

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

**COLLEGE OF SCIENCE
FACULTY OF BIOSCIENCES
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**ASSESSMENT OF THE EFFECTS OF REGULATORY ENVIRONMENT ON THE QUALITY
MANAGEMENT OF VEGETABLES PRODUCED IN THE GA SOUTH MUNICIPALITY OF
GHANA**

by
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NOVEMBER, 2018

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MANAGEMENT OF VEGETABLES PRODUCED IN THE GA SOUTH MUNICIPALITY OF
GHANA

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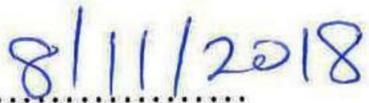
NOVEMBER, 2018

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made.

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ABSTRACT

The specific roles of regulatory bodies in monitoring the safety standards of fresh food produce and their effectiveness in discharging these roles is important to assure consumers of their safety. In Ghana however these specifics, with regard to the produce of ready to eat fresh vegetables have neither been fully understood nor investigated. The seeming absence of regulatory mechanisms and its corresponding policies from the appropriate regulatory bodies have contributed to the challenges faced by vegetable producers and consumers in Ghana. Investigations were therefore conducted to assess the level of influence of regulatory institutions on vegetable production in the Ga-South Municipality of Ghana. The study adopted a descriptive cross-sectional survey using a structured questionnaire. A total number of 300 respondents comprising of 200 farmers, 50 exporters and 50 regulators were purposely selected. Descriptive analysis and ordinal regression were employed to analyze the data and explain the patterns of interactions among the identified regulatory factors influencing vegetable production. The results revealed that adoption of stringent safety standards, Hazard Analysis and Critical Control Point (HACCP), ability of regulators to strictly enforce the law, availability and adequacy of policies ensuring food safety and quality, the prevalent regulatory environment effects on vegetable safety/quality and enforcement of trade contracts to the letter are institutional environment factors that significantly influence the quality of vegetables ($P \leq 0.05$). The findings suggest that institutional changes with respect to the aforementioned variables and other complementary factors such as contract farming and credit access can significantly contribute to increased, efficient and safe vegetable production. The regression results showed that- gender, educational level and farmers working experience did not significantly influence people's perception on how regulatory bodies influence the quality of vegetables. The findings suggest that institutional changes must be made with respect to the variables mentioned early on and other complementary policies enforced to ensure safe and sustainable vegetable production.

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LIST OF ABBREVIATIONS

EMQAP:	Export Marketing and Quality Awareness Project
EPA:	Environmental Protection Agency
FAO:	Food and Agricultural Organization
FDA:	Food and Drugs Authority
FDB:	Food and Drugs Board
FRI:	Food Research Institute
GEPA:	Ghana Export Promotion Agency
GSA:	Ghana Standards Authority
GSB:	Ghana Standards Board
HACCP:	Hazard Analysis and Critical Control Point
HND:	Higher National Diploma
MCP:	Methylchloropropane
MOFA:	Ministry of Food and Agriculture
MOTI:	Ministry and Trade and Industry
NRCD:	Natural Resource Defense Council
POS/CR:	Point of Sale/ Cash Register
PPRSD:	Plant Protection and Regulatory Service Division
RandD:	Research and Development
SME:	Small and Medium Enterprise
SPS:	Sanitary and Phytosanitary Status
SPSS:	Statistical Package for Social Sciences
VEGPAG:	Vegetable Producers and Exporters Association of Ghana

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CHAPTER ONE

INTRODUCTION

1.1 Background

Quality management plays a vital role within the food industry. It cuts across the many different stages of sourcing, processing and packaging. In addition to the basic laws and regulations on nutritive value, quality management also incorporates factors that ensure the safety of the product that reaches the final consumer. Critical attention to ensure safety is especially needed where fresh food products such as fruits and vegetables are involved as they are highly susceptible to contamination. Developed countries that import farm produce pay such close attention to the quality and safety of vegetable products that they intercept those that do not meet their safety and quality standards. When a country fails to meet the international standards of quality, sanctions are posed against it. Ghana fell victim to such sanction in 2014 when it was at the top of the European Commission's Alert List of developing countries with poor interception records. This led to a voluntary ban on the vegetable sub sector by MOFA in the second half of 2014 until the latter part of 2017 when the ban was lifted (Yeray *et al.*, 2016). Ideally the ban was to address, improve and ensure the vegetable sub-sector compliance to Sanitary and Phytosanitary Status (SPS) standards. The ban however did not solve the problem as very little changed structurally and a high number of interception of exported vegetables was recorded immediately after lifting the ban (Yeray *et al.*, 2016). This suggests that merely imposing a ban is ineffective unless the core issues of food quality and safety are well implemented and managed.

In discussing about the quality and safety of vegetables produced in Ghana, the influence of institutional or regulatory environment on the production of quality food cannot be ignored.

Institutions are widely used practices of social interaction that have become embedded such that it is costly to choose alternative practices, technologies, or rules (Friel *et al.*, 2009). These structures can either drive or inhibit the production of quality food products as they control the adherence to standards of the various producers and stakeholders. Food safety in the emerging and developing countries are significantly determined by the influence of such institutional bodies (Weigl, 2008). The food regulations controlled and enforced by regulatory bodies must be strict to prevent unsuspecting consumers from consuming unsafe food. If the regulations are lax, food produced may not be safe leading to food poisoning and other threats to human health (Mougeot, 1994). With regard to vegetable production in Ghana, regulatory institutions such as the Ghana Export Marketing and Quality Awareness Project (EMQAP), a division under Ministry of Food and Agriculture has attempted to educate farmers on the procedures to ensure that their produce is safe for consumption. The farmers however are not implementing what has been taught in order for their produce to conform to set quality standards (MoFA, 2014).

The World Development Report (2008) considers agriculture an instrument that ensures economic growth in countries by the supply of quality foods for human consumption. Ensuring then that agriculture is boosted by the production of good quality and safe farm produce will greatly elevate the economies of developing countries such as Ghana. It is therefore necessary to evaluate the stakeholders, especially regulatory institutions, that ensure the realization of this safety and to put the required adjustments in place.

1.2 Problem Statement

A major challenge resulting in the production of poor quality vegetables in Ghana is the institutional environment marred with structural inefficiencies (Friel *et al.*, 2009). Institutional environment here refers to the relevant regulatory bodies who ensure food quality and safety.

This has exacerbated the difficulties in complying with food safety measures. The use of waste water to grow vegetables in the peri-urban communities in Ghana for example tends to be an agro-practice that obviously affects the health of consumers as the possibility of contaminating the harvested crop is very high. This problem in particular seems to persist due to unfavorable and inefficient institutional structures existent in Ghana. There is also the issue of compliance cost or burden especially with small-scale farmers who are unable to meet the financial commitment associated with putting safety and quality measures in place. Developed countries like Germany and France who are part of the European Union have established strong and active institutions that govern the supply of vegetables to their countries. This is not same for developing countries who tend to be their suppliers. Although, some studies have been conducted on the regulatory environment and how they drive food safety in some advanced economies, not enough research has been done in developing countries such as Ghana on how these institutions affect the production and supply of quality and safe fresh farm produce. (Cummins and Macintyre, 2006; Yeh *et al.*, 2008).

Justification

This study would fill the literature gap, on research done on the impact of institutional environment (regulatory bodies) on the production of quality vegetables in Ghana, by investigating this impact of the institutional environment in the Ga South municipality of Ghana. The findings and results of this study is expected to provide a valuable insight and guide to farmers, exporters and Ministry of Food and Agriculture on how to improve the quality of fruits and vegetable production. Again, the outcome of the study would guide the Ministry of Food and Agriculture in creating the necessary institutional framework or model that will enhance food safety and quality standards for exports in Ghana. The research would also address some of the

critical issues regarding food safety particularly involving vegetables. The study would serve as a basis for future studies on the subject matter.

1.4 Objectives and Specific Objectives

The general objective of the study is to assess the effects of institutional environment (regulatory bodies) on the quality of vegetables produced in the Ga South Municipality of Ghana.

The specific objectives are outlined below:

1. To assess the perceptions of vegetable exporters on the effects of regulatory environment in the Ga South Municipality of Ghana.
2. To assess the perceptions of regulatory bodies (Ghana Standard Authority, Environmental protection Agency and Food and Drug Authority, Plant Protection and Regulatory Directorate of Ministry of Food and Agriculture and the Agricultural Extension Department of the Ministry of Food and Agriculture of Ga South Municipal Assembly) on the effects of regulatory environment (regulations and standards) on the quality of vegetables produced in the study area.
3. To examine the views of farmers on the effects of institutional environment on the quality of vegetables produced in the Ga South Municipality of Ghana.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This Chapter reviews relevant literature on the effects of institutional environment on the supply chain of quality vegetables. It is organized into several themes. The first strand of literature gives an overview of institutions and actors involved in ensuring quality vegetables in Ghana. The second focuses on supply chain management with regards to vegetables, literature on vegetables and other food products would be reviewed. The Chapter further centers on the institutional factors that ensure quality vegetables.

2.1 Application of quality management in the food supply chain of vegetables

Supply chain management is one of the important elements in the production function. Supply chain looks at the relationships that exist between the production and distribution of resources (Meade and Sarkis, 1998). Supply Chain Management represents the management of the entire set of production, manufacturing/ transformations, distribution and marketing activities by which a consumer is supplied with a desired product. Supply chain management comprises the planning and management of all activities involved in sourcing procurement, conversion, and logistics management (Christopher, 2016). It also includes coordination and collaboration with channel partners, which may be suppliers, intermediaries, third-party service providers, or customers. Kalidas *et al.*, (2014) reported that the concept of supply chain management is to integrate, ensures supply and demand of goods and services within and across companies. Supply chain management refers to “the design and operation of physical, management information and financial systems needed to transfer goods and services from point of production to point of consumption in an efficient and effective manner” (Kalidas *et al.*, 2014). It can be seen from the

definition given by Kalidas *et al.*, (2014), that supply chain management looks at what an organization or group of people put in place in terms of information, finances, logistics among others to ensure that goods and services from where it is produced to where it is consumed in an efficient and effective way.

After the input stage, there is the production stage where the goods are produced. When the goods are produced they are stored at the procurement and storage level. The primary processing stage starts. Its completion begins the secondary processing stage. Goods and services go to the retailers for it to be sold and consumed by people and thus the final stage in the supply chain processes.

Since this study focuses on the supply chain of vegetables, the research looked at some literature by scholars concerning the supply chain of vegetable. Cadihon *et al.*, (2006) focused on tomatoes and how they are marketed to consumers. It looked at the individual traditional and modern vegetables supply chain. In the tomatoes distribution channel, tomatoes are sold by producers to a point collector who grades the produce but do in consultation with the broker-collector to locate wholesale consumers in the market city. Then enough produce are gathered for transport to their destinations. When it gets to its destinations, a wholesaler then tries to sell the vegetables to secondary wholesalers and retailers.

When supply chain issues happen, the first response is usually to tighten specifications or increase inspections of the food product. Surak, 2007, asserts that this does not address the root of the issue. The best solution is to build food safety and quality into the production and manufacturing process and the most effective ones use the principles of hazard analysis that are a central part of hazard analysis and critical control points (HACCP). Food processors and food

service companies require that their suppliers implement HACCP plans and good manufacturing practices and or good agricultural practices.

2.1.1 Benefits of food quality management in supply chain of vegetables

The whole supply chain management process is a value chain where blockages, value adding features and liability issues are recognized and addressed. This enables retail organization to have an efficient supply chain. Supply which is part of the retail operations ensures that the right product is in the right place, at the right time and at the right cost. The supply chain viewpoint can help the retailers identify greater suppliers and distributors and help them to improve productivity, which ultimately brings down customers costs.

Kalidas *et al.* (2014) have called for the need of supply chain in the supply of vegetables to the market. Supply chain development in the marketing of vegetables does not only benefit the private industry but also creates byproducts that arouse social, economic and environmental sustainability among countries. This in one way or the other creates employment, value addition and minimizes product losses.

Jedermann *et al.*, (2014) have reported that supply chain reduces product losses in transportation and storage. There is the need to feed the increasing population of the world. In view of that it is important food losses by providing the right supply chain. Also it is important to consider the transportation involve in food production. Getting food produce at the right place and at the right time is key in meeting the needs of the people in the society. Jedermann *et al.*, (2014) have indicated that millions of tons of foods perish and go waste along the food supply chain. These losses are caused by sub-optimal cold chain processes management.

A food supply chain or food system refers to the processes that describe how food from a farm ends up on our tables. The processes include production, processing, distribution, consumption and disposal. The food we eat reaches us via food supply chains through which food moves systematically in domino-like motion from producers to consumers while the money consumers pay for food goes to people who work at various stages along the food supply chain in the reverse direction. Every step of the supply chain requires human and/or natural resources. Because a food supply chain is domino-like, when one part of the food supply chain is affected, the whole food supply chain is affected, which is often manifested through changes in price.

In the food supply chain, food moves from producer to consumer via the processes of production, processing, distribution, retailing and consumption; thus, food moves from farmer to consumer in domino-like fashion. At the same time, money that consumers pay for food moves from consumers to producers in reverse process, again in a domino-like fashion from consumer to retailer to distributor to processor to farmer. Thus, the two-sided causality that connects farmers and consumers is mediated by these two set of domino causalities in the Figure 2.1;

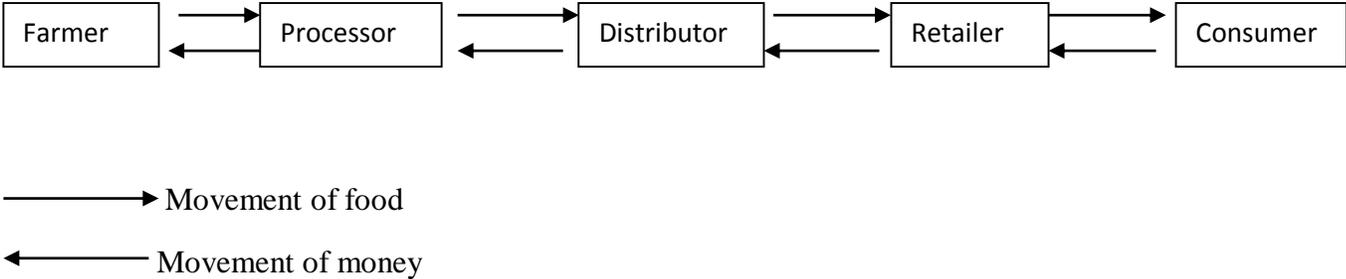


Figure 2.1 Movements of food and money in a simple food supply chain

In addition, both movements of food and money are facilitated by “pulls” and “pushes”. In a food supply chain, producers and processors push or supply food and consumers pull or demand food thereby facilitating the dominoes (food) to fall (move) towards the consumers. Similarly, Producers and processors pull money and consumers push money to facilitate the movement of

money from consumers to producers. Thus, if consumers' pull for food or push for money is weak or absent, the producers' push for food or pull for money would have to be strong in order to keep the food supply chain moving.

