VALUE CHAIN ANALYSIS OF TOMATO IN THE KPONE-KATAMANSO DISTRICT OF GHANA

BY

KUMI ENOCH

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN AGRICULTURAL ECONOMICS

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIUSINESS, COLLEGE OF BASIC AND APPLIED SCIENCES
UNIVERSITY OF GHANA

JULY, 2017

DECLARATION

I, **KUMI ENOCH,** the author of this Thesis titled, "*VALUE CHAIN ANALYSIS OF TOMATO IN THE KPONE-KATAMANSO DISTRICT OF GHANA*", do hereby declare that apart from the references of other people's work which I have duly acknowledged, the results presented in this thesis are from my own work.

The work has not been submitted in part or whole for a degree in this university or elsewhere.

……. …….

Kumi Enoch Date

This thesis has been presented for examination with our approval as supervisors.

……. …….

Dr. Henry Anim-Somuah Date

(PRINCIPAL SUPERVISER)

……. …….

Dr. John Baptiste D. Jatoe Date

(CO-SUPERVISOR)

ABSTRACT

This study considered a value chain analysis of tomato production and its related activities in the Kpone-Katamanso District of Ghana. Data collection was well-structured questionnaires administered to 210 respondents consisting of 120 farmers, 39 distributors, 31 retailers and 20 consumers. The first objective identified the actors in the chain, their functions and existing linkages. The main actors along the tomato value chain are farmers, distributors (assemblers and wholesalers) and retailers. The second objective examined the costs, returns and profit distributed along the chain by each actor. The retailer of the fresh tomato earned the highest profit of GHS 4.50 on every 5kg of fresh tomatoes sold. This is followed by the distributors (assemblers and wholesalers) with GHS 0.89 on every 5kg of fresh tomatoes distributed, and finally the farmer earns GHS 0.37 on every 5 kilograms of fresh tomatoes sold. The third objective identifies the power relations in the tomato value chain. The dominant actors who commanded power over others in the tomato value chain are the distributors of fresh tomatoes. The constraints to tomato confronting the actors are the lack of credit facilities, pests and diseases, lack of access to market information, seasonal price fluctuation of marketed tomato, high cost of tomato and unreliable source of supply. Ready market existence for trader association, increasing use of tomato, food security and its derivatives were regarded as opportunities.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACi	Africa Cashew Initiative
CBO	Community Based Organisation
DFID	Department for International Development
FAO	Food and Agriculture Organisation
FASDEP	Food and Agriculture Sector Development Policy
FIAS	Foreign Investment Advisory Services
GDP	Gross Domestic Product
GEPC	Ghana Export Promotion Centre
GLSS	Ghana Living Standard Survey
GPRS	Ghana Poverty Reduction Strategy
GTZ	German Technical Cooperation
IFAD	International Fund for Agricultural Development
ILO	International Labour Organisation
M4P	Market for the Poor
MOFA	Ministry of Food and Agriculture
NGO	Non-Governmental Organisation
ODI	Overseas Development Institute

ROI	Return on Investment
SLE	Seminar fur Landlice Entwicklung
UNIDO	United Nations Industrial Development Organisation

DEDICATION

This piece of work is dedicated to the Almighty Father, my mother Alice Boateng, my father Cosmos Kofi Kumi and my uncle Mr. Kwame Antwi Boateng.

ACKNOWLEDGEMENT

My heartfelt gratitude goes to Dr. Henry Anim-Somuah and Dr. John Baptiste Jatoe who have been more than great supervisors. I also thank all the faculty members for their immense contribution to my work during presentation sessions.

I am also extremely thankful to MOFA as an institution for granting me the SAAKS thesis grant in furtherance of my work and MOFA officials in the Kpone-Katamanso District Department of Agriculture for their support and guidance in assisting me with relevant information to reach out to the various actors within the district. My sincere thanks also go to Dr. Yaw Osei-Asare who has been an inspiration to me throughout my studies. May God richly bless those who work to oversee the day to day running of the department, both senior and junior members alike.

It is my ultimate prayer that God will continue to uplift the department to higher heights in its quest for sound and practical oriented research.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Majority of the poor and food insecure households in Ghana are predominantly known to be crop producers (Biederlack and Rivers, 2009). The others are occupied in micro-enterprise endeavours of which over 66% are women (USAID, 2010). According to Ghana Statistical Service (GSS, 2010a), about 52% of the individuals who are persistently poor without formal education engage in small holder crop production in the urban areas. Although there has been persistent decline of poverty in the urban areas in Ghana and the country as a whole since 1987, many urban folks still battle with poverty especially in some parts of Greater Accra (USAID, 2013).

Tomato (*Solanum lycopersicum, L.*) is a crop widely patronized worldwide for its succulent fruit (Srinivasan, 2010). Adu-Dapaah and Oppong Konadu (2002) also noted that the vegetable crop forms a key farming activity for people living in the savannah and forest savannah belts of the country. Tomato is very nutritious and forms a vital component of the food consumed worldwide. Tomato with its high per capita consumption in Ghana constitutes one of the commonly grown, marketed vegetables used in almost all Ghanaian homes (Adazabra, Appiah–Kubi, & Bamford, 2013; Ushawu, Asare-Bediako, & Buah, 2007). It consists of assortments of vitamin A, C, riboflavin, carbohydrate, protein, calcium and carotene, which are very essential in our diets (Bull, 1989; Purseglove, 1979). The lycopene in tomato is a healthy phytochemical, with many health benefits including cancer prevention (Bratianu & Schwontkowski, 2013).

Like other vegetables, tomato is an essential crop with the capability of ensuring enormous scale of contribution to economies of urban areas by enhancing the living standards of people in these areas especially for women. Tomato production is essential in alleviating poverty through job creation, enhancing the consumption pattern of people, and creating new opportunities for poor farmers (Robinson & Kolavalli, 2010).

Addressing tomato shortages will require a prioritized effort in tackling the problem of production and marketing. According to Overseas Development Institute (ODI, 2005) food security must engender growth, and the operational strategy devised to ensure this happens is a focused planned implementation of sustainable growth policies which ensures that tomato is always readily available in an open market.

Market studies conducted in urban tomato growing areas indicate that tomato is one of the vegetable crops that has a high demand locally and a potential for exports to the international markets (Robinson & Kolavalli, 2010). Analysis of commercialization levels based on Ghana Living Standard Survey (GLSS, 2010) shows that tomato has a high rate of commercialization, where commercialization essentially means a crop with a wide scope on the market (GSS,2010a).

Economist have always been of the view that, one of the surest way to development is through free market forces (Koenig *et al.*, 2008). Interventions in the form of regulation and policies not only influence international market but also the local one. It is imperative to understand that development in a demand-driven market is mostly enforced by consumer needs in the

maximization of profit by supplier with no intervention from government. As such this value chain approach will look at instrument that will regulate the market among its various stakeholders.

1.2 Problem Statement

Agricultural development can be constrained by many factors. Key constraints include high transaction costs, market imperfection, lack of technology, lack of access to credit, perishability of the products and the prevalence of staple foods that are only slightly traded (World Bank, 2008). These constraints may result in either exclusion of smallholders from market or unequal distribution of benefits. There is a need to manage effective participation of stakeholders to ensure that incomes are not reduced or further polarized (Kaplinsky and Morris, 2000).

In spite of the country's potential and intensification of urban/peri-urban tomato production nationwide, the tomato industry has not reach its potential regarding processing, marketing and improvement of standard of living of the actors along the chain (Robinson & Kolavalli, 2010a). Therefore, the country's inability to add value to the tomato from domestic production through to consumption, suggests that it has consistently been suffering from a series of production and marketing challenges (Bortey, 2010; Haruna, 2012).

Production of tomato in Ghana is characterized by low average yield emanating from the use of low quality local varieties, high perishability rate, competition from imports, and suboptimal land husbandry practices (Adu-Dapaah & Oppong-Konadu, 2002; Robinson & Kolavalli, 2010a). These constraints have thus contributed to low productivity of tomatoes in the country. Value chain analysis is important to understand relationships and linkages among buyers and suppliers and a host of market actors in between (Wenz and Bokelmann, 2011**)**.

