

**STRATEGIC INNOVATIONS IN URBAN AGRICULTURE, FOOD
SUPPLY AND LIVELIHOOD SUPPORT SYSTEMS PERFORMANCE
IN ACCRA, GHANA**

BY

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EXECUTIVE SUMMARY

This report on the strategic innovations in urban agriculture, food supply and livelihood support systems performance in Accra was conducted from August, 2007 to August, 2008. The study was partly funded by the Resource Centres on Urban Agriculture and Food Security (RUA-F-Ghana). The argument is that if activities in urban agriculture would be sustained then actors would need to be strategic in their choices. New ways and processes (innovations) ought to evolve; new support institutions or existing ones that have integrated urban agriculture in their programs ought to be visible. In this way, limitations concerning land, water and environmental protection usually associated with highly populated areas can be managed. Hence the issues of importance investigated by the study were: the nature of strategic innovations developed or adopted by actors in urban agriculture since 1997; the extent to which urban agricultural produce contribute to the supply of major produce including fresh vegetables, eggs and live poultry birds in Accra; and the effect of urban agriculture on the livelihoods of urban farmers and traders in Accra. The analysis of data involved determining the following:

- the policy support for urban agricultural innovation system,
- the actors contributing to the urban agricultural innovation system
- the habits, competencies and practices of business actors (farmers and traders)
- effectiveness of functions of institutional actors (metro, NGO and
- innovativeness of linkages among actors in urban agriculture
- share of food trade contributed by produce from Accra

- contribution of urban agriculture to livelihood outcomes such as income, food expenditure, child education cost and participation in group action and practice of environmental management.

Data analysis was largely descriptive and the t-test was used to test the difference between means. The primary data was collected from 338 respondents including 100 farmers, 120 traders and 18 representatives of institutions in urban agriculture. The respondents were randomly selected and interviewed in locations determined by them. A semi-structured questionnaire was used to aid the face-to-face interviewing. The respondents have varied socio-economic background – gender, age, education, marital status, family size, major urban agricultural activity, other occupation, and experience in urban agriculture. The secondary data on policy elements and time series data was obtained from the Ministry of Food and Agriculture and other empirical literature.

The results of the study show that:

- i. There have been strategic innovations related to urban livestock and crop production in the city of Accra since 1997.
- ii. The innovations have been as a response to demand for fresh eggs, vegetables and live birds. In addition land in front and at the back of residential facilities as well as open spaces belonging to both the State and private people are suitable for vegetable cultivation and livestock housing.
- iii. Policies concerning urban agriculture have not been explicit although the city byelaws recognise the possibility of the activities and have set the standard requirements allowed for crop and livestock production in the city. The current Food and Agricultural Sector Development Policy (2007) has incorporated in it intentions for promotion of urban agriculture although no specific projects and programmes were determined. However, all programmes on extension education for farmers nationwide

have been planned to affect urban agriculture. Thus there is a Metro Agricultural development Unit phasing the fee-free agricultural extension and low-cost veterinary services.

- iv. The key actors in the urban agricultural innovation system are those involved in product demand, enterprise development, agricultural research, agricultural information diffusion and market infrastructural development. In this study the actors are represented as traders, farmers, CSIR/IWMI/Universities, the Metro Agricultural Development Unit (MADU) extension and financial and transport institutions respectively.
- v. Innovation by the business or non-institutional actors (farmers and traders) is mainly as a result of influence of external agents, principally farmers' associations. The areas of innovation among farmers were in improved varieties/breeds, agrochemicals/veterinary drugs, machinery, feed, water, feed formulation, housing, land preparation, diversified markets (grocery point, supermarket and urban market) and ICT (mobile phone). The use of mobile phone was the commonest innovation among traders. Other types of innovations related to the way traders presented products for sale, diversified products, storage and selling mechanism (marketing). Government extension agents and NGO's did not seem to be of great influence on innovation development and adoption by farmers and traders.
- vi. Institutional level innovations concern new things that are done within the organisation as a result of the institution's involvement in urban agriculture. The institutions that support urban agriculture are few but their innovativeness is quite marked. For instance, governmental institutions such as the MADU are influencing changes in the AMA bye laws that are overly stringent on urban farmers and traders. Non-Bank financial institutions such as ProCredit Ltd. as a result of their involvement

in urban agriculture restructured their organisational policy towards credit, trained staff and incorporated urban processed fisheries into their strategic plans. Through the facilitation of IWMI an award category was created for Best National UPA Farmer on the National Farmers' Day in 2006.

- vii. Linkages are being formed among farmer based organisations and research institutions such as the International Water Management Institute (IWMI). Otherwise the strongest linkages are between farmers and traders and then crop farmers and MADU.
- viii. From the four markets surveyed in the Accra Metropolitan Area (AMA), urban agricultural production accounted for between 46 percent and 75 percent of the supply of the selected fresh produces including eggs, live poultry birds, green leafy vegetables (*ayoyo*, *gboma*, *alefu*) and okro.
- ix. Urban agriculture impacts positively on the livelihoods of practitioners in the city of Accra. Net monthly incomes of GH ₵1.96 and GH ₵1,792.92 were recorded in 2007 for the respondents. Over 95% of traders and farmers use urban agriculture income to finance part or all their household food expenses. Food is always available in the households of respondents and majority (over 60%) feed at least three times within a day. In terms of child education financing, about 90 percent of respondents partially or wholly funded their children's education from urban farm/trade income. In addition over 60 percent of respondents, by virtue of their involvement in urban agriculture, have become more socially included and aware of maintaining a sound environment to improve sustainable natural resource base. Many (80%) urban farmers know the consequences of using unapproved chemicals and untreated waste water on the environment. Many traders understand that using unsafe water to clean vegetables is detrimental to human health and safety.

- x. The results suggest that since urban agriculture is a strategy that has been adopted in response to the availability of favourable resource and policy conditions, more efforts are needed to improve upon the situation. A specific urban agricultural policy that mandates specific areas to be demarcated for vegetable production and small animal keeping should be developed by government and implementation facilitated by the key actors.
- xi. Farmers' associations have been found to be a very important source of innovation and platform for diffusion. Farmers are therefore encouraged to join farmers' associations in order stay abreast with new happenings in the industry as well as improve upon advocacy for a favourable policy framework.

ABBREVIATIONS

ADB	African Development Bank
AMA	Accra Metropolitan Assembly
ASTI	Agricultural Science Technology and Innovation
AWGUPA	Accra Working Group on Urban Agriculture
CACS	College of Agriculture and Consumer Sciences
CSIR	Centre for Scientific and Industrial Research
CTA	Technical Centre for Agricultural and Rural Cooperation
DfID	Department for International Development
EPA	Environmental Protection Agency
FASDEP	Food and Agriculture Sector Development Policy
FBO	Farmer Based Organisation
GDP	Gross Domestic Product
GEA	Government Extension Agent
GPRTU	Ghana Private Road Transport Union
GSS	Ghana Statistical Service
ISSER	Institute of Statistical, Social and Economic Research
IWMI	International Water Management Institute
MADU	Metropolitan Agricultural Development Unit
MoFA	Ministry of Food and Agriculture
NGO	Non Governmental Organisation
RUAF	Resource Centres for Urban Agriculture and Food Security
SRID	Statistical Research and Information Directorate
STEPRI	Science, Technology, Policy and Research Institute
UA	Urban Agriculture

UPA	Urban and Peri-urban Agriculture
UN	United Nations
UNDP	United Nations Development Programme
WHO	World Health Organisation

TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
EXECUTIVE SUMMARY	ii
ABBREVIATIONS	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xiii
LIST OF FIGURES	xv
CHAPTER ONE	
1.1 Background and Problem Statement	1
1.2 Objectives of Study	4
1.3 Relevance of Study	5
1.4 Organisation of Study	6
CHAPTER TWO	
2.1 Agriculture, Economic Development and Urbanisation	8
2.2 Urban Agricultural Development, Strategy and Innovation	9
2.2.1 The Concept of Urban Agriculture	9
2.2.2 Evolution of Urban Agriculture	14
2.2.3 Urban Agricultural Systems and Conditions for Growth	17
2.3 Strategy and Innovation in Urban Agriculture	21
2.3.1 The Concept of Strategy Development in Urban Agriculture	21
2.3.2 Innovations in Agriculture	22
2.3.3 Gender and Strategic Innovations in Urban Agriculture	25
2.3.4 Stakeholders and Innovation towards Urban Agricultural Development	28

2.4	The Food Supply System and Urban Agriculture	31
2.5	Livelihoods Support Systems and Urban Agriculture	34
2.6	Methodological Issues in Systems Analysis	37
2.7	The Geographical Area of Study	40

CHAPTER THREE

3.1	Research Design	43
3.2	Method of Analysis	44
3.2.1	Analysing Strategic Innovations in Urban Agriculture in Accra	44
3.2.2	Analysing the Contribution of UA to food supply in Accra	46
3.2.3	Analysing the Effect of UA on livelihoods in Accra	47
3.3	Sources and Method of Data	48
3.4	Scope and Limitations of Study	52

CHAPTER FOUR

4.1	Characteristics of Survey Respondents	54
4.2	Strategic Innovations in Urban Agriculture	59
4.2.1	Policy Support for Urban Agricultural Innovation System	59
4.2.2	Actors in Urban Agricultural Innovation System	60
4.2.3	Habits, Competencies and Practices	61
4.2.4	Sources of Innovation by farmers and traders in Accra	62
4.2.5	Type of Farmer Innovations	63
4.2.6	Types of Trader Innovations	66
4.3	Effectiveness of Functions of Institutional Actors in UA in AMA	68
4.4	Innovativeness of Linkages among Actors in Urban Agriculture	71

4.5	Contribution of UA to Food Supply in Four Markets in Accra	76
4.6	Contribution of UA to Livelihoods of Practitioners in AMA	80
4.6.1	Contribution of UA to Livelihoods of Farmers	80
4.6.2	Contribution of UA to Livelihoods of Traders	87
CHAPTER FIVE		
5.1	Summary and Conclusion	94
5.2	Recommendations	97
REFERENCES		99
APPENDICES		104

LIST OF TABLES

Table	Page	
2.1	Examples of Agricultural Innovations in Africa	25
2.2	Gender in Irrigated Vegetable Production in West African Countries	26
2.2	Contribution of UA to Food Supply in Selected Countries	33
2.3	Net Monthly Income from Mixed Vegetable Production in Selected Sites	36
3.1	Farmers Interview List	50
3.2	Traders Interview List	50
3.3	List of Institutions	51
4.1	Representation of Respondents by Age	55
4.2	Educational Background of Respondents	55
4.3	Marital Status of Respondents	56
4.4	Number of Dependants of Respondents	57
4.5	Farming/Trade as a Major Occupation	58
4.6	Number of years in Farming/Trade	58
4.7	Sources of Innovation in Urban Agriculture	63
4.8	Specific Farmer Innovation Areas, Sources and Years Introduced	66
4.9	Specific Trader Innovation Areas, Sources and Years Introduced	68
4.10	Institutional Projects/Programs in UA	73
4.11	T-test Results on Accra Egg Supply	77
4.12	T-test Results on Live Poultry Birds	78
4.13	T-test Results on Accra Local Vegetables	80
4.14	Income of Vegetable Farmers in AMA	82
4.15	Proportion of Weekly Food Expenses Financed by UA	82
4.16	T-test Results on Farmers Food Expenses Financing	83

4.17	Proportion of Yearly School Expenses Financed by UA	84
4.18	T-test Results on Farmers Children School Financing	85
4.19	Farmers Social Inclusion	86
4.20	Net Monthly Income of Traders	88
4.21	Proportion of Weekly Food Expenses Financed by Trade	90
4.22	T-test Results on Traders household Food Financing	90
4.23	Proportion of Yearly Children's School Expenses Financed by Trade	91
4.24	T-test Results on Traders Children School Financing	92
4.25	Traders' Social Inclusion	92

LIST OF FIGURES

Figure		Page
2.0	Marketing Channel of UA Products	28
2.1	DfID Sustainable Livelihood Framework	34
2.2	Porters Value Chain	40
2.3	Geographical Area of Study	42
3.1	Actors in ASTI System	44
4.1	Linkages among ASTI Actors	72
4.2	Egg supply in Selected Accra Markets	77
4.3	Live Poultry Bird Supply in Selected Accra Markets	78
4.4	Local Vegetables Supply in Selected Accra Markets	79
4.5	Farmer's Food Expenditure Financing	83
4.6	Farmer's Child Education Cost Financing	84
4.7	Trader's Food Expenditure Financing	90
4.8	Traders' Child Education Cost Financing	91

CHAPTER ONE

INTRODUCTION

1.1 Background and Problem Statement

Agriculture has been a dominant sector of the Ghanaian economy since time immemorial. In 2007, agriculture alone accounted for about 38 percent of gross domestic product (GDP) (ISSER, 2008). More than 60 percent of Ghanaians find their livelihood in agriculture and agricultural related activities such as food processing and raw food trading. Agriculture in Ghana like in some other parts of the world has been viewed as an entirely rural activity for a long time. In recent times however, farming in the cities (urban agriculture) seems to be gaining recognition. A decade ago, the United Nations Development Program (UNDP) estimated that more than 800 million people were involved in urban agriculture around the globe (UNDP, 1996). Out of these, 200 million people practiced market oriented farming on undeveloped urban spaces. Within the same period, 40 percent of the people who lived in cities in Africa were involved in urban agriculture (Mougeot, 1994). About 80 percent of families in Libreville, 68 percent of urban dwellers in six Tanzanian cities, 45 percent in Lusaka, 37 percent in Maputo, 36 percent in Ouagadougou and 35 percent in Yaoundé were involved in urban agriculture (UNDP, *ibid*).

Recent statistics show that in West Africa, 20 million people are involved in varied forms of urban agriculture (Drechsel et al, 2006). In Ghana, urban agriculture has been observed in all the major cities. In the city of Accra alone, it is estimated that some 60 percent of the population is involved in backyard gardening (AWGUPA, 2006). The potential of urban agriculture in contributing to urban food supply and improved livelihoods of many in cities cannot therefore be

overemphasized. With rapid population increases, the need for increased food supply becomes even more pertinent.

The rise in population is more pronounced in urban areas as a result of migration of people from rural areas among other factors. It has been forecasted that by 2015, twenty-five (25) countries in Sub-Sahara Africa will have higher urban than rural populations and by 2030, the number would increase to forty-one (41) (UN-Habitat, 2001). In 2004, it was estimated that about 44 percent of the population in West Africa lived in urban areas (UN, 2004). In Ghana, more than 20 percent of the population lived in Accra, the capital city (GSS, 2000). The estimated population of Accra was approximately 1.7 million, although it is known that during the day the number increases. This has been attributed to temporary migration of people who come to the capital to engage in all forms of income generating activities as well as visit public offices to transact business.

The food needs of the residents of Accra are mainly met by supplies from rural Ghana. Agriculture in the rural parts of Ghana is predominantly rain fed and coupled with low productivity and insufficient infrastructure it may not always be able to supply enough of the fresh foods particularly vegetables of exotic origin such as lettuce and green pepper (see also Obosu-Mensah, 1999). Vegetables have become part of the diet of residents in urban Ghana; the changing eating habit to incorporate more fresh products is being encouraged by health conscious groups and individuals. That is why production of such products which is located close to the consumer need not be discouraged.

There are arable lands in Accra but they are not necessarily demarcated for agricultural activities. Indeed, there are city bye-laws setting the limits for land use for agriculture in parts of the city. The implication is that those who can engage in agriculture in Accra need to respond

by doing more in terms of mobilization of adequate factors of production and food distribution. It also means that activities in urban agriculture need to be carried out with well thought out plans. In other words, urban agricultural practitioners and support systems need to be strategic in their choices. New ways and processes (innovations) ought to evolve; new support institutions or existing ones that have integrated urban agriculture in their programs ought to be visible. In this way, limitations concerning land, water and environmental protection usually associated with highly populated areas can be managed. It is asserted that many urban farmers squat on owned but unutilized land and sometimes engage in practices that are detrimental to the larger environment.

There is an institutional framework that organizes technical and managerial information for dissemination. There is a Department of Agriculture and other units of public health and environmental protection in the Accra Metropolitan Assembly (Egyir and Nyameke, 2007). What is not well known is how far their functioning has been changing to respond to the growing needs of urban agricultural practitioners. Is the framework adequate to cause change in people whose lives depend on tilling the land, raising livestock, processing agro products or selling fresh food commodities in Accra?. Again, are groups such as farmer-based organizations (FBOs), non-governmental organizations (NGOs) as well as private sector input dealers doing enough to support the urban agricultural innovation system?

Research Questions

Towards a better understanding of the foregone issues, the following questions are raised:

1. What strategic innovations developed by actors in urban agriculture have evolved in recent times in Accra? (say what types of innovations have existed since 1997 and what are the sources of these innovations?)
2. Are the innovations contributing substantially to total food supply in Accra?
For instance, how is urban agriculture contributing to the supply of major fresh produce such as vegetables, eggs and live poultry?
3. How are the innovations in urban agriculture affecting the livelihoods of producers (farmers and traders) in Accra? For instance, what level of net income is generated, what savings are being made, what is the level of household food security, what is the status of child education and how are the producers associating with others in their neighbourhood?

1.2 Objectives of the Study

Recommendations that achieve best practices in the utilization of urban spaces, maintenance of environmental health and sanitation, increased food supply and improved livelihoods can be possible when there is a thorough study of issues related to them. The primary objective of this study is to identify recent strategic innovations in urban agriculture, the contribution to food supply and its effect on livelihoods of producers in Accra. The specific objectives are to:

1. Identify and describe the nature of recent strategic innovations in urban agriculture in the city of Accra.
2. Determine how urban agriculture is contributing to the supply of selected fresh produce in Accra.

3. Assess the extent to which urban agriculture affect the livelihoods of farmers and traders of fresh produce in Accra.

1.3 Relevance of the Study

Rural-urban migration has been a trend in Ghana for a very long time and people continue to move from the rural areas into urban areas for different economic, political, social and technological reasons. When migrants arrive in town they face many challenges, viz., unemployment, poverty, diseases, crime and congestion. Many migrants move in search for greener pastures. However, the formal sector is unable to absorb all the migrants to the cities. In Ghana, urban agriculture has served as a source of income for the otherwise 'jobless' in the city. In the city of Accra, 280,000 urban dwellers benefit from urban vegetable farming (Drechsel *et al*, 2006). A study that describes the nature of the innovation system that supports urban producers is not only timely but also useful for policy direction. Following recent studies in effectiveness of urban producer organisations, there have been calls for specific urban agricultural policy and infrastructural development (Egyir *et al*, 2007). Understanding the dynamics in technologies employed in urban vegetable farming and other non-vegetable agricultural enterprises would lead to effective stakeholder involvement in the development of the innovation system. Many people speculate that urban agriculture is subsistent rather than a market oriented activity. It is important to document information collected and evaluated quantitatively on shares of food commodity sales contributed by urban agricultural production. The results of the study will thus contribute to the quantitative knowledge base of urban agriculture.

Previous studies that observed that urban farming plays a critical role towards improved livelihoods of the urban poor in several African countries associated it with few indicators such as improved food security and improved nutritional status (Maxwell & Armah-Klemasu, 1998; Ayaga *et al*, 2005; Drechsel *et al*, 2006). This study will explore the extent to which urban agriculture affect more livelihood outcome indicators. Social indicators such as child education and empowerment due to group participation will be measured. Apart from being an important source of urban food supply, agriculture in the city makes use of available spaces contributing to the greening of the city, reduction in air pollution (carbon sink) and improvement in air quality. The perception of urban agricultural producers concerning the effect of their activities on the environment would also be documented. When producers' knowledge level and attitudes are well understood any sensitisation actions will be well designed and phased effectively. .