Economist Herbert Stein once stated, "If something cannot go on forever, it will stop." By this, he meant that if a trend is unsustainable—that is by meeting the needs of the present while preventing future needs from being met—that trend will ultimately come to an end. Stein's aphorism describes the current direction of the global food system and the global food supply chain. The current supply chain, despite the decreased food prices it provides to consumers and the high cost efficiencies it provides to businesses, is exacting heavy costs on the global environment, is generating massive food wastage, and is incredibly dependent on a steady supply of fossil fuels in order to function. As a result the global supply chain should be considered unsustainable and a new food system is required in order to replace it. One such promising replacement is the shortened/local food supply chain, which outperforms the global supply chain in areas such as energy, environmental sustainability, and food wastage. Consequently, this paper will critique the current global food system—through the lens of food wastage, energy usage, and environmental impact—and argue for the necessity of a wide-scale adoption of a local food supply chain, which has much less serious impacts than the current global model, while also discussing the challenges facing the adoption of a local food supply chain and food system.

First, however, it is necessary to have an understanding of what a food supply chain is. A food supply chain, or food system, according to a lecture by the Harvard Medical School, refers to the "processes that describe how food from a farm ends up on our tables. These processes include the production, processing, distribution, consumption and disposal (of food)" (Surak, 2007). Moreover, according to the lecture, any food supply chain shares a few key characteristics: a)

“food moves systematically in domino-like motion from producers to consumers” and b) “Every step of the supply chain requires human and/or natural resources”. In addition there is a “push-pull” dynamic within the food supply chain, with food producers and processors ‘pushing’, or supplying food, and consumers ‘pulling’ or demanding food, and this continuous shift between supply and demand allows the food supply chain to function. These features are a key part of what makes any food supply chain.

Given this definition of a food supply chain, what makes the global food supply chain so distinct from other supply chains? In essence, the global food supply chain is characterized by several key trends: globalization, consolidation, and commoditization, as stated in the research paper “Unraveling the Food Supply Chain: Strategic Insights from China and the 2007 Recalls”. For globalization, there has been a shift in the food supply chain, particularly in the United States, from what “was predominantly regionally localized and consisted of mostly small-to-medium size independent and local businesses” to a global model, which relies on importing (to reduce costs) and exporting (to increase revenue) at all levels of the supply chain. This has led to the dominance of “large, vertically integrated multinationals with huge product diversity and a focus on low cost and efficiency” with more than 80% of food sales being delivered by large multinational enterprises. Consolidation, the next trend in the global supply chain, has been due to “only small margins attainable in most links of the food supply chain” resulting in “pressures to reduce cost and maximize profits”. As a result, the food supply chain is dominated by a few large businesses—Wal-Mart, Cargill, Unilever, and Nestle among them—which has resulted in a concentrated control of all food markets and the companies erecting “[high] barriers against the entry of potential competitors”. The final trend, commoditization, is the result of a shift in food from being seen as a ‘value-laden’ item—where the specific nature of the food is of importance

to customers—to a commodity good, which is treated as a generic item. This has led to food being “aggregated from multiple global sources, standardized and traded on spot markets based largely on price alone” given that commodity transactions “often take place over long distances; and standardization reduces the need for communication and knowledge about the specific product characteristics”.

The consequences of these trends in the global food supply chain is that food supply chain managers pay attention on maintaining high levels of standardization, high volumes, and low prices, and that extensive global sourcing of food ingredients is a reality. The resulting global food supply chain is one that has provided massive profits for the companies organizing it as well as massive cost savings for consumers. In fact, according to an article by Derek Thompson in *The Atlantic*, the amount of household food expenditures shrunk from about 30% in 1950 to about 13% in 2003. However, this global supply chain is also facing unique issues of its own and is accompanied by the “(1) additional costs for oversight, logistics, pipeline inventory and quality management; (2) heightened vulnerability and greater supply risks stemming from potential supply disruptions, lack of accountability, lower visibility and quality failures; (3) issues concerning global financing and funds transfer; and (4) lower responsiveness [to issues in the supply chain] due to longer lead times”, according to the authors of “Unraveling the Supply Chain”. Beyond that, however, the global supply chain exacts several costs not accounted for by traditional business practices.

One of these hidden costs is intense ecological damage. According to the textbook, *Food Supply Chain Management: Economic, Social and Environmental Perspectives* by Madeline Pullman and Zhaohui Wu, 2011, 50 million acres of agricultural land are lost each year due to soil erosion and degradation under the current food system, and 70% of all available fresh water worldwide is

used by agriculture (Madeleine and Zhaohui, 2011). Meanwhile, the United Nations 2013 Food and Agriculture Report states how livestock production in the food supply chain is responsible for 18% of all global greenhouse gas emissions, higher than the global transportation sector, and is one of the major contributors to climate change (UN FAO, 2013). Moreover, the report also notes that since forests are often cleared to make space for livestock grazing and crop land; over the last 25 years, the world has lost forests equal in size to India, while by 2050 it can be expected that degraded cropland will result in a reduction of available farm land by 8-20%, a challenge given that many farmers are struggling to provide food for the world on the land they have available now. These trends are only likely to worsen if the current food system remains in place, as leaders in the global supply chain are unlikely to avoid the environmentally damaging practices of the current system.

Yet despite the environmental destruction caused by the global food supply chain, it is failing in its basic goal to ‘feed the world’. As stated in the United Nations Food and Agriculture Report, there are 975 million people in the world today who suffer from malnourishment and food insecurity, or not knowing where their next meal is coming from, while a billion individuals are overweight. The report further states that these problems are not “an issue of just more food...they are an issue of access”, citing statistics on India, which despite being a net exporter of food with millions of tons of grain, has 47% of its population suffering from malnourishment. A report by the Natural Resource Defense Council (NRDC) by Dana Gunders, 2016 stresses this issue of access even further stating that within the United States 40% of all food produced within the United States is never eaten—the equivalent of throwing out 165 billion dollars a year, and 17% of all the waste in landfills—while one in six Americans suffers from hunger and not knowing where their next meal will come from (Gunders, 2016). The report points out that such

wastage occurs on all levels of the food supply chain, from farm to landfill. For an example, on the farming level, waste occurs when farmers overplant crops as a response to economic demand, as well as when food safety scares within the supply chain prevents certain crops from being harvested. Meanwhile, on the retail level, waste is seen as a positive, with one representative from Trader Joe's stating that "a store [which] has low waste numbers...can be a sign that they aren't fully in stock and that the customer experience is suffering". These examples illustrate the systemic nature of wastage within the global food supply chain, showing that the global food system is struggling with its basic mission of delivering food from producers to consumers.

Finally, the global food supply chain takes an enormous toll on energy usage. Why is this important? In the words of Phillip Ackerman-Leist in his book *Restoring the Foodshed*: "Food and energy are virtually synonymous", which means that energy, defined as the ability to do work, is ultimately tied in to how people grow food (Ackerman-Leist, 2016). If all human energy was devoted to producing food, complex civilizations couldn't exist. Yet, "transporting, processing, distributing, and even storing food waste is energy intensive", according to Ackerman-Leist, (2016) and the majority of energy the supply chain uses to grow and distribute food comes from outside sources, namely fossil fuels. This has resulted in seven to ten calories of fossil fuels being needed to produce and deliver a single food calorie within the United States. If the price of fossil fuels were to rise in any significant way, many farms would be unable to produce and distribute the food necessary for the local population to be fed. As a consequence of this and all other trends listed above, the global food supply chain finds itself vulnerable to the slightest disruption of business as usual, endangering the environment with its business practices, prone to serious safety and traceability concerns, and generating enormous wastage while failing in its goal of feeding others with food.

All of these problems necessitate that a new food supply chain be developed. Ironically, to create this new food supply chain will most likely mean returning to an older model: to the traditional, regionalized distribution system that has historically been the norm for most human societies. This regional food system requires “diverse agricultural production, small scale processing, small scale distribution, and environmental responsibility” for all people involved. But the key feature of a local supply chain, as stated by a paper by Christine Aubry and Leila Kebir, 2013 in the *Food Policy Journal* is that the supply chain has “a very small number (or even the absence of) intermediaries between producers and consumers, and/or by the short geographical distance between the two (they ideally fulfill both conditions)”. (In other words, these shortened food supply chains can help rebuild a proximity between farmers and consumers that has been lost by the transition to a global food supply chain. This proximity can be classified as either organized or geographical. Organized proximity relates to the way “in which actors [in the supply chain] can be close, irrespective of the geographical distance”. This proximity is based on two fundamental factors: membership, “the feeling of belonging to the same network or club” according to Aubry and Kebir, 2013, “the fact of recognizing oneself in a common project, mentally adhering to common categories, sharing values, sharing a certain idea of quality of life and agricultural products. Geographic proximity, on the other hand, is characterized by a short distance between the various actors within the supply chain. This distance though is relative to the means of transport available within one area and the geography of that area and can vary widely depending “on whether the journey is on a comfortable main road, on small mountain roads, or through city traffic jams” as well as the perception both actors in the supply chain have of each other. Regardless, proximity is key for a short supply chain.

This short food supply chain moreover is also characterized by its diversity. It can take many forms of production and distribution, from “farmer’s markets...basket/box delivery systems, and mobile shops”, with all working to reunite the producer and consumer of food. However, a paper by the European Union Rural Review notes that local food supply chains and food systems can be broadly categorized into three types: direct sales to individuals, collective direct sales, and partnerships. Direct sales to individuals are the simplest form of the local supply chain and involve a “direct transaction between farmer and consumer”. This method allows the consumer to gain a direct relationship with the farmer about their food’s origin as well as cultural and culinary value. Direct sales also don’t have to be face to face, and are sometimes done with online shopping, with producers taking extra care to maintain their relationship with the consumer. Next, there are collective direct sales, which involve “producers cooperating formally and informally to collectively sell their products directly [to customers]”. Their customers can include consumer buying groups, which purchase products directly from farms or collective-selling outlets where several farms or cooperatives of producers work together and jointly organize the sale of their products, with sales also being made at local festivals as well. Finally, there are consumer-producer partnerships, which would “enable consumers to play a more active role in establishing and supporting local food systems...in their community” with Community Supported Agriculture (CSAs), where a consumer contributes a proportion of the farmer’s production costs and in return would receive a set amount of produce, being a prominent example of this type of local food supply chain. These are the three main means of organizing a shortened food supply chain.

Given this definition, how does a local food supply chain counter the immense ecological and energy costs, in addition to the chronic food wastage, of the current global food supply chain? To

begin with, as noted by Gunders, 2016, regional/local food distribution would result in “Shorter transport times and distances [that] would likely lead to lower ”shrink” (loss of product) during transport and could create a market for produce with a shorter shelf life at the time of harvest”, while a closer relationship between producers and consumers of food would encourage consumers to not waste food, another major source food wastage, as “cheap, available food has created behaviors that do not place high value on utilizing what is purchased” . Meanwhile, less food wastage would result in less energy wasted, according to Phillip-Ackerman Leist, 2016 given that whenever food is lost it also means losing the “unnecessary dispersal of pesticides, carbon, airborne particulates, and other pollutants associated with producing [the] food” (Ackerman-Leist, 2016). In terms of environmental benefits, it’s known that “food waste comprises an astonishing one-third of all material sent to landfills, and it is estimated that landfills in the United States produce approximately 20 percent of the nation’s methane emissions—energy lost and pollution unleashed” so any reduction in food wastage would reduce CO₂ emissions. Meanwhile, according to the United Nations, food security and environmental sustainability on a global basis, and especially within developing nations, will come to depend on the next 20 years on “increased and more secure production among small and medium farmers”, and corresponding local food supply chains, rather than the multi-national conglomerates currently dominating the global food system. Finally, there are economic benefits as well with local food systems as money tends to be ‘recycled’ throughout the food systems, and local jobs are easily created, and avoid the costs involved with sustaining a global food supply chain — increased vulnerability to supply disruptions, maintaining quality and inventory management, and low responsiveness to supply chain disruptions. All these benefits point to how shorter food supply chain would provide a better alternative to the current system.

So what are the obstacles then to implementing a local food supply chain on a wide scale? The European Rural Review has found that while many producers are interested in adopting local food systems are struggling to acquire the skills to value and market their local products. An information gap also exists with many producers not fully comprehending “the legislative and regulatory framework for adding value and developing their supply chains” as well as the technical and financial tools to support a local supply chain. For people who want to create local food supply chains, on the other hand, the primary obstacles they are encountering are an established generation of older farmers who have adapted to the global food system, as well as high land values making it difficult for new members to enter the food system. Yet perhaps the greatest obstacle facing the implementation of local food supply chain is the sheer momentum of the present global food system. As Madeline Pullman, in her book *Food Supply Chain Management*, puts it: “the vast majority of agricultural lands are already being farmed under the industrial model, and this model has proven, so far, in producing sufficient calories to meet global demand” (Madeleine and Zhaohui, 2011). In short, the current food system stands merely because it is considered the default distribution system.

However, in the context of Ghana, the GhanaVeg Sector Reports (2016) has indicated that there are supply chain actors who provide technical support services for the vegetable sector in Ghana. Among the technical service needs as recognised by the GhanaVeg Sector Reports (2016) are Commercial growers, Emerging commercial grower, input suppliers (large scale), input suppliers (rural shops), handing agents and logistical service providers. The findings of the GhanaVeg Report (2016) also affirm that there are supply chain partners such as input suppliers, crop exporters or buyers and equipment suppliers.

The commercial growers focus on production and investment planning that evaluate both the quantitative and qualitative demands of the market. Thus, financial planning and market to deal with the uncertainties that may come up. Commercial growers also look at cultivation (irrigation, pest and disease control, soil fertility) and product handling (sorting grading, preservation, handling and packaging). The supply chain actors in the supply of vegetables to the market see input suppliers in two ways. The first input supplier is into wholesale or supplying of goods in larger quantity. In doing so, the suppliers look at the trends and the opportunities in the market. The second supplier on the other hand focuses on rural markets or shops. This facet of the input supplier in the supply chain management looks at cultivation by recognizing soil fertility control, crop protection among others.

The final actor in the provision of technical support services for the vegetable sector in Ghana is the vegetable handling agents and logistical service providers. They are into the management of quality vegetables through sorting, grading, processing and packing of fresh vegetables. The technical support service for the vegetable sector requires strong know-how, competencies and skills to supply vegetables to the market.

2.2 Overview of Institutional Environment

Referring to the macro level aspects of society, the IE consists of the various building blocks of national setting and context. Forces within an IE may pressure local firms to retain traditional channel systems that are suboptimal from the perspective of supply chain innovations. Specifically, theorists (Scott, 2007) recognize three elements composing the IE: regulative, normative and cultural – cognitive.

Regulative element refers to the demands of governments and regulatory bodies to comply with laws and other requirements. Regulative institutions such as the courts and government

bureaucracies interpret societal standards in a way that reflect the power of political societal constituents. Channel structures and processes are influenced by regulative elements through the two basic mechanisms of imposition and inducement (Grewal and Dharwadkar, 2002). Imposition refers to the coercive power of institutions to impose restrictions directly through authoritative orders and indirectly through rules. Inducements are incentives in the form of subsidies, taxes, tariffs and other concessions provided to influence business behaviors. By imposing constraints or providing inducements, the legal and regulatory mechanisms in a country effectively shape channel member actions. In the United States, partners to a joint Point Of Sale/ Cash Register (POS/CR) system are confident that contracts clauses such as cost-plus pricing, penalty payments associated with logistic performance, and minimum purchase volume guarantees are enforceable. The certainty of court imposed sanctions for contract violations effectively disciplines parties to adhere to their agreed upon activity sets and investments.