A review of literature on value chain indicates that, in the1990's, the concept of agricultural commodity value chain received increased attention. Indeed, Ghana's Food and Agricultural Sector Development Policy (FASDEP II) has one of its core mandate to increase competitiveness in both domestic and international market (MOFA, 2008). Increasing the purchasing of tomato in the domestic market result in significant market opportunities in the local economy. This can greatly lead to the effort of reducing poverty and marginalization of the poor (Will, 2006)

According to Danso *et al* (2002) agriculture in urban/peri-urban areas is solely a profit-oriented production which gives farmers two to three times the income they could have realized from the sale of tomato from a traditional rain-fed agriculture. However, existing threats of tomato production from inputs, assembling, distribution through to retailing in the market places a huge constraint on the urban/peri-urban tomato value chain.

Findings from Robinson & Kolavalli (2010) on the tomato value chain in Ghana revealed that, prices of raw tomato vary from place to place, season to season and within the same season. This results in an uneven distribution of returns for the actors in the chain. According to Schmitz (2005), gains in value chains are unevenly distributed, therefore there is the need to understand the governance of the chain as one of the means of solving this issue.

One way to improve productivity, profitability and sustainability of smallholder farmers is by improving access to the product markets. Indeed, the first of four policy objectives of the World Bank's agriculture-for-development agenda is improvement of access to market and establishment of efficient value chain (World Bank, 2008). However, findings by ACDI/VOCA (2014) revealed that there are major bottlenecks hindering the development of value chain in Ghana. According to Masters *et al.*, (2013), developing a value chain is subject to constraints and opportunities in production, marketing and the distribution phases of the tomato value chain. This study also seeks

to fill in the gaps in the previous works carried out by ACDI/VOCA (2014) and other researches on the tomato value chain of Ghana.

It is therefore against this background that the study seeks to answer the following questions:

1. Who are the actors in the tomato value chain, their functions and existing linkages?

2. How are costs, returns and profits distributed among the actors in the tomato value chain?

3. What are the power relations in the tomato value chain?

4. What are the constraints and opportunities that exist in the tomato value chain?

1.3 Objectives of the Study

The main objective of the study is to analyse the tomato value chain in the Kpone-Katamanso District. Specifically, the study seeks to;

1. Identify the various actors, their functions and assess the existing linkages in the tomato value chain.

2. Examine the distribution of cost, returns, profit among the actors in the tomato value chain in the Kpone-Katamanso District of Ghana.

3. Assess the power relations in the tomato value chain.

4. Analyse the constraints and opportunities that exist in the tomato value chain.

1.4 Relevance of the Study

The impact of tomato value chain is broad ranging from poverty reduction, employment generation, nutritional enhancement and health benefit. Tomato is classified as the most important vegetable crop cultivated and consumed across the globe.

Identifying the actors, their functions and existing linkages in the tomato value chain will ensure that actors collaborate and understand their core roles and how their duties affect one another along the chain. Through cooperation, the overall competitiveness and growth of the final product is improved in the district. This will give most smallholder households a pathway out of poverty as value is added at each stage of the chain.

The cost and returns at the production, assembling, wholesaling and retailing to final consumption will engender policy makers to upgrade the sector to benefit the actors along the chain. This involves analyzing the profit margins as well as the value addition within the chain. This will assist in determining who benefits from participating in the chain and who would need support to improve performance and gains.

The power relations in the tomato value chain is essential because it will provide the tomato value chain actors with the necessary information to formulate strategies that will enhance the operation of the activities of the various actors. It will also assist policy makers and donors with information on how best to provide chain actors with the needed support and technical assistance to strengthen their position in the chain. This will result in a more equitable distribution of gains along the chain and will stymie stronger actors lording of other actors.

Knowledge of the constraints and opportunities at all the stages of the tomato value chain will assist chain actors to develop a common and shared vision which will enhance performance. Identifying threats provides a platform for the chain actors to develop strategies which will curb the constraints and turn it into an opportunity for the greater good of the actors. On the other hand,

identifying the opportunities in the value chain enables chain actors to focus their attention on maintaining and strengthening such areas to ensure competitiveness. All these will ensure that there is value addition at each stage along the value chain in order to meet both local and international demands.

1.5 Organisation of the study

This study is organized into five chapters. Following Chapter one is chapter two which reviews relevant literature on the tomato value chain in Ghana. Chapter three presents details into the methodology for achieving each specific objective. An empirical study was undertaken in the Kpone-Katamanso District of Ghana to gather data that highlighted the tomato value chain and activities related to it. Based on this, results for each objective was presented in chapter four. Finally, chapter five concludes with the summary, conclusion and recommendations for the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature carried out to provide a clear understanding to this study. Literature reviewed covers important areas such as: background to tomato production, analysis of cost and margins, value chain and pro poor growth, gender and value chain analysis.

2.2 Background to Tomato Production

Tomato cultivation is done either by transplanting or sowing the seeds directly on the field. For the purposes of increasing yield, tomatoes are mostly transplanted (Steduto, Hsiao, Fereres & Raes, 2012). On the one hand, direct sowing is non-economical for hybrid tomato cultivars due to high seed cost (Steduto, et al., 2012). Hybrid tomatoes usually produce no seeds, thus compelling farmers to purchase seeds at higher prices season after season. In the evaluation of plant performance, it is significant to determine the optimum planting spacing and plant population per hectare (Adebooye, Ajadi, & Fagbohun, 2006). Plant population refers to the number of plants per unit of area of land. For the purpose of this study, plant population refers to the number of tomato plants planted to maturity per hectare (10,000) of land. Plant population is accounted for by the planting rate and the plant spacing. Planting rate refers to the number of plants/seedlings planted per area of land to attain a certain planting population. On the one hand, planting spacing refers to the arrangement of plants in a particular manner to attain some desired plant population. In Ghana, tomato is usually nursed and transplanted unto the field.

Tomato is classified as the vegetable with the highest number of varieties sold worldwide (Sacco, 2008). The availability of a wide range of varieties thus gives farmers the opportunity to

choose the preferred varieties for planting. The different varieties of tomatoes vary in size, shape, colour, taste, plant type (determinate or indeterminate), disease and pest resistance, and the period of maturity inter alia. Choosing from a pool of tomato varieties can be quite difficult for farmers, since several factors have to be taken into account. KwaZulu-Natal Department of Agriculture and Environmental Affairs (2003) noted some factors that have to be considered in the selection of tomato varieties for cultivation, among which include;

- **Fruit quality**: The quality of vegetables and fruits is a key determinant of consumer preference for a particular variety (cultivar), and also exerts a consequential effect on the output market (Demand and Supply). Fruit firmness, juiciness, size, shape, colour, shelf life, and uniformity are some of the quality features tomato consumers often demand. In making production decisions, there is the need for tomato farmers to consider the quality needs of the output market.
- **Adaptability and reliability of variety**: Farming in general is a risky venture due to producers' (farmers') inability to fully control all factors of production. Field tomato production is also as risky as any other farming enterprise due to unpredictable weather and other uncertainties that are usually associated with the performance of crops. In order to manage/reduce the risk associated with the production of tomatoes, farmers tend to choose varieties that will offer them higher yields even under unfavorable conditions such as bad weather, and pests and disease infestations (KwaZulu-Natal Department of Agriculture and Environmental Affairs 2003)
- **Susceptibility to various diseases and nematodes**: There is a wide range of diseases that affect tomatoes and cause reduction in yield. In order to fight against losses resulting from

diseases, there is the need to implement control measures all season round. This is an expensive exercise which reduces the profitability of production.

- **Target market**: Farmers often produce tomatoes to meet the demands of specific markets such as the fresh/table tomatoes market and the processing/preservation market. The quality features desired by the various markets vary with regard to juiciness, firmness, shape, size, colour and flavour inter-alia (KwaZulu-Natal Department of Agriculture and Environmental Affairs, 2003).

2.3 The Concept of Value Chain and Supply Chain

Supply Chain Analysis and Value Chain Analysis (VCA) are terms used interchangeably, creating confusion among readers and therefore need to be understood properly due to its importance to the study.

2.3.1 Concept of Value Chain

The concept of value chain was pioneered by a Harvard Professor, Michael Potter, who is one of the foremost proponents of value chain analysis was able to establish a dichotomy between value chain and a value system; and according to him a value chain is a combination of activities that works together to provide value to a consumer while a value system is a link up of value chains between firms (Potter, 1998). The primary focus on the value chain is on the benefit that accrue to the actors along the chain. Thus, effective value chain generate profit.

Kaplinsky and Morris (2000), defined value chain as the full range of activities that are required to bring a product (or service) from conception through the different phases of production to delivery to final consumers and disposal after use. The need to bring producers to markets is essential to assess and analyze markets before administering upgrading activities with value chain operators. Thus, the value chain approach begins from understanding of the consumer demand and

works its way back through distribution channels to the different stages of production, processing and marketing (GTZ, 2007).

