyir et al. (2014) noted that farmers had mobile phones, they could not specifically state how these farmers used them for the marketing of their produce as specifically noted in this study. Farmers communicate with their customers, receive and provide updates on market trends and availability of goods.

This is how a farmer expressed it:

“At times, I call, at times, they call. When my produce are ready, it is me who calls to tell them my produce are ready, ‘come and see’ and at times they call and ask if my produce are ready”.

(Mustapha, 18 years of farming, Personal Interview, GBC, June 2016)

7.4 Finance Related Adaptation

The theme and codes for the production adaptation are indicated in Table 7.1. Under this section financial management was the only strategy realised.

7.4.1 Financial Management

Farmers employed different financial strategies to survive the negative effects of urban change which are reduced earnings, market risks and uncertainty and pressure on dwindling lands (See Table 6.3); and take full advantage of the positive effects which are improved market conditions, improved financial earnings, more reliable sources of livelihood, improved living standards and freedom and fulfilment to work as entrepreneurs

(See Table 6.2). The strategy of financial management can be divided into two. The first is the raising of money for farming activities, and the second is the management of financial resources. With respect to raising money for farming activities, some of the strategies farmers used included borrowing, use of contract farming, and reinvestment of capital. Farmers sometimes borrowed from market women, relatives and other sources when they experienced financial difficulties. This is how some farmers put it:

“...when the market is not good, we don’t get anything. It gets to a level where you don’t have 10pesewas on you. Then you go to people to borrow money from them promising you will pay back when things work out. This is very disgraceful”.

(Mawutor, 9 years of farming, Personal Interview, GAEC, June 2016)

“Ooh when I took it (loan) for what I was doing, it helped me.”

(Abanga, 19 years of farming, Personal Interview, Tema Motorway, June 2016)

“Yes, I take loan. It is loan that I work with...it is indeed loan that I work with. I will not lie to you; it is loan that I work with”.

(Odotei, 30 years of farming, Personal Interview La-Tseaddo, June 2016)

Table 7.6: Financial Management Response from Survey

Strategy	Frequency	Percentage
Borrow to finance production	30	11.9
Practice Contract Farming	23	9.16
Practice Financial Planning	45	17.93
Reinvest profit	233	92.82

Source: Field Data, 2017

The findings of this study are in line with suggestions made by other studies (Danso & Drechsel, 2003; Egyir et al., 2014; Obuobie & Hope, 2014) on urban agriculture in Ghana,

where they have asserted that urban farmers obtain credit from middle persons, friends and relatives and sometimes from their own businesses to finance their farming activities. Table 7.6 indicates that out of the 251 farmers surveyed, 11.9% admitted that they borrowed to finance their production. In several African cities, Cabannes (2012) noted that one of the main ways of financing urban agriculture is by borrowing from non-formal institutions such as friends and family.

Contract farming does not involve documentation but an oral agreement between the middle persons and the farmers. This request can come from middle persons or farmers for which both parties may respond positively to. The market women provide them with some form of pre-financing package, which makes these oral agreements binding. Though not all farmers are involved in these informal contracts, others use them as a strategy to pre-finance their farming activities because they serve as a means of credit to them. The survey data indicate that 9.16% of the farmers used contract farming as a strategy to finance production. Henseler and Amoah (2014) for example, have noted that informal contract farming has also been a key strategy of urban farmers in engineering their finances even though they did not link it to urban change. This is how some farmers expressed the strategy of contract farming in this study:

“Buyers come and sometimes they say if you plant this, I will buy them for you so you also have to grow them for the person”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, June 2016)

“With the loans, we don’t get people to lend us; maybe it is your customer you arrange with. Let’s say, you arrange that you have bought everything apart from fertilizer so you borrow like 300 cedis or something to buy the fertilizer and the price for it is also 150 cedis for one bag and if you are able to buy 2 which is 300 cedis... so with this 300 cedis, if it is given to you to buy, then all the work produced will be given to her to buy and sell”.

(Andrew, 10 years of farming, Personal Interview, GAEC, June 2016)

“I have some (middle persons) I work with. For them in case of need...maybe I have cultivated something, which is not ready yet, I can contact one and say maybe I am hard up or I am dry, so I need this. The middle person can give it to me, and when that person comes to buy the produce, it is deducted from it. For them, anytime I have goods, I make them buy first. What is left is then I sell to the rest”.

(Baaba, 28 years of farming, Personal Interview, Dzorwulu, June 2016)

With respect to financial planning, farmers expressed that they try as much as possible to keep some for their profits and save them for future production. With this strategy, some farmers do not borrow at all but rather reinvest their capital by employing prudent financial strategies. This is how a farmer voiced it:

“It all depends on you the individual working and how hard you plan. After selling, you buy your medicines, what you use for food, what you will use for your rounds. All of these you calculate it down always you will live alright. So the work it differs from individual to individual and how they do theirs. So for me I have never taken loans. Even the women I work with, I have never taken a loan from them before... since I started working. I will not even take it but if my things are ready and then we have agreed on a price say 200 cedis then I can say I need 100 cedis and if the person comes to harvest, I take the balance later”.

(Bonsu, 25 years of farming, Personal Interview, Dzorwulu, 2016)

Table 7.6 indicates that 17.93% of the farmers used financial planning while 92.82% used reinvestment of profit as financial adaptation strategies in their farming activities.