Normative element refers to a society's values and norms that direct behavior through social obligations and expectations (Scott, 2007). Normative expectations prescribe how specified actors are to behave, imposing constraints as well as empowering social action. Channel member behaviors are influenced by normative elements through the mechanisms of authorizing and acquisition (Grewal and Dharwadkar, 2002). Authorizing involves the development of socially appropriate codes of conduct while acquisition refers to mimicking the behaviors of other firms that are deemed legitimate. Normative elements impact channels as local firms adopt certain modes of conducts and mimic the structures and processes of businesses that they consider legitimate. In the United States, shared understandings of business ethics and notions of proper "businessman ship" support the high degree of trust and cooperation needed to execute many aspects of joint POS/CR programs. Likewise, many distributors and retailers in the United

States tend to support supply chain innovations due to simple mimicking of successful programs by respected and leading companies in similar domestic industries.

Regulatory institutions refer to the formally codified, enacted, and enforced structure of laws in a community, society, or nation. Less formal are the normative institutions, which typically manifest in standards and commercial conventions such as those established by professional and trade associations, and business groups while cognitive institutions are the axiomatic beliefs about the expected standards of behavior that are specific to a culture, which are typically learned through social interactions by living or growing up in a community or society. Despite some “family quarrel” about its accuracy, the three-fold categorization has been widely known to have influence on social behaviour including business practices. Thus the extent of performance in the food sub-sector is largely dependent on the nature of institutional environment. But how often do the law enforcing agencies in the food supply sub-sector ensure that farmers adopt good agricultural practices to produce quality and safe vegetables. How quality of food does produced in Ghana measure up to the required standard, and to what extent do vegetables and fruits exported onto international market perform. To answer this puzzle in the food supply chain sector, this study is set out to investigate the extent to which institutional environment drive quality production of vegetables in Ga South Municipality.

Cultural – cognitive element refers to the socially mediated construction of a common framework of meaning that provides templates and scripts for action (Scott, 2007). Cultural – cognitive institutions achieve compliance by providing actors with “prefabricated organizing models and scripts” (Scott, 2007) making other types of behaviors inconceivable. Cultural control is habitualized and yields programmed actions through two mechanisms, imprinting and bypassing (Grewal and Dharwadkar, 2002). Imprinting is organizational inertia where past

practices are sacrosanct while bypassing occurs where actors so highly socialized into their role expectations that habitualized responses bypass formal organizational controls. Examples where culture embeds local channel member expectations include the keiretsu system in Japan, guanxi in China, blat in Russia among others (Grewal and Dharwadkar, 2002).

Besides, institutional Environment is an important element in operations of an enterprise and entrepreneurial goal are affected by environmental actions. In fact, environment could be impairment to intention in a society (Korunka *et al.*, 2003). Institution is an important factor in humanizing and identifying the target group' needs is the first step in development with institutional approach

According to many economists “institutions matter and are prone to analysis” (Kraybill and Weber, 1995). They include the regulations and customs by which society lives and the mechanisms created to enforce the regulations and customs.

The magnitude of match between the objectives of institutional constraints and choices that individuals make in the specific institutional environment depends on the effectiveness of enforcement mechanisms. Enforcement is carried out by three different parties - self-imposed codes of conduct; retaliation and or societal sanctions or coercive enforcement by the state.

Institutions in a general context can be either formal or informal in nature. Formal is defined institutions as rules that are readily observable through written documents or rules that are determined and executed through formal position, such as authority or ownership. Formal institutions on one hand, for that reason, include explicit incentives, contractual terms, and firm boundaries as defined by equity positions. The informal institutions on the other hand, in turn, are defined as rules based on implicit understandings, being in most part socially derived and

therefore not accessible through written documents or necessarily sanctioned through formal position. Consequently, informal institutions include social norms, routines, and political processes.

The link between formal and informal institutions is historically close. The interconnection between formal and informal institutions is clear; on one hand norms and customs are the basis from which laws and constitutions drive their lawfulness. On the other hand new laws would lead in the long run to helping to shape potential norms and customs that command the society. In other words, the informal institutions are either personified in formal institutions or emerge as a result of adopting formal institutions for long period of time.

As the author note, this interaction can be a cooperative or a conflict process. If formal rules are in harmony with the prevailing informal rules, the interaction of their incentives tends to reduce the level of transactions costs. However, their interaction tends to raise transaction costs when the two forms of rules conflict with each other.

Kraybill and Weber (1995) identified three categories of institutions that affect economic outcomes: political institutions, market institutions and civil institutions. These three categories covering the various fields of socio-economic activity, together determine the institutional environment in which individuals and their organizations exist and grow. Institutions are defined as regulatory structures, governmental agencies, laws, courts, and professions (Scott 2007). They ‘define situations and set parameters for maintaining a stable system; they regulate social relations to maintain and ensure conformance with existing value patterns and consistency among these patterns themselves’ (Oberman 1993).

The institutional environment comprises the rules and requirements with which organizations must comply to gain the desired rewards of support and legitimacy. Institutional theory identifies

three types of pressure: coercive-conforming in response to unavoidable requirements, such as regulatory pressure; normative-conforming in response to cultural norms; and mimetic-conforming to meet the behaviors of competitors.

Some authors defined the institutional environment as the set of political, economic, social and legal conventions that establish the foundational basis for production and exchange. According to others the institutional environment include the systems of formal laws, regulations, and procedures, and informal conventions, customs, and norms, that broaden, mould, and restrain socio-economic activity and behavior.

As Slangen *et al.*, 2014, mention, there is a distinction between institutional environment and institutional arrangements. The former refers to the general institutions of societies that set the “rules of the game” and make them binding, either because these rules are enforced by a coercive, last resort power (*i.e.* the State), or because they represent the beliefs and principles forming the identity of a society (nation, language, etc.). It includes therefore both its formal and informal components. The institutional environment applies to a large extent of heterogeneous transactions. In this sense, it is generic. In contrast, the notion of institutional arrangement refers to mutual (and most often bilateral) obligations established mainly by contracts between agents. Institutional arrangements therefore refer to governance structures and contractual arrangements analyzed by Williamson (1996) and many other scholars. They cover institutions related to provisions “between economic units that govern the ways in which these units can cooperate and/or compete” (Davis and North, 2012).

Emphasis made by Institutionalists is that rules, laws and regulations, norms of behaviour, and cultural-cognitive orientations all but determine behavior more than do contingency and

competitive factors. Actors of institutions include not only the state and the professions, but also interest groups and public opinion (Scott, 2007).

2.3.0 Formal institution

According to Ilbery and Kneafsey (2000) formal institutions regarding marketing of food are the rules and regulations that guide the functioning of the physical market place such as the building, logistics and other infrastructure that help in facilitating the supply of agriculture produce and other commodities (Ilbery and Kneafsey, 2000). An example of institutional environment or the rules and regulations regarding agricultural products in the works of Easton and others (2007) include the allocation of vendor permits and lots, the limitation of the use of specific products. Another instance of formal rule is when market organization enforces that sanitary standards and quality should be maintained in the industry (Easton *et al.*, 2007).

2.3.1 Informal institution

As formal rules (formal institutions) function effectively in the agriculture cycles, informal rules (informal institutions) as identified by Murdoch and Miele (1999) also play important roles in the marketing of agriculture products. For example if dispute or misunderstanding arises in the course of business, farmers sometimes do not take recourse to legal actions but settle issues amicably among themselves (Eskola, 2005). For instance, when a seller sells a produce higher the price he/she is supposed to sell can cause agitations among farmers.

In the works of Eaton and others (2007) which focused on the “analyzing the role of institutional arrangements: vegetable value chains in East Africa” submitted that the institutional environment for marketing fresh vegetables in the East Africa such as Uganda, Kenya and Tanzania apply the transaction cost framework in the marketing of their vegetables. The institutional arrangement in

the Eastern Africa countries also lay emphasis on spot marketers and the transaction cost in the supply of vegetables.

Many farmers in countries like Uganda and other East Africa countries prefer the spot marketing approach since it helps them in the selling of their fruits and vegetables. Spot marketing is not only adopted for the selling of agricultural products but for most commodities and they are preferred than allocations and directions which come through government and other hierarchies within a firm (Fafchamps, 2004). Eskola (2005) has indicated that small-scale farmers prefer to sell their produce through the spot market mechanism. Spot markets which are seen in the East Africa countries help farmers to bring their products to informal market places which enable them to establish circle of customers.

Minit and Ngigi (2004) posit that spot market which is an informal market arrangement between traders may function accurately in the absence of formal rules. Trade contracts among farmers and rural traders are informal, based on verbal agreements.

In the case of any misunderstanding, the transaction costs of resorting to formal institutions (such as the police, courts) are usually higher than the costs involved in the dispute, because the transactions are usually small.

The institutional environment as indicated in Easton *et al* (2007) study in the East African countries looked at transaction cost in relation to the supply of fruits and vegetables as well. Transaction cost covers the price that farmers can get in to the wholesale markets higher than what they get from the collector. Since farmers are price takers they find it difficult to bargain for their produce, a law is been formulated to govern and guide the cost at which farmers sell their produce so as not to cause them on the disadvantage (Posner, 1996). Transaction costs are high

since fruits and vegetables are perishable products, and therefore cannot be stored until sufficient information on qualitative and quantitative demand has been obtained. The institutional environment could be designed in such a way that it will favor the lowering transaction costs, although finding the right model is not easy to come by (Easton *et al*, 2007).

2.4.0 Institutions and Stakeholders involved in ensuring the quality of vegetables in Ghana

The FAO (2002) has indicated that a well-structured food system involves the dynamic interdependence of a number of key actors which include: the government, private sector partner (this comprises farmers and other producers, processors, marketers and distributors; consumers; and organizations specialized in scientific and technological research, education and information.

Nevertheless, these key actors have independent jurisdictions, the system should be structured in such a way that it will provide an appropriate framework for the development of strong institution, partnership, co-ordination and cohesiveness of actions, communication and team work between public and private benefits.

Regarding partnerships, it functions in an open and transparent process. Associates who serve as partners must have clear description of responsibility and the authority to make decisions for meeting their duties. Partners must have, or be given, the resources to effectively involve in the institutional debate and to work efficiently.

When it comes to key actors that ensure the supply of quality products especially food are the Food and Drugs Authority and the Ghana Standard Authority. These organizations have been instituted by the government to ensure that quality and safe products are supplied not only in Ghana but goods which are exported outside Ghana. They are the two main regulatory bodies in

Ghana responsible for ensuring safety and quality food and products that are consumed in Ghana (Amoa-Awua *et al*, 2007).

Apart from the two regulatory bodies as indicated above, there are other institutions that are established in addition to FDA and GSA to ensure safety food and products. They are the Environmental Protection Agency who is in charge of all kinds of chemicals used in controlling pests in the agricultural cycle. The institution ensures that quality chemicals are used in controlling pests for agricultural purpose.

There is also the Plant Protection and Regulatory Service Division (PPRSD) under the Ministry of Food and Agriculture (MOFA). This body is authorized by the government to see to it that the appropriate agricultural input for food production (agro-inputs, for instances agrochemicals) is sold in the market.

2.4.1 The Ghana Food and Drugs Authority

The food and Drugs Authority (FDA) formerly called the Food and Drugs Board (FDB) was founded in August 1997 under the Food and Drugs Law, 1992 Public Health Act 2012 (Act 851) to oversee and regulate food, drugs, food supplements, herbal and homeopathic medicines, veterinary medicines, household chemical substances, tobacco among others. The Ghana Food and Drugs Authority comprise two main divisions, the food division and drugs division. The food division is further separated into the food inspectorate division and the food safety division. The drugs division also has its separate sections. They are the registration and inspectorate division, safety monitoring and clinical trials, cosmetic Med. Devices and house Chem division (FDA, 2016).

The Public Health Act, 2012, Act 851 authorizes the FDA to protect the Ghanaians through the regulation of foods, drugs, household chemical substances, cosmetics and medical services. There will be loss of human capital if individuals consume foods which are unsafe and have critical regulatory issues. The Food and Drugs Authority also provide technical support to the food industry to promote the production of safe and quality food through the application of food safety management systems. The Food Inspection directorate of the FDA there is Food Enforcement Department who inspects and control food manufacture, storage, retail and disposal. There is also the Food Post Market Surveillance Unit (FPMSU) which monitors the safety of quality foods in storage and trade and ensures that food products are advertised according to the FDA advertisement of food products.

There are laws that regulate the foods and drugs that are produced in Ghana. They are called the food and drugs law. According to Anthony (2011), the Food and Drugs law states the following:

*“*any person who sells or offers for sale any food that;*

- *has in or upon it any poisonous or harmful substance,*
- *is unwholesome or unfit for human consumption,*
- *consist in whole or in part of any filthy, putrid, rotten, decomposed or diseased substance,*
- *is injurious to health or is not of the nature, substance or quality prescribed by standards commits an offence”.*

These provisions as prescribed by the law are made to ensure that the health of Ghanaians is safe enough to influence positively on the productivity of the nation. The Authority is to ensure that all manufactured food product meant to be eaten safe and devoid of unacceptable level of material that are harmful to human health. They are also to make sure that food industries and drug manufacturing industries maintain acceptable standards to promote good health of the

citizenry. Rarely, they carry out awareness creation activities to educate the general public about food safety issues to enable consumers to make informed decisions.

2.4.2 The Ghana Standard Authority

The Ghana Standard Authority was established by NRCD 1973. It was formerly called the Ghana Standard Board (GSB). When it was established in 1973, it was solely vested with the duty for preparing standards for products and processes for ensuring order with government policies on standards, methodology, Standardization, Testing and Quality Assurance of both locally manufactured and imported products are complied with throughout the country.

Apart from safety, other quality attributes associated with the Ghana Standard Authority include: nutritional value organoleptic properties for example, appearance, colour, texture, taste; and functional properties. Consumers, the food industry and government regulators are also concerned with these quality criteria. Quality can be considered as a complex characteristic of food that determines its value or acceptability to a consumer and it is important to realize that consumers' evaluation of quality is often subjective. From a regulatory or consumer protection point of view, "quality" is a basic requirement of the GSA which must be met under existing laws and regulations to maintain that foods are safe, not contaminated, adulterated or fraudulently presented. Safety requirements for foods are neither optional nor negotiable. Likewise, recent international conditions focus the need for food safety. Measures to be based on include risk analysis following principles and procedures expounded by relevant international actors, (FAO, 2000). By virtue of their role of ensuring the safety and quality of products of which fruits and vegetables are no exception, the board in collaboration with other agencies like Food Research Institute (FRI), Food and Drugs Authority (FDA), Plant Protection Regulatory

Services Directorate (PPRSD) and the Vegetable Producers and Exporters Association of Ghana (VEGPAG) have developed standards for most importable vegetables and fruits.

These standards for quality are to ensure that whatever fresh vegetables the consumer buys is safe and meets the standards expected by the consumer. The board usually organizes seminars, workshops and radio talk shows to create awareness and educate the general public on quality, standards and safety of food (FDB, 2005).

2.4.3. Ghana Export Promotion Authority (GEPA)

The GEPA is the national export trade support institution of the ministry of trade and industry (MOTI) responsible for the enabling, enhancement and promotion of Ghanaian exports. It was founded by Act 396 in 1969 as an agency of the ministry of trade and Industry with the mandate to develop and promote Ghanaian exports. The focus of GEPA has primarily been to diversify Ghana's export from Gold and other unprocessed materials such as cocoa beans, timber logs and lumber.

2.5.0 Conceptual Model and Research Hypothesis and Regression Model

2.5.1 Hypothesis development

The institutional environment consists of actors or stakeholders that determine how vegetables in the Ga South Municipality would be supplied. The actors or stakeholders such as the Ministry of Agriculture, Ghana Standard Authority among others operate by laws, policies and regulations they have formulated. The actors who are in charge in the supply chain of quality vegetables will then determine the level of quality of the vegetable, whether is of high or low quality.