Moreover, value chain can only exist when all the actors in the chain function in a way that would maximise the generation of value for the actors along the chain. A value chain can be seen in a dual sense. On the one hand, the range of activities administered within a firm to produce a certain output is considered. On the other hand, the range of activities implemented by various actors to bring a raw material at the initial stage of the chain through to the sale of the final product are also considered.

This study looked at the latter approach where the chain started from the production of tomato and the linkages with other key actors which are involved in how the product gets to the final consumer with the processor being the only actor missing out due to the study area. The various steps and actors involved in the process from the production stage to the delivery of the product to the market in a value chain is sometimes known as supply chain or market chain (Webber and Labaste, 2007). This is usually so when the emphasis is not on value creation but the on the delivery at each stage of production.

Fig 2.1: Diagrammatic representation of value chain concept

Source: Will (2007)

The representation of the value chain concept by Will (2007) shows that, a value chain of an agricultural commodity (good or service) will generally involve; input dealer for the provision of inputs, farmers for primary production, middlemen for intermediary trade or marketing, processors for product processing, retailers for sales to consumers and consumers for final consumption of produce.

According to Will (2007), in value chain analysis it is essential to factor in the aggregate scale of the economy. Various actors and institutions outside the micro level (input provision to consumption as in Figure 2.1) with their varying attitude and norms have to be involved in activities along the chain. In the case of Ghana, they could include; Ministry of Food and Agriculture (MOFA), District Assemblies, other government institutions, national and international non-governmental organisation (NGOs) among others. It is very crucial to clearly identify all the various stakeholders of the chain for effective maximization of value addition at each stage of the chain.

2.3.2 Concept of supply chain

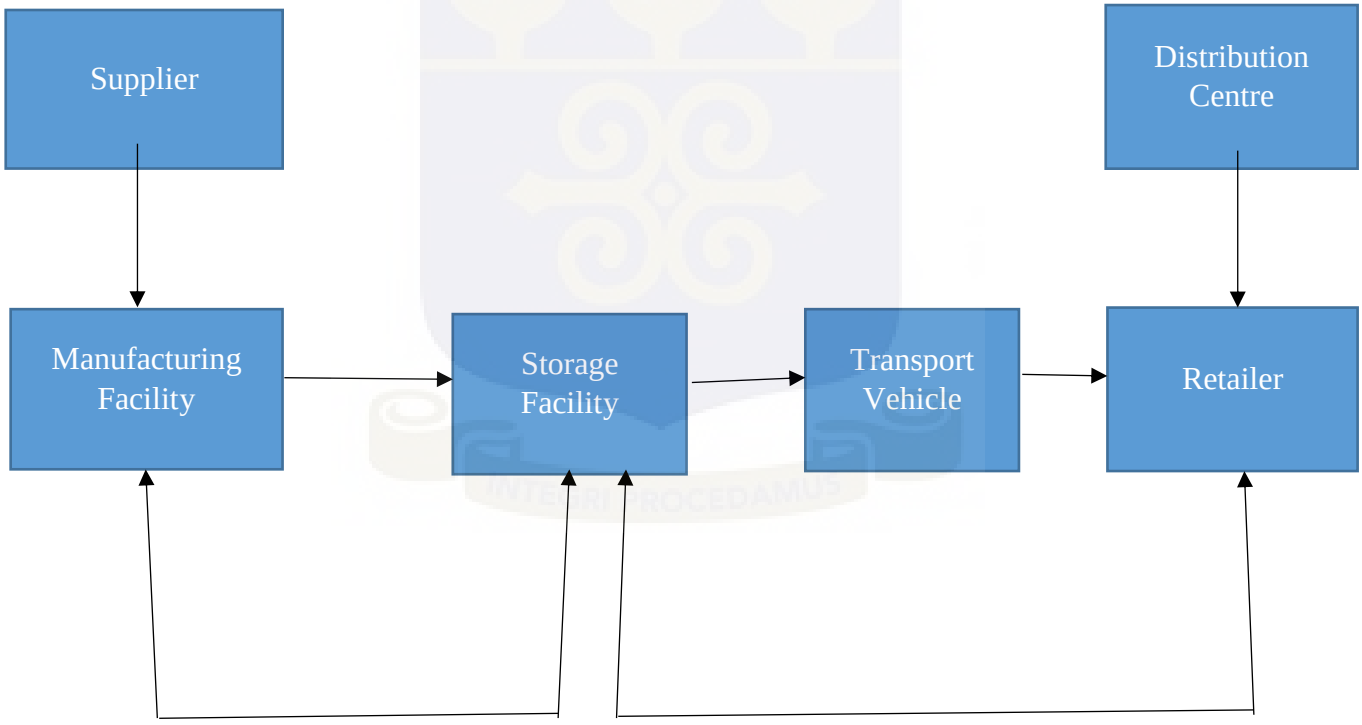
Supply chain is the set of relationships between suppliers, manufacturers, distributors and retailers that facilitate the transformation of raw material into final products (Beamon,1998). It is important to note that, although the supply chain comprises different business components, the chain is viewed as a single entity. Others define supply chain analyses as the study of quantitative models

that characterize the various economic trade-offs in the supply of a product (Simchi-Levi *et al*., 2004). According to Simchi-Levi *et al*. (2004) supply chain analyses have led to new research ventures that mixes various disciplines of traditional economics, mathematics, policy setting and decision making on a pragmatic level. Additional research areas result in a profound combination of descriptive and predictive models' characteristics by each sub-field.

As shown in Figure 2.2, a supply chain is comprised of two basic integrated processes;

- The production, planning and inventory control process
- The distribution and logistics process

Fig 2.2: Supply Chain Concept



Source: Beamon (1998)

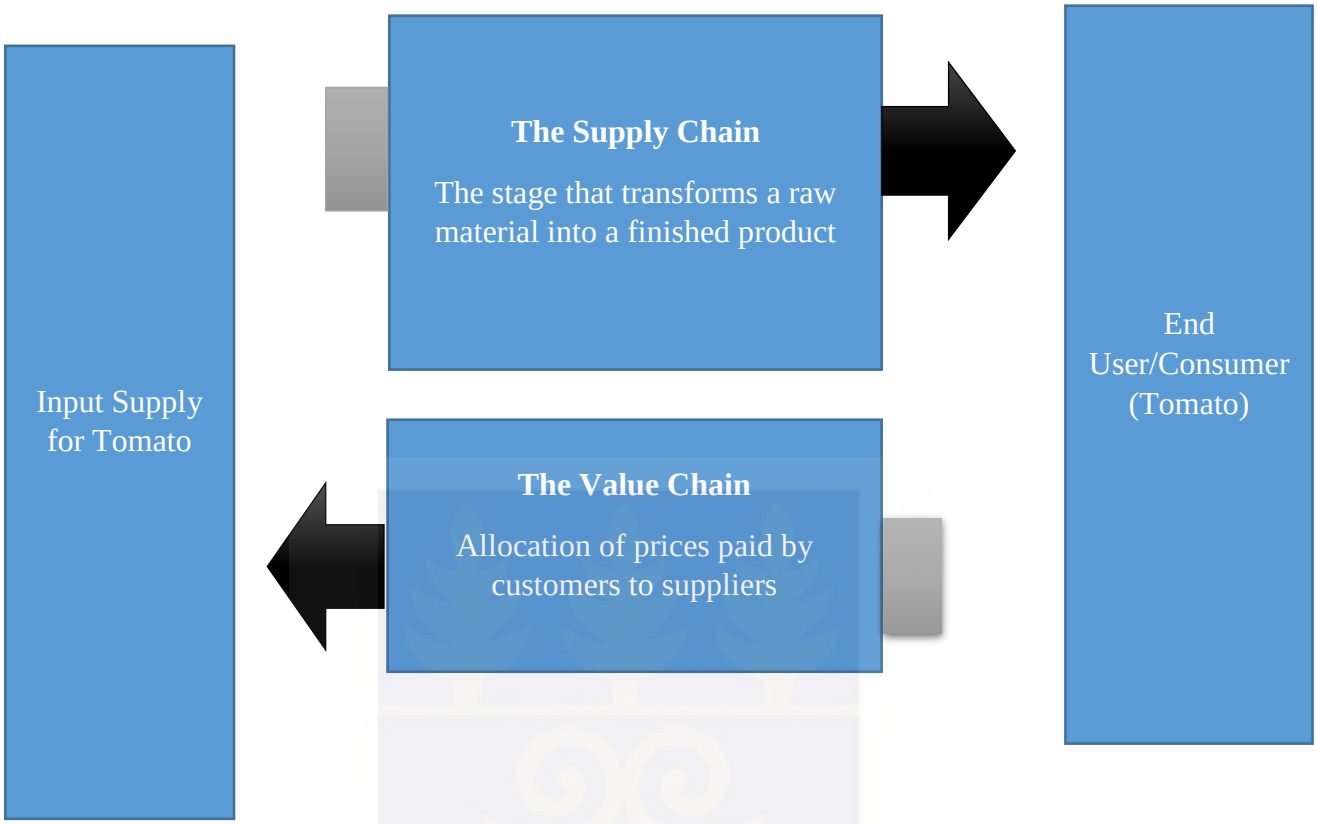
2.3.3 Contrast between Supply Chain and Value Chain