1.4 Organisation of Study

This study is organized into five chapters. Apart from Chapter One which has presented the introduction, Chapter Two presents the review of relevant literature on the subject. Here, major issues related to the broad concepts in agriculture, urbanization and strategy development are discussed from the point of view of theory and empirical findings. In Chapter Three, theoretical basis of discussing the adequacy of strategic innovations, share of urban food supply and livelihoods is first described, and methods by which each specific objective is analysed is also described. The chapter ends with a description of the sources and data collection procedures. The results are presented and discussed in Chapter Four. Finally, in Chapter Five the summary of the study is presented, and the conclusions drawn based on the study's findings and recommendations for policy action and future research also given.

CHAPTER TWO

LITERATURE REVIEW

In this chapter, various literature relevant to urban agriculture are reviewed. The chapter opens with a discussion of agriculture, economic development and urbanization. Then, the concept of urban agriculture, evolution of urban agriculture and the concepts of strategy and innovation are examined. A discussion of urban agricultural systems and conditions for growth follow. A brief on stakeholders in urban agriculture, the food supply system and livelihoods related to urban agriculture is given. Finally, important methodological issues are discussed and a brief history and geography of the city of Accra is presented.

2.1 Agriculture, Economic Development and Urbanization

Agriculture is the science, art or occupation concerned with cultivating land, raising crops and feeding, breeding and raising livestock (Nichols *et al*, 1999). As an occupation agriculture has been the backbone of many developing economies. The activities in agriculture including organisation for inputs, production of crops, livestock and fish as well as assembling and distributing produce, lend themselves easily as income generating ventures for a wide range of people (Uphoff, 1985). Apart from serving households and individual interest agriculture, particularly that of primary production contributes greatly to national economic development. It is said that land is abundant in Africa and agriculture is dominated by the food sector (ADB, 2003). The world's dependence on Africa's food and beverage commodities including cocoa, coffee, maize, rice, and fruits and vegetables is not insignificant. Agriculture in Sub-Saharan

Africa employs 65 percent of the labor force and generates 32 percent of GDP growth (alafrica.com, 2006). "In Sub-Saharan Africa, home to 229 million extremely poor rural people, agriculture is about much more than simple food security," said Robert B. Zoellick, World Bank Group President. "A greater focus on agriculture will help boost overall economic growth and can offer multiple pathways out of poverty." Indeed, the call for focus on agriculture suggests that wherever agriculture can thrive and affect livelihoods it ought to be encouraged.

Recent trends in urbanization have made the rural-urban dichotomy in agriculture come into question. In 2001, the UN-Habitat forecasted that by 2030 forty-one countries in Sub-Saharan Africa will have higher urban than rural populations. Currently, about 43 percent of Ghana's population lives in urban areas. Accra is the most urbanized city in Ghana. The urbanization in Accra and other cities is due to rapid population increase as a result of urban development factors. Large businesses, industries and educational facilities are all concentrated in the cities, particularly of Africa. It means that the business activities that convert land resources to food and distributes it to the needy should go on in and around the cities.

2.2 Urban Agricultural Development

2.2.1 The Concept of Urban Agriculture

Urban agriculture is a very difficult term to define. Several people have expressed different opinions on this term. Whilst some definitions have been limited to production activities in the cities and its immediate environs, other definitions broadly define urban agriculture to include business services that supply inputs, process and distribute outputs within a given urban area.

According to Mougeot (2000), urban agriculture can be defined as an agricultural enterprise located within or on the fringe of a town or city or a metropolis which grows or raises, processes and distributes a diversity of food and non-food products, (re)-using largely human and material resources, products and services found in and around that urban area and in turn supplying human and material resources, products and services largely to that urban area. Baker and Sabel-k (2000) agree with this definition but see urban agriculture as an industry rather than an enterprise and went ahead to classify agricultural industries within the city as intra-urban and those on the fringes as peri-urban. Earlier on, the UNDP (1996) had defined urban agriculture as an industry that produces, processes and markets food and fuel, largely in response to daily demand of consumers within a town, city or metropolis on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods using and re-using natural resources and urban wastes to yield a diversity of crops and animals. With respect to the current study, urban agriculture could be defined as the production and marketing of crops and animals within the jurisdiction of the Accra Metropolitan Assembly (AMA).

All the definitions suggest that urban agriculture has benefits as well as risks. Many researchers have observed that the benefits and risks of urban agriculture are environmentally or health related. (Obuobi *et al*, 2006, Cofie *et al*, 2005, Faraqui *et al*, 2004, Afrane *et al*, 2002).

- i. Environmental benefits: Urban agriculture helps in flood control, land reclamation, city greening, city waste recycling and prevents building on unsuitable lands (Obuobi *et al*, 2006, Mayor, 2006).

With respect to flood control, urban agricultural crops have served as wind breaks and helped reduce erosion and floods that are common in cities. For instance, in certain parts of Accra (e.g. Alajo) which usually experiences flooding during the rainy season, agro forestry

could be one way of managing the flood. Lands that have been previously abandoned or used for other purposes and hence have lost their agricultural value can be reclaimed through urban agriculture. Parts of the cities in Ghana are without any green vegetation; urban agriculture is the surest way of ensuring healthy and green cities. Urban agriculture would also contribute to the greening Ghana initiative that was launched in 2006. Poor waste management is another environmental problem in Ghana and the Accra Metropolitan Assembly is not an exception. Urban agriculture could be used to recycle waste for soil fertility purposes. Urban agriculture has been noted as being a facilitator of recycling wastes such as poultry manure, cow dung, household, market waste as well as human waste. Examples of waste usage in urban agriculture in West Africa have been cited in Nigeria and certain parts of Ghana (Cofie *et al*, 2005). Finally on environmental benefits, city authorities battle with encroachers on government lands, unapproved areas for building etc. day in, day out. Recently in Accra, a demolition exercise was carried out to forcibly evict people who had put up structures under high tension pylons. Urban agriculture could be used to prevent people from building in such unapproved areas. A typical example of how urban agriculture has worked in this respect is the urban crop cultivation that is taking place under high tension pylons in Dzorwulu (a suburb of Accra). Even though certain places are not suitable for buildings and/or human settlements, they certainly are a good habitat for urban agricultural activities.

- ii. Health benefits: The health benefits that are associated with urban agriculture are related to those obtained from consuming the urban agricultural products.

Urban agricultural products such as vegetables (including mushrooms) and meat from small animals such as grasscutters, rabbits and poultry contribute to the nutritional wellbeing of

urban residents. These crops and animals are important sources of proteins, vitamins, minerals and other food nutrients that are essential for the proper growth and development of the body.

iii. Environmental risks: Urban agriculture contributes to environmental pollution. The improper use of agrochemicals such as pesticides, insecticides, weedicides and growth regulators can lead to the pollution of water bodies and the larger environment. Inappropriate agricultural practices affect the stability of urban ecosystems. Urban livestock keeping can be a nuisance to residents if proper sanitary conditions are not maintained. Improper disposal of animal droppings and inappropriate buildings for animals could release bad odours into the environment. For example, some residents in Awoshi in Accra in February, 2008 went public to express their displeasure about the activities of some pig farmers in the vicinity. It is therefore very important for urban farmers to maintain strict conditions of hygiene if their activities are to be accepted by residents.

iv. Health risks that are associated with urban agriculture are also concerned with food contamination, overuse of pesticides, zoonotic diseases etc. Urban agricultural products (especially urban crops) could be contaminated as a result of some of the practices of practitioners. Such practices include the use of untreated waste water (Amoah *et al*, 2005). In areas where farmers have no access to low-cost high quality irrigation water they sometimes resort to the use of any available water which in most situations is untreated. Such water can be a source of contamination to crops; especially those consumed in the raw state, and could be very harmful to the health of the consumers (Keraita and Drechsel, 2004, Faraqui *et al*, 2004, Niang *et al*, 2002, Sridhar and Adeoye, 2000). According to Mwale (2006), the World Health Organization (WHO) has stated that untreated waste water use in crop production is the largest environmental killer around the world.

In Ghana, an experiment was carried out by Armar-Klemesu and Maxwell (1998) to ascertain the sources of contamination of vegetables (lettuce) in Accra. Samples of lettuce were taken from three different sources; the farm gate of vegetables grown under irrigation using tap water, farm gates of vegetables grown with drain water (waste water) and vegetables found in the major urban wholesale markets irrespective of whether they were from the urban area or rural area, irrigated or rain-fed. It was discovered that vegetables that were grown with tap water had lower bacterial counts than samples bought at the farm gate irrigated with drain water. However, both groups of vegetables had significantly lower bacteria counts than samples bought from the urban wholesale markets. They concluded that, food contamination (in Accra) is from the marketing, handling and distribution system rather than in the production system. It was suggested that consumers be educated on food hygiene and handling in order to prevent gastrointestinal infections.

Another source of health risk which is not strictly only an urban agriculture phenomenon is the overuse of pesticides. Pesticide overuse could result both in food contamination and pesticide poisoning. This poses health problems to the farmer himself and to the consumers at large.

Urban crop production sites could also serve as breeding grounds for the malaria vector. Several studies have proved that malaria cases in surroundings around irrigated urban farms are higher than those far away (Klinkenberg *et al*, 2005, Afrane *et al*, 2002). Urban livestock production could also affect residents especially when there is the incidence of zoonotic diseases (diseases that are transferred from animals to man and vice versa). Some of these zoonotic diseases (e.g. mud cow disease, avian flu and anthrax) spread rapidly and are very difficult to control.

2.2.2 Evolution of Urban Agriculture

Urban agriculture the world over is said to be shaped principally by three things; continuity of historical practices, industrial agricultural revolution and post second world war rapid urbanization (UNDP, 1996).

Historically, certain cultures in ancient civilizations are said to have grown medicinal plants, culinary herbs and mushrooms in urban areas. Among historic cases to be rediscovered are the ones that were grown in Latin America, Aztec, Mayan and Incan cities. These cities were self-reliant in perishable fruits and vegetables (UNDP, 1996). This practice of growing crops in cities is what has continued in a lot of cities worldwide today. Before the advent of modern urban sanitation systems, urban agriculture was the principal method that was used to treat and dispose off urban wastes. With advancement in agriculture, modern techniques were used to treat urban wastes and agriculture (mainly food production) was shifted to the hinterlands. The situation was further aggravated by well intentioned and well funded development experts. For instance, the many specialized divisions of the United Nations have been made in such a way that technical assistance for food production has been separated from important disciplines to urban agriculture such as health, nutrition, city planning and management, waste management and the environment. The situation of dissociating agriculture with urban areas continued until the latter part of the twentieth century which was characterized by unreliable food production and distribution systems. Rapid population growth and urbanization coupled with economic instability made it necessary for urban residents themselves to take to urban farming. The largely UNDP's (1996) account of the history of urban agriculture is as presented below.

In Asia, urban agriculture was well established in the nineteenth century. The practice was accepted as a normal urban function and land use. This was especially important prior to the development of rail transport, internal combustion engines and cold storage systems. In China, a specific urban development strategy was developed to make cities self reliant in vegetable production. As a result of the strategy, many Chinese cities achieved nutritional self-reliance in non-grain food (Allen and You, 2002). Urban famine which was frequent in China was also avoided as a result of urban agriculture. Hong Kong even though it is a very dense city produces two-thirds of poultry, one-sixth of pigs and close to half of all vegetables in the city (UNDP, 1996). In Japan, every available space in the city is used for urban agriculture. There are land use and tax systems that favour urban agriculture. In fact, urban agriculture is included in the regular census and numerical papers are published on urban agriculture (UNDP, *ibid*).

In Latin America, pre-Columbian civilizations had highly developed intensive agricultural systems. Urban agriculture faded out until after the Second World War. School gardens were developed in urban areas and flowers grown for export to other countries. In Bolivia, a green house system was developed. In Peru, fish was produced using waste water in the city and a unit was established in the agriculture ministry to promote urban agriculture. In 1995, fifty (50) urban agricultural experts from Mexico to Argentina came together to form the Latin American urban agriculture network in order to promote the industry.

The 1970's and 1980's saw a lot of home and community gardens in North America. By 1994, thirty percent (30%) Of families in the United States had home gardens and out these, eighty percent (80%) were urban residents. According to the United States 1980 census, metropolitan areas produced thirty percent (30%) of the dollar value of United States agricultural

production and by 1990; the dollar value of metropolitan agricultural production had risen to forty percent (40%).

In Europe (especially Italy), small scale urban farmers organized into co-operatives and associations. A movement on sustainable agriculture that sought to promote nutritional self reliant communities was created in France and Germany and this movement included urban farmers.

Urban agriculture is also a common phenomenon in African cities. Cities in Morocco have a reputation for fresh vegetables in the markets of the city. In Zambia, as at 1980, sixty percent (60%) of low-income households were involved in urban agriculture. Around the same time, a lot of innovations took place in urban agriculture in Africa. For example, Thai mushroom was introduced in Ghana and in Senegal; Lebanese immigrants introduced intensive vegetable and flower systems. With time, different forms of urban agricultural systems evolved in Africa prominent among which was roadside agriculture. Unlike in other parts of the world, urban agriculture in most parts of Africa had no governmental support. Among African governments that supported urban agriculture were Tanzania, Malawi, Mozambique and Zambia. In both Mozambique and Zambia, policies favouring urban agriculture were adopted and in Malawi and Tanzania, cities were planned and developed to be self reliant in perishable foods.

Urban agriculture is therefore an ancient phenomenon that is observed in all parts of the world even today. It seems to be working well especially in areas where there is governmental support (Allen and You, 2002). Whether we like it or not, urban agriculture can not be wished away that easily as a result of the important role that it plays in urban food supply and in the livelihoods of millions of people around the globe. Urban agriculture therefore needs to be properly developed to meet current world trends and standards. For this to happen, the

involvement and support of all stakeholders is crucial to the growth, development and sustainability of this farming system.

2.2.3 Urban Agricultural Systems and Conditions for Growth

1. Urban Agricultural Systems

Different criteria have been used to describe urban farming systems. According to Mougeot (2000), urban farming systems can be classified by location, crops cultivated, tenure modality, scale of production, seasonality and product destination (see also Moustier, 1999). Baker and Sabel-k (2000) agree with Mougeot (2000) but add that classification should be based on other factors such as city zone, socioeconomic status, time allocation and product system. Mwale (2006) asserts that the United Nations Development Programme (UNDP) has identified more than forty (40) farming systems in urban areas. These farming systems take place in varied places ranging from backyards, rooftops, window boxes, roadsides, beneath high tension poles, within utility rights way, banks of rivers, school grounds, hospitals, etc. (Mougeot, 2006). Nugent (2000) has simply categorized urban agriculture into the ‘disparate and possibly segregated’ larger scale commercial intensive horticulture and livestock industry and the subsistence and small scale (semi-) commercial production.

In West Africa, three major types of urban agricultural production systems have been identified (Cofie *et al*, 2006). These are open-space agriculture which is mostly market oriented, backyard gardening (subsistence based) and livestock husbandry and aquaculture. In the city of Accra, seven farming systems have been identified by Armar-Klemesu and Maxwell (1998) as well as Zakariah (1998). These are seasonal crop farming, customary land rights systems, vegetable growing systems, small ruminants and poultry, commercial livestock farming,

backyard gardening and miscellaneous (export crop production and micro livestock production). Danso *et al* (2000) reduced the farming systems categorization in Accra to only five types consisting of vegetable farming, backyard gardening, livestock and ruminant farming, seasonal farming and others (commercial pineapple and urban ornamental farming). However, we could simply think of the farming systems in Accra as classified into crop and non-crop production systems.

2. Conditions for Growth in Urban Agriculture

There are certain conditions that are very crucial to agricultural growth be it in the rural or urban area. These conditions include the availability of water, inputs and certain services. Jacobi *et al*, (2000) also identified five conditions that are necessary for growth in urban agriculture. These conditions are categorized as: natural conditions, physical infrastructure and services, socio-cultural conditions, institutional conditions and economic conditions.

Natural conditions generally refer to the amount and seasonality of rainfall and temperature variability. In Ghana, agricultural production depends heavily on rainfall. The amount of rainfall and its distribution is very important to crop cultivation (especially vegetables). It is reported that urban crop production in Cairo is restricted as a result of very low annual rainfall of 25 millimeters (*Jacobi et al*, 2000). In the dry season, it becomes necessary for irrigation to be carried out. This means that there is need for a certain level of investment especially in irrigation equipment in areas where climatic conditions are not very favourable. Temperature can also affect the growth and development of plants as well as animals. The maturity time of certain plants is greatly affected by prevailing temperatures (*Williams et al*, 1991). Another important natural condition for urban crop production is the soil quality. Most

crops (especially vegetables) will grow on a wide range of soil types, the main requirement being that they are fertile and well drained.

Physical infrastructure and services that are necessary for urban agriculture include the availability of water, open spaces, inputs, credit and urban agricultural extension services. The availability of infrastructure and access to water can compensate for the lack of rainfall. Spaces must also be available for urban agriculture. In many cities, there are usually a lot of unutilized spaces which may be unsuitable for other purposes other than agriculture. These open spaces can therefore be converted to more productive use by using them for agricultural purposes. To add to these, input providers should be readily available and accessible to urban farmers to enable them get supplies of improved seeds and agrochemicals among others.

Socio-cultural conditions that influence urban agriculture are the formation of user groups, co-operatives and associations by farmers. The farming traditions and food preferences of urban households is an important condition for urban agriculture. Urban households that culturally have a farming background easily engage in urban agriculture when they relocate to urban areas. They usually cultivate traditional crops that are not usually sold in the urban markets and with time, they diversify into the production of other marketable commodities. The attitude or behavior of city residents towards urban agriculture is another cultural condition for its survival. Different people view urban agriculture in different ways ranging from outright rejection to minimal tolerance. In Ghana, getting the population to have a tolerant positive attitude towards urban agriculture has been gradual (Obosu-Mensah, 1999).

Institutional conditions refer not only to the capacity of organizations to fulfill their mandates but also the political acceptance of urban agriculture. There are institutions responsible for providing certain infrastructure and services in the city and its environs. For urban agriculture

to take place, it must be ensured that these institutions provide these infrastructure and services and not restrict access to them. For instance, proper functioning of institutions would have influence on water supply, allocation and use of land, waste recycling and environmental protection in the city development. In Ghana, institutions that can be mentioned here are the Town and Country Planning Department, Ghana Water Company Limited, Ministry of Food and Agriculture and the Waste Management Department of various cities and municipalities. For effective urban agriculture to take place, the institutional conditions have to be linked with the legal framework for urban production.

Finally, economic conditions stimulate urban agriculture. In most African countries, market liberalization coupled with structural adjustment programs in the 1980's and 1990's has made it difficult for the formal labour sector to serve the employment needs of the country's residents (Jacobi *et al*, 2000). The resultant shortage of adequate and accessible income for city dwellers makes the informal sector (including agriculture) an alternative source of employment for many city dwellers.

2.3 Strategy and Innovation in Urban Agriculture

2.3.1 The Concept of Strategy Development in Agriculture

Strategy is a plan for dealing with uncertain future circumstances. It is a set of rules by which the actions to be taken depends on the circumstances, including natural events and the actions of other people (Black, 1997). To develop a strategy suggests that there is a clear goal; the intended purpose for the plan (the strategy) is known (Hornby, 2006). In business, the goal of effective marketing leads to strategy that shows how to mix the development of the right product with the right price, place and promotions (Stokes, 1985). In rural economies, traditional

or subsistence agriculture as a strategy for livelihood is adopted in response to the available land, family labour and minimum capital.

The foregoing suggests that choice of type of urban agriculture could be strategic. In other words, the natural and economic environmental conditions pertaining in the economy will be a key influence on what farming or trading practices that people living in cities that want to earn a living or supplement their income select or create. Where there is sufficient soil, water and climatic conditions, a wide range of rain-fed cropping systems will be chosen. With erratic rainfall pattern, irrigated cropping systems will be the best strategy. With no or low space, small animal rearing and trading will be the dominant strategy. A mixed strategy makes it possible for failure in one activity to be compensated for by success in the other. The possibility of failure in the use of a chosen strategy calls for innovativeness, new ways of doing things.