The quality of vegetables are able to be establish because institutions mount different forms of pressure to which organizations respond, causing them to establish fields of action that define their operations and the conditions under which they (actors) get legitimacy (Meyer and Rowan,

1977; Scott, 1995). Institutional theory contends that, organizations employ structures, processes, programmes, policies and/or procedures because of the pressure coexisting institutions exert on them (Kostova and Roth, 2002). On the inter-organizational level, pressure from government, industry alliances, and expectations from society define and determine what socially acceptable (Oliver, 1997) is. These institutional structures influence organizations like Small and Medium Enterprises (SMEs) in terms of innovation capacity, supply chain, and competitive advantage (DiMaggio and Powell, 1993) pursued to achieve set objectives (Peng *et al.*, 2008).

However, some of these institutionalized practices and structures may lead to agricultural or farming effectiveness, innovation capacity and performances, it may also lead to decisions that threaten same. The significance of the institutional environment indicates that policymakers of firms, for instance, can encourage institutions to ensure high innovative capacity and improve supply chain performance by strict enforcement of policies through supervision, monitoring, training, research and development (R & D), and application of sanctions (regulative dimension) (Vesper, 1996). Such practice, with time will obviously be internalized (cognitive) where high innovation capacity becomes part of the value systems and way of life of the society (culture and normative) for new institutions to emulate (mimetic). Therefore, a society with strict application of innovation policies and favourable regulations possesses the required attitudes, motivation and capabilities to develop orientation towards improve supply chain performance thereby leading to competitive advantage.

Below represents the research hypothetical model of the research

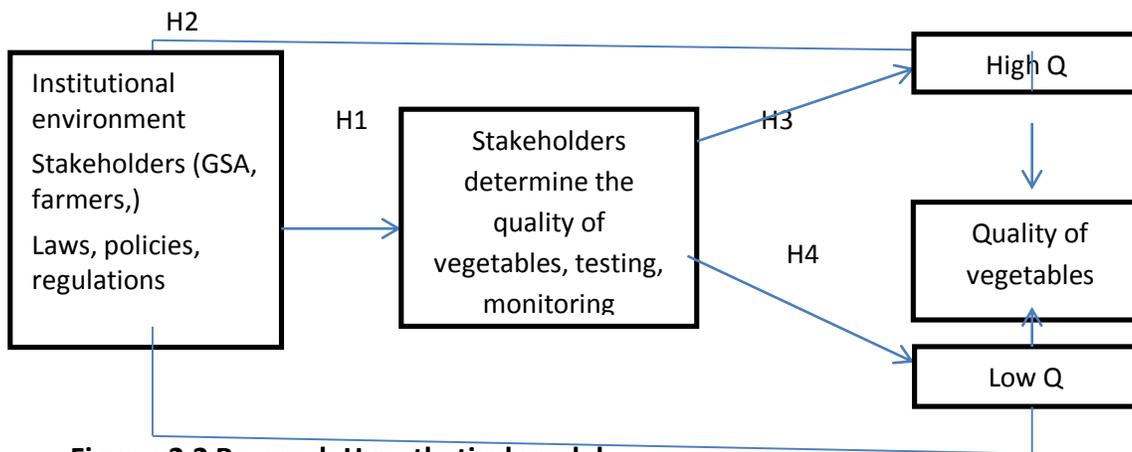


Figure: 2.2 Research Hypothetical model

Based on the model above the following hypotheses are made:

H1. Institutional environment will positively influence the supply of quality vegetables in the Ga south municipality.

H2. Institutional environment determine high level quality of vegetables produced in the Ga South Municipality

H3. Institutional environment determine low level quality of vegetables produced in the Ga South Municipality

2.5.2 Regression model

The regression model is a statistical procedure that allows a researcher to estimate the linear, or straight line, relationship that relates two or more variables. This linear relationship summarizes the amount of change in one variable that is associated with change in another variable or variables. The model can also be tested for statistical significance, to test whether the observed linear relationship could have emerged by chance or not. In this section, the two variable linear

regression model is discussed. In this course of statistical methods, multivariate regression with relationships among several variables, is examined. Rachel Gordon A. (2012).

The two variable regression model assigns one of the variables the status of an independent variable, and the other variable the status of a dependent variable. The independent variable may be regarded as causing changes in the dependent variable, or the independent variable may occur prior in time to the dependent variable. It will be seen that the researcher cannot be certain of a causal relationship, even with the regression model. However, if the researcher has reason to make one of the variables an independent variable, then the manner in which this independent variable is associated with changes in the dependent variable can be estimated.

In order to use the regression model, the expression for a straight line is examined first. This is given in the next section. Following this is the formula for determining the regression line from the observed data.

In the regression model, the independent variable is labelled the X variable, and the dependent variable the Y variable. The relationship between X and Y can be shown on a graph, with the independent variable X along the horizontal axis, and the dependent variable Y along the vertical axis. The aim of the regression model is to determine the straight line relationship that connects X and Y . The straight line connecting any two variables X and Y can be stated algebraically as

$$Y = a + bX \qquad \text{Equation 1}$$

Where “ a ” is called the Y intercept, or simply the intercept, and b is the slope of the line. If the intercept and slope for the line can be determined, then this entirely determines the straight line.

In addition, where two or more variables interact to cause an effect on one or more dependent variables, bivariate models may be unable to explain this, or may mislead a researcher

concerning the true relationships among variables. One way of dealing with these problems is to create multivariate models, where the effect of all relevant variables is considered. When dealing with many variables, all of which are measured at no more than the nominal level, a multivariate model produces tables of 3, 4, 5 or more dimensions. These are very difficult to analyze, although some researchers use loglinear models to examine these. The other difficulty of these models is that even where relationships among variables are found, it may be difficult to describe them in an understandable manner. Where the variables have at least an ordinal level of measurement, researchers generally move well beyond cross classification tables, and are able to examine the correlation among the rankings of members of a population on several variables. The same is possible with variables that have interval or ratio scales. For variables having these latter scales, the correlation coefficients measure the manner in which distances between values of the variable are related. Using these correlation coefficients, it is possible to construct various types of multivariate models. Factor analysis is one of the most common of these. In factor analysis, a researcher takes a large number of variables, and attempts to group these variables into common types of variables, or factors. Cluster analysis is another multivariate method that can be used. Cluster analysis can be used to group variables together, but is more commonly used to provide clusters of cases that are reasonably similar to each other. If all the variables have interval or ratio level scales, then multivariate regression models are commonly used. One advantage of a regression model over factor or cluster analysis is that the regression model can be used to obtain an estimate of the actual amount of change in a dependent variable that occurs as a result of a change in an independent variable. Where the model includes several independent variables, both the individual and the combined effect of these on the dependent variable can be estimated. For example, in the example of the female labour force participation rate, it is possible to obtain a model that examines the effect of both increased wages, and declining economic

status, on female labour force participation rates. It is also possible to produce simultaneous equation estimates, where variables may be simultaneously independent and dependent variables. In the labour force participation example, the increased entry of females into the labour force helps improve the economic status of families. Thus the relative economic status of young families cannot be regarded as a variable that is completely independent of other labour force variables. The two are simultaneously determined.

The Ordinal regression function is as shown below:

$$Y_i = \beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8 + \beta_9 + \varepsilon \quad \text{Equation 2}$$

Where

Y_i = the dependent variable (thus quality of vegetable)

β_0 = constant

β_1 = existence and use of strong public health and consumer welfare systems (PH)

β_2 = adoption of stringent safety standards (SS)

β_3 = Adoption of HACCP approach to assuring food safety (HACCP)

β_4 = Transparency in the formulation of national regulations

β_5 = Regulators adopt crossbreed regulatory systems

β_6 = equipment (Equip)

β_7 = adoption of hybrid regulatory systems (HR)

β_8 = reliance on certification including traceability (Cert)

ε =error term

In the regression model, the independent variable is labelled the B variable, and the dependent variable the Y_i variable. The aim of the regression model is to determine the straight line relationship that connects B and Y_i . Rachel Gordon A. (2012).

2.6.0 Vegetables Production in Ghana

According to Factsheet- Vegetable Ghana (2014), vegetables that are used in Ghana and are of national significance. Five vegetables rank in the top 20 of crop and livestock products. These are outlined in table 1 below:

Table 2: Vegetables of national significance in Ghana

Crop	Value (1000 US \$)	Production (tonnes)
Taro	275639	1299650
Chillies and peppers (green)	127105	270000
Tomatoes	125652	340000
Chillies and peppers (dry)	96398	88000
Okra	51159	88000

Source: Factsheet – Vegetables Ghana, 2014.

2.6.1 Local and Exotic Vegetables in Ghana

According to Sinnadurai (1971), local vegetables or vegetables most commonly produced in Ghana include: “tomato (*Lycopersicon esculentum*), onion (*Allium cepa*), shallots (*Allium escalonicum*), okra (*Hibiscus esculentus*), eggplant (*Solanum melongena*), local spinach (*Amaranthus*spp), Indian or Gambian spinach (*Basella*alba), sweet and chillipepper (*Capsicum annuum*), and hot pepper (*C. frutescens*)”. These vegetables find a ready market, not only in the cities but also in the rural areas.

Exotic vegetables are also called European vegetables. These types of vegetable are produced purposely for the foreign nationals in Ghana and Ghanaians who prefer the foreign vegetables. Exotic vegetables in Ghana include cauliflower and carrots. These vegetables are sometimes low and lack quality sometimes. Lettuce is another exotic vegetable in Ghana. It is becoming increasingly popular mostly regional capitals such as Accra, Kumasi and other cities.

Cucumber is also gaining popularity as an exotic vegetable in Ghana. The sale of vegetables is growing tremendously in Ghana recently. In all, vegetables such as tomato, hot pepper, onion, eggplant and okra are perhaps the most common vegetables in Ghana. For example, Okra, Hot pepper, and eggplant are comparatively easy to grow since they are easygoing to the climatic conditions and may be grown as rain fed crops (Sinnadurai, 1971).

2.6.2. Quality vegetables

Besides safety of foods as well as vegetables, the issue of quality is very important. The term quality indicates the extent of excellence of a product or service or the suitability of a product for a specific use (Abbott, 1999).

Abbott (1999) indicates that the quality of produce includes sensory characteristics, nutritive values, chemical constituents, mechanical properties, functional properties and flaws.

Shewfelt (1999) and Abbott (1999) points out that quality is normally defined either by a product orientation or consumer orientation. Shewfelt (1999) further suggests that increasing features of the product itself may be termed quality and that the buyer's perception and response to those features be mentioned to as acceptability.

With regards to vegetables, Kogbe (2015) has indicated that the features required by the Ghana Standard Authority comprise: nutritional worth organoleptic feature which include appearance, colour, texture, taste; and other functional features. Buyers, the food industry and state regulators are also concerned with these quality measures as submitted by Kogbe (2015). When it comes to quality, it can be seen as a complex feature of food that determines its value or acceptability to a consumer and it is important to note that customers' assessment of quality is often subjective.

Abbott (1999) suggests that individuals use most of their senses to measure quality: "sight, smell, taste, touch, and even hearing". When a consumer of a product adopts all sensory inputs, for example, appearance, aroma, flavor, hand-feel, mouth-feel and chewing sounds, it determines a final judgment of whether a produce (fruit or vegetable) is acceptable or quality.

From a governing or consumer perspective, quality can be referred to as the basic objective requirements which must be fulfilled under existing laws and regulations to ensure that foods are safe, not contaminated, tainted or deceptively presented. Safety requirements for foods are neither optional nor negotiable.

Moreover, recent international agreements focus on the need for food safety. These agreements are based on risk analysis succeeding principles and procedures expounded by the necessary international organization, (FAO, 2000).

The roles by actors on food safety ensure that laws governing the safety and quality of food products of which vegetables are no exception are adhered in countries. In Ghana, agencies like the Food Research Institute (FRI), Food and Drugs Authority (FDA), Plant Protection Regulatory Services Directorate (PPRSD) and the Vegetable Producers and Exporters Association of Ghana (VEGPAG) have developed standards for most importable vegetables and fruits (FDB, 2005).

These principles for quality are to warrant that whatever new vegetables the consumer buys from the market is safe and meets the standards expected by the consumer. Agencies are responsible for food quality through seminars, workshops and radio talk shows to create awareness and educate the general public on quality, standards and safety of food (FDB, 2005).

In Aked (2000) contribution to quality vegetables, the scholar posits that appearance is one of the most significant quality attribute of fresh and slightly processed produce, with primary concern for size and colour regularity, shininess, and absence of defects in shape or skin (Aked 2000).

The works of Nune *et al.* (2007), indicate that appearance, colour, texture and aroma are probably the most important requirement used by consumers to measure the instant quality of an agricultural produce and this in one way or the other influence buyers to patronize a product.

Zuniga and others (2007) also have suggested different attributes in the concept of quality depending on the particular actor who is procuring a product or service. Most actors contributing

in the valuation of food quality for the export market are normally producers, importers, exporters, processors, wholesalers, retailers and buyers.

While external organizations like voluntary agencies and the government may influence these perceptions. Suppliers and sellers stress on visual features for instance colour, size, form and shelf-life, taking into account consumer choices. Public officials are involved in regulations concerning health and safety aspects. Producers and processors commonly give preference to profit attributes, like higher yields, suitability for mechanical harvesting and industrial preparation, and resistance against pest and diseases.

Liu and Yan (2009) would have indicated that quality vegetable do not contain over-the-limit harmful substances such as nitrate, nitrite, and pesticides which do not have negative implications on human health after taken in the produce. Liu and Yan further stress that the quality of a vegetable is dependent on the kind of soil that the vegetables are produced on. On the soil where there is a high level nitrate, heavy metal and pesticide accumulation, it will be difficult to produce quality vegetables.

It is important to note that in view of providing quality vegetables reliance on agricultural inputs such as fertilizers and pesticides should be reduced to secure the accumulation of harmful substances (Rao and Puttanna, 2000).

In a view of this there is an urgent quest by the developed countries to find an alternative method to produce quality vegetables. However, consumers are interested in many more aspects related to food quality such as taste, freshness, appearance, nutritional value and food safety. This criterion of consumers described by Zuniga – Arias and Ruben, (2007) supported what Zind (1989), described about consumers. According to Kader (1999) and Zuniga – Ariasa and Ruben,

(2007), quality, which is, the degree of excellence or superiority of fresh fruits and their products is a combination of attributes, properties, or characteristics that give each commodity value in terms of human food. He further stated that the relative importance of each quality component depends upon the commodity and its intended use (example, fresh or processed) and varies among producers, handlers and consumers. Romano *et al.* (2006) and Kader (1999) reported that quality has different meanings for different stakeholders (producers, distributors, consumers, etc) but consumer acceptance seems to be the most important factor to consider. To producers, a given commodity must have high yield and good appearance, it must be easy to harvest, and must withstand long distance shipping to markets. Appearance quality, firmness, and shelf life are important from the point of view of wholesale and retail marketers while consumers judge quality of fresh fruits on the basis of appearance (including freshness) and firmness at the time of initial purchase (Janic, 2004). Kader (2008) stated that although consumers may buy fruits on the basis of their appearance and firmness, subsequent purchases depend on their satisfaction with how these fruits taste. He further stated that fruit quality in terms of flavour is influenced by the cultivar, maturity stage at harvest, postharvest handling procedures and environmental conditions (for instance avoiding mechanical damage and chilling injury), ripeness stage at the time of eating the fruit. Vegetables, the indispensable staple produce that provides human beings with many beneficial substances in Africa and other developing countries, are heavily contaminated by pesticides during cultivation (Wen *et al.*, 2009). However, Liu and Yang (2009) have submitted that vegetables serve as an essential source of energy such as vitamins, beneficial active nutrients, amino acids among others. In countries like China and other regions vegetables are produced in high-value particularly during out of season period. Due to the high economic benefits attached to the cultivation of vegetables, more people have developed more interests in vegetables cultivation.