7.5 Differences in Urban Farmers' Adaptation to Urban Change

The chi-square analysis indicated that there were differences in the three forms of adaptation intensity under study at the different clusters. The chi-square test for production, marketing and finance adaptation intensity were significant at 1% significant level with. Also the F-statistics for the ANOVA for between the farm sites for the three

adaptation intensity were all significant at 1%. The results of the chi-square test and ANOVA are indicated in table 7.7.

Table 7.7: Responses on Improved Financial Earnings

		Mean	Mean	Mean	Total
MMDA	Site/Cluster	Production	Marketing	Finance	Mean
		Adaptation	Adaptation	Adaptation	Adaptation
		Intensity	Intensity	Intensity	Intensity
	Airport	1.81	0.94	0.57	1.11
LADMA	La-Tseaddo	1.68	0.89	0.43	1.00
	Dzorwulu - Fiesta	2.77	0.98	0.54	1.43
AMA	Royal				
	Dzorwulu Ebony	1.24	0.84	0.30	0.79
	CSIR	1.91	0.92	0.27	1.03
	Okponglo	1.00	0.65	0.32	0.66
	Korle-bu	0.92	0.84	0.49	0.75
	Ashongman	1.98	0.87	0.41	1.09
Ga East	GAEC	1.01	0.60	0.25	0.62
LANMMA	Pantang	1.51	0.68	0.33	0.84
ASMA	Ashaiman	0.87	0.73	0.48	0.69
ADMA	Tema Motorway	1.38	0.77	0.41	0.85
	Klagon	1.80	0.68	0.39	0.96
TMA	Sakumono Beach				
	Road	2.88	0.96	0.62	1.49
	GHAIP	1.01	0.90	0.45	0.79
KKMA	GRIDCo	2.27	0.98	0.70	1.32

Source: Field Data, 2017

Table 7.7 clearly indicates that with respect to production, sites such as Dzorwulu Fiesta Royal, Sakumono Beach Drive and GRIDCo had high adaptation intensity where sites such as Korle-bu, GAEC and Ashaiman had low adaptation intensity. With respect to marketing, though the differences are not as clear as production, sites such as Airport, Dzorwulu Fiesta Royal, Sakumono Beach Road and GRIDCo were relatively higher compared to sites such as GAEC and Opkonglo. With the finance adaptation differences, sites such as Airport, Sakumono and GRIDCo were relatively higher compared to places such as Klagon, GAEC and CSIR. With respect to the total mean adaptation, Dzorwulu, Sakumono Beach Road, Airport and GRIDCo were leading with other sites such as GAEC, Opkonglo and Ashaiman at the bottom.

7.6 Factors influencing Urban Farmers' Adaptation to Urban Change

The section presents the ordinary least squares estimates of the factors that influenced urban farmers' adaptation to the effect of urban change. The hypothesis tested was that urban farmers' adaptation to the effect of urban change is influenced by personal and farm characteristics as well as institutional factors. The results of the estimates are indicated in Table 7.8.

7.5.1 Personal Characteristics

The number of places farmed by a farmer within GAMA increased the urban farmers ability to adapt to the effect of urban change in the area of production. This was significant at 5% at a marginal effect value of 0.212. The region of birth also positively predicted urban farmers ability to adapt to the effect of urban change relating to production and marketing but not finance.

Table 7.8: OLS Estimates of Factors affecting Urban Farmers Adaptation

Category of Variable	Variable	Production Related Adaptation	Marketing Related Adaptation	Finance Related Adaptation
Coefficients/Marginal Effects				
Personal Characteristics of farmers	Years of farming in Accra	-0.00264	0.00120	0.00317
	Sex	0.0392	-0.0754	0.173
	Level of farm engagement	0.190	-0.0820	-0.253***
	Region of birth	0.225*	0.162*	0.0657
	Household size	0.0556***	-0.00242	0.00354
	Level of education	0.300**	-0.0203	0.0192
	Places farmed in GAMA	0.212**	0.0578	0.0419
Farm Characteristics	Vegetable production intensity	0.0142***	0.00525*	-0.00377**
	Total land size	-0.0136	-0.00286	-0.0221
	Total labour employed	0.0189**	0.00990***	0.00730**
	Use of pumping machine	0.149	0.0581	0.0655
	Use of weedicide	0.351*	-0.107	0.0434
	Use of organic fertilizer	0.0920	0.182	-0.00538
	Use of inorganic fertilizer	-0.284	-0.0176	0.0564
Use of ploughing machine	0.00376	-0.0498	0.0773	
Institutional	Open Government Land	-0.0856	0.129*	-0.0360
	Constant	-0.0551	2.169***	0.942***
	Observations	251	251	251
	R-squared	0.262	0.097	0.162
	F-Statistics	4.34***	2.18***	3.00***

*** p<0.01, ** p<0.05, * p<0.1

Source: Field Data, 2017

This means farmers who were born in GAMA can adapt more to the effect of urban change in the area of production and marketing than farmers who were born outside GAMA. Region of birth and places farmed in GAMA proved to be consistent in their positive

influence when it comes to adaptation to urban change though not in all areas. Farmers with larger household sizes significantly increased the intensity of urban farmers' adaptation in the area of production and finance but decreased with respect to marketing even though finance and marketing were not significant. The direction of how the level of education influences adaptation is similar to that of household size because level of education has a positive influence on production and finance adaptation intensity and negative effect on marketing; with only production related adaptation representing as significant. Since the base of the level of education was primary, farmers who had primary education increased their production adaptation intensity more than those had other levels of education by 0.0556. Level of farm engagement decreased finance related adaptation intensity but did not influence production related adaptation and marketing. This means farmers who were full time (base for level of farm engagement) adapted less in terms of finance intensity due to the effect of urban change.