2.3.2 Innovations in Agriculture

The development and implementation of strategy require effective planning and mobilization of resources. New ideas, technologies and processes are called for. The process of developing such new things is referred to as innovation. Other definitions are known. In Ethiopia, farmer innovation is seen as a different way of doing agriculture and natural resource management through creating new practices or modifying existing ones; bringing additional value over the common practices of the community without affecting the broader environment (Wettasinha *et al*, 2006). In South Africa, innovation has been seen as ‘a method or idea developed by an individual or a group without external support; a tested idea; a practical solution to a problem that an individual or group developed’ (Wettasinha *et al*, *ibid*).

In agriculture, two main types of innovations have been identified: biological/chemical and mechanical (Ruttan and Hayami, 1995). Biological/chemical innovations are observed as improved seed varieties, fertilizers, pesticides and the practice of organic farming. Mechanical innovations translate into modern machinery for land clearing, pesticide and fertilizer spraying, harvesting, shelling and threshing and packaging. Whilst the first innovation type is considered as land saving, the second is considered as labour saving. The use of high yielding varieties of seeds, water harvesting techniques, pest management chemicals and soil fertility improvement products result in intensive cultivation of crops, possible on small land areas.

Critchley (2000) has noted that in East Africa, the most common innovations fall under water harvesting, organic matter management and gully harnessing. In Ethiopia, similar innovations have been noted in land improvement, soil fertility management and rain water harvesting (Alemayehu, 2001). In northern Ghana, the people in Wapuli have developed a salt lick from a combination of naturally occurring salty soil, oyster shell and cassava flour (Bruce, 2006). On the other hand, organic farming that yields high value products (produced without chemicals) reaps high income due to premium price payments by buyers. Machines and high technology irrigation equipments save labour effort and time. Many urban agricultural farmers are known to be practicing on part time basis. The availability and affordability of such technologies become critical.

A third type of innovation referred to as institutional innovation by Ruttan and Hayami (1995) has to do with research knowledge development and education through project implementation. It also concerns new managerial practices of planning, controlling, leadership and direction, staffing, financing and administration. The extent to which farm organizations as well as support institutions (governmental and non-governmental) that have a stake in agriculture

engage in research that develops new managerial practices and technical knowledge in urban agriculture is important. In 2006 for instance, the International Water Management Institute (IWMI) in Accra under its Resource centres for Urban Agriculture and Food Security (RUAF) programme, organized the Accra Working Group on Urban and Peri-urban Agriculture (AWGUPA) to contribute to the information collation and dissemination system of urban agriculture. IWMI and some other stakeholder organizations that are in Accra are profiled in the next section.

The sources of innovation have been categorized into two: Internal or self driven and external. Producers own experimentation and originating from them is referred to as an internal source of innovation. That from Scientists (and other researchers in marketing) is referred to as external source of innovation. The transfer of technology model (ToT) is the dominant way of transferring technological information in most African countries (Bauer *et al*, 1998). With this model, Scientists develop the technology and transfer to farmers through formal extension agents. These technologies are however not readily accepted by farmers due to their expensive nature (Reij and Waters-Bayer, 2001, Critchley, 2000, Chambers *et al*, 1989). Farmers therefore tend to try out new things either on their own or as a result of what they have seen other farmers doing. However, few farmers document their innovations. It is therefore difficult to document farmer innovations because farmers themselves do not necessarily know that they are innovating (Reij and Waters-Bayer, 2001). A few farmer innovations in Africa have been described by Mutanga and Critchley, 2001 (Table 2.1).

Table 2.1: Examples of agricultural innovations in Africa

Innovation	Brief Description
1.Road run-off harvesting	1. Run-off is harvested from a tarmac road and distributed through a field using various types of banks and channels.

2. Gully harnessing	2. A gully has been rehabilitated with stone barriers and made productive by planting fruit trees.
3. Compost making	3. Compost is produced in large quantities based on manure from stall-fed livestock.
4. Vegetative gully healing	4. Land is reclaimed from gullies by the combination of trash/soil cross-gully checks and vegetative barriers.
5. Integrated water management	5. A valley bottom is made cultivable by raised beds which can drain water or distribute run-off as required.

Source: Mutanga and Critchley, 2001

2.3.3. Gender and Strategic Innovations in Urban Agriculture

There are varying patterns of involvement of men and women in urban agriculture. The trends so far suggest that the choice of involvement by men and women in any part of the urban agriculture chain, from input supply to output development is strategic. Choice appears to be based on demands of physical strength, capital requirements (skills and funds), return on investment or food security. In most East African countries (eg. Kenya, Tanzania, Mozambique, Uganda, and Zimbabwe) urban agriculture is mostly practiced by women either as individuals or in groups (Drechsel et al, 2006). This situation has been attributed to the fact that women have the primary responsibility of the sustenance and wellbeing of the home coupled with their relatively lower educational status (Chancellor, 2004, Obosu-Mensah, 1999). This pattern is somewhat reversed in most West African Countries. A study of urban agriculture in thirteen West African countries revealed that it is only in Gambia, Guinea and Sierra-Leon cities that females form over 70 percent of the population (see Table 2.2).

Table 2.2: Gender in irrigated vegetable production in selected West African Countries

Country	Cities	Male (Percent)	Female (Percent)
Benin	Cotonou	75	25
Burkina Faso	Ouagadougou	62	30
Cameroun	Yaoundé	84	16
Cote D'Ivoire	Abidjan, Bouake	60-95	5-40
Gambia	Banjul	10	90
Ghana	Accra, Kumasi, Tamale, Takoradi	80-90	10-20
Guinea	Conakry	30	70
Mali	Bamako	76	24
Mauritania	Nouakchott	85	15
Nigeria	Lagos, Ibadan	75-95	5-25
Senegal	Dakar	70-95	5-30
Sierra-Leone	Freetown	10-20	80-90
Togo	Tsevie	70-80	20-30

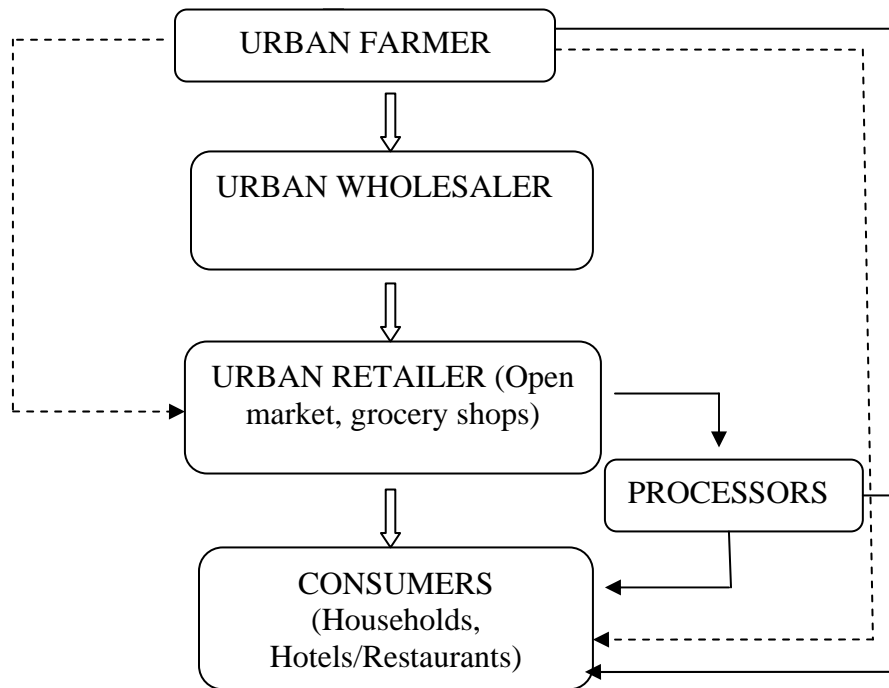
Source: Drechsel et al, 2006.

In the city of Accra, urban agriculture is mostly practiced by men (Egyir *et al*, 2007, Drechsel *et al*, 2006, Cofie *et al*, 2005). Where women were found in vegetable cultivation, they were usually into the cultivation of traditional crops like okro and green leafy vegetables such as *ayoyo* (*Cochorus spp*) and *alefu* (*Amaranthus spp*). Male farmers engage in intensive exotic vegetable cultivation which is deemed more profitable (Cofie *et al*, 2005). Among the reasons for the low participation of women in urban crop cultivation in Accra is the arduous nature of

farm work. The work involves manual land preparation, watering, transplanting, weeding and harvesting (Egyir *et al*, 2007, Drechsel *et al*, 2006, Cofie *et al*, 2005).

Post-production processes such as harvesting, packaging and sale (retailing) is seen as less physically challenging. Women therefore dominate the marketing of urban agricultural products. In Ghana and Burkina Faso, it has been observed that the marketing of cabbage, carrots, lettuce and *ayoyo* among others was dominated by women (Drechsel *et al*, 2006, Cofie *et al*, 2005, Gerstl, 2001). Urban women make arrangements with urban farmers and buy directly from the farms for sale to consumers and other users (retailers, cooked food sellers) in the urban markets. Occasionally, retailers and some consumers go to the urban farms themselves to buy directly from the farmers (Egyir *et al*, 2007). A large proportion of all livestock particularly sheep, goat, poultry, grass cutter, rabbits and pigs are sold directly to consumers and processors of meat (see Figure 2.1).

Figure 2.0: Marketing channel of urban agricultural products



Legend: --► Occasional Crop Channel—► Livestock Channel ⇔ Crop/Livestock Channel

Source: Researcher's Impression

2.3.4. Stakeholders and Innovations towards Urban Agricultural Development

Stakeholders are the persons who operate urban agriculture enterprises and those external to the enterprise but influence the processes that produce and distribute the output of the enterprise. Anybody who stands to lose if an activity (business) is run badly is a stakeholder (Black, 1999). Stakeholders in urban agricultural activities may be categorised into public institutions, private institutions, profit oriented firms and not-for-profit organizations (Uphoff, 1985). These stakeholders play significant roles in facilitation, networking, policy advice and the general support of livelihoods related to the agricultural production and marketing systems. Public institutions are made up of the local government and administrative departments and the formal organizations mandated by government to do research, give technical support and implement regulations formulated to protect consumers, producers and the general environment (Uphoff, *Ibid.*). Private institutions in urban agriculture are either formally registered with the Registrar Generals' Department or operate in the informal sector. The private institutions in urban agriculture usually have a profit-making motive. Not-for-profit organizations are formally registered private companies limited by guarantee.

In the city of Accra, a number of urban agriculture stakeholders have been profiled (Egyir *et al*, 2007, Cofie *et al*, 2005). They are the International Water Management Institute (IWMI), Environmental Protection Agency (EPA), Ghana Standards Board (GSB), Ministry of Food and Agriculture (MOFA), Accra Metropolitan Assembly (AMA), Heifer Ghana, Food and Drugs

Board (FDB), Enterprise Works Vita, General Agricultural Workers Union (GAWU), Town and Country Planning and Food Research Institute (FRI). What is of interest is the extent to which their mission and functioning evolve innovations that contribute to the growth and development of urban agriculture.

International Water Management Institute (IWMI)

The International Water Management Institute is an international non-governmental organization that focuses on research concerning poverty reduction and food security through sustainable and efficient agricultural soil and water management. The institute under its Resource Centres for Urban Agriculture and Food Security (RUAF) launched a four year project on urban agriculture in Accra with the main aim of projecting urban agriculture in the city of Accra. Activities under the programme include awareness creation, information exchange, training and capacity building and facilitating policy formulation. A working group on urban agriculture (AWGUPA) was constituted in 2006 and is still vigorously working to promote urban agriculture in Accra.

Ministry of Food and Agriculture (MOFA)

The Ministry of Food and Agriculture is a national body that oversees the affairs of all agricultural commodities except cocoa and timber. The Ministry through its Metropolitan Agricultural Development Unit (MADU) collaborates with various agencies to implement government policies concerning crops, animals, food processing, technical information development and dissemination and formal irrigation water supply for crops.

Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) is a government agency under the Ministry of Local Government, Rural Development and Environment. The agency is mandated to regulate the management of chemicals, and wastes and the importation, registration, distribution, application and disposal of pesticides. The agency has an Accra district office that monitors enterprises in Accra with chemical use functions.

Heifer Ghana

Heifer Ghana is part of Heifer International, a US based non-governmental organization. Heifer Ghana is focusing on the provision of food and income producing animals alongside training in skills development, participatory methods and gender to help reduce hunger, poverty and environmental degradation. In Accra, the organization has trained over hundred (100) people in grass cutter production.

Enterprise Works Vita

Enterprise Works Vita is a non-profit organization that fights poverty in the developing world through business development programs that allow small agricultural producers and other entrepreneurs to increase productivity and incomes, pursue sustainable business opportunities and create jobs that benefit their families, communities and regions. In Ghana, it has introduced simple irrigation machinery for all types of farming and stoves for traditional catering.

2.4 The Food Supply System and Urban Agriculture

The food supply system involves the interaction of sources of production, intermediary marketing agents and services, infrastructure and regulations. It is complex and its effectiveness requires the integration and linkages of various elements. The sources of food supply in any economy are varied: internal and external. The internal, local or domestic sources may be rural, peri-urban or urban. The external is that from foreign origins across the country's borders. Whether an economy depends on any of the sources is related to several factors. Food production that depends heavily on natural resources would originate from areas with favourable ecology and fair availability of the other factors of production. Ghana's urban food supply tends to be rural and foreign source dependent. The expenditure on foreign supply keeps rising because the rural production is insufficient. The insufficiency is partially attributed to poor transport and telecommunication infrastructure, lack of energy for preservation and ineffective handling by middle men who travel long distances to prepare and ship produce to urban areas. Where the food stuff is highly perishable, the situation of post harvest loss is worsened.

Obuobie *et al* (2006) have noted that urban agriculture could be a means of obtaining a balanced food supply in urban areas. Urban agriculture complements rural agriculture and supports the diets of many urban consumers. Nugent (2000) has stated that urban agriculture can meet part of the urban demand of particular types of food such as fresh vegetables, poultry, potatoes, milk, fish and eggs. Indeed, a recent study in the city of Kumasi (Ghana) showed that ninety-five percent (95%) of fresh milk, ninety percent (90%) of lettuce, ninety percent (90%) of spring onions and fifteen percent (15%) of poultry were produced within Kumasi city (Drechsel *et al*, 2006). In the city of Accra, similar studies have shown that more than eighty percent (80%) of spring onions and lettuce consumed in Accra was produced in the city of Accra (AWGUPA, 2006). In an urbanized country like the United States of America (USA), thirty percent (30%) of

agricultural production is from metropolitan areas (UNDP, 1996). The contribution of urban agriculture to food supply in selected countries around the globe is as shown in Table 2.2.

Therefore it is said that, even though urban agriculture may not contribute significantly to the gross domestic product (GDP) of an economy, its impact on the supply of food at the household level may be very significant (Maxwell and Armar-Klemasu, 1998, Egyir *et al*, 2007).

Table 2.3: Contribution of urban agriculture to food supply in selected countries

Country	Urban agriculture's contribution to specific commodities
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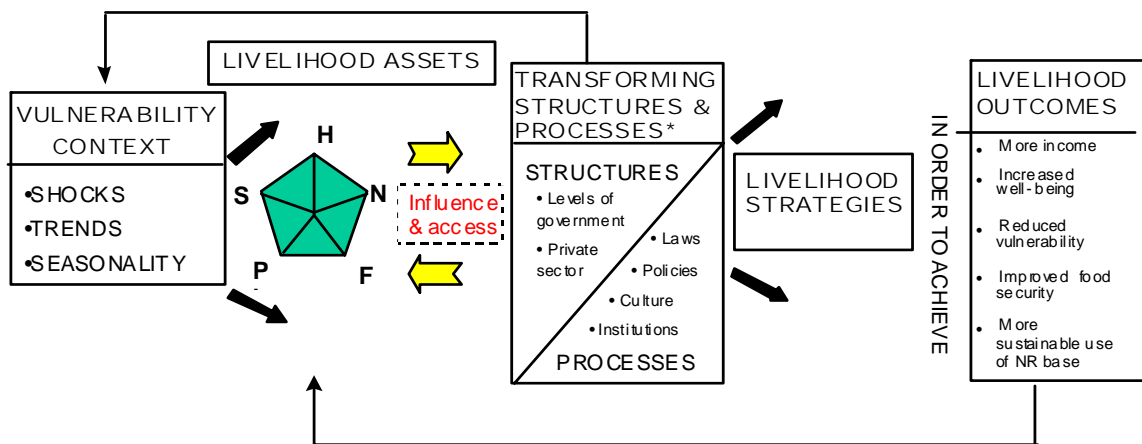
Mali	Bamako city is self-sufficient in horticultural production and some products are shipped outside the metropolitan area.
Uganda	In Kampala, 70% of poultry meat and eggs are produced inside the city.
Zambia	In Lusaka, subsistence food production accounts for 33% of total consumption by squatters.
China	Over 90% of vegetable and over half of meat and poultry demand in 18 of China's largest cities is grown in urban areas.
Hong-Kong	Vegetables sufficient to meet 45% of local demand.
Indonesia	In Jakarta, almost 20% of food consumed by squatters is self produced.
Nepal	In Kathmandu, 37% of food producers surveyed met their household plant food needs and 11% met their animal food needs.
Singapore	Eighty percent of the poultry and 25% of vegetables are produced within the city.
United States of America	Thirty percent of US agricultural production produced within metropolitan areas.

Source: UNDP, 1996

2.5 Livelihoods Support Systems and Urban Agriculture

The livelihoods support system involves the interaction of livelihood assets, strategies and outcomes together with the effects of institutional and informal processes, risks and shocks. The assumption by DfID is that all individuals in society are endowed with some level of human, financial, physical, natural and social/capital resources which describe their livelihood assets (DfID, 1999). The individual select strategies (primary production, manufacturing or services) that are carried out to improve their level of food security, income and employment, well being, reduce vulnerability and environmental degradation. These are the livelihood outcomes (Figure 2.1).

Figure 2.1 DfID's Sustainable Livelihoods Framework



Source: DfID, 1999

However, due to the fact that the environment within which these strategies are operated is full of shocks, unfavorable trends and seasonality, certain transforming processes and structures are always needed to boost the strategies. In rural societies, the availability of natural capital influences the choice of primary production as the major strategy for livelihood development. Hence, crop, livestock, fisheries and agro-forestry is practiced. On the other hand,

the availability of physical, human and financial capital in urban areas influences the choice of manufacturing and service (formal sector activities) as the major strategy for livelihood development. However, as the population in towns and cities increase continuously, the rate of employment in the formal sector begin to reduce. If the implementation of various support programs and policies is not effected to create more formal sector jobs, the residents tend to find livelihoods in the informal sector. Among the informal sector activities that urban dwellers engage in are commerce, artisanship, other exchange based activities and urban agriculture.

Jacobi et al, 2000 assert that increasing farming activities in the city is linked to economic decline and increasing poverty in urban centres. Moustier (2001) has noted that urban vegetable production is one way of obtaining stable source of income for less qualified workers with limited initial capital for investment. The importance of urban agriculture in the development of livelihood outcomes of many city dwellers can thus not be over emphasized. Its contribution to household food security through direct supplementation of household food is well known (Obuobi et al, 2006). Armar-Klemasu and Maxwell (1998) also noted that ‘food is still the single most important commodity in the urban consumers’ basket of goods and services’ and urban agriculture could help to reduce the household expenditures on food and/or provide a means of obtaining food. Indeed a rapid appraisal of households in the university of Ghana campus suggest that most households cultivate annuals and perennial crops or raise small animals in spaces in front and backyards, use the output to supplement household food supply (Egyir et al, 2007). At least 20% of all plantain, okro and maize consumed in 10% of households in the link gate area are obtained from home gardens.