In China and other developed countries, studies (Zhang *et al.*, 2006) have shown that they produce more than ten vegetable species, which include tomato, rape, lettuce, Chinese cabbage, Malabar spinach, cucumber, garlic, green pepper, okra, Ipomoea aquatic forsk, Gynurabicoloar, bitter gourd etc.

India is seen as the world's largest producer of various fresh fruits and vegetables, spices, meat, minimal fibrous crops such as jute, millets, castor oil seed, coffee and many cash crops (Halderand Pati, 2011). Rais and Sheoran (2015), produced about 81.25 MT of fruits and 162.19 of vegetables which amounts for over 14% of the country's share in the world production of vegetables in India. However, more than 70 types of vegetables are grown in the country. More emphasis are on common vegetables such as brinjal, cabbage, cauliflower, onion, peas, tomato, sweet potato, lettuce, pumpkins/gourda, beans and cassava (Rais and Sheoran, 2015).

2.6.3 UN ECE quality standards for vegetables.

The quality of fruits and vegetables constitutes a dynamic composite of their physiochemical properties and consumer perception (kyriacou and rousphael, 2017). Consumption profiles tend to vary for each county and even regions within the country; they further vary with sex, age educational and socioeconomic levels.

The United Nations Economic Commission for Europe defines the commercial quality standards for agricultural produce in order to facilitate trade economic integration and cooperation. As all international standards this helps define a common trading language. The standards are cost free, specific for different agricultural products that include fruit and vegetables, potatoes, dry produce, meat eggs and flowers. The products are classified in decreasing order of quality as 'extra', class I and class II. In European Union regulations these standards are mandatory and

serve as a voluntary reference in commercial contracts with UN member states. Table 2.1 below summaries the UNECE standards for the vegetables considered in this study.

Table 2. 1 Summery of UNECE standards for quality vegetables

Crop	Minimum requirements	Extra	Class I	Class II
Aubergine	Intact, sound, clean, pest free, free from damage caused by pest, fresh in appearance, firm, flesh not fibrous or woody	Firm, stalk intact, flesh perfectly sound, no defects,	Slight defect in shape and colour, slight skin defects (bruising) healed cracks not exceeding 3cm ³	Defects in shape, defects in colouring, slight bruising slight healed cracks slight sun scorch not exceeding 4 cm ³
Garden egg	Intact, sound, clean, pest free, free from damage caused by pest, fresh in appearance, firm, flesh not fibrous or woody	Firm, stalk intact, flesh perfectly sound, no defects,	Slight defect in shape and colour, slight skin defects (bruising) healed cracks not exceeding 3cm ³	Defects in shape, defects in colouring ,slight slight healed cracks slight sun scorch not exceeding 4cm ³
Chilli	Intact, stalk may be missing, sound, clean, free from pest or damage caused by pest, fresh in appearance ,firm, free from high temperature damage, free from abnormal external moisture	Free from defects, except slight superficial defects that do not affect appearance, colour change due to ripening s not a defect	Slight defect in shape, colour, skin, stalk	defects in shape colour skin, stalk provided essential characteristics are maintained, slight lack of freshness
Pepper	Intact, stalk may be missing, sound, clean, free from pest or damage caused by pest, fresh in appearance, firm, free from high temperature damage, free from abnormal external moisture	Free from defects, except slight superficial defects that do not affect appearance, colour change due to ripening s not a defect	Slight defect in shape, colour, skin, stalk	defects in shape colour skin, stalk provided essential characteristics are maintained, slight lack of freshness

2.7.0 Effects of institutional environment on food production

Literature by Kader (2008) submits that there are numerous issues which affect vegetables and fruits quality. Maturity at harvest is one of the factors the researcher indicated as an important factor in determining the quality of vegetables and fruits (Kader, 2008). Nevertheless, Mitra and Baldwin (1997) indicates that various maturity indices have been proven however, due to differences among cultivars, production conditions and places, there is no consensus on maturity indices. Kader (1999) asserted that the eating quality of fruits when ripe depends upon maturity at harvest, avoiding physical damage and chilling injury during postharvest handling that minimized disease incidence. Sharma and Singh (2000) and Kader (2002) explained that harvesting practices determine the extent of variability in maturity and physical injuries. Physical injuries lead to accelerated loss of water and vitamin C and increased susceptibility to decay by fungi or pathogens during storage.

Temperature and relative humidity directly affect postharvest respiration and transpiration of fruits and vegetables. Kader (1985) asserted that elevated temperature would speed up respiration, leading to increased ethylene production and high carbon dioxide level and thus changes in flavor, taste, color, texture, appearance, and nutrients of the produce. Jobling (2000) stated that, at extremes of temperatures products get damaged. He explained that some products suffer chilling injury while others suffer damage at very high temperatures. He concluded that short exposures or few hours of exposures to extreme hot or cold temperatures can cause a marked decrease in shelf life and loss of quality. Jobling (2000) further stated that correct and careful temperature management throughout harvest, storage, transportation and marketing chain is essential if the quality of the product is to be assured.

Sharma and Singh (2000) and Kader (2002) indicated that appropriate postharvest handling operations that should be applied, must include controlling temperature (cooling) and RH, atmosphere (O₂ and CO₂ levels).

Scholars (Sharma and Singh, 2000; Kader, 2002) also stated it as a very important factor for determining fruit quality at delaying ripening by modified or controlled atmospheres and/or treatment with “*1-methylcyclopropene (1-MCP; Smart fresh)*” but cannot substitute for keeping banana at the optimal range of temperature and relative humidity. It can be useful supplemental treatments under conditions when a longer postharvest-life is needed for successful marketing.

Generally, the smaller the time between harvest and consumption of vegetables and fruits, the healthier the eating quality because postharvest-life based on flavour quality is generally about 70% of postharvest-life based on appearance quality of fruits. This is because of losses in sugars and organic acids used in respiration, losses of the fruit’s capability to produce its feature aroma due to depletion of precursors, and/or development of off- flavours (Sharma and Singh, 2000).

It is important to note that the temperature of fresh produce should be reduced immediately after harvesting and controlled right above where the chilling injury may occur. Thompson, (1996) reported that tropical fruit and vegetable crops often are susceptible to chilling injury when cooled below 13°C which reduces the quality of the product and shortens shelf life.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study area

For the purpose of this study the following towns in the Ga-South Municipality were selected for investigation: Tuba, Kofikwei, Obom and Odumplala. The population of Ga-South Municipality, according to the 2010 population census, is 411,377 making about 10% of the population of the Greater Accra region. Fifty one point one percent (51.1%) of the total population of the area are females whereas 48.9% are males. According to the Ghana Statistical Service (2014), 12.3% of the households in the municipality are engaged in agriculture. More than 76.5% of the agricultural households in the area are involved in crop farming and the rest rear animals as well as do other small scale businesses.

The towns were chosen from the Ga-South Municipality because of the high production of vegetables in those areas as compared to other towns. These areas (Tuba, Kofikwei, Obom and Odumplala) are also where vegetables are sold on a large scale. The selected towns are also among the leading producers and exporters of vegetables who are often faced with rejection on the international market. A wide variety of vegetables were grown in this area but the vegetables usually exported were of interest. These were chille, okra, garden eggs, tida, augbergine and pepper. A map of the Ga South Municipal area is shown in figure 3.1.

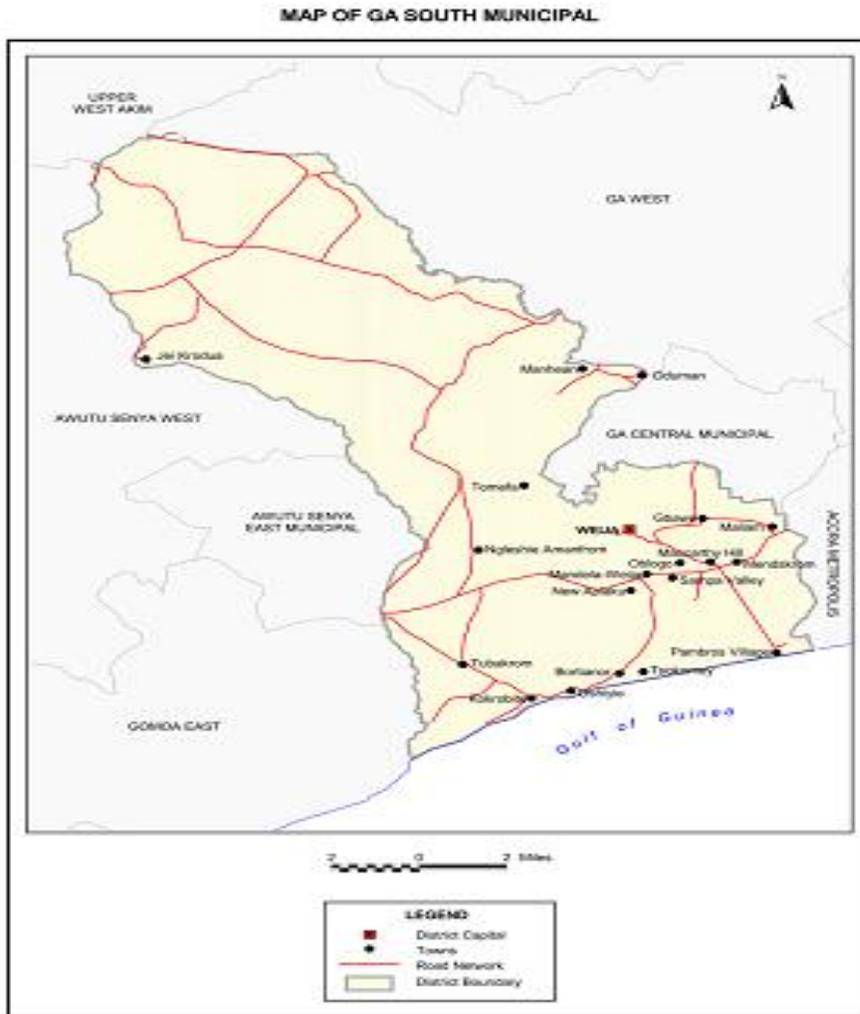


Figure 3.1: Map of Ga South Municipality

(Source: GIS 2014)

3.2 Participants of the study

The participants for the study were categorized into two. The first category comprised of farmers and local consumers of the vegetables while the second category was made up of exporters and professionals in the regulatory institutions. Farmers as well as consumers of exotic and indigenous vegetables were chosen to answer questionnaires on how vegetables were supplied to the market and the quality of the vegetables supplied.

Professionals from the institutions that regulate and ensure that quality vegetables are produced and marketed as well as exporters of such vegetables were also selected to provide information on how they ensure the quality standard of vegetables in the area. The regulatory institutions chosen for the study were Ghana standard board, Environmental protection Agency and Food and Drug Authority, Plant Protection and Regulatory Directorate (under Ministry of Food and Agriculture) and the Agricultural Department of the Ministry of Food and Agriculture (Ga South Municipal Assembly). In all a total of three hundred (300) people participated in the study. Two hundred (200) were farmers that produce the vegetables and local consumers, fifty (50) were exporters and ten (10) individuals from each of the chosen regulatory bodies (making a total of 50).

3.3 Questionnaire design

Structured questionnaires were designed made up of open and closed-ended questions. Sections of the questionnaire included demographics,

The questionnaires were pre-tested on small sample of the respondents at Tuba in the Ga-South Municipality in the Greater Accra region of Ghana to ensure content validity as indicated by Rogers (1995). Questionnaires were also administered to the institutions engaged in food safety to gather information on some of the standards or laws put in place to check food quality in Ghana.

3.4 Data Analysis

The analysis in this study was done using Microsoft excel spreadsheet version 2013. The data was cleaned and imported into Statistical Package for Social Sciences (SPSS), version 22, for analysis. The variables that were of interest were ordinal. This means that values were ranked but the real distances between groups were not known. The research adopted the ordinal regression so as to grade the quality of vegetables on scale that required participants to select from strongly agree to strongly disagree. The ordinal regression model analysis was also used to measure the impact of regulatory institutions on the supply of quality vegetables. The socio-economic and demographic features of the respondents and data gathered by observation were analyzed by descriptive statistics and presented in tables and graphs. The Ordinal regression function is as shown below; the terms in the equation 4 are explained in appendix 1.4:

$$Y_i = +\beta_6 + \beta_7 + \beta_8 + \beta_9 + \varepsilon \quad \text{Equation 4}$$

3.5 Determinants of Institutional Environment and Quality of Vegetables

A number of variables were identified in the study to be used in measuring the determinants of the quality of vegetables in the Ga-South Municipal. The dependent variable in the study was the quality of vegetables (based on UNECE standards specific for the vegetables under consideration in this study) and the independent variable in the study was the level of impact of regulatory institutions. The hypothesis was that the supply of quality vegetables was directly proportional to the level of influence regulatory bodies had on their production and supply. Influence of regulatory bodies was measured based on the level of adoption of stringent safety standards, adoption of HACCP approach to assuring food safety and regulators ability to strictly enforce the law and policies ensuring food safety/quality

CHAPTER FOUR

RESULTS AND DISCUSSION

Socio-demographic characteristics of respondents

Out of a total of 300 participants interviewed, 200 were farmers, 50 were exporters and 50 were professionals working with regulatory bodies (GSA, EPA, Agricultural Extension Service Directorate (MoFA), Plant Protection and Regulatory Services Directorate (MoFA) and FDA). Ten (10) questionnaires were given out for each agency or regulatory body contacted. Seventy eight percent (78%) of the total number of respondents were males and the remaining 22% were females. Vegetable exporters aged 40years and above were the majority among the respondents constituting a total of 86%. Majority of the exporters had higher national diploma (HND) at the time of the study representing 76% and 96% had worked for more than 10years. With respect to respondent's position in their place of work, 46% were owners whilst 54% were employees at the time the data was gathered. Of the 50 regulatory professionals engaged for this study 66% were males and the remaining 34% were females. Regulators aged 31-40years and above were the majority among the respondents constituting a total of 64%. With regards to the gender of farmers interviewed, 79% were males whilst 21% were females and majority of the farmers (33%) fell within the age group of 31-40years. Most respondents representing 96% had formal education and majority of them had worked for a period between 6-10years. Table 4.1 illustrates the demographic characteristics of the respondents.