The findings of this study can be compared to others on how personal characteristics of farmers affect farmers' adaptation in general. With respect to level of farm engagement, for instance, it can be compared to Deressa et al. (2009), which found that farmers who earned more farm income had a higher adaptation in production than farmers who earned less. On the variable of household size the study's finding is different from that of Uddin et al. (2014), which observed that when the household size of a farmer decreases, adaptation to climate increases and vice versa. Similarly, Tessema, Joerin and Patt (2018) observed that farmers with larger household sizes adapted more to climate change. The positive relationship of household in this study could mean farmers may rely on household labour for production since hired labour may not be that reliable for production in urban agriculture as the qualitative analysis has suggested.

With respect to the level of education, the observation of this study is different from that of other studies where they discovered that farmers with higher education were more capable of adapting to climate change than farmers with lower levels of education (Deressa et al., 2009; Apata, 2011; Uddin et al., 2014; Tessema et al., 2018). The findings of Bahinipati and Venkatachalam (2015), on the other hand, is a little similar to that of this study because the former realised that those who had lower education adapted more in terms of using salt and flood tolerant indigenous paddy seeds as a production adaptation strategy to climate change.

7.5.2 Farm Characteristics

With respect to farm characteristics' influence on urban farmers' adaptation, total labour employed significantly increased production, marketing and finance related adaptation intensity at 5%, 1% and 5% respectively. Vegetable production intensity which is the total number of times a farmer grows vegetables increased production and marketing related adaptation but decreased finance related adaptation. Farmers who used weedicides adapted more to production, less to marketing and more to finance even though only production adaptation proved to be significant. This implies that a farmer who uses weedicides adapts more to the urban change than a farmer who does not use it. This means farmers use weedicides as a way of maximum the limited land available to them and crop production as well.

7.5.3 Institutional

Open government as a predictor of adaptation is significant in terms of marketing but not production and finance related adaptation. Even though open government land predicts marketing related adaptation, it is not that significant (10%). This implies that it does not matter much the type of land a farmer farms on because it does not really predict his or her adaptation to urban change, whether private, family or native, or government institutional lands.

7.6 Conclusion

Farmers used different strategies to adapt to both negative and positive effects of urban change that affect urban agriculture. While some of these adaptation strategies target particular effects, others target more than one. Even though some of the adaptation strategies targeted one effect they have rippling effects on farmers. Some of the adaptation strategies were not used by all the farmers but the descriptive statistics proved that an appreciable number of farmers embarked on the adaptation strategies realised under the qualitative analysis. The chi-square and ANOVA tests indicate that there are clear differences in adaptation intensity with respect to the various farm sites within GAMA. The regression estimates found that farmers' personal characteristics predicted their production adaptation than farm characteristics and institutional factors and farm characteristics also predicted that of market and finance related adaptation as well as production related. In addition, production adaptation can be predicted more by personal and farm characteristics than marketing and financial adaptation.

CHAPTER EIGHT

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

8.1 Introduction

This is the final chapter of the study. It contains the summary and the conclusions drawn from the findings. It also provides policy recommendations, indicates the study's contribution to knowledge and makes suggestions for further research.

After engaging literature on urbanisation and urban agriculture, it was observed that there was a paucity of research in some aspects of urban agriculture in Ghana, notwithstanding the numerous research that have been conducted. These gaps were as follows:

- i. A firm linkage between urban change in Ghana and its effects on urban vegetable farming had not been well explored and explicitly established in the extant literature.
- ii. The various dimensions of urban agriculture (such as production and marketing) which are affected when the urban centre goes through a change had not been explicitly addressed in existing literature. In addition, the nuances that crops up when one dimension of urban agriculture affects another as a result of urban change had not been well addressed in literature.
- iii. Even though some studies have indicated that urbanisation affects urban agriculture, the focus of the effect had been on the negative effects with the positive effects almost missing. Besides the negative effects had been narrowed to land with other dimensions such as changed climatic patterns and farm labour supply challenges had been not well considered.

- iv. The conceptualisation of adaptation of farmers had not been properly linked to urban change. Besides the adaptation strategies indicated in literature had well specified as to which changes they are targeting; which were for positive or negative reasons.
- v. The methodological approach used in studies on urban agriculture adaptation had been predominantly qualitative with almost the quantitative aspect non-existing. Besides, the only areas that were known for urban vegetable farming have been considered in existing studies with the unknown areas left out.
- vi. How institutional actors in urban agriculture influenced urban farmers' activities during the process of urban change had not been explored in literature.

Based on these concerns in research, the study raised the key research question; how are urban farmers adapting to the effects of urban change on their farming activities within the framework of laws, policies, and actions of formal institutions which influence urban agriculture'? This was followed by these sub questions:

- i. How are the frameworks and roles of institutional actors influencing urban agriculture within the context of urban change?
- ii. How does urban change affect urban farmers' farm decisions and actions?
- iii. What strategies are urban farmers using in adapting to the effect of urban change?