Urban agriculture also plays an important role in the incomes of urban residents. Far back in 1987, Kwakye-Boadu (1987) found out urban market gardening was profitable in terms of

supplementing income and providing food for household consumption. Yawson (1997) also discovered that urban vegetable gardening contributed between fifty-five percent and ninety-five percent (55% - 95%) of total household income of the producers. In the city of Accra, Drechsel *et al*, 2006 reported that up to sixty percent (60%) of farmers involved in irrigated vegetable cultivation rely solely on it as a source of income. In 2005, the typical net monthly incomes of mixed vegetable producers in selected cities ranged between US \$ 20.00 in Bamako and US \$ 279.00 in Nairobi (see Table 2.3).

The rippling effects of urban agriculture in terms of employment creation for urban dwellers involved in the processing, distribution and input supplies can be imagined. What is very real is that, through urban agriculture, people are able to purchase certain household assets, attend hospital, pay school fees etc. In the city of Bamako, an urban farmer said that he was able to buy four houses from urban agriculture proceeds after twenty (20) years (Drechsel *et al*, 2006). In the same city, a woman whose husband got incapacitated was able to send her children to school through urban agriculture proceeds (Drechsel *et al*, *ibid*).

Urban agriculture is a poverty reduction strategy that needs to be explored by all developing economies including Ghana.

Table 2.3: Net monthly income from mixed vegetable production in selected cities

City	Country	Net monthly (\$ US)
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Accra	Ghana	40-50
Bamako	Mali	20-200
Bangui	Central African Republic	320
Banjul	Gambia	30
Bissau	Guinea-Bissau	24
Brazzaville	Congo	80-270
Cotonou	Benin	50-110
Dakar	Senegal	40-250
Dar es Salaam	Tanzania	60
Kumasi	Ghana	35-160
Lagos	Nigeria	120
Lome	Togo	13-330
Nairobi	Kenya	10-279
Niamey	Niger	40
Ouagadougou	Burkina Faso	25-70
Yaoundé	Cameroon	34-67

Source: Drechsel et al, 2005

2.6 Methodological Issues in Systems Analysis

The methodology for analyzing the performance of a system has been variously described. Porter (1985), Austin (1995) and CTA (2004) have been noted in the literature.

Porter (1985) asserts that the margin (profit/loss) obtained from the production of any commodity is related to the value created or lost in the cause of mobilizing logistics, carrying out operations during production and marketing and the services after sales (see Figure 2.2). Assuming that there is an urban agricultural value chain, the primary elements to analyze would include the value added to inputs delivered into a farm or processing centre, cultural practices, output packaging and storage, transportation and sales. The effectiveness of the secondary elements such as research and development, infrastructure, technology, procurement and human resource affect the level of value addition and profit margin obtained.

Austin's text on agro-industrial project analysis assumes linkages between the production chain, micro-macro environment, institutional framework and international systems ought to be

mapped and assessed whenever the performance of an agro-industry needs to be understood. He asserts that procurement, processing/operations and marketing are key in developing the industrial sector of agriculture and the strength of linkages among stakeholders should be the focal point for growth orientation. The implication this has for the study on urban agriculture is that the relationship between stakeholders in urban agricultural production viz., producers, input dealers, policy makers, NGO's and international markets need to be well understood. The performance of one group would be closely linked to the performance of others. Non-performance of the system means there is poor functioning of one or more of the linkage groups.

In 2004, CTA developed an analytical framework for assessing the agricultural science, technology and innovation (ASTI) system of products and subsectors (CTA, 2005, Owusu-Bennoah *et al*, 2007). Underlying the framework was the assumption that every system thrives on innovation development. The framework identified five elements of the system that needed close examination for innovations in terms of situation descriptions and impacts. The elements are arranged in a sequential form and are shown in the following steps:

1. Review of economic and sectoral policy framework
2. Identifying the key actors in the ASTI system
3. Assessing habits and practices, competencies and performance of the actors
4. Assessing functions of the actors and
5. Mapping the strength of linkages among the actors

For any subsector or product, the areas of policy review to be highlighted are innovations in policy design, planning, budgeting and implementation that target the subsector.

The actors of the ASTI system are categorized under demand (D), enterprise (E), research (R), diffusion (D) and infrastructure (I). The demand actors include traders, processors and

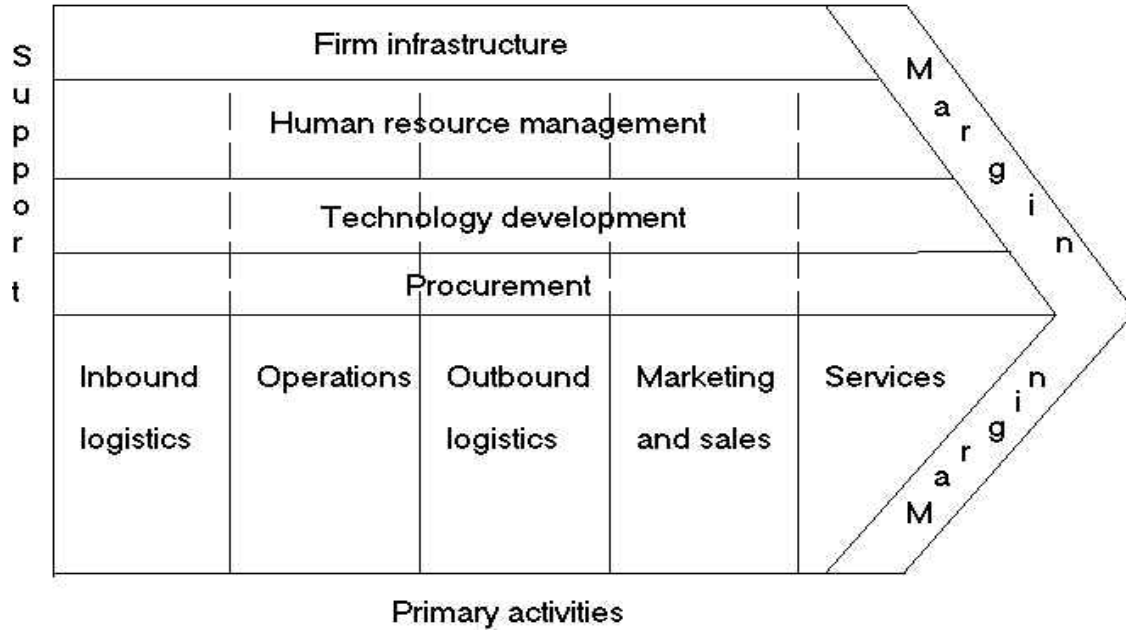
consumers of end products. The enterprises are the primary producing firms, say the farmers and input dealers who supply and use logistics. The research actors are those in production and marketing research who develop and try new technologies in response to market situation. The diffusion actors are the consulting, training and extension agencies who package research information and share the knowledge with enterprises and demand actors; and the infrastructure actors are the individual firms and organizations that provide finance, market services, transport and other infrastructure.

The habits and competencies of actors are shaped by inherited information and new knowledge, lessons and experiences. The extent of innovativeness shapes performances. The functions of actors are basic or supportive. They may be mandatory, originating as statutory functions enshrined in State constitutions. The nature and origin of functions affect the extent of innovation and performance. The strength of linkages among actors allows for collaborations, networking and learning that affect innovation and systems performance.

The ASTI framework suggests that with good policies and strong linkages among actors in urban agriculture, producers will be responsive and innovate to sustain or support livelihoods. All the three analytical frameworks (Austin, Porter and ASTI) in a way agree that public-private partnership drive innovation development, value addition and the good life of individual (group) actors of a system. Hence, any of the following can be adapted in: assessing whether there are strategic innovations in urban agriculture, describing the types and sources of innovations for the various actors or stakeholders in urban agriculture; and describing how food supply in Accra and lifestyles of producers have been affected.

Fig. 2.2 Description of Porter's value chain

M. Porter's Value chain



Source: Porter, 1985

2.7 The Geographical Area of Study

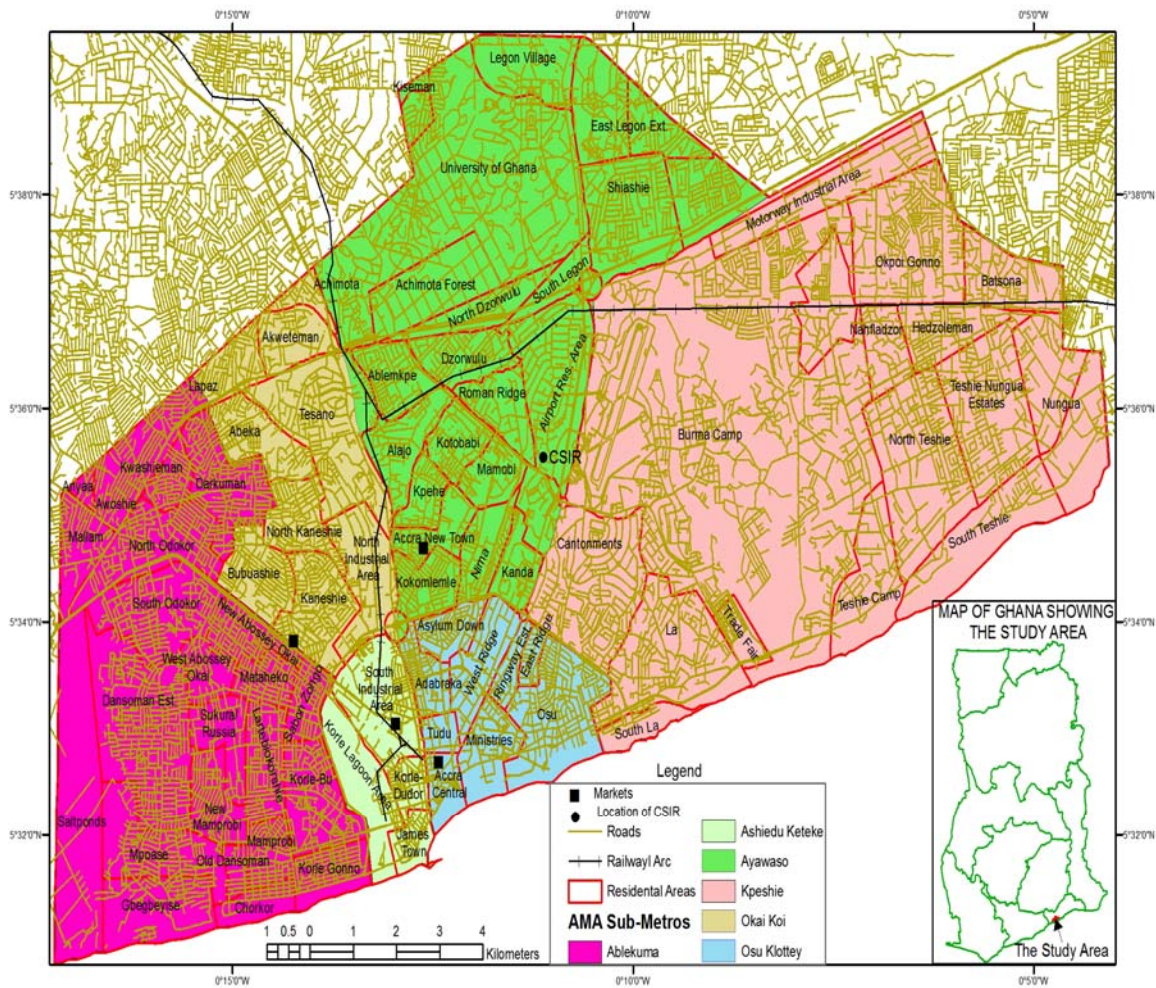
Accra, the capital city of Ghana occupies an area of 240 square kilometers (GSS, 2002). Its population in year 2000 was estimated to be about two million with a population growth rate of 3.4% per annum (GSS, *ibid*). In local government terms, the city is described as the Accra Metropolitan Assembly (AMA). It is administratively divided into thirteen sub-metro's viz; the North Okaikoi, Okaikoi South, Ablekuma North, Ablekuma South, Ablekuma Central, Ayawaso Central, Ayawaso West Wagon, Ayawaso East, Nungua, La, Teshie, Ashiedu-Keteke and Osu-Klottey sub-metros (see Figure 2.3). All these sub-metros are endowed with resources that support agriculture.

First, the land and ecology, arable open spaces yet to be developed into residential facilities exist behind and in front of offices, homes and schools. There are other water logged areas yet to be reclaimed. Secondly, many unskilled labourers that can be employed and trained

to undertake various activities within a short time around. The supply of such labour is made possible by the high rate of immigration by rural folks with minimum education and low white colour employable skills. Third, capital inputs for managing urban agriculture abound. There are many importers, wholesalers and retailers of seed, fertilizer, agrochemicals, machines, tools and other equipment. It is access to credit for starting businesses related to farming that may be limited. This is because all the over 100 commercial banks and non-bank financial institutions in the area require collateral as evidence of credit worthiness; the practitioners of commercial urban agriculture are generally placed in the low income category. However, there is ready market for most of the output of urban agriculture particularly the fresh food. This means that with good financial planning, ploughed back capital accumulated from sale would be the strategy to adopt. There are about thirty-three markets under the Metropolitan Assembly. Notable among the well organised markets in the city are the Makola, Kaneshie, Agboghloshie and Mallam Atta markets. Other informal ones are located within all the sub-metropolitan areas.

The city of Accra lies within the coastal savanna zone and has a mean annual rainfall of 810 mm (Agbozo *et al*, 2003). There are two rainy seasons; the major season is between March and June and the minor season is between October and December. However, it is observed that only about 80 days of rain can be depended upon (Egyir *et al*, 2007, Kufogbe *et al*, 2005, Agbozo *et al*, 2003) and irrigation thus becomes critical for sustainable urban agriculture.

Fig 2.3: Map of AMA showing the geographical area of study



CHAPTER THREE

METHODOLOGY

This chapter describes the methodology employed in the analysis of specific objectives of the study. First, the research design and method of data analysis are described. The data sources and method of data collection are also presented. The chapter ends with the scope and limitations of the study.

3.1 Research Design

The design of any research is exploratory, descriptive or causative (Burns and Bush, 2002). In order to identify the strategic innovations in urban agriculture, both the exploratory and descriptive designs were used. It is assumed that the innovations that have been developed or implemented by farmers and traders in the AMA have not been documented so they were explored and a description of their nature given. The descriptive design was employed in determining the contribution of innovations in urban agriculture to food supply since simple ratios and percentages are employed. Finally, in order to assess the effect of urban agriculture on livelihood outcomes in Accra, a combination of the three designs was employed. The perception and opinions of farmers on livelihood situations and linkage with output of urban agriculture is carried out.

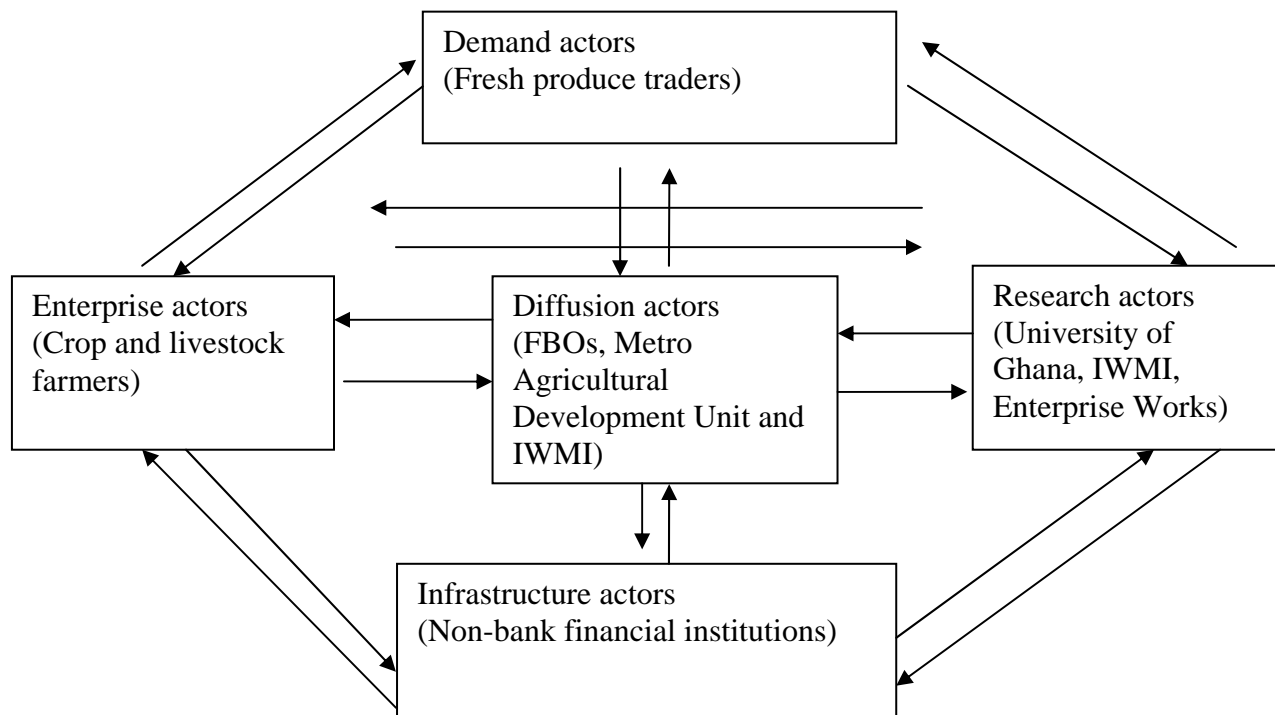
3.2 Method of Analysis

3.2.1 Analyzing Strategic Innovations in Agriculture in Accra

In order to identify the strategic innovations in urban agriculture in Accra, the Agricultural Science Technology and Innovation (ASTI) Systems framework suggested by CTA (2005) was employed. The ASTI was selected because it better explains the inter-relationships between the various actors in the urban agricultural system. The five elements of the urban ASTI system were identified. Hence,

1. The policy framework concerning agriculture was reviewed and new priorities (innovations) for UA identified.
2. The key actors in the system were identified and profiled using the D-E-R-D-I categorization (see figure 3.1).

Figure 3.1 Actors in the ASTI System



Source: Adapted from CTA (2005)

3. Innovations in the habits and practices, competencies and performance of selected actors were assessed.

The indicators of habits and practices measured included: level of training and learning, input acquisition, operations in production and marketing and the use of services. Also, the indicators of competency included level of formal education, apprenticeship and application of technical and managerial skills. Finally, the indicators of performance were: trends in output, area (size/capacity), unit price of product, changes in technology (biological/chemical and mechanical innovation use) and product improvement (packaging and standardization)

4. Effectiveness of key functions being performed by actors in the innovative system was then determined by comparing basic (statutory) functions to current actions to understand the extent to which the latter involves new ways of doing things (institutional innovation).
5. The strength of innovative linkage strategies among various actors was mapped by using a likert scale that scored strong=1 and weak=0. The perception of respondents particularly, the institutional actors, concerning the strength of a linkage was evaluated using percentages. Where less than 50 percent of actor select 1 as response, linkage is categorized as generally weak, otherwise it is strong. Additionally, producers' innovations over the last ten years were determined by asking farmers and traders about innovative practices in their businesses. These were then described using percentages and charts.