The Primary difference between a supply chain and a value chain is a fundamental shift in attention from the supply base to the customer. Supply chain focuses on merging supplier and production processes, improving efficiency and reducing waste while value chain focus on creating value in the eyes of the customer. The difference in their usage is often lost in language expression employed in the business and research literature (Feller et al., 2006)

According to literature, it is quite obvious that both value and supply chains deal with the interplay of firms and processes that are needed to deliver products to an end user and they both aim at identifying opportunities for and constraints against increasing productivity. It therefore becomes difficult to clearly distinguish between these two concepts.

Mayer-Stamer and Waltring (2007) argue that the two concepts were primarily the same but the choice of one depends on the direction to which the researcher's analysis is focused. However close, the distinction is between these two concepts, and some other researchers have tried to differentiate these two concepts.

Fig 2.3: Supply Chain vs Value Chain Concept



Source: Adopted from Cox *et al.*, (2002)

2.4 Tomato Value Chain in Ghana

Value chain analysis gives answers to a set of questions such as which actors perform the various activities in the chain, who participates at which stage, where the different stages take place, how they are linked, who gets what benefits and why. According to the findings by Robinson & Kolavalli (2010), the aim of promoting tomato value chains is to generate greater added value and to improve the competitiveness of locally produced tomato in the domestic markets. The tomato value chain like most value chains begins at the input supplying stage. The input suppliers are individuals or organizations who supply farmers with inputs such as tomato seedlings and agrochemicals. The next stage in the tomato value chain is the production of raw tomato. Robinson

& Kolavalli (2010), reported that tomato production in urban areas in Ghana is mostly carried out by smallholder farmers who rely on family or hired labour to undertake maintenance and harvesting activities on the farm. The distribution stage includes assemblers, local traders, intermediaries and retailers. The final stage in the tomato value chain is occupied by consumers who buy raw tomato from the local markets, road side vendors and other retailers.

2.5 Global Value Chain

The global value chain cut through all kinds of socio-economic realities and identify constraints which define a specific product. The approach combines two important analytical tools. According to Gilbert (2006), the term global value chains is a range of processes leading to the production of the final product the consumer is willing to buy. This is in part engendered by the realization that many manufactured goods are processed in different countries prior to final sale, and that trade in intermediate products has become a significant aspect of all international trade. Global value chain analysis looks at the value contribution at each stage of the chain to the final product. Value chain analysis identifies a number of strategies for adding value. In particular, it emphasizes the opportunities for adding value through increasing buyer service elements of the total product package delivered to buyers. Particularly in fresh produce value chains, value can be added through reliability of delivery, speed of delivery, and product innovation. In other words, adding value need not involve physical transformation of the product. Global buyers such as malls and large processors are not solely buying a physical product. They are buying a product that is bundled with a set of value-adding services. Moreover, GVC linkages offer the prospect of private sector knowledge transfers that should provide relevant information for producers, processors and exporters in developing countries. This knowledge transfer is not automatic but one that comes by making strategic effort improve a product at each stage of the chain (Humphrey, 2006).

2.6 Marketing of Tomato in Ghana

Marketing consists of individual and organizational activities that facilitate and expedite satisfying exchange relationships in a dynamic environment through the creation, distribution, promotion and pricing of goods as described by Pride & Ferrel (1991). Essentially, marketing is a management process which identifies, anticipates and supplies, tomatoes to consumers efficiently and profitably. How efficiently farmers' market tomatoes influence their profit levels which in turn informs their decision to continue producing. In Ghana, tomatoes can be marketed through various channels. The marketing channels taken by farmers to market fresh tomatoes should be capable of delivering tomatoes to the consumers in the desired form and at an efficient cost, compared to other channels. The fresh tomatoes marketing channel refers to the various routes available in moving the tomatoes from the farmer to the final consumer. Along each marketing channel is a marketing chain which comprises of a series of intermediaries that carry out various activities. Marketing chain refers to various intermediaries/marketing agents (such as farmer, wholesalers and retailer) that usually undertake various activities in shifting the commodity to the final consumer. Some of the intermediary activities include loading/unloading, transportation and distribution. Though tomato farmers have multiple markets, proximity and availability of market are the key determinants of a particular market chosen by a tomato farmer in Ghana. This difficulty in marketing fresh tomatoes in the country can be partly attributed to the perishability of the crop and the restrictions imposed by "market queens" in marketing tomatoes in the key tomato wholesale markets in the country as noted by Robinson & Kolavalli (2010).

2.7 Value Chain Analysis.

Value Chain Analysis is a method for accounting and presenting the value that is created in a product or service as it is transformed from raw inputs to a final product consumed by end users (FIAS, 2007).

- FIAS (2007) indicates that the analysis must constitute;
- Identifying a market segment to assess
- Analyzing the channel
- Mapping the Framework of the value chain
- Quantifying and establishing the benchmark performance
- Analyzing performance gap

To define it in a different context, Kaplinsky and Morris (2000) indicates that the analysis should constitute following;

- The entry point of the value chain analysis
- Mapping value chains
- How final markets are accessed
- Standardizing the efficiency of production
- The power structure of value chains
- Upgrading in value chains

The steps from the two sources may differ though, they are technically similar. The choice of sector to assess when undertaking value chain analysis as suggested by FIAS (2007) is similar to what Kaplinsky and Morris refer to as determining the starting point, only that, FIAS requires a

more detailed enquiry than Kaplinsky and Morris approach. Also, FIAS (2007) adds the need for analyzing the market in value chain analysis which Kaplinsky and Morris (2000) puts as identifying product category and how producers can access the market.

2.7.1 Mapping the Value Chain

To understand the relationships among actors in the value chains, it is vital to know the various actors and the direct and indirect influence they have in the chain (FIAS, 2007; Tamasese, 2009). Lundy *et al*., (2012) classified three levels under value chain mapping. These are;

- Core processes which involves understanding how the different business links function together as a system. Identifying the actors, their roles, the flow of product, communication and information flow through the chain assists in the comprehension of this process.
- Partner networks are external actors or organizations (public or private) that are not included in the value chains core stages but occupy a critical role in the functioning of the business and enable the chain to operate efficiently. The purpose of this group is to support or assist the different links of the chain and facilitate the development of the business.
- External influences are part of a larger socioeconomic system and institutions in a country. These institutions may be formal (legislations, laws) or informal (cultural practices) and operate at diverse scales. These larger systems can facilitate, limit or be neutral to the development of the value chain.

According to Kaplinsky and Morris (2000), horizontal and vertical stream usually show the single stream, however, intra chain linkages are mostly dual in nature. Also, it must be understood that in real world value chain is sophisticated in nature and a particular value chain may develop into another complex value chain. This same notion of Kaplinsky and Morris on value chains is supported by Brown *et al.*, (2000) who indicate that, basic fundamental theory the value chain in

real world is far from a simple concept which can easily be grabbed at ease, the real world is much messier, and a decision which sometimes lack clarity of thought is settled on what to map along the chain.

According to a report by Kumar *et al.*, (2012) on the value chain analysis of the maize seed delivery system in India, mapping is used to show the flow of transactions from sourcing of raw materials and inputs, to production, processing, marketing and final sale. The maps also illustrate costs, value addition at each stage, secondary services important to each stage, critical constraints, and the influence of players along a value chain. They identified the major actors in the maize seed value chains as seed companies, input suppliers (including manufacturers, wholesalers and retailers); producers; and institutional setup of state and central governments. Again, they reported that the mapping structure includes mapping services that support, or could potentially support, the value chain's overall efficiency.