The study was situated in two main sets of theories. They were theories which explained urban change and its effect, and those which explained the adaptation of farmers to the change. The urban change theories were modernisation theory of urbanisation and the resilience model while that of adaptation were the protection motivation theory, theory of planned behaviour and social cognitive model. The philosophy which underpinned the

design of the study was the pragmatist approach. This approach combines both the positivist and interpretivist approaches to research. Based on this philosophy, a sequential mixed method which first used a qualitative research approach for its analysis and later followed with a quantitative approach was used. The qualitative data sources included interviews from 29 farmers of which two were key informant farmers and 13 other key informants from 12 institutions. The quantitative sources of data were obtained through a survey of 251 farmers and a rainfall, temperature and humidity data from the Ghana Meteorological Agency (GMA). The qualitative data was analysed by doing a content and thematic analysis of the transcribed interviews and the quantitative data was also analysed using principal component analysis, ANOVA, Chi-square and ordinary least squares.

8.2 Conclusion

The following conclusions were made based on the key findings of the study:

8.2.1 The Legal and Policy Frameworks and Institutional Actors Influencing Urban Agriculture

With the objective of examining the legal and policy frameworks and institutional actors influencing urban agriculture, some conclusions were drawn. They were first, there is still no comprehensive urban agriculture policy document in Ghana even though government sees urban agriculture as a very important area that needs promotion and attention. The few policy documents available are on other aspects of urban agriculture such as water use in general in farming and also indicate government's concern and interest to promote UA.

Second, the policies on water use and land especially are not strictly adhered to since institutions concerned such as MoFA offices, health directorates and environmental and sanitation offices at the MMDAs are limited in resources in controlling and regulating their use.

Third, the various institutions which promote urban agriculture play roles which are similar and overlapping. Some of these are training of farmers and provision of logistics. Even though they succeed in collaborating in some areas in the promotion of UA, the collaboration and coordination among them is not always strong.

Fourth, the institutions which serve as landlords to these farmers have no official agreement with the farmers who are using their lands. This means that the farmers have no guarantee and can therefore be asked to leave the land at any time. Finally, these institutional landlords sometimes mistreat these farmers since the farmers have no place to farm on when they lose their farmlands. It can therefore be concluded that some roles and frameworks of institutions such as provision of land, training and logistics are very helpful to farmers while those on land, especially, make farmers uncertain about their future in the city.

8.2.2 Urban Change and its Effects on Urban Farmers' Activities and Decisions

The conclusion drawn from this objective is that there have been changes in GAMA over the years and these changes have affected urban farmers' decisions and actions in terms of production, marketing and finance. Some of the effects of these changes have been only positive, others only negative while others have resulted in both negative and positive consequences to the farmers. These changes include climatic and weather patterns which affect temperature and rainfall patterns; built environment which include increase in the infrastructure, housing and road network; population and lifestyle dynamics which includes increased foreigner population, prevalence of western lifestyle and changed eating habits; increase in price level which include high prices of goods and services; and land ownership and use which includes encroachment on native farm lands. The positive

effects of these changes on farmers' activities include improved transport accessibility, improved market conditions, improved living standards and safety and security on present lands. The negative effects on the other hand include water use challenges which include use of polluted water; pressure on dwindling farmlands which includes a situation where buildings are taking over farm lands; and farm labour supply challenges which include farm labour scarcity and unreliability. In addition, it cannot be concluded that the positive effects of urban changes outweigh the negative ones or vice versa.

8.2.3 Urban Farmers adaptation to urban change

The findings show that farmers have responded to the changes they have witnessed in GAMA over the years by employing several adaptation strategies. While some of the strategies targeted a particular effect, others targeted more than one. The adaptation strategies which focused on production included the use of different water sources for farming, intensified and strategic planting, relocation to cheap and free lands and train labour and use multiple labour sources. Those that focused on marketing included managing customers and observing market trends before planting vegetables while finance related adaptation included the use of prudent financial management skills. The findings of the study also show that when it comes to farmers' adaptation to urban change, the characteristics of farmers, farm characteristics and institutional factors play a role and production adaptation can be predicted more than marketing and finance adaptation by personal and farm characteristics of urban farmers in the context of urban change. Also when it comes to adaptation with respect to the various farm sites, some areas adapt more in production, marketing and finance as compared to the others. The highly adapting areas are mainly GRIDCo, Dzorwulu Fiesta Royal and Sakumono Beach and the low ones are Ashaiman, Tema Motorway and GAEC.

8.2.4 General Conclusion

It can be concluded that there is a firm linkage between urban change, urban agriculture and urban farmers' adaptation. The change in GAMA can be explained by the theory of modernisation; which means the concepts of westernization and neoliberalism which are key features of the modernization theory have also proven to be key features of the change in GAMA in affecting urban farmers. Examples of these are high land commercialization, improvement in technology and crave for western lifestyle; which were all found in the study.

Farmers have also shown some high resilience to the change in GAMA in adaptation through various means and it can be explained by adaptive capacity, a key component of the theory of resilience which asserts that when a system goes through a change it has the capacity to adapt. Farmers' adaptation to the effect of urban change can be explained by the social cognitive model, theory of planned behaviour and protection motivation model, theories which assert that response to change can be explained by personal and environmental factors.

8.3 Policy Recommendations of the Study

The conclusions made from the study call for policies which have to be formulated to make urban farming important in food security provision and other the socioeconomic benefits it provides to farmers as Ghana urban centres go through a process of rapid change. The studies recommendations have therefore been categorized into the short, medium and long term strategies.

8.3.1 Short Term

In the absence of the formation of an urban agriculture development authority which is medium term strategy in my view, the MoFA offices at the MMDAs can help famers by

coordinating the activities of these institutions that help in the promotion of urban agriculture for efficient transfer of production technologies and marketing and financial skills to these farmers. This will avoid the repetition of roles of institutions and augment government efforts in promoting urban agriculture. Institutions supporting urban agriculture must use multi-faceted and targeted strategies in helping farmers to adapt to the positive and negative effects of urban change.