3.2.2 Analysing the Contribution of Urban Agricultural Production to Food Supply in Accra

In order to determine the contribution of urban agricultural production to food supply of selected commodities in Accra, the following linear equation was used

$$\%FS_A = \%FS_R + \%FS_U + \%FS_M \dots\dots\dots (3.1)$$

$\%FS_A$ = Total percentage of food supply in Accra

$\%FS_R$ = Percentage of food supplied from other part of Ghana

$\%FS_U$ = Percentage of food supplied from urban Accra

$\%FS_M$ = Percentage of food supplied from imports

Three categories of food commodities were of interest in this regard; local vegetables (alefu, ayoyo/edeme, gboma and okro), poultry eggs and live poultry birds. The share from urban agriculture for each vegetable was then determined as,

$$FS_U = \frac{N-R}{N} * 100\% \dots\dots\dots (3.2)$$

Where;

N = Total volume/value in each category of food item

R = Total volume/value from other part of Ghana

Statement of Hypothesis

H_0 : $FS_U = 0$

H_1 : $FS_U > 0$

Test of Significance

The student t-test is then used to test whether the share from urban agriculture in Accra is significant. Descriptive statistics was then employed to depict the shares from urban and rural agriculture.

3.2.3 Analyzing the Effect of Urban Agriculture on Livelihood Outcomes in Accra

Following DfID's Sustainable Livelihood Framework (DfID, 1999), the extent to which the livelihood outcomes of the people engaged in urban agriculture in Accra was determined. The assumption is that urban agriculture is a livelihood strategy that is applied to the minimum assets of urban farmers and traders to achieve improved livelihood outcomes. The measurable indicators of livelihood outcomes included:

1. Income = Savings on food and net income from sales
2. Food security = Food availability at household level; the number of times a household consumed a meal. An average of 3 times daily was expected; otherwise the situation was categorized as insecure.
3. Wellbeing = Child education funded from urban agriculture income and/ savings; cost contributed was measured.
4. Vulnerability = reduction or improved social inclusion or community leadership; membership of farmer or trader associations was measured and analysed using percentages.
5. Sustainable use of natural resources = perceptions of farmers and traders of the impact of urban agriculture on the physical environment as well as /personal

health and safety was measured using a likert scale to determine extent of agreement.

3.3 Sources and Method of Data Collection

Both primary and secondary data were employed in the analysis of this study. The secondary data on policy targets, projects and programs related to urban agriculture were obtained from documents such as the national development plans (1957-2006, various editions), food and agriculture development policies, AMA bye-laws and other empirical literature. Other time series data of production and area cultivated were obtained from the statistical research and information directorate (SRID) of MOFA (see Appendix 4).

Primary Data Collection

Data for the analysis of nature, sources and type of strategic innovations, share of urban food supply, and level of income from urban production as well as perception of impacts of UA were obtained from survey.

1. Selection of survey areas

There are thirteen sub-metros in AMA, the city of Accra. Five communities and four markets were purposively selected based on ease of access to respondents during a rapid appraisal of farmers in the city. However, the location and spread of the communities show that there is fair coverage. Each of the locations was known for specific crops or livestock production. Hence the major crops targeted included local and exotic vegetables; the livestock products were poultry, grass cutter, pigs and eggs.

2. Selection of respondents

Simple random sampling and convenient sampling procedures were employed. To select both traders and farmers a list of farmers and telephone contacts produced by key informant farmers (Opare and Fuseini, Executive members of FBOs in Dzorwulu and La) expedited action on visits to farmers (Table 3.1, Appendix 5). With traders, those who were available during the time of visit were interviewed (Table 3.2). Therefore although there was no systematic random selection, each farmer/trader was given a chance to respond to questions posed.

Twenty support institutions for urban farmers and traders (enterprise and demand actors) were targeted. A list was obtained from Egyir et al, 2007 and Cofie et al, 2005. The organizations were then categorized according to ASTI typology as research, infrastructure and diffusion. However, only eighteen completed and returned questionnaires distributed to them (Table 3.3). Senior officers and executives of associations of the organizations were interviewed to obtain information on

mission/vision/objectives, mandatory/basic and support functions as well as current programmes and projects related to agriculture and urban agriculture in particular.

Table 3.1: List showing category and number of farmers interviewed

Urban agricultural product	Number of respondents		
	Male	Female	Total
Vegetables	48	2	50
Pigs	15	5	20
Grass cutter	27	3	30
Total	90	10	100

Source: Field survey, 2007

Table 3.2: List showing category and number of traders interviewed

Commodity	Number of respondents		
	Male	Female	Total
Exotic vegetables	1	39	40
Local vegetables	0	20	20
Eggs	0	40	40
Live Poultry birds	19	1	20
Total	20	100	120

Source: Field survey, 2007

Table 3.3: List of institutions interviewed

Research and Development	Science and Technology Policy and Research Institute (of CSIR) International Water Management Institute (IWMI) University of Ghana (College of Agriculture and Consumer Sciences) Enterprise Works Vita
Diffusion	Metro Agricultural Development Unit (MADU) Accra Working Group on Urban and Peri-urban Agriculture (AWGUPA) Greater Accra Poultry Farmers Association Ablekuma Co-operative Grass Cutter Farmers Association Awoshi Pig Farmers Association
Infrastructure	Accra Metropolitan Assembly (AMA) Environmental Protection Agency (EPA) Women's World Banking Ltd. Procredit Ltd. La Community Bank Ltd. Ghana Private Road Transport Union Greater Accra Input Dealers Association, Water Vendors Association

Source: Field survey, 2007

3. Interview procedure

A combination of procedures was employed. First, a rapid appraisal of key informants was carried out to aid in the design of questionnaires for farmers, traders and institutions (see appendix 1-3 for final samples). Then in December, the questionnaires were pretested and modified using five people from each category of respondents. Actual data collection for farmers and traders lasted for one month (December, 2007-January, 2008). The institutional questionnaire also lasted for one month February- March, 2008.

4. Data cleaning, entry and reduction

Data cleaning lasted for two weeks. It included standardization of units of measures, cross checking on respondents for non-responses and coding of non-precoded questions. The SPSS software was employed during data entry and descriptive analysis: frequencies, percentages, central tendency measures, cross tabulations and test statistics. The Excel package was then used to generate all graphs and pie charts.

3.4 Scope and Limitations of Study

This study sought first, to identify the strategic innovations in procurement of logistics, production of food commodities and marketing of the food in the Accra Metropolitan Area. The AMA in this area was not only limited to the city of Accra but its immediate environs as well. This was because 90 percent of the poultry and livestock farms identified were located in the peri-urban areas in Tema and Awoshie areas. Only three of the key livestock types were studied: live birds, grass-cutter and pigs. These are confined and can be promoted in low space areas, hence a study of their potential in livelihood development of urban residents.

There are many official and unofficial market places in the AMA. However, only four key ones noted as retail markets were selected. These were Kaneshi, Makola, Agbogbloshie and Mallam Atta markets.

Eighteen out of the twenty institutions proposed were finally included in the study. This was because the time frame for following up the others expired. The omitted ones were: The Ghana Standards Board and the Agricultural Engineering Services Directorate of the MoFA.

The study relied largely on the recall ability of farmers and traders and this could limit the conclusions of the study. Incomes of grass cutter and pig farmers could not be computed due to lack of reliable data.

Food security is measured as availability, accessibility and utilisation. However, in this study it was limited to available food in the home for three meals daily. The utilisation in terms of nutrition and safety was ignored due to the complexity of measuring these variables.

CHAPTER FOUR

RESULTS AND DISCUSSION

In this chapter, the results obtained from the study are discussed. The chapter opens with a discussion of the socioeconomic background of farmer and trader respondents. A description of such characteristic allows for explanation of any variations in habits and competencies (entrepreneurial abilities or propensity to innovate). The results on nature of strategic innovations developed or adopted by urban farmers, traders and formal institutions concerned with urban agriculture over the last decade are then presented. Next, the contribution of urban agriculture to the supply of certain fresh vegetables in four selected markets in the Accra Metropolitan Area (AMA) is evaluated. Finally, the effect of urban agriculture on the livelihoods of the key practitioners (farmers and traders) in AMA is discussed.

4.1 Characteristics of Survey Respondents

1. Age Distribution of Respondents

The respondents were between the ages of 18 years and 76 years. Most of the farmer respondents (70%) were younger; the oldest was 50 years. Among the trader respondents, an 83.3% majority were within this age bracket. Only 8.5% of all respondents were more than 60 years of age and these were all males among both traders and farmers. This goes to suggest that older males are more likely to participate in urban agriculture than females (see Table 4.1).

Table 4.1: Representation of respondents by age

AGE RANGE	FARMERS (%)		TRADERS (%)		ALL (%)
	FEMALE	MALE	FEMALE	MALE	
18-30	0	17.5	15	7.5	20.5
31-40	1.3	22.5	30	5.8	31
41-50	3.8	25	23.3	1.7	26.5
51-60	1.3	12.5	11.7	1.7	13.5
60 +	0	16.3	0	3.3	8.5
Mean	44.9		39.6		
Maximum	76		70		
Minimum	22		18		
Standard Deviation	13.9		10.9		

Source: Authors' computation from field data, 2007

2. Education

Seventy-three percent (73%) of all respondents have had some form of education ranging from the primary to tertiary level. The remaining 23% have not had any formal education at all. Among those who were not formally educated at all, 29.2% were traders and 23.8% were farmers. Additionally, more farmers (26.3%) tended to have secondary and tertiary education than traders (14.5%). This suggests that relatively speaking; farmers are more educated than traders and are expected to explore further, better ways of undertaking the economic activities they are engaged in.

Table 4.2: Educational background of respondents

EDUCATIONAL LEVEL	FARMERS (%)		TRADERS (%)		ALL (%)
	FEMALE	MALE	FEMALE	MALE	
Primary	0	10	10	3.3	12
JSS	0	2.5	6.7	2.5	6.5
Middle School	1.3	16.3	27.5	0.8	24
Secondary	2.5	15	6.7	5	14
Tertiary	0	8.8	0.8	0	4
Vocational/Technical	2.5	13.8	6.7	0	10.5
Other	0	3.8	0.8	0	2
None	0	23.8	24.2	5	27

Source: Authors' computation from field data, 2007

3. Marital Status and Number of Dependants

Among all respondents, about 73% were found to be married. Eighty-one percent (81.3%) of farmers were found to be married as compared to about 67% of traders. Nineteen percent of respondents were single, 2.5% either separated or divorced and 6% was widowed. This means that urban agriculture practitioners have families/people that depend on them for their livelihoods.

Among those who participate in crop/livestock farming, 68.2% have between zero to three dependants with 93.2% of these dependants being in school. About 73% of traders have between zero to three dependants but with a lower percentage (87.6%) of these dependants being in school. About 3% of traders have above seven dependants. The average number of children for both farmers and traders was approximately three. However no farmer was found to have more than seven dependants. The implication is that the possibility of family labour for both farmers and traders is high and positive for actors who are low income and cannot always pay for all services planned to be undertaken.

Table 4.3: Marital Status of respondents

MARITAL STATUS	FARMERS (%)	TRADERS (%)	ALL (%)
Single	12.5	23.3	19
Married	81.3	66.7	72.5
Widowed	5	6.7	6
Separated	0	2.5	1.5
Divorced	1.3	0.8	1
Total	100	100	100

Source: Authors' computation from field data, 2007

Table 4.4: Number of Dependants of Respondents

NUMBER OF DEPENDANTS	FARMERS		TRADERS	
	Percent of Farmers	Percent in School	Percent of Traders	Percent in School
0-3	68.2	93.2	73.4	87.5
4-7	31.8	6.8	24.1	11.7
8-11	0	0	1.7	0.8
12	0	0	0.8	0
Total	100	100	100	100
Mean	2.7	1.7	2.6	1.7
Maximum	7	5	12	0.7
Minimum	0	0	0	0
Standard Deviation	1.7	1.2	1.9	1.7

Source: Authors' computation from field data, 2007

4. Farming/Trade as a Major Occupation

Approximately 80% of respondents' either solely farm or trade in urban agricultural products for their livelihood. However, only 55% of farmers practice farming for their livelihood. The remaining 45% only practice farming as a part-time/leisure activity as these are fully employed in the government sector, private sector or run their own businesses. Among traders however, about 96% engage in trade as a full time activity. This may be attributed to the fact that in trade, the physical presence of an individual is needed at all times unlike farming that demands attention only at particular times. Additionally, this situation may be attributed to the fact that farmers are mostly male and more educated and hence tend to find it relatively easier to find alternative sources of livelihoods in other sectors of the economy.

Table 4.5 Farming/Trade as a major Occupation

FARMING/TRADE MAJOR OCCUPATION	FARMERS		TRADERS		ALL (%)
	FEMALE (%)	MALE (%)	FEMALE (%)	MALE (%)	
Yes	3.8	51.3	82.5	13.3	79.5
No	2.5	42.5	0.8	3.3	20.5

Source: Authors' computation from field data, 2007

5. Experience in Farming/Trade

The trend in experience in business is similar for both traders and farmers. Majority of the respondents (about 61%) have been farming or trading for up to ten years. There were few people with farming or trading experience above twenty years. Only one trader seemed to have been in business for more than forty years. No farmer had been farming for more than forty years. This can be explained by the fact that farming which is not mechanised requires more physical strength to be carried out.

Table 4.6: Number of years in farming/trade

Number of Years	Farmers		Traders		All	
	Frequency	(%)	Frequency	(%)	Frequency	(%)
Up to 10	61	61.4	72	60	133	60.5
11-20	23	22.9	35	29.2	58	26.4
21-30	12	11.5	9	7.5	21	9.5
31-40	4	4.2	3	2.5	7	3.2
Above 40	0	0	1	0.8	1	0.4
Total	100	100	120	100	220	100
Mean	13.6		11.6			
Maximum	60		45			
Minimum	0.25		0.08			
Standard Deviation	10		8.8			

Source: Authors' computation from field data, 2007

4.2 Strategic Innovations in Urban Agriculture

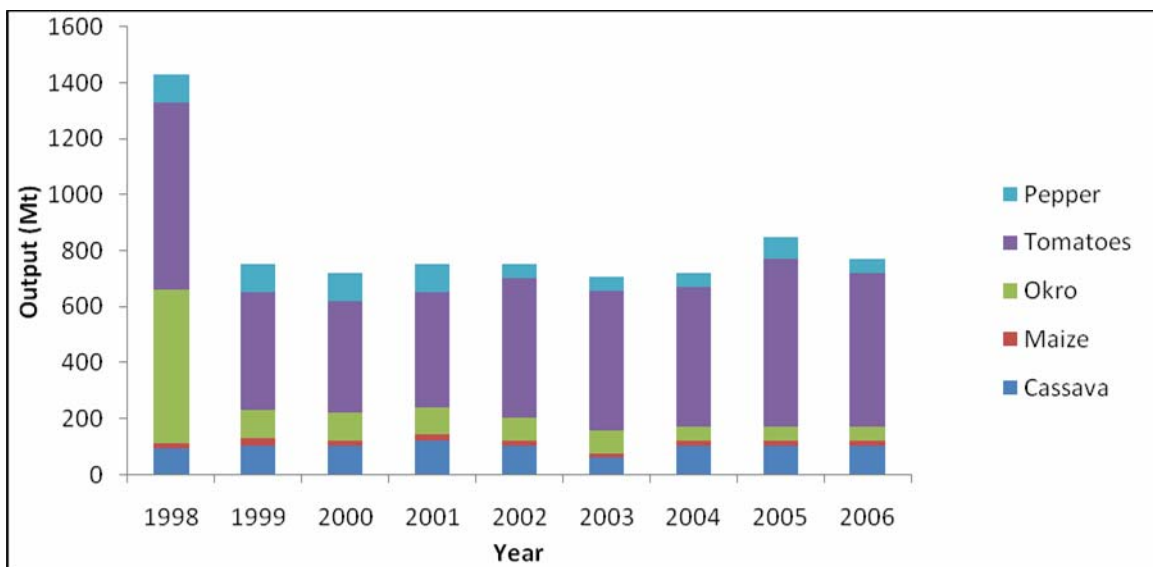
4.2.1 Policy Support for Urban Agricultural Innovation System

Ghana has always planned for agricultural, science, technology, education, health etc. in the national development agenda since independence in 1957. In the 2000s specific policies on food and agriculture, science and technology, information and communication technology, land administration and trade have been added (Owusu-Benoah et al, 2007). The recent Food and Agricultural Sector Development Policies (I and II) like many of the development plans, have specified strategies for the development of food commodities including vegetables and livestock (MoFA, 2007). The macro economic policies support a liberalised economy and encourage a liberalised input and output markets for all food commodities. Input subsidies and output price support regimes of the 1960's, 1970's and early 1980's gave way in the 1990's and 2000s. Urban producers, like all others, have to face market prices for all inputs including funds. However, not much external support has been modelled for urban farmers as done for rural based products such as plantain. For plantain for instance, several development partners (France, Canada, UK, USA, The Netherlands and World Bank) came on board from 1990 to fund projects that sought to improve cultivars, pest and disease management and the general farming system. They partnered various institutes in the Council for Scientific and Industrial Research to develop materials (hardware and software) for dissemination to farmers and processors.

The Ministry of Food and Agriculture has been re-structured to have decentralised departments at all 138 district/municipal/metro levels in the country. This was to ensure that local agricultural content was developed and disseminated in appropriate formats,

mainly through face-to-face, use of and audio/audio-visuals and very recently, the mobile phone. How urban farmers and traders have responded should be seen in the positive growth trends in cropped area, output, yield and producer prices. Yet recent data on a few crops suggest that output has stagnated (Figure 4.1). Although there have been increases in prices of all inputs the adoption of improved technology (albeit low) cannot be doubted (ISSER, 2007).

Figure 4.1: Production of selected crops in the city of Accra, 1998-2006



Source: Drawn from raw data collected from the SRID, MoFA, Accra

4.2.2 Actors in the Urban Agricultural Innovation System

The key urban agricultural actors identified were for Demand - wholesalers, retailers, processors and consumers of food commodities; for Enterprises – farmers; for Diffusion – Metro Agricultural Development Units of the Ministry of Food and Agriculture, agro-based non-governmental organisations (NGOs) and farmer-based

organisations (FBOs); for Research and Training- the Council for Scientific and Industrial Research (CSIR), School and Agricultural Research Centres of the University of Ghana and the Ghana Atomic Energy Commission; and for Infrastructure – the Metropolitan Assembly, Community Banks and microfinance institutions and other commercial and development banks, input dealers (agrochemicals, tools and machines), landowners and transport unions.

4.2.3 Habits, Competencies and Practices

The socio-economic backgrounds of the farmer and trader respondents suggest that the market for urban agricultural products is free entry; there are no restrictions by gender, age, education and marital status and motivation to engage in UA activities (full time or part time). Most lands of Ghana is vested in Chiefs, Clan/family heads or individuals and the wide range of tenure system (inheritance and leases) ensures that adults, migrants, males, females, rich, poor, illiterate or literate have access to land for production of food crops such as vegetables (see also Okyere *et al*, 1993). In general, the mean farm size is about one hectare. However, for urban vegetables, plots are as small as 0.1 hectare. Planting materials may be recycled or purchased from any of the many retail outlets in the city. Many farmers learn by observing peers or consulting with government extension workers. Occasionally, some farmers participate in workshops or training programmes organised by researchers or other NGOs or input dealers. The social exchange is promoting information flows, enhancing learning and an understanding for innovation although not much is there to show for initiatives taken by practitioners.

Urban farmers and traders access microcredit mostly from non-bank financial institutions and individuals. Some of these actors participate in formal farmer-based organisations; others do not, probably due to non-availability or low possibility of reaping benefits such as access to higher credit level and ability to influence market prices.