Table 4.1: Demographic Characteristic of Respondents

Variable	Exporter(N=50)	Regulator(N=50)	Farmers(N=200)
Gender	Frequencies (Percent %)	Frequencies (Percent %)	Frequencies (Percent %)
Male	39(78)	33(66)	158(79)
Female	11(22)	17(34)	42(21)
Age(yrs)			
≤20	0(0)	0(0)	23(11.5)
21-30	0(0)	18(36)	57(28.5)
31-40	7(14)	32(64)	66(33)
>40	43(86)	0(0)	54(27)
Educational level			
No formal education	0(0)	-	
Basic	2(4)	-	192(96)
HND	38(76)	-	1(0.5)
1 st Degree	10(20)	-	7(3.5)
Duration of work			
<1year	0(0)	-	49(24.5)
1-5yrs	1(2)	-	56(28)
6-10yrs	1(2)	-	76(38)
>10yrs	48(96)	-	19(9.5)

- : Represent respondents who did not answer the questionnaire

4.1 Regulators views of the effect of applying food safety standards in the supply chain management of vegetables.

The views of regulatory bodies, being, Ghana Standard Authority, Environmental Protection Agency and Food and Drug Authority were sought on the effectiveness of their regulatory systems on the supply of quality vegetables in the Ga-South Municipality, using an 8 item Hedonics scale with five point ratings. The result of this investigation is shown in Table 4.2. The least degree of the effectiveness of the regulatory system was given the least score (1) as “Strongly disagree” and the most effective was given the highest score (5) as “Strongly agree”. In between these two extremes are Disagree (2), Not sure (3), Agree (4). A total score of 8 indicated least favorable response possible (about 25%), a score of 24 (about 50%) indicates a neutral response and a score of 40 (about 75%) indicates most favorable response to views on the

effectiveness of regulatory environment on supply of quality vegetables. The total scores for any individual fell between 8 and 40. If the total score happens to be above 24 (50%) which is the neutral response (median score), it is classified as expressing satisfactory views or effectiveness to the assertion, a score below the median mark would mean unsatisfactory opinion or ineffectiveness to the assertion.

With regards to opinions of the regulators on the regulatory systems put in place, the results showed that majority of the respondents (56%) agree that there is a strong public health and consumer welfare emphasis in decisions by regulatory agencies indicating effectiveness and satisfactory views and opinions and 44% disagreed suggestive of ineffectiveness and unsatisfactory views. Majority of the respondents representing 44% agreed that there is adoption of stringent safety standards indicating satisfactory views of effectiveness in the adoption of stringent safety standards. Most respondents (40%) expressed a satisfactory opinion that adoption of HACCP approach to assuring safety is perfect whilst 22% disagreed indicating unsatisfactory opinion that adoption of HACCP approach to ensuring safety is perfect. With regards to whether there is transparency in the formulation of national regulations, most respondents expressed a satisfactory opinion to the assertion representing 50%. 46% however expressed a neutral response. With regards to whether regulators adopt crossbreed regulatory systems, majority of the respondents gave a neutral response (42%) suggestive of neutral opinion. Concerning whether there is increased reliance on certification, majority (38%) agreed to the assertion indicating effectiveness and satisfactory opinion whilst 33.3% disagreed suggestive of ineffectiveness or unsatisfactory remarks. 33.3% each of respondents expressed both satisfactory and unsatisfactory views to the assertion that farmers and exporters implement adequate traceability. This is an indication that with respect to whether farmers and exporters implement adequate traceability, the regulators were divided on the issue with half of the

respondents agreeing and half disagreeing. When the respondents were asked whether as regulators, they are able to strictly enforce the laws governing the supply chain management of vegetables, majority representing 40% agreed to the assertion indicative of satisfactory remarks and effectiveness whilst 33.3% were indifferent/not sure suggestive of neutral opinion (Table 4.2). The results as shown in table 4.2 present an interesting view of the regulators on the effectiveness of the regulatory systems. The respondents from the regulatory bodies seem to agree on the variables presented. It is however important to note however that regulators are not sure whether the systems they adopt is crossbreed. This may be due to communication gaps existent in the regulatory body. If such is the case the gap has to be identified and corrected.

More than half of the regulators disagree that farmers and exporters implement adequate traceability. Whereas an equal number agree that they do. This presents a problem because even the regulators themselves are not certain whether or not farmers and exporters conform strictly to the set regulations. Systems must therefore be put in place to establish that farmers and exporters conform to set regulations. This can be done by inspection and records keeping. It can also be seen from table 4.2 that a good amount of the regulators (24%) disagree that they are able to enforce the laws. This may be the reason why the vegetables grown in this area have not been able to meet the required quality standards of importing countries. Regulators have to rethink their current strategies of enforcement and come up with a way of putting systems in place to strictly enforce the laws.

Table 4.2 Regulators views on Regulatory mechanisms on supply chain management of vegetables

Variable	Strongly disagree Frequencies (Percentage %)	Disagree Frequencies (Percentage %)	Not sure	Agree	Strongly agree	Total no of respondents
Strong public health and consumer welfare emphasis in decisions	0(0)	22(44)	0(0)	28(56)	0(0)	50(100)
There is adoption of stringent safety standards	0(0)	15(30)	13(26)	22(44)	0(0)	50(100)
Adoption of HACCP approach to assuring safety is perfect	0(0)	11(22)	0(0)	20(40)	19(38)	50(100)
There is transparency in the formulation of national regulations	0(0)	2(4)	23(46)	25(50)	0(0)	50(100)
Regulators adopt crossbreed regulatory systems	0(0)	15(30)	21(42)	4(8)	0(0)	50(100)
There is increased reliance on certification	0(0)	16(32)	5(10)	19(38)	0(0)	50(100)
Farmers and exporters implement adequate traceability	0(0)	14(28)	10(20)	14(28)	12(24)	50(100)
As regulators we are able to strictly enforce the law	12(24)	9(18)	14(28)	15(30)	0(0)	50(100)

Statistical analysis using ordinal regression was conducted with the supply of quality vegetables as dependent variable and the variables presented in the questionnaire as the independent variables. This was done on the basis that the supply of quality vegetables is a function of the institutional environments in place as shown in Table 4.3. Among the institutional environment

variables investigated, the results revealed that; adoption of stringent safety standards, adoption of HACCP approach to assuring food safety, regulators ability to strictly enforce the law, policies ensuring food quality, availability and adequacy, influence of institutional environment on vegetables safety/quality and enforcements of trade to the later were the institutional environment factors that significantly influence the quality of vegetables at 95% confidence level (5% alpha level) in the ordinal regression analysis ($P \leq 0.05$).

Table 4.3 Ordinal regression analysis of Determinants of Institutional Environment and Quality of Vegetables

Variable	β (coefficient)	SE	P-value	95% CI	
				Upper	Lower
Strong public health and consumer welfare emphasis in decisions	-0.325	0.595	0.593	-0.564	0.915
There is adoption of stringent safety standards	2.157	0.538	0.001*	1.042	3.272
Adoption of HAACP approach to assuring food safety	-1.368	0.468	0.008*	-2.338	2.260
There is transparency in the formulation of national regulations	0.973	0.621	0.131	-3.140	2.260
Regulators adopt crossbreed regulatory systems	-0.073	0.545	0.894	-1.202	1.056
There is increased reliance on certification	-0.493	0.323	0.142	-1.163	0.178
Regulators are able to strictly enforce the law	1.042	0.356	0.008*	0.304	1.779
The laws regarding the supply of quality of vegetables are strong/effective	0.018	0.109	0.869	-0.202	0.238
policies ensuring food safety/quality are available and adequate	0.797	0.322	0.017*	0.148	1.447
Basic equipment for quality determination are available and are used adequately	-0.833	0.472	0.085	-1.784	0.118
Institutional environment strongly affects the vegetables safety/quality	0.726	0.255	0.007*	0.212	1.241
Trade contracts are enforced to the later	-0.713	0.360	0.054*	-1.439	0.013
when regulatory bodies perform their duties well, safety/quality of vegetables will improve	-1.359	0.980	0.173	-3.335	0.617
Constant term	0.65				

Ordinal regression analysis was also conducted to determine how the demographic characteristics of the institutional environment influence the supply of quality vegetables. The regression results showed that gender and educational level of regulators did not significantly influence the quality of vegetables ($P \geq 0.05$). The number of years of experience however significantly influenced their perception on how institutional environment affects the quality of vegetables at 5% level of significance ($P \leq 0.05$). The results are shown in table 4.4.

Table 4.4 Ordinal regression analysis of demographic characteristics and determinants of institutional environment and quality of vegetables

Variable	B	SE	P-value	95% CI	
				Upper	Lower
Educational level	-0.671	0.419	0.116	-1.514	0.172
Years of experience	0.060	0.308	0.038*	-0.600	0.833
Gender	0.549	0.455	0.234	-0.368	1.466

4.2 Views of the Environmental Regulators on Safety/Quality of vegetables.

The views of regulators whose policies specialize on environmental issues were obtained using a 16 item likert scale with five point ratings. The results are shown in Table 4.5. The instrument consisted of 16 statements, thus, a score of 16 indicates the least favorable response possible (25%), a score of 48 (50%) (Median) indicates a neutral response and a score of 80 (75%) indicates most favorable response. The total scores for any individual would then fall between 16 and 80. If the total score happens to be above 48(50%) which is a neutral response (median score), it is classified as expressing satisfactory views to the effectiveness to the assertion, a score below the median mark would mean unsatisfactory opinion or ineffectiveness to the assertion and a score of exactly 48(50%) would be suggestive of a neutral opinion and views.

The results showed that majority of the respondents (52%) agree that that there the laws regarding supply of quality vegetables are strong/effective indicating satisfactory views and opinions and 48 % disagreed suggesting ineffectiveness and unsatisfactory views. Majority of the respondents representing 42% agreed that policies ensuring food safety/quality are available and adequate indicating satisfactory opinion and 30% disagreed to the assertion. Most respondents (46%) expressed a satisfactory opinion that policies on food safety/quality are adequately enforced whilst 34% disagreed indicating unsatisfactory opinion. With regards to whether basic equipment for quality determination are available and are used adequately, most respondents expressed a satisfactory opinion to the assertion representing 48% and 36% expressed a neutral response. With regards to whether regulatory environment strongly affects vegetables safety/quality, majority of the respondents agree (58%) suggestive of effectiveness Kader (2008) satisfactory views to that assertion. Concerning whether vegetables produced in Ghana are of very high quality, majority (38%) agreed to the assertion indicating effectiveness and satisfactory opinion whilst 34% disagreed suggestive of ineffectiveness or unsatisfactory remarks. 34% of respondents strongly agree to the assertion that Ghana's exports vegetables are rejected because the vegetables do not meet the standards of the importing countries. Fernando (2018) reported that appearance is one of the most significant quality attributes of fresh and slightly processed produce, with primary concern for size and colour regularity, shininess, and absence of defects in shape or skin before they meet export criteria. This assertion seems to be consistent with the findings of this study.

When the respondents were asked whether customers expected high quality vegetables in the supply chain, majority representing 46% agreed to the assertion indicative of satisfactory remarks and effectiveness. These findings confirms the work of Nune *et al.*, (2007), who

indicated that appearance, colour, texture and aroma are probably the most important requirement used by consumers to measure the instant quality of an agricultural produce and this in one way or the other influence buyers to patronize vegetable product.

Concerning whether trade contracts are enforced to the later, majority (42%) agreed to the assertion indicating effectiveness and satisfactory opinion. Most respondents (40%) expressed were not sure and expressed a neutral opinion to the fact that institutional environment have a great impact on the supply of quality vegetables. Lal (1999), reported that given the fact that institutional factors influence production and marketing costs it is natural to expect that they would influence farmers' decisions to either produce for sale, consumption or for both. This is especially true as discovered by WFP (2009) that when smallholder farmers fail to access more profitable markets, they normally resort to produce mainly for home consumption. When the respondents were asked whether when regulatory bodies perform their duties well, safety/quality of vegetables will improve, the results indicated that 80% strongly agree to the assertion. However with respect to whether, the regulators are faced with rejection from the farmers anytime they visit with technical assistance, most respondents were divided with 38% agreeing and 38% giving a neutral response.

Even though the majority regulators agree that vegetables produced in the Ga-South Municipality are of very high quality; it is also noticeable that they also strongly agree that the vegetables do not meet the standards of importing countries. This sends a strong signal that their standards of quality have to be revised to suit that of importing countries. It is also seen from table 4.5 that the environmental regulators are not sure whether their presence and or policies have any impact on the quality of the vegetables produced, yet they agree that if they perform their duties well the quality of the vegetables will improve. In order for there to be improvements

in the quality of vegetables they have to revise the strategies by which they execute their work and adopt more effective procedures.

Table 4.5 Views of the Environmental Regulators on safety / Quality of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
The laws regarding supply of quality of vegetables are strong/effective	0(0)	24(48)	0(0)	26(52)	0(0)	50(100)
Policies ensuring food safety/quality are available and adequate	0(0)	15(30)	14(28)	21(42)	0(0)	50(100)
Policies on food safety/quality are adequately enforced	0(0)	17(34)	0(0)	10(20)	23(46)	50(100)
Basic equipment for quality determination are available and are used adequately	0(0)	8(16)	18(36)	24(48)	0(0)	50(100)
Regulatory environment strongly affects vegetables safety/quality	6(12)	4(8)	5(10)	29(58)	6(12)	50(100)
Vegetables produced in Ghana are of very high quality	4(8)	17(34)	3(6)	19(38)	7(14)	50(100)
Ghana's exports vegetables are rejected because the vegetables do not meet the standards of the importing countries	4(8)	8(16)	10(20)	11(22)	17(34)	50(100)
Quality of vegetables produced and traced is very high and acceptable	0(0)	17(34)	6(12)	5(10)	22(44)	50(100)
Customers expects high quality vegetables	0(0)	13(26)	4(8)	10(20)	23(46)	50(100)
Trade contracts are enforced to the later	6(12)	13(26)	3(6)	21(42)	7(14)	50(100)
Producing to meet acceptable standards and quality demands incurring very high cost	0(0)	6(12)	20(40)	7(14)	17(34)	50(100)
When regulatory bodies perform their duties well, safety/quality of vegetables will improve	0(0)	3(6)	1(2)	6(12)	40(80)	50(100)
The use of waste for growing vegetables affects the quality/safety of crop	3(6)	1(2)	1(2)	13(26)	32(64)	50(100)
Institutional environment have a great impact on the supply chain of quality of vegetables	1(2)	8(16)	20(40)	15(30)	6(12)	50(100)
All stakeholders along the vegetable supply chain observe high standards of food safety/quality measures	0(0)	11(22)	15(30)	20(40)	4(8)	50(100)
We are faced with rejection from the farmers anytime we visit with technical assistance	4(8)	19(38)	2(4)	19(38)	6(12)	50(100)

Values in parenthesis are percentages and outside are frequencies

4.3.0 Exporters views on the effect of regulatory environment on the supply chain management of vegetables

When the exporters were asked to describe the quality of vegetables produced or traded in Ghana, 64% asserted that it was good whilst 36% asserted that it was fair. The exporting company usually determined the measure of quality and safety of vegetables using their own measuring instrument. The experiment was done using a 9 item likert scale with five point ratings. The details are outlined in Table 4.6. The results showed that majority of the respondents (68%) strongly agree to the assertion that there is a strong public health and consumer welfare emphasis in decisions by regulatory agencies. Majority of the exporters representing 74% agreed that there is adoption of stringent safety standards. These standards of quality by exporting companies are to warrant that whatever new vegetables the consumer buys from the market is safe and meets the standards expected by the consumer. Exporting Agencies also ensure food quality through seminars, workshops and radio talk shows to create awareness and educate the general public on quality, standards and safety of food (FDB, 2005).