M4P (2008) presented the first step of a value chain analysis as identifying and mapping the core activities of the chain, the actors and the flow of products. The relationships and linkages between the chain actors, the services that feed into the chain among others are also mapped.

2.7.2 Analyzing Costs and Margins

Marketing costs refer to those costs, which are incurred to perform various marketing activities in the shipment of goods from producers to consumers. Marketing cost includes: Handling cost (packing and unpacking, loading and unloading putting inshore and taken out again), transport cost, product loss (particularly for perishable fruits and vegetable), storage costs, processing cost, capital cost (interest on loan), market fees, commission and unofficial payments (Heltberg and Tarp, 2001).

Marketing margin is a commonly used measure of the performance of a marketing system (Abbott and Makeham, 1981). It is defined as the difference between the price the consumer pays and the price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services (Cramers and Jensen, 1982; William and Robinson, 1990; Holt, 1993).

To create a sustainable competitive edge in a firm or organization, the returns of investments must be determined. This analysis helps to restructure the entire value chain (Dekker, 2003).

In the analysis of the value chain of a UK retailer, Dekker (2003) reported that, the chain was stratified into relevant activities where costs and revenues were assigned. Birachi *et al.,* (2010) provided survey evidence on the expansion of market access and value addition in the banana and Irish potato value chains in DRC and Rwanda. They reported that the level of performance attained by actors can be represented by the magnitude of the profits and this reflects the extent to which objectives have been achieved. The profitability of a business must be determined by a new entrant before venturing into it. Financial aspects such as revenues, costs and margins must be investigated and the knowledge of these in the value chain ensures that a new entrant or a researcher understands issues and the requirements such as the cost of entry (M4P, 2008).

Reports by Liang *et al.*, (2010) on the value added and governance structure of the pear industry in China was that, the value of the pear as well as the cost was accumulated in the process of production, transporting, packaging, processing, marketing and consumption. They defined the cost as the added expenses occurring during the process from input purchasing to output sale.

2.7.3 Value Added and Value Chain

The value addition along the chain will be computed by subtracting the intermediate input from the price of the product (FAO, 2005).

Essentially value added is the monetary value that can be quantified at each level of production or distribution (McCormick and Schmitz 2000). Value added is a significant tool which is used to determine how competitive a firm is compared to its competitor's. FIAS (2007) defines value added as the value of output at market price minus the value of all intermediate inputs purchased from other firms.

The value chain consists of series of activities that create and improve value, resulting in the total value a firm delivers. This could lead to an identification of the costs and cost profiles in the firm (Hinson, 2010). According to Kuwornu *et al*., (2013), adequate information about the contribution of the various chain segments to total value is needed in the analysis of the value added along the chain. Such activities that add value are contributions from labour, use of non-current assets and all activities that increase the economic return of the fresh tomato. UNIDO (2009) defined value added as a measure of the difference between the value of all goods and services produced and the value of those bought non-labour inputs which have been used in the production process.

2.7.4 Value Chain Governance

According to Haruna *et al.,* (2012) on the value chain assessment of tomato in the Upper East Region, power relations in the value chain describe actors who do not only determine their own actions but may set parameters and powerfully influence other actors to conform. They identified that during the bumper season, wholesalers of tomato in the Upper East Region of Ghana were the lead actors in the chain. They determined the quantities, set prices of tomato and controlled the

flow of information in the chain. Governance in the value chain ensures that interactions between the chain participants are organized rather than simply being random (Kaplinsky and Morris, 2000). The analysis of governance provides an understanding of how a chain is controlled and coordinated when certain actors wield more power than others in the chain (Gereffi and Fernandez-Stark, 2011). This knowledge helps determine the avenues and opportunities for realistic action, lobbying and policy formulation. (Babu &Verma, 2010).

A study on the analysis of the groundnut value chain in Ghana by Yayah Abiba (2014), identified the distributors in the chain as the dominant actors. These actors set prices and determined quantities for cashew as well as controlled the flow of information. According to the findings by Liang *et al.,* (2010) on the value added and governance structure of the pear industry in China, there are imbalances between sellers and buyers regarding the distribution of benefits and risk sharing. They reported that farmers hardly receive a reasonable share of profits compared to the risk they shoulder and this is as a result of their weak bargaining position.

The absence of governance in a value chain according to Irawati *et al*., (2009), results in problems of uneven distribution of gains among actors and an unfair value-added distribution. Issues of chain coordination or governance are uncovered when there is an analysis of a value chain. McCormick and Schmitz (2000), also defined the governance in the chain as the pattern of direct and indirect control. Thus, governance constitutes a key factor in defining how upgrading objectives can be achieved (UNIDO, 2009). According to Gereffi and Fernandez-Stark (2011), there are five (5) types of governance structure namely markets, modular, relational captive and hierarchy

for realistic action, lobbying and policy formulation (Babu and Verma, 2010).

A study on the analysis of the groundnut value chain in Ghana by Owusu-Adjei (2010), identified the distributors in the chain as the dominant actors. These actors set prices and determined quantities for groundnuts as well as controlled the flow of information. According to the findings by Liang *et al.,* (2010) on the value added and governance structure of the pear industry in China, there are imbalances between sellers and buyers regarding the distribution of benefits and risk sharing. They reported that farmers hardly receive a reasonable share of profits compared to the risk they shoulder and this is as a result of their weak bargaining position.

The absence of governance in a value chain according to Irawati *et al*., (2009), results in problems of uneven distribution of gains among actors and an unfair value-added distribution. Issues of chain coordination or governance are uncovered when there is an analysis of a value chain. McCormick and Schmitz (2001), also defined the governance in the chain as the pattern of direct and indirect control. Thus, governance constitutes a key factor in defining how upgrading objectives can be achieved (UNIDO, 2009). According to Gereffi and Fernandez-Stark (2011), there are five (5) types of governance structure namely markets, modular, relational captive and hierarchy.

2.7.5 Constraints in Tomato Production and Distribution

In developing countries, tomato produced by smallholder farmers are marketed by wholesalers/retailers. Their operation in the distribution chain is by collecting, assembling and distribution of tomato product in the open market to reach the final consumer.

Although the distribution chain is well known, the economic and institutional barriers to tomato marketing (transportation costs, quality standards, inadequate and uncoordinated tomato market information systems) limit vegetable-sector development (IFPRI, 2010)

2.8 Related Empirical Studies

Owusu-Adjei et al., (2017) carried out value chain analysis of groundnut in Ghana. Through mapping, value chain actors were identified to be primary producers (farmers), distributors, processors and retailers of output. Costs and returns estimates indicate that, for every litre of groundnut oil and kilogram of paste produced along the oil and paste chain respectively, the farmer benefits most when he or she sells groundnut in a shelled form. This is followed by the distributor, the retailer of processed output and finally the processor. On the other hand, when the farmer sells groundnut in an unshelled form, the distributor benefits most from both the oil and the paste chain with 51% increase in profit. Assessment of the governance structure by the use of score matching approach showed that distributors are the dominant governance in the chain. In marketing, high cost of transportation and unreliable sources source of supply were the key constraints, while lack of access to credit facilities coupled with high cost of raw materials were identified in the processing segment. Availability of market was regarded as the major opportunity both to production and marketing of groundnut. Groundnut processing as a means of providing employment was also regarded as a major opportunity in the processing segment.

African Cashew Initiative, ACi (2010) conducted an analysis on the cashew value chain in Ghana and ascertained that, marketing channel consists of producers, village merchants, or agents and exporters. It was identified that constraints at the farmer level included limited access to good planting material; a high incidence of pest infestations; weak extension services; and weak farmers' associations. On the other hand, limited access to working capital, an inconsistent supply of raw cashew nuts, inadequate transport facilities, and frequent fuel price fluctuations that result in high transportation costs are major bottlenecks on the side of processing companies.

Another research was carried out by Osman (2012) on the analysis of value addition in soybean supply chain in Northern Ghana. He identified the actors, their relationships and existing linkages by conducting a mapping exercise within the framework of the network flow theory composed of a series of sequentially related events and activities. The constraints to soybean farming were determined as lack of storage facilities, high cost of labour and costs of inputs, inadequate access to credit and lack of efficient transportation systems in conveying harvested soybeans to market centres.