4.2.4 Sources of Innovation by Farmers and Traders in Accra

Innovations in urban agriculture are propelled by two main things: the urban agricultural practitioner himself/herself and external agents such as NGO's, government extension agents and farmer based organisations. From the studies on the field, about 48% of farmers have ever done something new (innovation) on their own. The remaining 52% have however not introduced any new thing on their own in the last ten years. Some 65% of farmers have also introduced new things (innovations) on their farms as a result of what they learn from other people (external agents). The other 35% of farmers have not put into practice what other people teach them or what they see their colleagues doing. These findings go to suggest that whereas some farmers experiment on their own to come out with innovations, others need to be 'pushed' by some external force to do so. However, it is a bit surprising that some farmers have not done or introduced anything new either on their own or as a result of what an external agent has told them in the last ten years. Interactions with the farmers revealed that some farmers think that there is really no need to change their practices or innovate since the old practices seem to be working quite well for them. Additionally, this group of farmers do not see why some

external agent should know more about their business than they themselves and therefore do not co-operate with them to bring about innovations.

Among traders, only 5.9% have ever done something new on their own in the last ten years. Ninety-four percent (94.1%) have even on their own never innovated in the last ten years. About 3% of traders have also innovated as a result of influence by external agents in the last ten years. The remaining 97% of traders have in the last ten years never innovated as a result of external agents. This goes to suggest that traders in urban agricultural products have in the last ten years not been very innovative in their businesses.

In conclusion, urban agricultural practitioners are constantly innovating either on their own or as a result of influence by an external agent. The main source of innovation by urban agricultural farmers is through the influence of external agents. Within traders of urban agricultural products however, the individual traders themselves are the main brains behind innovations in trade.

Table 4.7: Sources of Innovation in Urban Agriculture

SOURCE	FARMERS (%)		TRADERS (%)	
	Self	External Source	Self	External Source
Yes	47.5	65	5.9	2.5
No	52.5	35	94.1	97.5
Total	100	100	100	100

Source: Authors' computation from field data, 2007

4.2.5 Type of Farmer Innovations

The innovations among the urban farmers were in the areas of improved crop varieties/breeds, agrochemicals/veterinary drugs, machinery, water, feed, housing, land

preparation, supermarket, grocery point, credit management, urban market and ICT (mobile phone).

The commonest innovation among farmers within the AMA was the use of mobile phone as 70% of all farmers make use of this ICT tool to communicate with their customers/suppliers of inputs and check on market trends even though this is not the only motivation for owning a mobile phone. The introduction of new agrochemicals/veterinary drugs was also prominent among these urban farmers (25%). This can be largely attributed to the fact that pest and disease control is very important if good returns are to be made from the farms. The source of this kind of innovation was from external sources prominent among which was farmer based organisations (associations). Innovations agrochemicals/veterinary drugs is a recent phenomenon among the farmers within AMA as 14% of those involved introduced them within 2006 and 2007. This is not surprising because new drugs/agrochemicals are constantly being introduced onto the market as old ones become less effective as organisms develop resistance over the years.

Feed is very crucial to the urban livestock farmers as animals are not supposed to be left to loiter around the city by law. Sixteen percent (16%) of livestock farmers have between 1997 and 2007 developed/introduced new feeds to their livestock. The farmers have found innovative ways to preserve feeds (especially grass) for the dry season. They have also found ways of enriching the feeds of the livestock with various feed supplements. Majority of the livestock farmers (13% out of 16%) who have innovated in feed did that as a result of what they learnt from farmer based associations. Just as feed is important in urban livestock production, water is an important component of urban crop production. Fifteen percent (15%) of crop farmers have found ways of conserving water

and introduced at least an irrigation tool (watering cans) on their farms within the last ten years. Only 4% of farmers innovated in water on their own as the remaining 11% did this as a result of what they saw other farmers do. It was realized that innovations in this area were in dug out wells, shallow pits and ponds. However, these facilities belonged to groups of farmers in the farming area rather than individuals.

Appropriate housing is another important thing to be considered in urban livestock production but only 7% of livestock farmers have developed improved housing structures for the animals between 2006 and 2007. Four percent (4%) of these farmers did this on their own and the remaining 3% did that as a result of farmer based organisations. Even though marketing of urban agricultural products is not a problem, some farmers have innovated by establishing contacts with supermarkets, grocery points and markets in urban centres. They deliver specified products to these destinations at specified intervals through out the entire year.

In conclusion, even though the greater percentages of urban farmers within the AMA have held onto their old practices, some try out new things/ideas from various sources. Innovation in improved crop/breed, agrochemicals/veterinary drugs, feed and water are highest among urban livestock/crop farmers and these took place between 1997 and 2007. Farmer based organisations (associations) seemed to be of great influence on innovation development among urban livestock/crop farmers in the AMA. Very few farmers innovated as a result of contact with government extension agents and NGO's. This was because in some places, extension service was either very minimal or absent. Extension agents should intensify their efforts if the needed impact on urban farmers is to be felt. Also, NGO's and other stakeholders in urban agriculture within the AMA should

develop innovations together with the farmers themselves as these would be better appreciated and most likely to be implemented by the urban farmers.

Table 4.8: Specific Farmer Innovation Areas, Sources and Years Introduced

INNOVATION TYPE	REPRESENTS (%)	SOURCE OF INNOVATION (%)						YEAR INTRODUCED (%)			
		Self	Farmers	NGO	GE A	FBO	Others	1997-1999	2000-2002	2003-2005	2006-2007
Improved crop/breed	18	11	4	0	1	1	1	2	3	8	6
Agrochemicals/Vet drugs	25	4	5	1	0	15	0	3	1	7	14
Machinery	8	3	2	1	1	1	0	5	0	2	1
Water	15	4	11	0	0	0	0	3	2	3	7
Feed	16	2	1	0	0	13	0	0	0	1	15
Housing	7	4	0	0	0	3	0	0	0	0	7
Land Preparation	1	1	0	0	0	0	0	1	0	0	0
Supermarket	3	3	0	0	0	0	0	1	1	1	0
Grocery point	2	2	0	0	0	0	0	0	0	2	0
Credit Management	2	2	0	0	0	0	0	1	1	0	0
Urban market	1	1	0	0	0	0	0	1	0	0	0
N=100											

Source: Authors' computation from field data, 2007

4.2.6 Types of Trader Innovations

The innovativeness of traders in various urban agricultural products (fresh vegetables, live poultry birds and poultry eggs) was found to be meagre. The areas of innovation where less than 10 percent of respondents specified were in new products,

product presentation, product packaging, product storage, ICT (mobile phone) and local market location.

Just as was discovered among urban farmers, the use of mobile phone (60%) was the commonest innovation among urban agriculture product traders. They used their phones to contact farmers/suppliers of the commodities in which they trade. In a few instances, they also used their phones to contact important customers (especially retailers of the various commodities). Apart from the use of mobile phone, the greatest percentage of respondents (5%) innovated in the way they present products for sale. Initially, some traders used to display their goods on the bare floors even though there is an AMA by-law that prohibits this. Currently, some traders raise the commodities (especially the exotic fresh vegetables usually eaten in the raw state) above the ground and protect them from direct sunlight. The major source of this kind of innovation was through the influence of NGO's, government extension agents and the individual traders themselves. About 3% of those who innovated in the way they present their commodities did that between 2003 and 2005. The rest of the innovations took place between 2000-2002 and 2006-2007. Within the same period, only 2.5% of traders innovated through product diversification by introducing new urban agricultural products to their trade. The source of this kind of innovation is the individual traders themselves and this can be explained by the fact that individual traders are responsible for taking all the decisions concerning the trade. In terms of product storage and marketing, 1.6% of respondents innovated in this way and both were self driven. These innovations also took place between 2006-2007 and 1997-1999 respectively.

It can be concluded that farmers within the AMA are comparatively more innovative than traders in urban agricultural products. Additionally, the source of innovation by traders is principally internally driven whereas farmers are propelled to innovate as a result of influence by some external agents, especially members of farmer-based organisation.

Table 4.9: Specific Trader Innovation Areas, Sources and Years Introduced

INNOVATION TYPE	REPENDENTS (%)	SOURCE OF INNOVATION (%)				YEAR INTRODUCED (%)			
		Self	Traders	NGO	GEA	1997-1999	2000-2002	2003-2005	2006-2007
New Product	2.5	1.7	0	0.8	0	0.8	0	0.8	0.8
Product Packaging	0.8	0	0.8	0	0	0	0	0	0.8
Product Storage	0.8	0.8	0	0	1	0.8	0.8	2.5	0.8
Product Presentation	5	0.8	0	3.2	0	0.8	0	0	0.8
Local Market	0.8	0.8	0	0	0	0	0	0	0
N=120									

Source: Author' computation from field data, 2007

4.3 Effectiveness of Functions of Institutional Actors in Urban Agriculture in AMA

The research, diffusion and infrastructure actors are referred to here as institutional actors. The results of the study show that, the institutions in urban

agriculture in this study were formed between 1960 and 2003. Fifty percent of the institutions are governmental, 25 percent are non-governmental organisations (NGOs) and 25 percent are private institutions. The governmental institutions included the Metro Agricultural Development Unit (MADU) of the Ministry of Agriculture, the Environmental Protection Agency, the Science and Technology Policy and Research Institute, College of Agriculture of the University of Ghana and the Public Health department of the Accra Metropolitan Assembly. By statutory order these institutions are mandated to support standard setting, extension/diffusion, research and policy development. The non-governmental organisations included the International Water Management Institute, the Accra Working Group on Urban Agriculture (AWGUPA), Enterprise Works and farmer cooperatives. They have no government mandate but have as their basic function, research and diffusion. The private organisations interviewed included financial institutions, water vendors and the road transporters. The financial institutions mobilise funds for on-lending to those in need of credit.

The institutions interviewed have varying levels of involvement in urban agriculture in the city of Accra. Half of the institutions (50%) are strongly involved in urban agriculture, 25% are fairly involved and 25% are weakly involved in urban agriculture. Institutional innovations in urban agriculture can take place at both the internal (institutional) level and the external level. Institutional level innovations concern new things that are done within the organisation as a result of the institution's involvement in urban agriculture. For instance, the AMA is reviewing its bye-laws and issues related to urban agriculture have been given priority attention. At a stakeholder's forum organised by the AWGUPA in 2007, the proposals in the new byelaws were

shared. For instance, the MADU had called for increases in the number of animals allowed to be kept within compounds. Non-Bank financial institutions such as ProCredit Ltd. as a result of their involvement in urban agriculture restructured their organisational policy towards credit, trained staff and incorporated urban processed fisheries into their strategic plans. Otherwise, all the banks expect persons in UA business to build their credit worthiness and access loans. No special products have been developed for UA per se.

At the external level, institutions develop innovations and pass them on to targeted recipients (eg. Farmers, traders, researchers, extension agents and AMA) (see Table 4.10 for some projects/programs undertaken by some of the institutions). Farmer based associations in this study within the last decade developed mainly biological innovations for their members. This type of innovation was also developed by the AMA and MOFA for farmers and researchers. Enterprise Works Ghana was the only institution that developed mechanical innovations for farmers. They did this by finding alternative water sources for farmers by drilling tube wells and introducing treadle pumps for irrigation. The International Water Management Institute (IWMI) innovated in the area of health and policy. They spearheaded the education of farmers and traders on the use of untreated waste water for irrigation. In the area of policy, they were instrumental in the formulation of the new Food and Agricultural Sector Development Strategy (FASDEP II). The institute tabled a paper that ensured the acknowledgment of urban agriculture as a livelihood strategy in the drafted FASDEP II. Additionally, it was through the facilitation of IWMI that an award category was created for Best National UPA Farmer on the National Farmers' Day in 2006. The Environmental Protection Agency (EPA)

mainly develops chemical innovations for various groups of people including farmers and traders.

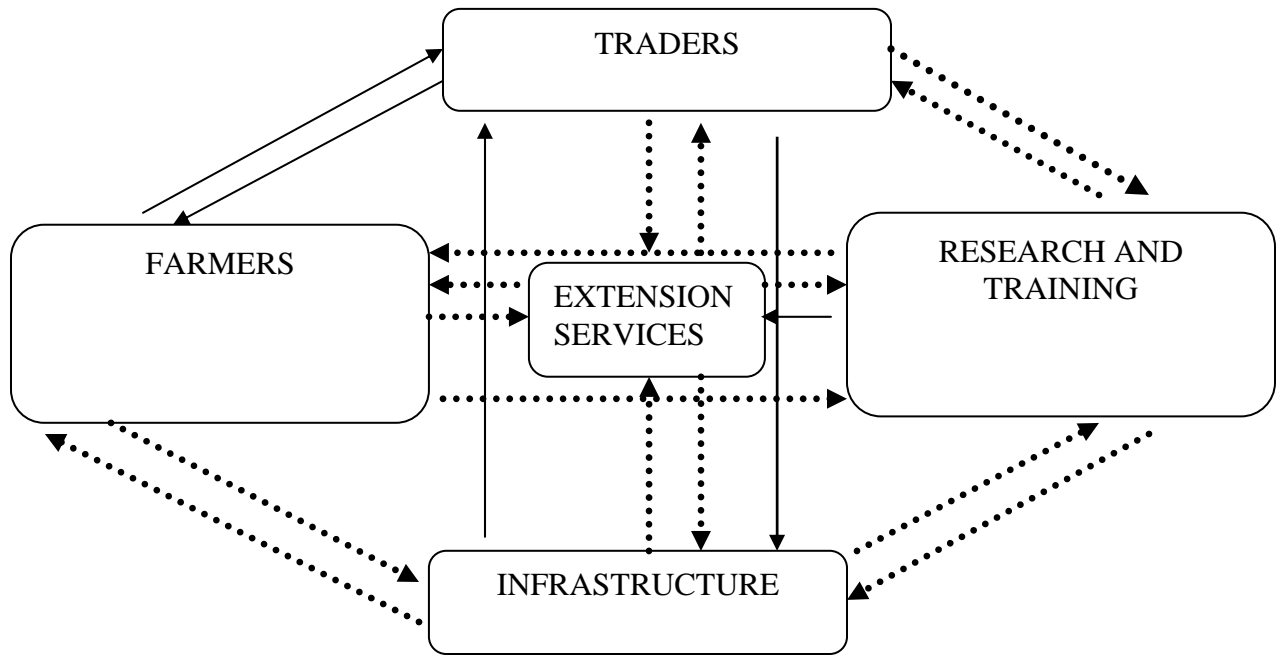
It is clear that the institutions that support urban agriculture are not many. However, the effective functioning of those who are involved cannot be questioned. In the survey all the institutional respondents perceived that, they had performed their role as mandated or as their mission statements required them to. The conclusion is that since more than 50 percent have expressed high effectiveness of functioning, a score of 1 is given; the null hypothesis is rejected in favour of the alternative that the institutional actors in urban agriculture in Accra are functioning effectively.

4.4 Innovativeness of Linkages among Actors in Urban Agriculture

The institutions in urban agriculture do not work in isolation but have to work within a certain policy framework and with each other. The perceived linkages among the various actors based on the actor's perceptions are as shown in Figure 4.2. The strongest linkages are among farmers and traders; traders and transporters/financial institutions. Most of the financial institutions are non-bank or informal sector microcredit institutions. The strong linkage here is expected as these actors are the business actors who engage in the buying and selling of services and the produce from UA activities. The new linkage strategies found here was the communication format which has been modernised from the usual face-to-face to the use of the mobile phone for message delivery. Otherwise, linkages between all the other actors were perceived as weak, since more than 50 percent of the respondent said so. Extension services to farmers and traders are not regular.

Researchers in the agricultural science departments of the Universities and CSIR have not targeted UA issues; UA research is by chance.

Fig 4.2 Linkages among ASTI Actors



Source: Author's computation based on respondents' perceptions

Legend: Strong linkage ←—— Weak linkage ←.....

Table 4.10 Institutional Projects/Programs in UA

Name of Institution	Year Established	Mission	Projects/Programs in UA (1997-2007)
Ablekuma Grass cutter farmers Co-operative Society	2003	To engage as many people as possible in grass cutter production.	<ul style="list-style-type: none"> • In 2003, more than 120 farmers were trained in grass cutter production • In 2004, a three-day training program sponsored by MOFA, GTZ and Heifer Int. was organised for farmers. • In 2005, an international forum on grass cutter production was held in Accra and members were given free grass cutters by an NGO (Heifer Int.). • In 2006, 25 youth were trained in grass cutter production. • In 2007, training programs were held in the Volta region under the sponsorship of Development solutions Centre.
Ga Adangbe Pig Farmers Coop. Society	1950	Advocacy for and education of pig farmers	<ul style="list-style-type: none"> • Education of members on good husbandry practices
EPA	1974	To co-manage, protect and enhance the country's environment as well as seek common solutions to global environmental problems.	<ul style="list-style-type: none"> • Enactment of the pesticide act (Act 521) • Stakeholder's meeting on pesticides administration.
IWMI	1983	Improving the management of water	<ul style="list-style-type: none"> • Baseline studies on UA in Ghana and West

		and land resources for food, livelihoods and nature.	<p>Africa (2 yrs)</p> <ul style="list-style-type: none"> •Waste composting for UPA: Multidisciplinary feasibility study for Accra, Kumasi, Tamale (4 yrs) •Co-composting sludge and solid waste for use in UPA (5 yrs) •Safe wastewater irrigation in UA and PUA (6 yrs) •Economic assessment of risk and benefits of UA (1 yr) •UA and urban malaria, is there a link? (3 yrs) •RUAUF (Phase 1 and 2, i.e. since about 8 yrs) •Health risk assessments of sludge and wastewater use (2 yrs) •Marketing and consumption studies for lettuce (1 yr) • Health risk perception studies (2 yrs)
MADU (MOFA)	1997	To identify all farmer groups, all existing agricultural stock of the metropolis and tackle income generating agricultural enterprises that will improve growth by 5%, reduce or alleviate poverty and improve the health of Ghanaians through qualitative and quantitative nutrition.	<ul style="list-style-type: none"> • Education of urban dwellers on importance of UA. • Training and educating farmers on the importance of UA. • Organisation of a series of fora to ensure implementation of programs on UA. • Training farmers to practice home gardening on pilot basis.
ENTERPRISE WORKS VITA	2002	Enterprise Works/VITA combats poverty by	<ul style="list-style-type: none"> • Undertook a project in irrigated horticulture.

		helping small producers and other entrepreneurs build sustainable businesses that create jobs and increase productivity, market opportunities and incomes.	<ul style="list-style-type: none"> • Introduction of treadle pumps for irrigation. • Tube well drilling.
CACS (U/G)	2002	Contribute to modernization of agriculture in Ghana	<ul style="list-style-type: none"> • Socio-economic research in urban farmer organisation and taught course in peri-urban livestock management
STEPRI	1990	Research and Policy review	<ul style="list-style-type: none"> • Member of AWGUPA and lead in UA pilot project activities
AWGUPA	2006	Advocacy and education and training of urban farmers	<ul style="list-style-type: none"> • Organisation of UPA stakeholder fora, farm visits and drafting of guiding principles
Greater Accra Input Dealers' Association	1990	Import, distribution and retailing of agro-inputs and chemicals	<ul style="list-style-type: none"> • Sensitisation of farmers of new and more effective inputs
PROCREDIT Ltd.	2000	Provide credit to SM enterprises	<ul style="list-style-type: none"> • Provide credit to fish smokers
La Community Bank Ltd.	1990	Mobilise funds and provide credit to low income earners	<ul style="list-style-type: none"> • Provide credit to credit worthy clients
Womens' World Banking	1990	Provide credit to low income earners	<ul style="list-style-type: none"> • Provide micro credit to traders
GPRTU, Circle	1980	Provide good quality transport services to all in need	<ul style="list-style-type: none"> • Hiring of trucks to traders. Provision of passenger services to farmers and consumers
Water Vendors Association	2000	Supply water to all in need	<ul style="list-style-type: none"> • Supply water to horticultural farmers

Source: Compiled by author from institutional questionnaires, 2008

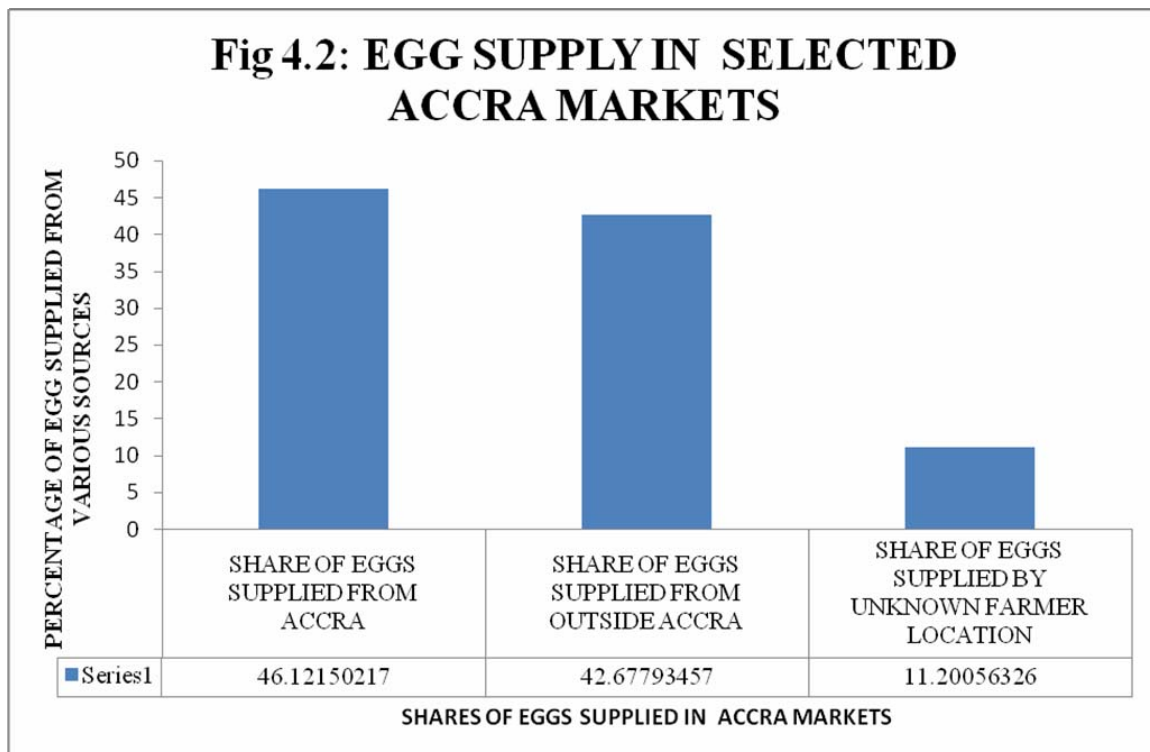
4.5 Contribution of UA to Food Supply in Four Markets in AMA

The contribution of urban agricultural production to the supply of poultry eggs, live poultry birds and local vegetables (ayoyo, alefu, gboma and okro) was determined in four selected markets within the AMA namely; Kaneshie, Agbobgloshie, Mallam Atta and Makola markets. The total market value of commodities handled by all the traders interviewed in the four markets was determined for each commodity and the share from production within the AMA was calculated.