MMDAs should be in constant discussions with the institutions whose lands are been used by the farmers while permanent places for farming in within the GAMA are identified and maintained in the long term. MMDAs and the MoFA offices and concerned and NGOs should make a conscious effort to sensitize government agencies and urban dwellers on the opportunities urban agriculture brings to urban dwellers in a rapidly urbanising city. This should especially focus on employment creation, food security and general welfare improvement among some sections of the urban poor.

Farmers in the low adapting areas should find out why farmers in the other sites are adapting more and if it is for a better reason and yielding better results, they should learn from this high adapting farmers. On the other hand, farmers in high adapting sites should learn why their colleagues are adapting less and if it is for a positive reason , they should learn also from them.

8.3.2 Medium Term

In the absence of the proposed comprehensive urban agriculture policy, there should be the formation of an urban agriculture development authority in Ghana. This will be a semi-autonomous body which will be under MoFA. This body will address the issues of training of urban farmers, coordination between institutions which influence urban agriculture

especially in the area of production and even help in the formulation of laws that protect urban farmers in any part of the country with respect to land and water use as well as their welfare and human rights. This authority will be ultimately tasked with the drawing a of comprehensive urban agriculture policy for Ghana.

8.3.3 Long Term

Urban farmers have, to some extent, been left out in Ghana's urban development due to the lack of a comprehensive urban agriculture policy document in Ghana. Therefore, one key long term recommendation of this study is that a comprehensive urban agriculture policy should be drawn. This policy will properly address the issues of making urban agriculture part of the urban spatial planning for current and future urban centres. As part of the spatial planning, a proper land ownership policy whose conditions favour farmers must be established. The policy should also factor in and make sure that an acceptable quality of water is used by urban farmers for their farming activities. There should also be a proper coordination and collaboration among institutions which influence urban agriculture in the policy document. It should also factor in the building of farmers capacity in the area of production, marketing and finance.

8.4 Contribution to Knowledge

The study has contributed to knowledge based on the results obtained in the following ways: first, in terms of concept, it has shown a firm linkage between urban change, its effect on urban agriculture and the adaptation of urban farmers. In terms of sample size and area coverage, it has also been able to analyse urban changes effect on urban farmers by covering a wider scope with a sample size of 251 and study sites which were 17 in all. By this, areas which were outside the known areas of UA studies have been included in a single study. Some of the new areas are Pantang, GHAIP, GRIDCo and Ashongman. The

study has also used quantitative analyses to study the factors that contribute to the adaptation of urban farmers to the effect of urban change and indicated that personal and farm characteristics as well as institutional factors are key. The quantitative analysis has also been used to indicate which areas in GAMA are adapting more or less as a response to rapid urban change in the area of production, marketing and finance.

8.5 Suggestions for Further Studies

The study, therefore, makes some suggestions for further studies. A tracer study of loss of urban farmers and lands for agriculture within the study area over the past 30 years should be conducted. A quantitative analysis of the negative and positive effects of urban change on urban farmers must be conducted to know which is more pronounced. Also a study on why some farms sites in GAMA are adapting at different intensity level must be investigated. A study on institutions' intentions of promoting urban agriculture in Ghana should be conducted. How the activities of illegal land occupants and encroachers on open government spaces are affecting urban vegetable farmers' activities should be looked researched into.

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APPENDICES

Appendix of Tables

Appendix Table 1: Profile of 29 farmers and 1 marketer interviewed

No	Pseudo Name	Age in yrs	Location	Place of Brith	Multiplicity of crops	Years of Farming in Accra
1	Agyemang	50	GAEC	Kade, ER	Single	6
2	Hamid	30	CSIR, Airport	Accra, GAR	Multiple	16
3	Siddiq	51	GAEC	Bawku, UER	Multiple	21
4	Seidu	35	GAEC	Bawku, UER	Multiple	19
5	Baaba	42	Dzorwulu Junction	Bawku, UER	Multiple	28
6	Kwame	44	Legon – Okponglo	Mampong, ER	Multiple	20
7	Ebo	36	Dzorwulu Ebony	Bisease, CR	Multiple	8
8	Mumuni	36	GAEC	Maamobi, GAR	Multiple	24
9	Amartey	63	GAEC	Accra, GAR	Multiple	48
10	Kangayo	50	Dzorwulu	Bawku, UER	Multiple	26
11	Ndetsi	76	La- Dadekotopon	Boadua, ER	Multiple	22
12	Bonsu	40	Dzorwulu Ebony	Berekum, BAR	Multiple	25
13	Hakeem	49	Tema Motorway	Bawku, UER	Multiple	15
14	Comfort	62	La-Dadekotopon	La, GAR	Multiple	42
15	Abanga	28	Motorway	Bawku, UER	Multiple	19
16	Chief	42	GAEC	Bawku, UER	Multiple	10
17	Yahaya	41	Motorway	Bawku, UER	Multiple	16
18	Yakubu	35	Tema Motorway	Bawku, UER	Multiple	15
19	Morro	56	Motorway	Tema, GAR	Multiple	27
20	Odotei	60	La Dadekotopon	La Dadekotopon	Multiple	30
21	Mustapha	65	GBC	Bawku, UER	Multiple	18
22	Mawutor	24	GAEC	Klikor, VR	Multiple	9
23	Amakye	49	GAEC	Asuom, ER	Multiple	15
24	Malik	45	GAEC	Bawku, UER	Multiple	31
25	Abubakar	42	Tema Motorway	Walewale, NR	Multiple	15
26	Hamza	55	CSIR	Bawku, UER	Multiple	20
27	Andrew	35	GAEC	Bawku, UER	Single	10
28	Akonai	65	Gridco	Accra, GAR	Multiple	20
29	Farouk	45	Korle-bu	Bawku, UER	Multiple	32