Schipman (2006) employed the Gereffi *et al.*, (2005) approach in determining the governance structure in the pepper value chain in Ghana. According to this approach, there are five main types of governance structure, namely; Market, Modular, Relational, Captive and Hierarchy. The determining factors of these governance structures as defined by Gereffi *et al.*, (2005) are, the complexity of transactions, the possibility of codification and competence level of suppliers. The study ranked the state of these determining factors on a scale one to four (with four being the highest) in the fresh, dry and powder chili value chains. Ranks are therefore compared to the "blue print" by Gereffi *et al.*, (2005) to determine the type of governance structure in each of the chains. Results from the study indicated that, the governance structure of fresh and dry chili chains are that of the market. In other words, relationships among actors or all transactions are market coordinated. Cost of switching from one partner to the other are low for actors. That of the domestic and international chili powder chain was modular. This means suppliers of pepper manufacture or process products according to detailed instructions of the purchaser but maintain full responsibility. This value chain governance offers suppliers the possibility of stronger integration from which positive impacts such as transfer of know-how, reliability and others can be expected without losing their own freedom.

Gross margins were also used as primary tool to compare profit distribution along various product value chains. The gross margin was calculated as the total value of the chilly minus the cost of the variable inputs per maxi bag of pepper. The margin accruing to the pepper farmer was found to be higher than those accruing to the remaining actors, namely, processors and retailers.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the method of analysis for each of the objectives. The chapter begins with the conceptual framework and the theoretical framework of the value chain analysis. The study area, method of data collection, sample size, sampling procedure and sources of data are then presented.

3.2 Conceptual Framework

The concept shows the general activities from production to consumption in the value chain as illustrated in Fig 3.1. The framework provides and illustration of the activities in the tomato sector in the Kpone-Katamanso District of Ghana. The actors, value adding activities, relationships and linkages are identified through the value chain map. The chain starts from input supply, production, distribution until it is finally reaches the consumer. The only channel which is essentially the local channel of operation can be identified in the illustration.

Production of tomato begins with the purchase of the inputs from the input suppliers. The primary producers whose principal responsibility is to grow tomato sells to the market queens who are supported by assemblers in assembling the purchased of on-farm tomato.

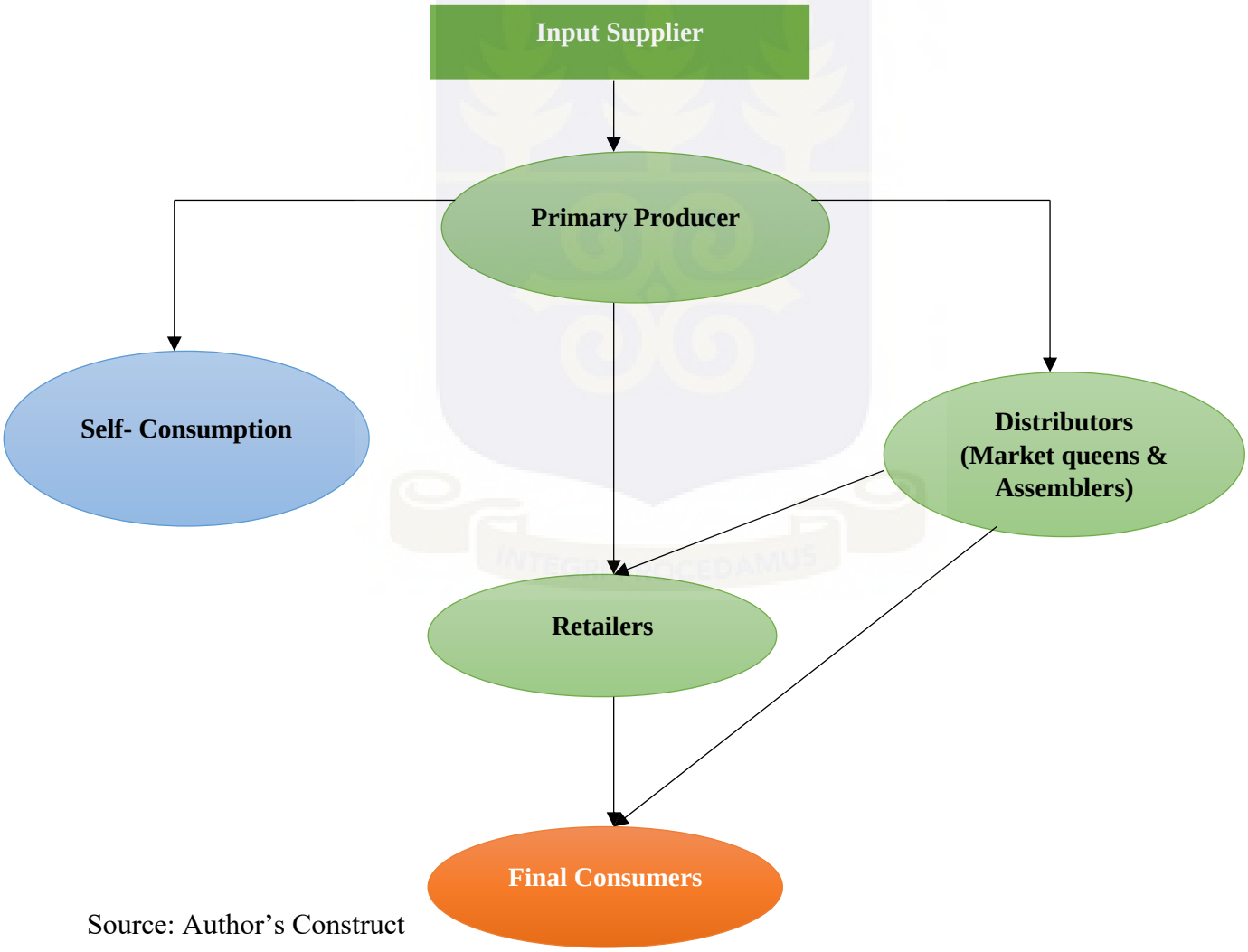
Market queens upon purchasing tomato on-farm sell their tomato stock to retailers. However, some retailers who have direct access to farmers also purchase directly on-farm in order to minimize higher prices from the market queens. This however is a seldom case since majority of the

activities are direct from the sale from producer to market queens to retailers and does not have any effect on the dynamics of the value chain within the district.

The principal purpose of the study is to examine ways to improve profitability at each stage of the chain which will essentially reduce poverty among the various actors of the chain.

Further, it provides the background for identifying and examining the constraints along the tomato value chain. Consequently, suggestions to minimize these constraints are rooted in this study.

Fig 3.1 Tomato value chain



Source: Author's Construct

3.3 Theoretical Framework

According to FIAS (2007), value chain analysis is a method for accounting and presenting the value that is created in a product or service as it is transformed from raw inputs to a final product for consumers. To estimate the value added in the value chain the absorption cost technique is employed. This costing technique assumes that the relevant cost to the business is the total cost which is a sum of total variable and fixed costs (Kuwornu et al., 2013). This is mathematically presented as;

Added Unit Cost or Added Value= Total Cost (TC) – Value of Primary Inputs (VP)….. (3.1)

Value addition estimated by this technique takes into consideration variable and fixed costs. In this research, value or cost is added by an actor to the end product of the preceding actor to generate the final output. The value added per unit of a product is the price difference the actor pays for input delivery by actors at the previous stage of the chain (Kuwornu *et al.,* 2013).