Most respondents (72%) expressed a satisfactory opinion that adoption of HACCP approach to assuring safety is functional. With regards to the transparency in the formulation of national regulations, most respondents expressed a satisfactory opinion to the assertion representing 46%. With regards to whether exporters adopt crossbreed regulatory systems, majority of the exporters agree to the assertion (80%) suggestive of satisfactory opinion. Concerning the increased reliance on certification, majority (56%) agreed to the assertion indicating effectiveness and satisfactory opinion. Majority of the respondents disagreed to the assertion that there is strict enforcement of rules and regulations by the law enforcement agencies (38%). The significance of the institutional environment indicates that policy makers of exporting firms, for instance, can encourage institutions to ensure high innovative capacity and improve supply chain performance

by strict enforcement of policies through supervision, monitoring, training, research and development and application of sanctions (regulative dimension).

Though the result in table 4.6 show that there is increased reliance on certification, it seems not to have a bearing on the quality of the vegetables produced. This suggests that certification is not enough to determine whether an exporting company will adhere to quality regulations. An equal number of people agreeing to the fact that it is difficult to successfully operate without the adoption of informal methods or connections further emphasizes that certification is not a good determinant for the production of quality vegetables.

Table 4.6 Exporters views on the effect of regulatory environment on the supply chain management of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
1.Strong public health and consumer welfare emphasis in decisions	0(0)	0(0)	2(4)	34(68)	14(28)	50(100)
2.There is adoption of stringent safety standards	0(0)	(0)	2(4)	37(74)	11(22)	50(100)
3.Adoption of HACCP approach to assuring safety is perfect	0(0)	10(20)	0(0)	36(72)	4(8)	50(100)
4.There is transparency in the formulation of national regulations	0(0)	2(4)	10(20)	23(46)	15(30)	50(100)
5. Regulators adopt crossbreed regulatory systems	0(0)	0(0)	4(8)	40(80)	6(12)	50(100)
6.There is increased reliance on certification	0(0)	2(4)	2(4)	18(36)	28(56)	50(100)
7.There is strict enforcement of rules and regulations by the law enforcement agencies	11(22)	19(38)	2(4)	10(20)	8(16)	50(100)
8. It is difficult to promise our customers and business partners of services and get away without actually doing it	2(4)	0(0)	0(0)	44(88)	4(8)	50(100)
9. It is difficult to successfully operate as a business entity if you do not adopt informal approach(connection)	2(4)	0(0)	4(8)	22(44)	22(44)	50(100)

Values in parenthesis are percentages and outside are frequencies

Further investigation revealed that the vegetables mostly used for export in the Ga South Municipal area were; chillie (23%), okra (14), garden eggs (24%), tida (16%), augbergine (12%) and pepper (11%). Figure 4.1 gives a diagrammatic representation of the vegetables used for export.

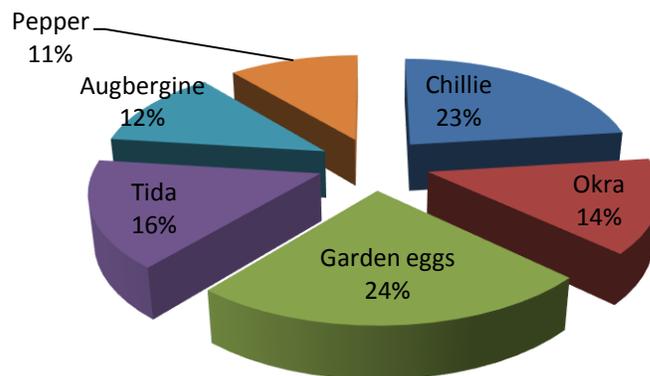


Figure 4.1: Vegetables used for export by exporters

4.3.1 Normative systems of exporters

The views of exporters on normative systems put in place to ensure safety and quality of vegetables were ascertained using a 4 item Likert scale with five point ratings. The outcome is shown in Table 4.7. A score of 4 indicates the least favorable response possible (25%), a score of 12 (50%) (Median) indicates a neutral response and a score of 20 (75%) indicates most favorable response to views of exporters on the normative system on quality of vegetables. The total scores for any individual would then fall between 4 and 20. If the total score happens to be above 12(median score) which is a neutral response, it is classified as expressing satisfactory views to the effectiveness to the assertion, a score below the median mark would mean unsatisfactory opinion or ineffectiveness to the assertion and a score of exactly 12(50%) would be suggestive of a neutral opinion and views.

The results revealed that, majority of the exporters (76%) agree to the assertion that their company or business belongs to highly controlled industry group, they expressed a satisfactory opinion and effectiveness to that assertion. Majority (70%) also expressed a satisfactory opinion and agree to the assertion that their business are expected to comply with the industry group standard of practices. 60% of the exporters agree and expressed satisfactory opinion to the fact that their company follows the standard practices of the industry groups in its business activities. Most exporters agree (52%) and strongly agree (48%) and expressed satisfactory opinion that their company is committed to ensuring that exports are of international quality. It can be seen from the results that the exporting companies agree that they have to be committed to ensuring that exports are of international quality. This is not consistent with to the results outlined in table 4.5 where it ascertained by environmental regulators that vegetables produced are rejected because they do not meet the standards of importing countries. These stakeholders then have to come together to agree on and ensure that their views and measure of quality are same and consistent.

Table 4.7 Normative systems of exporters on supply chain management of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
1.My business belongs to highly controlled industry group	0(0)	3(6)	0(0)	38(76)	9(18)	50(100)
2.My business is expected to comply with the industry group standard of practices	0(0)	0(0)	0(0)	35(70)	15(30)	50(100)
3.Overall, my company follows the standard practices of the industry groups in its business activities	0(0)	0(0)	0(0)	20(40)	30(60)	50(100)
4. My company is committed to ensuring that exports are of international quality	0(0)	0(0)	0(0)	26(52)	24(48)	50(100)

Values in parenthesis are percentages and outside are frequencies

The views of exporters on safety and quality of vegetables in Ghana were also ascertained using a 16 item likert scale with five point ratings (Table 4.8). Since the instrument consists of 16 statements, the following score values were revealed; a score of 16 indicates most unfavourable response possible (25%), a score of 48 (50%) (Median) indicates a neutral response and a score of 80 (75%) indicates most favourable response to views of exporters on the safety/ quality of vegetables in the supply chain management. The total scores for any individual would then fall between 16 and 80. If the total score happens to be above 48 (median score) which is a neutral response, it is classified as expressing satisfactory views to the effectiveness to the assertion, a score below 48 would mean unsatisfactory opinion or ineffectiveness to the assertion and a score of exactly 48(50%) would be suggestive of a neutral opinion and views.

The results revealed that, Majority of the respondents (72%) showed unsatisfactory opinion and disagree to the assertion that farmers/traders check pesticides residues in vegetables before selling them. Most exporters disagree (60%) indicating unsatisfactory and ineffectiveness to the assertion that the laws regarding the supply of quality of vegetables are strong and effective. Most exporters however agree (66%) to the assertion that policies ensuring food safety/quality are available and adequate indicating satisfactory views and effectiveness of policies on food safety and quality, however with regards to whether policies on food safety/quality are adequately enforced, majority (68%) of the exporters disagree and expressed unsatisfactory views and ineffectiveness to the assertion. The institutional environment plays a significant role in shaping events at the downstream or governance level. With good institutions a more favourable environment supporting economic growth is created. Well-organized institutions translate into good governance structures (Slangen *et al.*, 2004). Most responders agree (66%) to the assertion that basic equipment for the determination of quality of vegetables are available and

are used adequately indication satisfactory opinion since the total score was more than the top 50% (median score). Majority of the exporters strongly agree (44%) and agree (42%) to the assertion that institutional environment strongly affects the vegetables safety/quality. Most exporters however expressed neutral and unsatisfactory views (56%) to the assertion that vegetables produced in Ghana are of very high standards. Majority of the exporters strongly agree (88%) indicating a total score more than the median score (top 50%) and expressed a satisfactory views to the assertion that Ghana's export vegetables are normally rejected because the vegetables do not meet the standards of the importing countries. When respondents were asked whether the quality of vegetables produced and traded in Ghana is very high, most respondents representing 80% expressed satisfactory opinion and agreed to that assertion. With regards to whether customers expect high quality and high standards vegetables, most exporters agree (60%) and expressed a satisfactory opinion to the assertion. Majority of the exporters agreed (62%) and expressed satisfactory opinion to the assertion that trade contracts are enforced to the later. When the exporter's views were ascertained whether producing vegetables to meet acceptable standards and quality demands incurring very high cost, Majority (58%) of them agree to the assertion.

Table 4.8 Views of exporters on Safety and quality of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
1.Farmers/traders check pesticides residues in vegetables before selling	36(72)	0(0)	0(0)	14(28)	0(0)	50(100)
2.The laws regarding the supply of quality of vegetables are strong and effective	6(12)	30(60)	0(0)	10(20)	4(8)	50(100)
3.Policies ensuring food safety/quality are available and adequate	10(20)	3(6)	0(0)	33(66)	4(8)	50(100)
4. These policies on food safety/quality are adequately enforced	3(6)	34(68)	6(12)	7(14)	0(0)	50(100)
5.Basic equipment for quality determination are available and are used adequately	0(0)	13(26)	0(0)	37(74)	0(0)	50(100)
6.Institutional environment strongly affects the vegetables safety/quality	0(0)	0(0)	7(14)	21(42)	22(44)	50(100)
7.Vegetables produced in Ghana are of very high standards	0(0)	7(14)	28(56)	9(18)	6(12)	50(100)
8.Ghanas export vegetables are rejected because of the vegetables do not meet the standards of the importing countries	0(0)	0(0)	3(6)	3(6)	44(88)	50(100)
9.Quality of vegetables produce and traded is very high	0(0)	0(0)	13(26)	30(60)	7(14)	50(100)
10.Customers expects high quality and high standards vegetables	0(0)	0(0)	0(0)	7(14)	43(86)	50(100)
11.Trade contracts are enforced to the later	0(0)	6(12)	10(20)	31(62)	3(6)	50(100)
12.Producing to meet acceptable standards and quality, demands incurring very high cost	0(0)	3(6)	0(0)	29(58)	18(36)	50(100)
13.When regulatory bodies perform their duties well, safety/quality of vegetables will improve	0(0)	5(10)	0(0)	23(46)	22(44)	50(100)
14. The use of waste water for growing vegetables affects the safety/quality of crop	0(0)	2(4)	0(0)	26(52)	22(44)	50(100)
15.Institutional environment have a great impact on the supply chain of quality of vegetables	0(0)	3(6)	0(0)	24(48)	23(52)	50(100)
16.All stakeholders along the vegetable supply chain observe high standards of food safety/quality measures	17(34)	22(44)	0(0)	5(10)	6(12)	50(100)

Values in parenthesis are percentages and outside are frequencies

4.4.0 Views of farmers on cultural system that affect the supply of vegetables

The views of farmers on cultural practices put in place to ensure safety and quality of vegetables were ascertained using a 6 item likert scale with five point ratings. The result of this investigation is found in Table 4.9. A score of 6 indicates the least favorable response possible (25%), a score of 18 (50%) (Median) indicates a neutral response and a score of 30 indicates most favourable response. The total scores for any individual would then fall between 6 and 30. If the total score happens to be above 18 (median score) which is a neutral response, it is classified as expressing satisfactory views to the effectiveness to the assertion, a score below the median mark would mean unsatisfactory opinion or ineffectiveness to the assertion and a score of exactly 18(50%) would be suggestive of a neutral opinion and views.

The results showed that, Majority of the farmers (74.5%) agree to the assertion that they follow the laid down farm practices by the regulatory agencies and 24.5% strongly disagree to the assertion. Most farmers strongly agree (58%) to the fact that they believe in the traditional farming practices very much expressing satisfactory views about using more traditional farming practices compared to modern methods. When the farmers view was ascertained whether they are comfortable with modern farm practices, 52% strongly disagree and 48% strongly agree to the assertion. Majority of the farmers (45.5%) however believe in strong personalities than institutional structures. Most respondents (54.5%) agree to the assertion that they believe in social network as a source of protection of their business indication satisfactory opinion since the total score was more than the top 50% (median score). The results goes to show that farmers do everything in conformity to the regulations stipulated by the relevant regulatory bodies as far as they are concerned. This is validated by the results in table 4.2 where regulators agree that farmers do implement the set regulations. The inconsistency seen then with the production of

vegetables that do not meet international quality standards may be as a result of the mode or method farmers use when adhering to the set down principles. It could also be that the farmers do not understand or have their individual interpretation of the set principles and could actually be deviating from them, although in their minds they are doing everything right. The regulatory authorities therefore have to sit with the farmers and deliberate how this gap can be bridged to improve the quality of vegetables produced for the international market.

Table 4.9 Views of farmers on cultural system that affect the supply of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
1.We follow the laid down farm practices by the regulatory Agencies	49(24.5)	2(1.0)	0(0)	149(74.5)	0(0)	200(100)
2.We believe in the traditional farming practices very much	45(22.5)	2(1.0)	0(0)	37(18.5)	116(58)	200(100)
3.We are not comfortable with strict regulations on farm practices	40(20)	4(2)	0(0)	128(64)	28(14)	200(100)
4. We are comfortable with modern farm practices	39(0)	83(52)	0(0)	0(0)	78(48)	200(100)
5.People believe in strong personalities than institutional structures	49(24.5)	2(1.0)	0(0)	58(29)	91(45.5)	200(100)
6.We believe in our social network as a source of protection of our business	65(32.5)	0(0)	26(13)	109(54.5)	0(0)	200(100)

Values in parenthesis are percentages and outside are frequencies

4.4.1 Views of farmers on Safety and quality of vegetables

In order to ascertain farmers' perception on the safety and quality of vegetables, a 12 item Likert scale with five point ratings were used. Table 4.10 shows the results of this investigation. Since the instrument consists of 12 statements, a score of 12 indicates the least favourable response possible (25%), a score of 36 (50%) (Median) indicates a neutral response and a score of 60

(75%) indicates most favourable response to views of exporters on the safety/ quality of vegetables in the supply chain. The total scores for any individual would then fall between 12 and 60. If the total score happens to be above 36(median score) which is a neutral response, it is classified as expressing satisfactory views to the effectiveness to the assertion, a score below the median score will be suggestive of unsatisfactory remarks whilst a score of more than the median mark will be suggestive of satisfactory opinion.

The results revealed that, Majority of the farmers (72%) disagree (indicating unsatisfactory opinion) to the assertion that farmers/traders check pesticides residues in vegetables before selling them. Most farmers disagree (82%) (Indicating unsatisfactory and ineffectiveness to the assertion) that the laws regarding the supply of quality vegetables are strong and effective. Most farmers also disagree (58%) to the assertion that policies ensuring food safety/quality are available and adequate indicating unsatisfactory views and ineffectiveness of policies on food safety and quality. This could be another reason why they produce vegetables that do not meet international standards; the standards are simply not available and those that are available are not well understood or inadequate. With regard to whether policies on food safety/quality are adequately enforced however, majority (76.5%) of the farmers strongly disagree and expressed unsatisfactory views and ineffectiveness to the assertion. Most farmers strongly disagree (75%) to the assertion that basic equipment for the determination of quality vegetables are available and are used adequately indicating unsatisfactory opinion (since the total score was less than the top 50% (median score)).The findings of the study agree with the work of Abbott (1999) who suggested that farmers use most of their senses to measure quality: “sight, smell, taste, touch”. When a consumer of a product adopts all sensory inputs, for example, appearance, aroma, flavor, hand-feel, mouth-feel and chewing sounds, it determines a final judgment of whether a produce

(fruit or vegetable) is acceptable or of good quality. These are done mostly due to the unavailability of adequate basic equipment. Majority of the farmers strongly agree (47.5%) to the assertion that the use of waste water for growing vegetables affects the safety/quality of produce. Most farmers expressed unsatisfactory opinion (63.5%) to the fact that vegetables produced in Ghana are of very high standards. Majority of the farmers strongly agree (62.5%) and expressed a satisfactory views to the assertion that Ghana's export vegetables are normally rejected because the vegetables do not meet the standards of the importing countries. When respondents were asked whether the quality of vegetables produced and traded in Ghana is of high quality and acceptable, most respondents representing 63.5% expressed satisfactory opinion and agreed to that assertion.