Appendix Table 2: Profile of Institutions Interviewed

No	Name of Institution	Area involved in Urban Agriculture	Location of Office
1	CSIR Office, Airport	Land and Research	Airport, Accra
2	BNARI, GAEC, Atomic	Land , Fertilizer and Research	Atomic, Accra
3	Environmental Health, LADMA	Water and Food Inspection	La, Accra
4	IWMI, Airport	Water, Market, Research and Government Collaboration	Airport / Roman Ridge, Accra
5	GRIDCo	Land	Tema
6	Agriculture Department, LADMA	Water, Food Training and Technology	La, Accra
7	Agriculture Department, LANMMA	Training in Water, Food Safety and Technology	Madina, Accra
8	Agriculture Department, LANMMA	Training in Water, Food Safety and Technology	Madina, Accra
9	Agriculture Department, GEMA	Training in Water, Food Safety and Technology	Abokobi, Accra
10	LUSPA Department, AMA	Land and Demarcations	Accra, Accra
11	Planning and Development Department, LADMA	Land, Demarcations and Logistics	La, Accra
12	Agriculture Department, TMA	Training in Water, Food Safety and Technology	Tema, Accra

Appendix of Interview Guides and Questionnaire

University of Ghana, Legon

Institute of Statistical, Social and Economic Research (ISSER)

PhD in Development Studies

Interview Guide

This interview is for collecting data for a PhD thesis titled: Adaptation of urban vegetable farmers to urban change in the Greater Accra Metropolitan Area. Every information given for the purpose indicated will be treated as confidential. Besides, your right to privacy and anonymity during and after the interview is assured.

Objective 1: *Examining the legal and policy frameworks and institutional actors influencing urban agriculture*

1. Which of the laws or by-laws in Accra are affecting your farming activities?
 - In the area of land use
 - In the area of water use
 - Others
2. How are these by-laws in the Accra promoting your farming activities?
3. How are these by-laws in Accra serving as a challenge to your farming activities?
4. In what ways are the activities of city authorities or government serving as incentives to your farming activities?
5. In what ways are the activities of city authorities or government serving as disincentives to your farming activities?
6. What about international organizations and NGOs (this is a follow up question to questions 19 and 20)?
7. How are the activities of the Ga chiefs, Ga family heads, and families affecting your farming activities?
8. What about your landlords and landowners (this is a follow up question to questions 22)?

Objective 2 & Objective 3

- Assessing the urban change and its effects on urban farmers' activities and decisions
 - Assessing the strategies urban farmers use in adapting to the effect of urban change.
9. How many years have you been farming in Crops in GAMA?
 - a. Between what period?
 10. Which place(s) in Accra have you been farmed since you started farming in GAMA?
 11. What factors have accounted for the change of locations in GAMA as a farmer?

12. Which types of crops do you grow now?
13. Do you think the city of Accra has changed over the years when it comes to your farming activities?
14. If it has, in what ways?
15. How have the changes affected your production activities and decisions in the area of :
 - Crop choice?
 - Water use and availability?
 - Land use and availability?
 - Labour use and availability?
 - Application of technology and choice of farm system?
 - Other areas of production?
16. How have these changes affected your production positively?
17. How have these changes affected your production negatively?

18. How do you strategize to take advantage of these positive effects of production?
19. How do you strategize to minimize these negative effects of production?
20. How have the changes affected your marketing activities and decisions in the areas such as:
 - Transportation?
 - Demand for vegetables?
 - Etc?
21. How have these changes affected your marketing positively?
22. How have these changes affected your marketing negatively?

23. How do you strategize to take advantage of these positive effects on marketing?
24. How do you strategize to minimize these negative effects on marketing?
25. How have the changes affected your decisions of finance in the areas such as:
 - Credit?
 - Investment?
 - Financial Management
 - Cost of production and marketing?
 - Others?

26. How have these changes affected your finance in farming positively?
27. How have these changes affected your finance in farming negatively?

28. How do you strategize to take advantage of these positive effects on finance?
29. How do you strategize to minimize these negative effects on finance?

Thank you

Interview Guide for Institutions

This interview is for collecting data for a PhD thesis and it is titled, 'Adaptation of Urban vegetable Farmers to Urban Change in the Greater Accra Metropolitan Area'. Every information given for the purpose indicated will be treated as confidential. Besides, your right to privacy and anonymity during and after the interview is assured.

Objective 1

Examining the legal and policy frameworks and institutional actors influencing urban agriculture

General Questions in the Interview guide

1. Looking at the level of transformation in GAMA, in what ways do you think urban farming is being affected?
2. How positive are these changes to the farmers?
3. How challenging are these changes to the farmers?
4. What is your organization's view in terms of the importance of farming?
5. What are some of your policies and laws that affects urban farmers the following areas of :
 - Production?
 - Water use
 - Land use
 - Environmental and health issues
 - Land management
 - Skills and training
 - Others?
 - Marketing?
 - Training and skill provision
 - Logistics provision
 - Finance?
 - Credit
 - Training
 - Others
6. In what ways are these policies and laws helpful to the farmers?
7. In what ways are these policies and laws a challenge to the farmers?