Among the forty egg traders in the four markets, thirteen traders obtained their eggs from farms within the AMA, 17 from outside Accra and the remaining traders obtained from wholesalers whose sources are also multiple. Within 2007, the total cedi value of eggs traded by the forty people in the four markets stood at GH ₵1,581,081.20. Out of this figure GH ₵1,729,218.40 representing 46.1% came from within the city of Accra. The other 42.6% and 11.2% of eggs supplied to these markets came from outside Accra and unknown farmer locations respectively (see Figure 4.2). Interviews with the traders however revealed that the 54% of eggs that did not originate from Accra actually came from farms located in the Brong Ahafo and Ashanti Regions. Farms within these regions deliver packed eggs in vans at specific points and times in parts of the city of Accra. No imports were recorded. A t-test showed that the contribution of urban agricultural production to the supply of eggs within these four markets was significant at 1 percent (see Table 4.11). The alternate hypothesis that urban agricultural production contributes positively to the supply of eggs is therefore accepted.

The total market value of live poultry birds traded among the twenty traders in the four markets surveyed stood at GH ₵15, 635,000.00 for the year 2007. Out of this figure,

GH ₵1,256,880.00 representing 45.6% came from Accra. The remaining 54.4% came from other parts of the country. A t-test performed showed that the contribution of urban agricultural production to the supply of live poultry birds in these markets was also significant at 1 percent (see Table 4.12). Imports were also not recorded here and this is because the imported poultry products are usually in the frozen form.

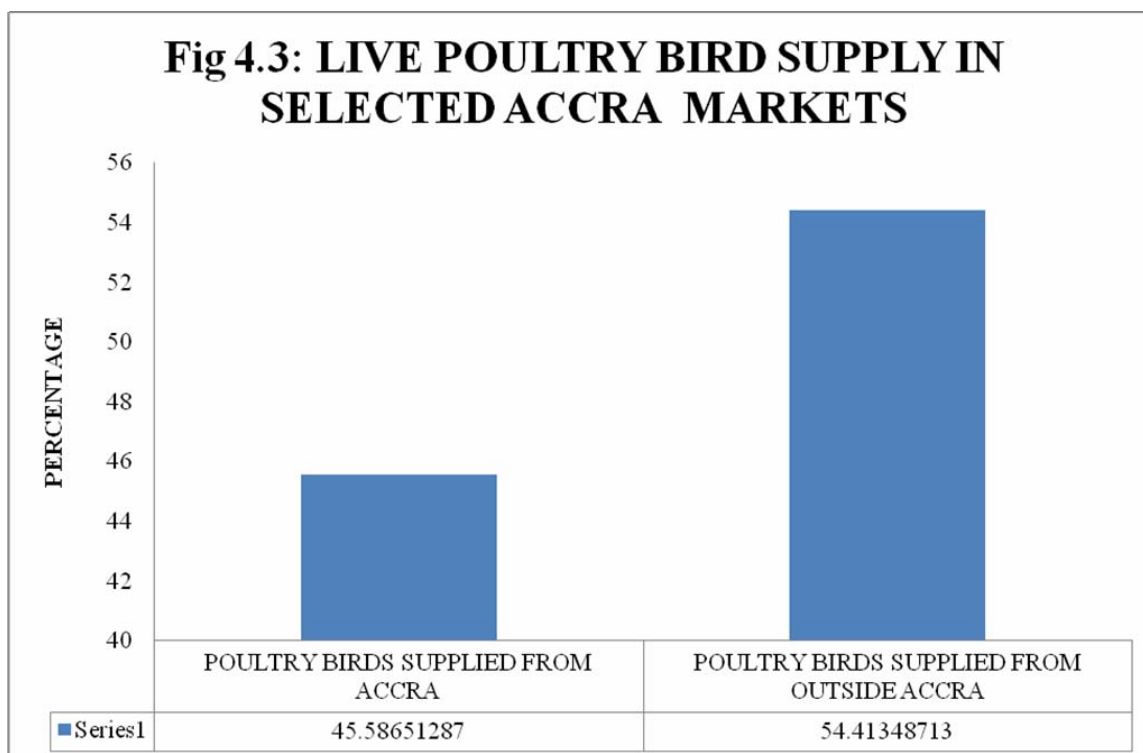


Source: Author's computation, 2007

Table 4.11: T-test results on Accra egg supply

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Accra Eggs	4.776	12	.000	56093.7231	30503.6305	81683.8157

Source: Author, 2008.



Source: Author's computation, 2007

Table 4.12: T-test results on live poultry bird supply

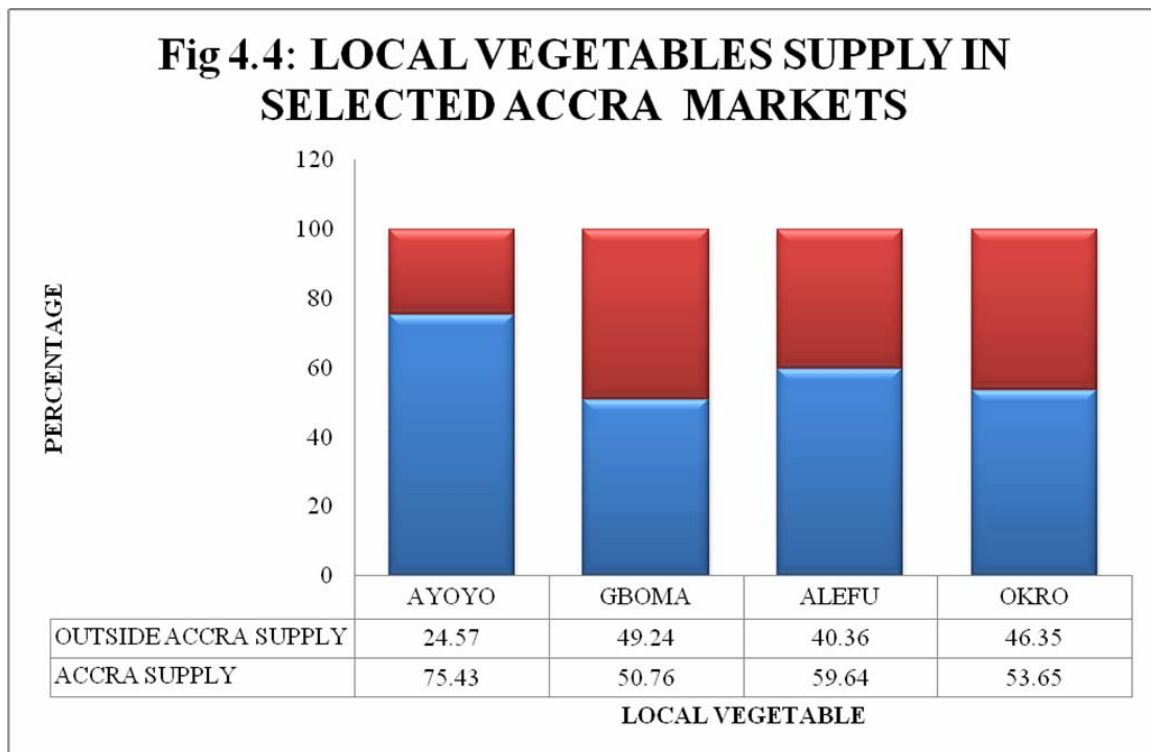
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Accra Poultry	5.199	17	.000	31305.5556	18601.1042	44010.0068

Source: Author, 2008.

Among traders of the four selected local vegetables, 75.4 percent 50.8%, 59.6% and 53.7% of ayoyo, gboma, alefu and okro respectively came from AMA (Accra) in 2007. The remaining 24.6%, 40.2%, 40.4% and 46.3% came from outside the AMA (outside Accra). The main urban agricultural production points within the city of Accra namely La, CSIR area, Korle-bu and Dworwulu were mentioned as sources of these vegetables. The general situation with local vegetables in the four markets studied is that

a greater percentage of local vegetables traded in these markets came from within the AMA (see Fig. 4.4). This can be attributed to the high perishability of fresh vegetables and therefore traders prefer sourcing vegetables from areas closest to them to reduce losses due to spoilage and other factors. A t-test for all four local vegetables showed that contribution to total supply from Accra was significant at 1 percent (see Table 4.13).

In conclusion, poultry birds and eggs produced in Accra contributes significantly to total supply of eggs and live poultry birds in the four markets studied. Urban agricultural production also account for higher percentages of fresh local vegetables traded within the four markets in the year 2007. Therefore even though urban agricultural production's contribution to the regional supply of these commodities may not be significant, it plays a very significant role at some market levels.



Source: Author's computation, 2007

Table 4.13: T-test results on local vegetables supply

	Test Value = 0					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Accra local vegetables	3.353	12	.006	3775.1385	1321.7281	6228.5488

Source: Author, 2008.

4.6 Contribution of UA to Livelihoods of Practitioners in AMA

4.6.1. Contribution of UA to livelihoods of farmers

The DfID framework was used as a guide to determine the livelihoods of practitioners that could be affected by urban agriculture. The livelihood areas were income, food security, wellbeing, vulnerability and sustainable use of natural resources.

The results of the study show that farmers in Accra are able to make some amount of money monthly from farming irrespective of whether they are full or part-time farmers. Among the vegetable farmers interviewed, 33%, 19.8% and 11.8% made between GH ₵51.00 and GH ₵100.00, GH ₵101.00 and GH ₵150.00 and GH ₵10.00 and GH ₵50.00 respectively for year 2007. The rest of the vegetable farmers (35.4%) made between GH ₵201.00 and GH ₵466.30 net monthly income. The mean income for vegetable farmers for the year 2007 was GH ₵126.44 (see Table 4.14). With respect to Grass-cutter and pigs, each animal sold earned the farmer GH₵ 48.00 and GH₵30.00 respectively. The farmer's total monthly income depended on the number of animals that were sold in any particular month. An average of two (2) was established from focus

group discussions. Farmers could spend a maximum of GH ₵20.00 in raising and marketing each animal. The indication is that there is profitable return on investing in urban agricultural products. Since all the respondents indicated that they recorded earnings from sale of produce, it is concluded that UA contributes to income generation.

The availability of food at the household level was used as a measure of food security. Farmers were questioned about their household expenditure on food and the percentage of food that was financed from urban agriculture proceeds. The results of the study show that among UA farmers in the AMA, 87.5 percent had enough food available for the household to have at least, three meals a day. Only 11 percent and 1.3 percent reported that they could only have meals twice or once respectively within the day. The mean weekly expenditure on food was GH ₵27.30 with a mode of GH ₵20.00. The maximum amount that was spent on household food per week was GH ₵150.00 with the minimum being GH ₵7.00. Out of these figures, 32.6% of farmers financed 81-100% of the household food expenses from urban agriculture proceeds, 23.9% financed 1-20% of household food expenses from urban agriculture and 20.1 % financed 21-40% of household food expenses from urban agriculture (see Table 4.15). About 5% of urban farmers did not use any farm income for financing food but used it to meet some other needs. The remaining 95% of the farmers used urban agriculture proceeds to finance between a portion and all their household food expenses in 2007 as depicted by the graph below (Fig 4.5). Apart from directly taking out money to finance food expenses, practitioners of UA consume some of the products they produce. This goes in a long way to reduce the household food cost as a result of the savings they make by not directly

taking out money to buy food. A t-test showed that urban agriculture is playing a significant role in household food provision (see Table 4.16).

Table 4.14: Income of vegetable farmers in AMA

INCOME RANGE (GH ₵)	PERCENTAGE OF FARMERS (%)
10-50	17.8
51-100	33
101-150	19.8
151-200	11.8
201-250	11
251-300	0
301-400	4.4
401-500	2.2
Mean	126.44
Maximum	466.30
Minimum	23.33
Standard Deviation	96.20

Source: Author's computation, 2007

Table 4.15: Proportion of weekly food expenses financed by UA

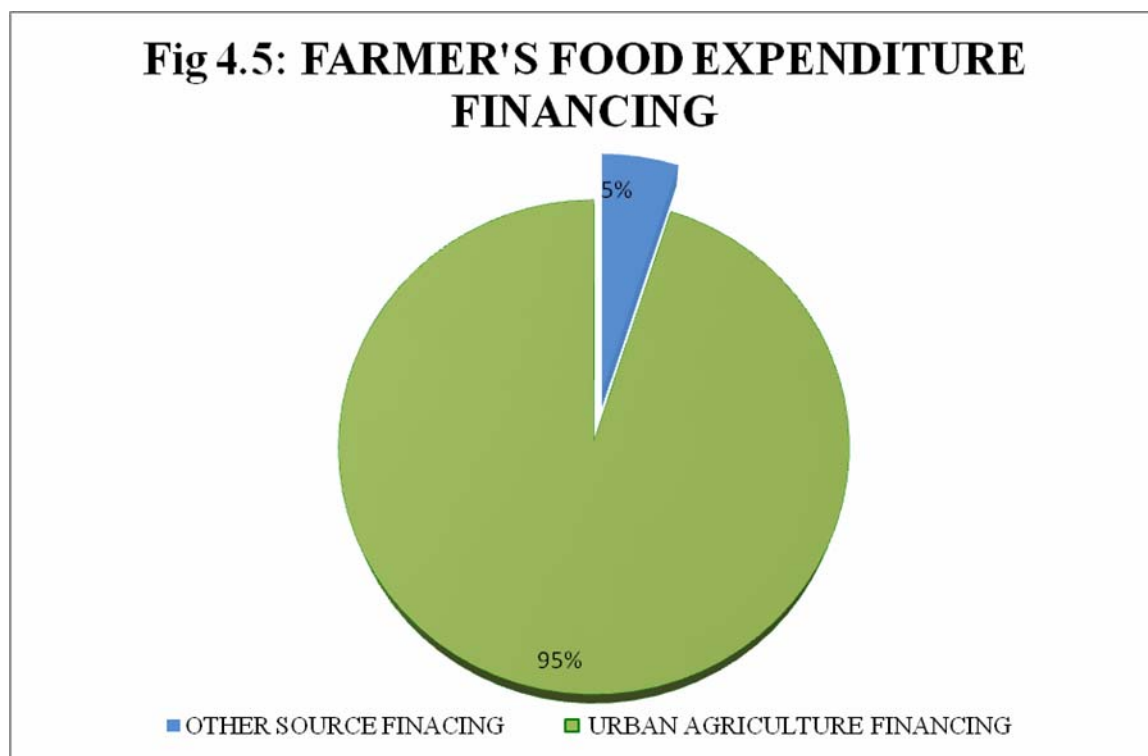
PROPORTION OF FOOD EXPENSES FINANCED BY UA (%)	PERCENTAGE OF FARMERS (%)
0	5
1-20	23.9
21-40	20.1
41-60	7.5
61-80	11.4
81-100	32.6
Mean	54.5
Maximum	100
Minimum	0
Standard Deviation	36.2

Source: Author's computation, 2007

Table 4.16: T-test result on farmers' food expenditure financing

	Test Value = 0					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Weekly food expenses	6.892	77	.000	15.7349	11.1890	20.2808

Source: Author, 2008.



Source: Author's computation, 2007

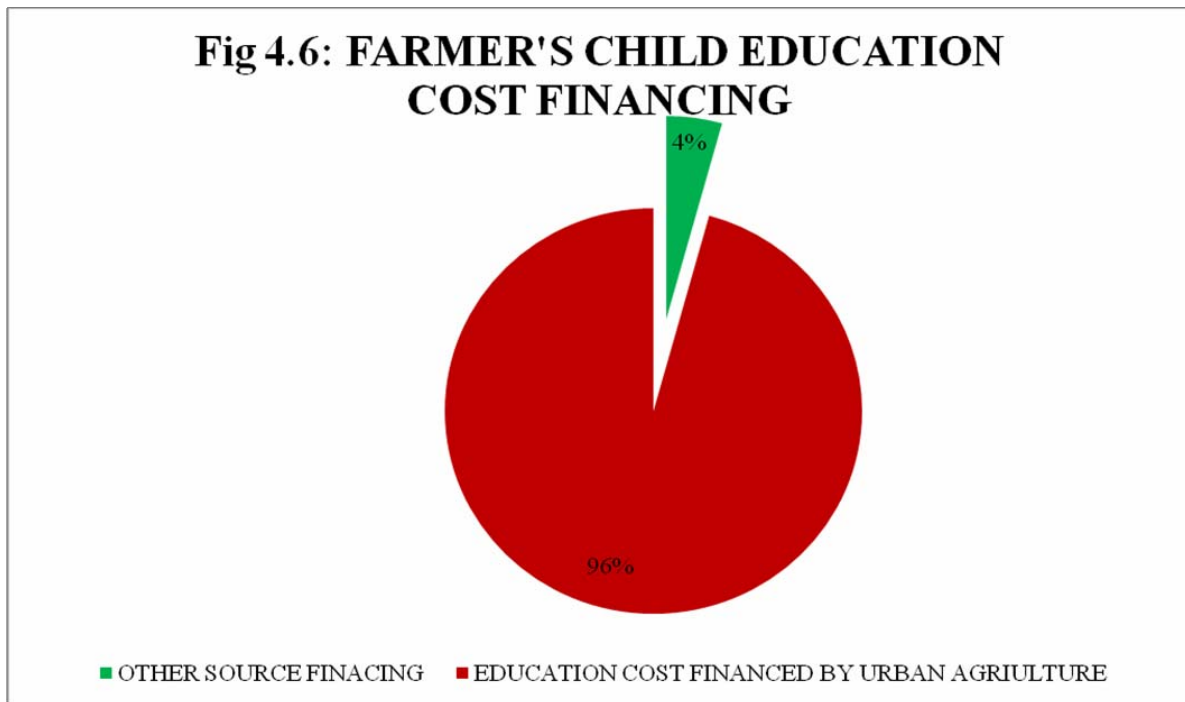
The wellbeing of the farmer was measured by using the child education cost that was funded from urban agriculture income. About 4% of farmers did not finance the education cost of dependants from urban agriculture income (Figure 4.6). The remaining 96% did. The mean proportion of child education expenditure funded from urban agriculture was about 58% (Table 4.17). The t-test result showed that the contribution of

urban agriculture to funding child education cost was significant at 1 percent (see Table 4.18). It is therefore concluded that UA plays a critical in improving the well being of its practitioners. Without practicing urban agriculture, some people will not be able to fund the education of dependants.