3.4 Method and Data Analysis

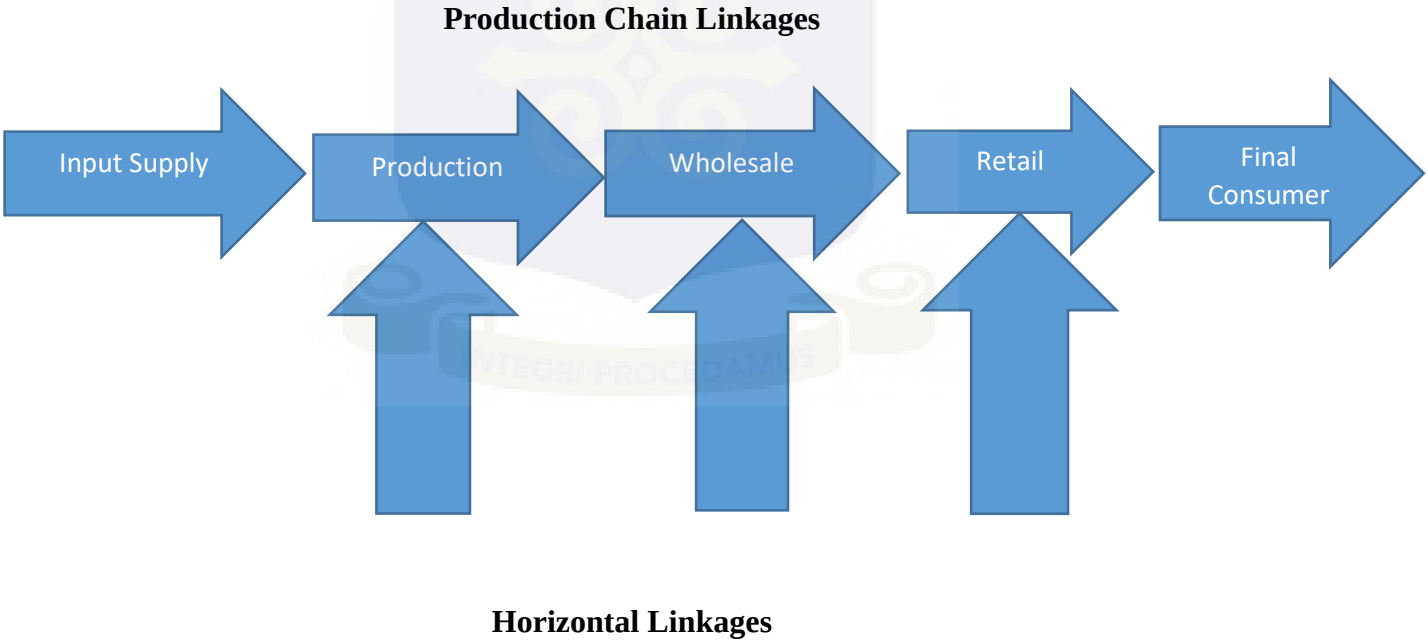
3.4.1 Value Chain Mapping

The methodology proposed by FIAS (2007) is applied in mapping the core production linkages which is similar to Austin's (1992) approach to production chain linkages. Combining these two approaches, this study shows a flow diagram to establish all the operational stages that tomato goes through, from farm to table as illustrated in Fig 3.2. At every operational stage, a link is drawn between the source of major inputs used by an actor, the output and the receiver of the generated output.

As suggested by FIAS (2007), the policies, institutions and infrastructure that affect the operation of the value chain are outlined. As stated earlier, this is what Austin (1992) referred to as horizontal linkages.

With reference to Making markets work better for the Poor, M4P (2008), mapping of the tomato value chain in the Kpone-Katamanso District of Ghana highlighted and linked areas such as the actors and the stakeholders involved. The tomato core actors, value adding activities, the relationship and linkages between the tomato value chain actors were mapped. With the knowledge of the actors and their activities, the flow of products from one actor to the next actor was mapped. This was executed to ascertain if the same tomato product in terms of form, shape, colour and weight moves from input to output from one actor to the next.

Fig 3.2: Production chain and the horizontal linkages



Source: Author's Construct

3.5 Estimation of Cost, Returns, Profits and Margins

According to Kuwornu *et al*., (2013), costs of a project or business comprises both investment and operating costs. Investment costs are the initial capital required that last more than one financial year. Operating costs on the other hand are costs such as wages, rent, sales, distribution and administration cost incurred on a daily basis. Such costs are usually incurred throughout a projects period and are sometimes financed from proceeds during production.

Fixed cost items were depreciated using the declining balance method to determine the salvage value. This method was chosen over the straight line method of depreciation because the latter assumes that the loss in value of an asset at the end of each year is the same throughout its useful life. This assumption is convenient but not always correct since not all the fixed cost items may depreciate evenly throughout their lifespan.

$$\boldsymbol{Depreciation}=\frac{\boldsymbol{2}}{\boldsymbol{n}}\boldsymbol{x\ R} \quad \text{..... (3.2)}$$

Where n = useful life (years)

R = Remaining book value at beginning of year.

Table 3.1 presents the format for calculating the financial ratios for each actor in the tomato value chain. To ensure a fair representation for each actor in terms of the form of tomato handled at each stage, the standard unit for calculations was 5 kilograms of raw tomato.

3.5.1 Estimating the Unit Total Cost

The unit total cost for the farmer, assembler/wholesaler and retailer consists of the unit fixed and variable cost for every 5 kilogram of raw tomato. Mathematically the unit total cost is stated in as;

$$\boldsymbol{Unit\ Total\ Cost}=\boldsymbol{Unit\ Fixed\ Cost}+\boldsymbol{Unit\ Variable\ Cost} \quad \text{..... (3.3)}$$

3.5.2 Estimating the Added Unit Cost or the Value Added

The cost of primary input for each actor is the same as the unit price of the previous actor. This is the cost at which an actor purchases tomato from the preceding actor. The added unit cost is also known as the value added by each actor on a unit of primary input (Kuwornu *et al.,* 2013). This is the difference between the unit total cost and the cost of primary input. Value added considers variable costs which includes direct material, labour and expenses. This is presented mathematically as;

$$\textbf{\textit{Added Unit Cost}} = \textbf{\textit{Total Cost}}\ (\textbf{\textit{TC}}) - \textbf{\textit{Value of}}\ \textbf{Primary Inputs}\ \textbf{(VP)} \quad \ldots\ldots\ldots\ldots\ldots\ (3.4)$$

The percentage added cost or value added is the proportion of each actor's contribution to the total value added expressed as a percentage.

3.5.3 Estimating the Unit Profit

Unit price of raw tomato is the selling price per actor in the chain. The unit profit is the difference between the unit selling price and the unit total cost. This is presented mathematically in as;

$$\textbf{\textit{Unit}}\ \textbf{Profit} = \textbf{\textit{Unit Selling}}\ \textbf{Price} - \textbf{\textit{Unit Total Cost}} \quad \ldots\ldots\ldots\ldots\ldots\ (3.5)$$

The percentage total chain profit is the proportion of each actor's contribution to the total chain profit expressed as a percentage.

3.5.4 Calculating Revenue

After costs per actor have been calculated, the revenues need to be identified. Revenues are calculated by multiplying the quantity of volumes sold (Q) with the selling price (P)

Revenue= (Q x P) …… (3.6)

3.4.5 Estimation of Return on Investment

To understand the financial position of an actor compared to other actors in the chain, the return on investment (ROI) is calculated. The return on investment (ROI) is estimated by dividing the

profit created by the actors by the unit cost incurred in producing an output. This is presented mathematically as;

$$ROI=\frac{Po-Co}{Co} \quad \text{.....(3.7)}$$

Where

ROI is Return on Investment

Po is the value of one unit of output

Co is Unit cost in producing an output.

3.5.6 Estimating of Return on Investment per Day

Calculating the return on investment per day is given in (3.8) as;

$$ROID=\frac{ROI}{\text{Time in generating profit}} \quad \text{.....(3.8)}$$

Where ROID is return on investment per day

Time is measured in days

Table 3.1: Calculation of costs, revenues, profit and margin

Value Chain Actor	**Costs**				**Revenue**	**Profits**			
	Unit Total Cost	Cost of Primary Input	Added Unit Cost	% Added Costs	Unit Price	Unit Profit	% Total Profit	Unit Gross Margin	% Gross Margin
Primary Producers	A	B	A-B	(A-B)/J	C	C-A	(C-A)/K	A-B+(C-A)	(B+C)/M
Distributors (Assemblers, Market Queens)	D	C	D-C	(D-C)/J	E	E-D	(E-D)/K	D-C+(E-D)	(C+E)/M
Retailers	F	E	F-E	(F-E)/J	I	I-F	(I-F)/K	F-E+(I-F)	(E+I)/M
Total			J	100		K	100	M	100
	Added Unit cost refers to the added cost at each stage of production net of the procurement from the previous stage								

Source: Van den Berg *et al* (2008)

3.6 Determining governance structure along the chains

Scoring exercise adopted by Kaplinsky and Morris (2000) was used on some selected indicators on the "importance" and "influence" the actors exert. "Importance" is assessed as an actor's ability to have great effect and influence in the chain, while "influence" means the power to have an effect or exert control on other actors or situations along the chain. The indicators included profit, bargaining power, protection from competition, and information concentration. The strength on each of the indicators amounted to a total score of 100% for all the actors in question i.e. producers, processors and distributors. Means of all the scores for the various indicators are calculated. The higher the score (%), the higher the level of importance and influence and therefore, the group of actors with the highest mean score (%) for all the indicators are considered as the dominant players along the tomato value chain.