8. What are some of the deliberate actions your organization has taken over the years to help or promote farmers activities in the areas of :
 - Production?

- Marketing?
 - Finance?
9. How have your actions serve as a challenge to urban farmers in GAMA?
 10. How have your actions serve as a benefit to urban farmers in GAMA?
 11. In your view, what is the future of urban agriculture in GAMA?

Thank you

Survey Questionnaire

University of Ghana, Legon

Institute of Statistical, Social and Economic Research (ISSER)

PhD in Development Studies

QUESTIONNAIRE

*This questionnaire is to solicit information on a PhD Thesis research on the **Adaptation of Urban Farmers to Urban Change in the Greater Accra Metropolitan Area**. The information you will give is purely for academic and research purposes. This questionnaire has been approved by the **Ethics Committee** of the University of Ghana hence I promise any confidential information given will be held as such. Thank you*

Code _____

Name of Interviewer (Optional) _____ **Location of farm** _____

Suburb _____ **Date of Interview** _____

Telephone of Farmer _____ **Email of farmer:** _____

SECTION 1A: Demography of Farmer

1. Name of farmer (Optional) _____
2. Age of farmer _____
3. Gender of farmer: 1. Male [] 2. Female []
4. Level of education of farmer: 1. None [] 2. Primary [] 3. JHS/Middle School [] 4. Secondary/ Technical/Vocational []
5. Tertiary [] 6. Non – Formal [] 7. Others _____
5. Household size of farmer: 1. Adults [] 2. Children [] Total

6. Marital Status of farmer: 1. Single [] 2. Married [] 3. Divorced [] 4. Widowed [] 5. Separated []
7. Have you lived in Accra all your life? Yes [] No []
8. If yes to 7, which suburb were you born in Accra? _____
9. If no to 7, which Region in Ghana where you born? _____
10. Where do you stay in Accra currently? _____
11. What type of farming are you involved in? 1. Only Full Time [] 2. Only Part time [] 3. Only Seasonal [] 4. Seasonal & Part time []
12. If it is only part time or seasonal, what extra job(s) do you do? 1. _____ 2. _____
_____ 3. _____ 4. _____

SECTION 1B: Farming History

13. Have you farmed anywhere in Ghana apart from Accra? Yes [] No []
14. If yes in 13, how many places? 1. _____
15. Which places (region(s))? 1. _____ 2. _____
3. _____ 4. _____
16. How many years have you farmed in your life? _____
17. How many years have you been farming in Accra? _____
18. Is farming your first job in Accra? Yes [] No []
19. If no to 18, what was your first job? _____
20. How many places have you farmed in Accra? 1. 1 [] 2. 2 [] 3. 3 [] 4. More than 3 []

21. If more than 1 in Q16, what made you move from your initial place?

No	Challenges	Tick
1	Land	
2	Market	
3	Water	
4	Labour	
5	Others	

Note: Can tick more than one

SECTION 1C: Farming Characteristics

22. Source of water? 1. Clean Stream [] 2. Gutter/Dirty Stream [] 3. Dug well [] 3. Natural Pool [] 4. GWCL [] 6. Rain []

23. How many site (s) is/are your farm(s) located in Accra? _____

24. Who is/are the owner(s) of the land(s) you farm on?

No	Owner	Tick
1	Self	
2	Family	
3	Private Person	
4	Private Enterprise	
5	Government Institution	
6	Open Government Land	
7	Chief / Natives/ Community Land	
8	Others, Specify _____	

Note: Can tick more than one

25. What is/are the size (s) of your land?

No	Size	Hectare (s)
1	Plot 1	
2	Plot 2	
3	Plot 3	
4	Plot 4	

26. Farm Inputs used?

	Pumping Machine	Water can	Fertilizer		Weedicides	Pesticides	Manure	Imported Seeds	Local Seed	Ploughing Machine	Water Can
			Org.	Inorg.							
Yes											
No											

27. If you are using family labour, how many are they? 1. Wife [] 2. Children _____ 3. Others _____ Total _____

28. What is your labour size on your farm including family labour?

Rainy Season		Dry Season	
Male	Female	Male	Female

29. What changes have you made to your farming in terms of crops?

No	Change	Tick
1	No Crop Change	
2	Added New Crops	
3	Reduced Crops	
4	Changed Entire Crops	

30. Which types of crops have you grown in the past year and at what frequency?

No	Food Crops	Frequency in a Year					
		Not at all	Once	Twice	Thrice	Quadruple	All the time
1	Cassava						
2	Maize						
3	Yam						
4	Sweet Potato						
No	Vegetable						
5	Traditional						
6	Tomato						
7	Sweet Pepper						
8	Okro						
9	Garden eggs						
10	Onions						
11	Jute (Ayoyo)						
No	Exotic						
12	Cabbaged						
13	Lettuce						
14	Carrot						

15	Spring onions						
16	Spinach						
17	Cauliflower						
No	Cucumber						
18	Mint						
19	Radish						
20	Chinese Cabbage						
21	Solanum (Gboma)						
22	Amaranthus						
	Fruit & Others	Not at all	Once	Twice	Thrice	Quadruple	All the time
23	Watermelon						
24	Ginger						