Table 4.17: Proportion of yearly children’s school expenses financed by UA

PROPORTION OF CHILD EDUCATION COST FINANCED BY UA (%)	PERCENTAGE OF FARMERS (%)
0	4.3
1-20	16.3
21-40	12.2
41-60	26.5
61-80	16.2
81-100	24.5
Mean	57.59
Maximum	100
Minimum	0
Standard Deviation	32.26

Source: Author’s computation, 2007



Source: Author’s computation, 2007

Table 4.18: T-test results on farmers' child education cost financing

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Farming Income	8.563	48	.000	654.2367	500.6120	807.8614

Source: Author, 2008.

In terms of vulnerability, urban agriculture was seen as a tool that could make urban farmers less vulnerable. Vulnerability was measured by social inclusion (membership of farmer based association). About 86% of farmers interviewed belonged to farmer based associations and another 45.5% belonged to other community based associations such as religious associations, neighbourhood associations and tribal associations. More farmers (80.8%) played an active role in the farmers associations as compared to the 68.6% who played active roles in the other community based associations they belonged to. The activities farmers engaged in as group members included leadership, participation in fora, workshops and seminars as well as weekly meetings. This suggests that urban agriculture has made the farmers more socially included and hence less vulnerable.

Table 4.19: Farmers' social inclusion

RESPONSE	MEMBERSHIP OF FARMERS ASSOCIATION (%)	MEMBERSHIP OF OTHER ASSOCIATIONS (%)
Yes	85.6	45.5
No	14.4	54.5
Total	100	100
Active Member	80.6	68.6
Not Active	19.2	31.4
Total	100	100

Source: Author's computation, 2007

The perception of farmers on the impact of urban agriculture on the environment was used as a measurable indicator for sustainable use of natural resource base. All the farmers interviewed perceived that the use of banned chemicals could negatively affect the physical environment. In terms of the use of untreated waste water, 81.8% of farmers perceived that the use of untreated waste water could negatively affect the health of consumers. The remaining 18.2% did not think that this practice could affect consumers negatively. Since the opinion of more than 50 percent of respondents reflects their understanding of sustainable natural resource base it is concluded that UA has an effect on improving this livelihood outcome. With the knowledge farmers will seek alternatives to untreated waste water and use chemical pesticides in ways that minimise the negative effect on the environment.

In conclusion, urban farming as a livelihood strategy is very important to many people in the city of Accra. It plays an important role in income generation, household food security, general well being (payment of school fees), reduction in vulnerability (i.e social inclusion of practitioners) as well as sustainable natural resource base. Those involved in the practice should therefore be encouraged to adhere to standards that have

been put in place by regulatory bodies to prevent contaminating the environment and consumers. Additionally, farmers could take advantage of the constantly changing technology and innovate in this area to enhance their productivity, increase yields and hence increase their income.

4.6.2. Contribution of UA to Livelihoods of Traders

Trade in urban agricultural products was common in all the four markets surveyed. A lot of traders were found selling vegetables (local and exotic), eggs and live poultry birds. From the market survey conducted, traders in eggs, live poultry birds, local vegetables and exotic vegetables were able to make net monthly incomes of between GH¢1.95 and GH ¢1,792.92 for 2007. Among egg traders, 28% made a net monthly income of above GH ¢300.00, 26% made between GH ¢151.00 - GH ¢250.00 and 18% made between GH ¢10- GH ¢50. The least net monthly income that any egg trader made for 2007 was GH ¢10.00 (See table 4.20). Within the same period, 43% of live poultry bird traders made above GH ¢300.00, 22% made between GH ¢151.00- GH ¢200.00 and 17% made between GH ¢51.00- GH ¢100.00. The least monthly income that any live poultry bird trader made for 2007 was GH ¢54.17. The least net monthly incomes were recorded by local vegetable traders. Thirty-four percent (34%) of the local vegetable traders made between GH ¢10.00- GH ¢50.00 a month. Within the same group, about 11 percent earned below GH ¢10.00 net monthly income. A few local vegetable traders

(6%) however made above GH ₵300.00. The least net monthly income that any trader in local vegetables made was approximately GH ₵2.00. However, only one person recorded this rather low income. The situation is different among exotic vegetable traders. About 22.4% made above GH ₵300.00, 20% made between GH ₵51.00- GH ₵100.00 and 55% made between GH ₵101.00- GH ₵300.00.

Since all (more than 50%) the respondents recorded positive net income, it is concluded that UA contributes positively to traders' income.

Table 4.20: Net monthly income of traders

INCOME LEVEL (GH ₵)	TYPE OF TRADER (%)			
	Eggs	Local Vegetables	Live Poultry Birds	Exotic Vegetables
Below 10	0	11	0	0
10-50	18	34	0	11
51-100	10	16	17	20
101-150	8	16	6	19
151-200	13	6	22	11
201-250	13	6	6	14
251-300	10	6	6	11
Above 300	28	6	43	22.4
Mean	310.20	96.62	437.50	291.53
Maximum	1,243.67	390.00	1,566.50	1,792.92
Minimum	10	1.95	54.17	12.16
Std. Dev.	335.56	104.70	460.74	397.14

Source: Author's computation, 2007

Food security among traders appears to be limited when compared to the case of farmers. Just 50 percent of traders said that their households had enough food for consumption three times daily. About 48.3% and 1.7% had meals twice and once daily respectively. The mean weekly expenditure on food was GH₵31.02 with a mode of GH

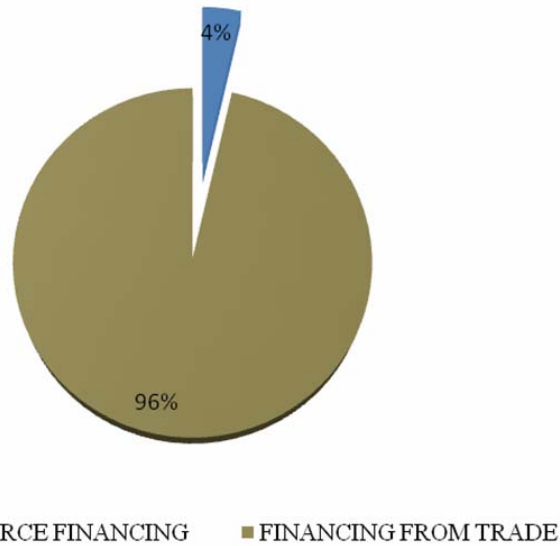
GH ₵30.00. The maximum amount that was spent on food per week by a household was GH ₵80.00 and the minimum was GH ₵5.00. Out of these figures, 42% financed 81-100% of the household food expenses from trade, 19.6% financed 1 percent to 20 percent and 15.2% financed 41-60% of household food expenses from trade (see Table 4.21). About 4% of the traders did not use any trade income to finance household food expenses. The remaining 96% financed part or all of their food expenses in 2007 from trade (Fig 4.7). Apart from directly taking out money to fund household food, traders sometimes take home the commodities they sell for consumption. A t-test showed that food expenses financed from trade income was significant at 1% (see Table 4.22)

Table 4.21: Proportion of weekly food expenses financed by trade

PROPORTION OF FOOD EXPENSES FINANCED BY TRADE (%)	PERCENTAGE OF TRADERS (%)
0	3.6
1-20	19.6
21-40	10.8
41-60	15
61-80	9
81-100	42
Mean	63.4
Maximum	100
Minimum	0
Standard Deviation	35.8
Mode	100

Source: Author's computation, 2007

Fig 4.7: TRADER'S FOOD EXPENDITURE FINANCING



Source: Author's computation

Table 4.22: T-test results on traders' household food financing

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Weekly food expenses	14.177	109	.000	18.9695	16.3175	21.6215

Source: Author, 2008.

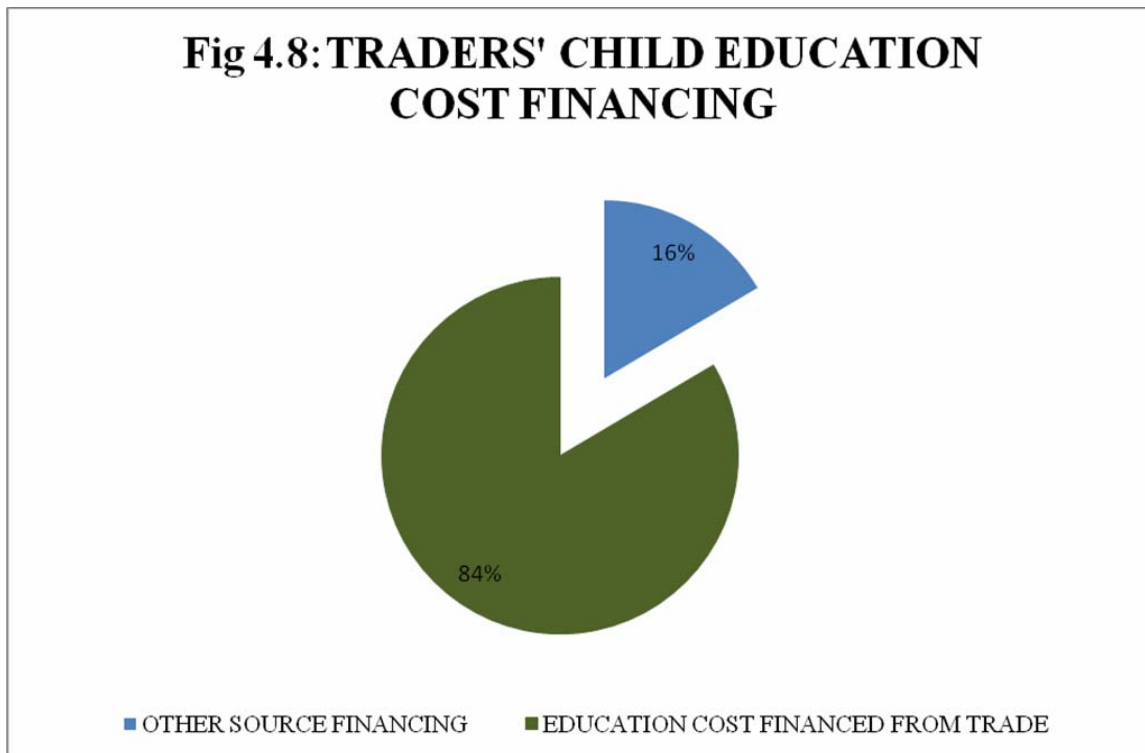
With regards to wellbeing (measured by child education funding), 43% of traders funded 81-100% of their dependants education cost from trade, 16.5% funded 41-60% and 11.4% funded 1-20% of their dependants education cost from trade income in 2007 (see Table 4.23). Averagely, 59% fund a portion of their dependants' education from trade proceeds. As much as 16.5% of traders did not fund any portion of their wards

education from trade in 2007. The remaining 83.5% funded between 1-100% of their dependants' education from trade. A t-test also showed that trade income from UA was playing a significant role in funding education cost (See Table 4.24).

Table 4.23: Proportion of yearly children's school expenses financed by UA trade

PROPORTION OF CHILD EDUCATION COST FINANCED BY TRADE (%)	PERCENTAGE OF TRADERS (%)
0	16.5
1-20	11.4
21-40	7.6
41-60	16.5
61-80	5
81-100	43
Mean	59.24
Maximum	100
Minimum	0
Standard Deviation	36.66
Mode	100

Source: Author's computation, 2007



Source: Author's computation, 2007

Table 4.24: T-test result on traders' child education financing

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Trade income	7.479	78	.000	306.3719	224.8133	387.9305

Source: Author, 2008.

In terms of social inclusion, 43.5 percent of traders belonged to trade associations whilst 33.3% belonged to other community based associations. Out of the percentage that belonged to trade associations, 78.5% played active roles as compared to the 75% who played active roles in the other community based associations. It can therefore be said that involvement in trade has improved the social inclusion of traders (See table 4.25).

In terms of environmental soundness, all the traders interviewed perceived that urban farmers who make use of banned chemicals could negatively affect the physical environment. Additionally, all the traders agreed that it is good practice to always wash items before display. However, only 99.9% felt that using contaminated water in cleaning the items could negatively affect the health of consumers.

Table 4.25: Traders' social inclusion

RESPONSE	MEMBERSHIP OF TRADE ASSOCIATION (%)	MEMBERSHIP OF OTHER ASSOCIATIONS (%)
Yes	43.2	33.3
No	56.8	66.7
Total	100	100
Active Member	78.5	75
Not Active	21.5	25
Total	100	100

Source: Author's computation

In conclusion, trade in urban agricultural products plays an important role in income generation, household food security, well being (child education financing) and improved social inclusion of practitioners. Traders should be encouraged to handle products (especially those that are consumed in the raw state) with care to prevent contamination. They should also introduce new products, identify new markets and take advantage of changing diets to increase their income.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter provides a summary of the research process and the results obtained. Relevant conclusions and recommendations are made based on the results.

5.1 Summary and Conclusion

Research in urban agriculture continues to be of interest to many stakeholders around the globe including Ghana. The current study has investigated the following critical issues in urban agriculture in the Accra Metropolitan Area: The strategic innovations in UA in the city of Accra since 1997; the contribution of UA production to the supply of eggs, live poultry birds, and vegetables in four markets; and the effect of urban agriculture on livelihoods of practitioners. Primary data was collected from respondents in five urban agricultural sites and four markets within the AMA. The sites were Dworwulu, La, Korle-bu, CSIR area and Awoshi and the markets were Makola, Mallam Attah, Kaneshie and Agboghloshi markets. A largely structured questionnaire sought answers concerning the various issues raised in this study from 120 traders, 100 farmers and 18 institutions. Secondary data included the review of relevant literature to understand the body of knowledge on urban agriculture and methodological issues in systems analysis.

The results of the study suggest that:

1. There have been strategic innovations related to urban livestock and crop production in the city of Accra since 1997.

2. The innovations have been as a response to demand for fresh eggs, vegetables and live birds. In addition land in front and at the back of residential facilities as well as open spaces belonging to both the State and private people are suitable for vegetable cultivation and livestock housing.
3. Policies concerning urban agriculture have not been explicit although the city byelaws recognise the possibility of the activities and have set the standard requirements allowed for crop and livestock production in the city. The current Food and Agricultural Sector Development Policy has incorporated in it intentions for promotion of urban agriculture although no specific projects and programmes were determined. However, all programmes on extension education for farmers nationwide have been planned to affect urban agriculture. Thus there is a Metro Agricultural development Unit phasing the fee-free agricultural extension and low-cost veterinary services.
4. The key actors in the urban agricultural innovation system are the demand, enterprise, research, diffusion and infrastructure represented by traders, farmers, CSIR/Universities, Metro Agricultural Department Unit (MADU) extension and financial /transport institutions respectively.
5. Innovation by the non-institutional actors (farmers and traders) is mainly as a result of influence of external agents, principally farmers' associations. The areas of innovation among farmers were in improved varieties/breeds, agrochemicals/veterinary drugs, machinery, feed, water, feed formulation, housing, land preparation, diversified markets (grocery point, supermarket and urban market) and ICT (mobile phone). Government extension agents and NGO's

did not seem to be of great influence on innovation development and adoption by farmers. These agencies should therefore develop innovations in collaboration with farmers to make them more acceptable to them. Among traders, innovations were in the areas of new products, product presentation, packaging and storage and ICT (mobile phone). The internal source of innovation was most common among traders. Innovations by the institutional actors (research, diffusion and infrastructure) concerns mainly programme planning and implementation. The governmental institutions such as the MADU, STEPRI and universities carry out their research and diffusion functions as mandated by statutory laws fairly well. Non-governmental organisations such as the International Water Management Institute (IWMI), Accra Working Group on Urban and Peri-urban Agriculture and Farmer Based Organisations also carry out their basic functions in research and diffusion fairly well. New research in waste water treatment for urban agriculture is being carried out by IWMI and AWGUPA is a forum represented by all stakeholders advocating for good agricultural practices and specific policy framework for urban agriculture. The infrastructure actors, including financial institutions, water vendors and private road transport unions carry out their functions fairly well although no specific services have been developed and targeted at urban producers.

6. Linkages are being formed among farmer based organisations and research institutions such as IWMI. Otherwise the strongest linkages are between farmers and traders.

7. From the four markets surveyed in the AMA, urban agricultural production accounted for between 46 percent and 75 percent of the supply of the selected fresh produce including eggs, live poultry birds and local vegetables like *ayoyo*, *gboma*, *alefu* and okro.
8. Urban agriculture impacts positively on the livelihoods of practitioners in the city of Accra. Net monthly incomes of GH ₵1.96 and GH ₵1,792.92 were recorded in 2007 for the respondents.
9. Over 95 percent of traders and farmers use urban agriculture income to finance part or all their household food expenses. Food is always available in the households of respondents and majority (over 60%) feed at least three times within a day. In terms of child education financing, about 90 percent of respondents partially or wholly fund their children's education from farming/trade income. In addition over 60 percent of respondents, by virtue of their involvement in urban agriculture, have become more socially included and aware of maintaining a sound environment to improve sustainable natural resource base. Many (80%) urban farmers know the consequences of using unapproved chemicals and untreated waste water on the environment. Many traders understand that using unsafe water to clean vegetables is detrimental to human health and safety.

5.2 Recommendations

The following recommendations are given based on the implications of the results presented.

- i.** Since urban agriculture is a strategy that has been adopted in response to the availability of favourable resource and policy conditions more efforts are needed to improve upon the situation. A specific urban agricultural policy that mandates specific areas to be demarcated for vegetable production and small animal keeping should be developed by government and implementation facilitated by the key actors. For instance, to sustain good agricultural practices, government extension agents, IWMI and AWGUPA should collaborate and reach out to more urban farmers; any innovations should be designed together with practitioners to make them more acceptable to the practitioners.
- ii.** Farmers' associations have been found to be a very important source of innovation and platform for diffusion. Farmers are therefore encouraged to join farmers associations in order to stay abreast with new happenings in the industry as well as improve upon advocacy for a favourable policy framework.
- iii.** Since urban agriculture provides a good source of income to farmers and improves livelihoods, modern techniques of production that make use of minimal space and enhances productivity should be promoted. Vegetable production and raising of grass cutter and rabbits are suggested.
- iv.** In order to enhance environmental soundness sensitisation programmes should continue to ensure that farmers and traders adhere to standards that have been put in place by regulatory agencies to prevent production and sale of unwholesome products and contamination of the environment.
- v.** Future research would be needed to establish innovation and policy needs of urban farmers which this study did not focus on.

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