Table 4.10 Farmers views on safety and quality of vegetables

Variable	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
1.Farmers/traders check pesticides residues in vegetables before selling	50(25)	144(72)	0(0)	6(3)	0(0)	200(100)
2.The laws regarding the supply of quality of vegetables are strong and effective	165(82.5)	33(16.5)	0(0)	2(1)	0(0)	200(100)
3.Policies ensuring food safety/quality are available and adequate	116(58)	84(42)	0(0)	0(0)	0(0)	200(100)
4. Policies on food safety/quality are adequately enforced	153(76.5)	47(23.5)	0(0)	0(0)	0(0)	200(100)
5.Basic equipment for quality determination are available and are used adequately	150(75)	50(25)	0(0)	0(0)	0(0)	200(100)
6.The use of waste water for growing vegetables affects the safety/quality of produce	45(22.5)	35(17.5)	2(1.0)	23(11.5)	95(47.5)	200(100)
7.Vegetables produced in Ghana are of very high standards	127(63.5)	0(0)	2(1.0)	71(35.5)	0(0)	200(100)
8.Ghanas export vegetables are rejected because of the vegetables do not meet the standards of the importing countries	63(31.5)	12(6)	0(0)	0(0)	125(62.5)	200(100)
9.Quality of vegetables produce and traded is very high and acceptable	127(63.5)	19(9.5)	0(0)	50(25)	4(2)	200(100)
10.Customers expects high quality and high standards vegetables	54(27)	12(6)	0(0)	14(7)	120(60)	200(100)
11.When regulatory bodies perform their duties well, safety/quality of vegetables will improve	2(1.0)	0(0)	10(5)	61(30.5)	127(63.5)	200(100)
12.Producing to meet acceptable standards and quality, demands incurring very high cost	30(15)	0(0)	(0)	45(22.5)	125(62.5)	200(100)

Values in parenthesis are percentages and outside are frequencies

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.0 Conclusion

Investigations were conducted to assess the effects of regulatory bodies on the quality of vegetables produced for export in the Ga South Municipality of the Greater Accra region of Ghana. Nine institutional factors were identified and analyzed on the basis of their influence on small-scale vegetable production. The results revealed that; adoption of stringent safety standards, adoption of the HACCP approach to assuring food safety, ability of regulators to strictly enforce the law, availability and adequacy of policies ensuring food safety/quality, effect of institutional environment on vegetable safety/quality and enforcement of trade contracts to the later were the institutional factors that significantly influence the quality of vegetables at 95% confidence level (5% alpha level) in the ordinal regression model ($P \leq 0.05$).

The regression results showed that, gender, educational level and the number of years of experience did not significantly influence farmers' perception on how institutional environment affects the quality of vegetables at a 5% level of significance ($P \geq 0.05$). The findings suggest that institutional changes in respect to aforementioned variables and other complementary institutions such as contract farming and credit access can affect the quality of crops produced as they significantly contribute to increased, efficient and sustainable vegetable production.

The results have also shown that when farmers are constrained by some institutional factors, the intended positive outcome of the existing institutional factors on small scale farmers may be unrealizable.

In order to increase the quality of vegetables produced in the Ga South Municipality, an immediate reconsideration of weak institutional factors identified such as the availability and

effectiveness of set regulations is crucial. Also, the availability and suitability of the physical resource attributes such as land and infrastructure are crucial in complementing effectiveness of institutional factors.

5.1 Recommendation

Based on the findings of the study, the following recommendations were made:

- The Ministry of food and Agriculture and other relevant organizations should place primacy on policies involving vegetable quality and safety as majority respondents were of the view that when regulatory bodies perform their duties well, safety/quality of vegetables will improve.

- The Government should strengthen and equip the institutional environment especially the Environmental protection Agency, The food and drug Authority and Ghana standard Authority to monitor the quality of vegetables in the study area.

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6. which form of vegetable do you produce/market/consume
 exotic vegetable local vegetable
7. If exotic or local vegetables, which specific vegetables do you produce?

8. Do farmers grade their vegetables before selling?
 Yes No
9. if yes, how do you grade your vegetables?
 Very High quality High quality low quality very low quality
10. How do you assess the quality of vegetables in food industry? Tick as many as you can.
 Freshness color Grading Price No pesticide residues size shape packaging certification
11. What do you require to determine the quality of your vegetable? Tick as many as you can
 shininess absence of defects color regularity size
12. What is used to determine the quality of a product smell taste touch appearance
13. Do you apply fertilizer to your vegetables?
 Yes No
14. What type of fertilizer do you use on your vegetables?
 Organic inorganic
15. How many times do you apply fertilizer to your produce
 weekly monthly quarterly yearly
16. Do you spray your vegetables?
 Yes No
17. How many times do you spray your vegetables
 weekly monthly quarterly yearly
18. What is the rainfall pattern in your area?
 weekly monthly other, specify
19. How many acres of land do you have?
 1-5 acres 6-10 acres 11-15 acres 16-20 acres 21 acres and above
20. What means are used to transport vegetables to consumers
 Vehicle bicycle any other specify.....

Using a scale of 1-5, where 1 corresponds to strongly disagree; 2 – Disagree; 3- Neutral; 4= Agree; 5-Strongly agree, kindly answer the questions below by ticking the appropriate scale that best deem fit to you.

Questions	1	2	3	4	5
1. Farmers check pesticide residues in vegetables					
2. The laws regarding the supply of quality vegetables are strong					
3. High cost are incurred in transporting vegetables to consumers					

Using a scale of 1-5, where 1 corresponds to very difficult ; 2 – difficult; 3- Neutral; 4= easy; 5- very easy, kindly answer the questions below by ticking the appropriate scale that best deem fit to you

Questions	1	2	3	4	5
4. How easy is it in selling your vegetables to the market directly					
5. How easy is selling your vegetable to the market through a trader					
6. How easy is selling your vegetables through group(s)					

Thank you

1.2 Sample questionnaire for Regulatory Institutions

**KWAME NKURUMAH UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

INSTITUTE OF DISTANCE LEARNING

MSc FOOD QUALITY MANAGEMENT

Questionnaire for Regulatory Institutions

Questionnaire on: The Effect of Institutional Environment on the Supply Chain Management of Quality Vegetables in the Ga South Municipality

For Institutions (Professionals)

This questionnaire has been designed to investigate the effect of institutional environment on the supply chain management of quality vegetables in the Ga South Municipality

Your response will contribute greatly not only in academia but also towards providing in-depth information to policy makers. Please note that responses to these questions would be used for academic purposes only and your confidentiality is assured.

Name of Institution

Position.....

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

[Please tick the appropriate answer]

21. Sex [i] Male [ii] Female

22. Age [i] 15-20 [ii] 21-30 [iii] 31-40 [iv] 41-50 [v] 51-60 [vi] 61-69 [vii] 70 and above

23. Marital Status [i] Single [ii] Married [iii] Divorced

24. Highest level of education

 [i] Primary/Basic [ii] Middle/JHS [iii] SSS/SHS/GCE O Level [iv]

Tertiary [v] Not Educated [vi] Other

(specify).....

25. Years of experience

[i] Less than 1 year [ii] 1 to 5 years [iii] 6 to 10 years

[iv] 11 to 15 years [v] 16 years and above

SECTION B: QUALITY OF VEGETABLES

1. Farmers check pesticide residues in vegetables
[i] Very low [ii] low [iii]high [iv] very high
2. What do you require to determine the quality of vegetable? Tick as many as you can
[i] shiness [ii] absence of defects [iii]color regularity [iv]size
3. Indicate the factors that affect the quality of vegetables
[i] Maturity at harvest [ii] temperature [iii] post-harvest handling
4. What roles do you play in ensuring quality vegetables?

.....

.....

SECTION C: INSTITUTIONAL ENVIRONMENT

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
	Strongly disagree	Disagree	Somehow disagree	Indifferent/ not sure	Somehow agree	Agree	Strongly agree
Questions	1	2	3	4	5	6	7
Stakeholders determine the level of quality of vegetables							
Your organization has enough legislation backing to determine the quality of vegetables in Ghana							
Institutional structures are in place to check the quality of vegetables							
the rule of law system encourages the production of vegetables in Ghana							
The laws regarding the supply of quality vegetables are strong							
it is easy to operate as a business entity without strict compliance of laws							
it is difficult for us to misrepresent our performance to appear in compliance							
there is strict enforcement of rules and regulations by the law enforcement agencies							
it is difficult to promise our customers and business partners of services and get away with without actually doing it							
it is difficult to successfully operate as a business entity if you adopt informal approach (connection)							
my/our firm is expected to comply with the industry group standard of practices							
overall, my/our firm follows the standard practices of the industry groups in its business activities							

1.3 sample questionnaire for Exporters

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
INSTITUTE OF DISTANCE LEARNING
MSc FOOD QUALITY MANAGEMENT**

Questionnaire for Exporters

Questionnaire on: The Effect of Institutional Environment on the Supply Chain Management of Quality Vegetables in the Ga South Municipality

This questionnaire has been designed to investigate the effect of institutional environment on the supply chain management of quality vegetables in the Ga South Municipality

Your response will contribute greatly not only in academia but also towards providing in-depth information to policy makers. Please note that responses to these questions would be used for academic purposes only and your confidentiality is assured.

Location (Town)

SECTION A: RESPONDENT'S BACKGROUND INFORMATION

1. Gender Male Female
2. Educational level HND 1st Degree 2nd Degree PhD
3. Your position in the company Owner Employee Others.....
4. Please, how long have you been in this business?

SECTION B: COMPANY BACKGROUND INFORMATION

1. Indicate type of business Farmer Exporter Farmer/ Exporter
 Middleman Regulator Other.....
2. List the vegetables you produce/trade.....
3. If farmer, how many acres do you produce?.....

4. If exporter/Middleman, what is your average tonnage per annum?.....
5. How do you describe the quality of vegetables produce/trade in Ghana?.....
6. How do you determine the quality/safety of vegetables in your company?.....

SECTION C: INSTITUTIONAL ENVIRONMENT / STRUCTURE

Please, use the scale below to provide your responses to all items under each subsection.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Strongly disagree	Disagree	Somehow disagree	Indifferent/ not sure	Somehow agree	Agree	Strongly agree

<i>In Ghana,</i>	<i>Strongly disagree</i>	<i>Neither agree nor disagree</i>			<i>Strongly agree</i>		
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1. There is a strong public health and consumer welfare emphasis in decisions by regulatory agencies	[]	[]	[]	[]	[]	[]	[]
2. There is adoption of stringent safety standards, with a broad scope of standards	[]	[]	[]	[]	[]	[]	[]
3. Adoption of the HACCP approach to assuring safety is perfect	[]	[]	[]	[]	[]	[]	[]
4. There is great transparency for national regulations	[]	[]	[]	[]	[]	[]	[]
5. Regulators adopt hybrid regulatory systems	[]	[]	[]	[]	[]	[]	[]
6. Past few year observed increased reliance on certification, including traceability	[]	[]	[]	[]	[]	[]	[]
7. There is strict enforcement of rules and regulations by the law enforcement agencies	[]	[]	[]	[]	[]	[]	[]
8. It is difficult to promise our customers and business partners of services and get away with without actually doing it	[]	[]	[]	[]	[]	[]	[]
9. It is difficult to promise our customers and business partners of services and get away with without actually doing it	[]	[]	[]	[]	[]	[]	[]
10. It is difficult to successfully operate as a business entity if you adopt informal approach (connection)	[]	[]	[]	[]	[]	[]	[]
11. My business belongs to a highly controlled industry group	[]	[]	[]	[]	[]	[]	[]
12. My business is expected to comply with the industry group standard of practices	[]	[]	[]	[]	[]	[]	[]
13. Overall, my company follows the standard practices of the industry groups in its business activities	[]	[]	[]	[]	[]	[]	[]
14. My company belongs to one or more industry groups that encourage improved business activities	[]	[]	[]	[]	[]	[]	[]
15. My business partners belong to one or more industry group that encourage improved business activities	[]	[]	[]	[]	[]	[]	[]

SECTION D: SAFETY/QUALITY OF VEGETABLES

Please, use the scale below to provide your responses to all items under each subsection.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	
Strongly disagree	Disagree	Somehow disagree	Indifferent/ not sure	Somehow agree	Agree	Strongly agree	
					Strongly disagree	Neither agree nor disagree	Strongly agree

<i>In Ghana,</i>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1. Farmers/traders check pesticide residues in vegetables before selling	[]	[]	[]	[]	[]	[]	[]
2. The laws regarding the supply of quality vegetables are strong/effective	[]	[]	[]	[]	[]	[]	[]
3. Policies ensuring food safety/quality are available and adequate	[]	[]	[]	[]	[]	[]	[]
4. These policies on food safety/quality are adequately enforced	[]	[]	[]	[]	[]	[]	[]
5. Basic equipment for quality determination are available and are used adequately	[]	[]	[]	[]	[]	[]	[]
6. Institutional environment strongly affects the vegetable safety/quality	[]	[]	[]	[]	[]	[]	[]
7. Vegetables produced in Ghana are of very high quality standards	[]	[]	[]	[]	[]	[]	[]
8. Ghana's export vegetables are rejected because of the vegetables do not meet the standards of the importing countries	[]	[]	[]	[]	[]	[]	[]
9. Quality of vegetables produce and traded is very high and acceptable	[]	[]	[]	[]	[]	[]	[]
10. Customers expect high quality and high standard vegetables	[]	[]	[]	[]	[]	[]	[]
11. Trade contracts are enforced to the later	[]	[]	[]	[]	[]	[]	[]
12. Producing to meet acceptable standards and quality, demands incurring very high cost	[]	[]	[]	[]	[]	[]	[]
13. When regulatory bodies perform their duties well, safety/quality of vegetables will improve	[]	[]	[]	[]	[]	[]	[]
14. The use of waste water for growing vegetables affects the safety/quality of crop	[]	[]	[]	[]	[]	[]	[]

15. Institutional environment have a great impact on the supply chain of quality vegetables	[]	[]	[]	[]	[]	[]	[]
16. All stakeholders along the vegetable supply chain observe high standards of food safety/quality measures	[]	[]	[]	[]	[]	[]	[]

1.3 Equation for ordinal regression

$$Y_i = \beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8 + \epsilon$$

Where

Y_i = the dependent variable (thus quality of vegetable)

β_0 = constant

β_1 = existence and use of strong public health and consumer welfare systems (PH)

β_2 = adoption of stringent safety standards (SS)

β_3 = Adoption of HACCP approach to assuring food safety (HACCP)

β_4 = Transparency in the formulation of national regulations

β_5 = Regulators adopt crossbreed regulatory systems

β_6 = equipment (Equip)

β_7 = adoption of hybrid regulatory systems (HR)

β_8 = reliance on certification including traceability (Cert)

ϵ = error term

Source: Rachel Gordon A. (2012). Applied Statistics for the Social and Health Sciences