SECTION B: URBAN CHANGE AND ITS EFFECTS TO URBAN FARMERS

31. In what ways the changes in Accra positively affected on your farming activities over the years?

Dynamics	Positive effect	
	Yes	No
General		
Population Increase		
Increased Health Awareness		
Physical		
Increased Roads		
Increased Housing		
New Physical Developments		
Climatic and Environmental		
Unpredictable Rainfall		
Increased Heat		
Reduced Rainfall		
Production		
Labour changes		
Inputs availability		
Technological Availability		
Land		
Land Ownership changes		
Land availability changes		
Marketing		
Increase Vegetable Demand		
Restaurant, Hotels & Supermarkets		
Foreign Customers' Demand		
Prices of Goods		
Role of Middle persons		
Financial		
Change in Profitability		
Current Input Prices		

32. In ways have the changes in Accra negatively affected on your farming activities over the years?

Dynamics	Negative	
	Yes	No
General		
Population Increase		
Increased Health Awareness		
Physical		
Increased Roads		
Increased Housing		
New Physical Developments		
Climatic and Environmental		
Unpredictable Rainfall		
Increased Heat		
Reduced Rainfall		
Production		
Labour supply changes		
Inputs availability		
Technological Availability		
Land		
Land Ownership changes		
Land availability changes		
Marketing		
Increase Vegetable Demand		
Restaurant, Hotels & Supermarkets		
Foreign Customers' Demand		
Prices of Goods		
Role of Middle persons		
Financial		
Change in Profitability		
Current Input Prices		

33. In what specific ways have these changes resulted in a positive effect

A. Positive Effects

Climatic and Environmental	Increased Profit	Other			
Unpredictable Rainfall					
Increased Heat					
Reduced Rainfall					
Production	Input shops near	Inputs now available	Exposure to Modern Farming Trends	Saves Time	
Labour changes					
High Unemployment					
Inputs availability					
Technological Availability					
Land	Happy on Land	Gov't Protection	Safe from Robbers		
Land Ownership changes					
Land availability changes					
Increased Housing					
New Physical Developments					
Marketing	Increase Profit	Market Availability	No Transport Cost	Transport Availability	On farm sale
Increase Vegetable Demand					
Restaurant, Hotels & Supermarkets					
Foreign Customers' Demand					
Changes in Dietary Habits					
Increased Roads					
Population Increase					
Increased Health Awareness					
Financial	Increased Profit	Increased Income Flow	Reduce Cost of Production	Financial Planning	Other
Change in Profitability					
Current Input Prices					
Changed Financial Support					

34.

B. Negative Effects

Climatic and Environmental	Unreliable Water	High cost of Pumping	Challenge with GWCL				
Unpredictable Rainfall							
Increased Heat							
Reduced Rainfall							
Environmental Deterioration							
Production	Scarcity	Unreliable	High Price				
Labour changes							
High Unemployment							
Inputs availability							
Technological Availability							
Land	Eviction	Uncertainty over Land	Struggle over land	Reduced Land Size	Abuse by Land Owners	Low Land Fertility	Land Occupation
Land Ownership changes							
Land availability changes							
Increased Housing							
New Physical Developments							
Marketing	Unfair Market Prices	Market Risk	Low Profit				
Increase Vegetable Demand							
Restaurant, Hotels & Supermarkets							
Foreign Customers' Demand							
Prices of Goods							
Increased Roads							
Population Increase							
Increased Health Awareness							
Financial	High Input Prices	Difficulty in Financing	Delays in Payment	Decrease in Income			
Increase in Financial Institutions							
Change in Profitability							
Current Input Prices							
Changed Financial Support							

SECTION C: ADAPTATION STRATEGIES OF FARMERS TO THE URBAN CHANGE EFFECTS

35. What adaptation measures have you adapted to enhance the benefits and minimize the challenges

C. Benefits & Challenges

1	Production	Consider Weather Patterns		Use Waste Water		Use well Water		Use Clean River/Stream		Use Dirty Stream		Depend on Rains		Storage of Water		Use GWCL		Control Flooding	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
A	Climatic and Environmental Adaptation																		
		Use Family Labour		Additional Lab		Labourers from North		Train Labourers		Use Female Labour									
B	Labour Adaptation																		
		Use Inorganic Fertilizer		Use Organic Fertilizer		Weedicides		Insecticides		Other Chemicals		Pumping Machine		Water Can		Spraying Machine		Use Tractor	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
C	Input Use & Technology Adaptation																		
		Added Land		Use Gov't land		No Relocation		High Tension		Relocated Farm		Increase Production		Farm All year Round		Farm Seasonally			
D	Land Adaptation																		
		Added New Crops		Multiple Cropping		Changed Initial Crops		Strategic Planting		Choose suitable crops		Growing one crop		Grow Seasonal Crops		Strategic Harvesting			
E	Crop Adaptation																		

		Attitude of Patience	Attitude of Hard work	Depend on God						
F	Others									
		Direct Sale	Manage Customer Loyalty	Market Centres & Restaurants	Plant on request	Serve as Middleman	Study Market Trends	Use Middle Persons	Use Mobile Phones	
2	Marketing									
		Borrowing	Contract Farming	Financial Planning	Reinvestment	Self-Financing	Sell on Credit	Engage in other jobs		
3	Finance									

Consent Form

PhD Thesis Topic: Adaptation of Urban Farmers to the Urban Dynamics: The Case of Greater Accra Metropolitan Area

School: Institute of Statistical, Social, and Economic Research (ISSER), University of Ghana, Legon

I, the researcher of the study promise that any information given by the respondent in this interview will be kept as confidential and respondent will be treated as anonymous.

Signature.....

(Researcher)

I grant this interview with my consent

Name of Respondent:.....

Name of Organization:.....

Position:.....

Date:..... **Signature:**.....