3.7 Analysis of Threats and Opportunities in the Tomato Value Chain

An assessment of the soybean value chain in Northern Ghana by (Osman, *2013*) reported that developing a market viable chain is subject to threats. Reddy *et al.*, (2010) on the cereal value chains and retailing in India also revealed that food value chain is subject to inefficiencies. These inefficiencies are as a result of constraints such as inadequate infrastructure, too many middlemen and wholesalers. According to Popescu and Dascalu (2011), the concept of value chain is used as a management activity that allows an organization or an individual to understand the strengths and weaknesses of the systems that are studied. Constraints faced by the actors at the various levels of the cashew value chain were identified from literature. Respondents were presented with the constraints and opportunities and asked to strongly disagree, disagree, undecided, agree, strongly agree. A five (5) point Likert scale was used to analyze these responses (Likert, 1932).

Table 3.2: Scoring Exercise

Responses	**Weights**
Strongly Disagree	1
Disagree	2
Undecided	3
Agree	4
Strongly Agree	5

Source: Likert, 1932

The index for each constraint and opportunity using the Likert scale is represented as;

$$\textit{Total Score} = \Sigma fi \times Wi \quad \text{...} \quad (3.9)$$

Where Σfi = frequency of the i_{th} actor

Wi = weight of the responses

The mean score is specified in as follows;

$$\textit{Mean Score} = \frac{\Sigma fi \times Wi}{\Sigma fi} \quad \text{...} \quad (3.10)$$

3.8 Study Area

Kpone-Katamanso is located at the Eastern part of the Greater Accra Region and it stretches from the coast to the Southern lower slopes of the Akuapim mountains. Kpone-Katamanso is only 38 kilometer's commute from Accra, the capital city of Ghana is on the longitude 004^{1} 0E and latitude 5^{0} 60N. The District boundaries include;

Southern Belt: Ningo-Prampram District on the South East and Tema Metropolitan Assembly on the South West and the South by the Gulf of Guinea.

Northern Belt: SODA on the North East and LA Dadekotopon Municipal Assembly on the North West and on the North by Akuapim South.

3.8.1 Vegetation

The vegetation is the shrub and grassland in the district. The grassland is found in areas like Appolonia, Gbetsile, Kpone at Sea, and Michelle camp where livestock and crop farming are practiced.

3.8.2 Demographic Characteristics

The 2010 population and Housing census exercise is estimated that the population of Kpone-Katamanso District at 109864 (53488 females) representing 2.7% of Greater Accra's region total population. The total population density is 102 person per square kilometer.

3.8.3 Economic Activities

The local economy of the Kpone-Katamanso district is made up of agriculture, industry and commerce. The health of the local economy is hinged on service and industrial sector. The traditional economy in the district is fishing, crop production and livestock rearing.

A higher percentage of farmers in the area use obsolete farming equipment's such as hole and cutlasses as their main farming equipment's. The burgeoning youth in district work in the industries in Tema, however, a teeming youth in the district still engage in various forms of farming activities in the district.

Fig 3.3: Map of Kpone-Katamanso District

Source: Ghana Statistical Service, 2010

3.9 Types, Sources and Methods of Data Collection

The study used both primary and secondary data. The primary data used was mainly cross-sectional and covered actors in production, distribution (assemblers/wholesalers) and retailing in the Kpone-Katamanso District. Data was collected from tomato producers in the Kpone-Katamanso District in Greater Accra Region of Ghana.

This District has been purposively chosen because of its significant contribution to urban tomato production in the Greater Accra Region (MOFA, 2009).

For the interviews, a structured questionnaire was used. To augment our qualitative data, data from sources such as MOFA, research reports, journals among others was used.

3.9.1 Sampling Procedure and Sample size

The population for this study was constituted by all farmers who produced tomato for the 2016/2017 cropping season in the three major producing towns in the Kpone–Katamanso District. The Kpone-Katamanso District was chosen for the study because it plays an enormous role in meeting the districts fresh tomato needs in the Tema Metropolis.

Multistage sampling technique was used in selecting respondents for this study. The first stage was a purposive selection of 1 District in the region based on the intensity of tomato cultivation in the District and the availability of dam to aid regular supply of water for crop production.

Secondly, with the help of the Agricultural Extension officer in the District, 3 communities were selected based on the intensity of tomato production.

The third stage employed stratified sampling technique in choosing 40 farmers from each community.

The number of respondents were drawn from each stratum in proportion to the relative size of the population size of the stratum. Random sampling technique which employed the lottery technique

was used to select farmers from the various strata. A total of 120 farmers were sampled from three communities using stratified random sampling technique.

Snowball sampling was employed in eliciting responses from 39 distributors (assemblers, market Queens), 31 retailers and 20 consumers.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents and discusses the results obtained from the various analyses undertaken to address the objectives of the study. It starts with the socio-economic characteristics of respondents. Mapping of the value chain of tomato in the Kpone-Katamanso District of Ghana is presented. The next section presents the results and discusses the profitability of the tomato value chain and how this profit is distributed among the actors. The power relations in the chain is presented and results of the analysis of each actor's perception of constraints and opportunities at each level are presented in the proceeding sections.

4.2 Characteristics of Respondents

4.2.1 Gender

A total of 120 farmers, 39 assemblers/wholesalers, 31 retailers and 20 consumers were interviewed out of which 112 (53.33%) were males and 98 (46.67%) were females. This corroborates an earlier study on allocative efficiency of irrigated tomato carried out by Puozza (2015) where he revealed that 71.25% of 80 sampled tomato farmers in the Upper East Region were males and 28.75% were female. At the tomato farming stage 87 (72.5%) were males while 33 (27.5%) were females. These results concur with findings of Agyapong (2011) in his study on the pineapple value chain in the Akuapim South Municipality of Ghana. It was identified that, of the 378 farmers interviewed, 327 (87%) were males and 51(13%) were females. At the tomato distribution (assemblers, wholesalers and retailers) level of the chain in this study, 18 (25.71%) are males and 52 (74.29%) were females.

4.2.2 Educational Status

From table 4.1, 83 (69.17%) tomato farmers had some form of education (primary, JHS/MSL, SHS, vocational, technical, tertiary education among others) while the remaining 37 (30.83%) had no formal education. This contradicts an earlier finding by Osman (2012) in his study on the soybean value chain analysis in Northern. It was reported that of 152 tomato farmers interviewed, 86 (61.4%) were illiterates and 64 (38.6%) had some form of formal education. At the distribution (assemblers, wholesalers and retailers) level in this study, 45 (75.0%) respondents had formal education while 25 (25.0%) had no form of education.

4.2.3 Major Occupation of Respondents

Table 4.1 shows that 91(75.8%) farmers interviewed had crop production as their major occupation. On the other hand, 29(24.2%) were involved in were involved in non-farming activities as their major occupation. At the distribution level of the value chain, trading their main occupation with 28(71.79%) involved in the marketing of other commodities, craftsmanship, and farming of perennial and annual crops as their main occupation. The retailers involved in selling tomato are 25(80.6%) females and 6(19.4%) males of the retailers engage in other activities. This agrees with earlier reports by Robinson &Kolavalli (2010) who reported that tomato there have no exclusive traders. Because the harvesting of tomato is not a year-long activity, most of these farmers grow other crops as their major activity.

Table 4.1: Respondents Characteristics

Respondents	Respondents' Characteristics	Frequency	Percentage
	Gender		
	Male	87	72.5
Primary Producers	Female	33	27.5
	Education		
	Formal	83	69.17
	No Formal	37	30.83
	Major Occupation		
	Crop Production	91	75.8
	Other	29	24. 2
	Gender	13	33.3
	Male	26	66.6
Distributors	Female		
	Education		
	Formal	22	56.4
	No Formal	17	43.6
	Major Occupation		
	Trading	28	71.79
	Other	11	28.21
	Gender		
	Male	5	16.13
Retailers	Female	26	83.87
	Education		
	Formal	23	74.2
	No Formal	8	25.8
	Major Occupation		
	Trading	25	80.6
	Other	6	19.4
	Gender		
Consumers	Male	7	35.0
	Female	13	65.0
	Major Occupation		
	Farming	2	10.0
	Wage employment	14	70.0
	Other	4	20.0

Source: Field Survey, 2017

4.3 Mapping the actors, their function and existing linkages.

Figure 4.2 presents a background of the industry, framework, the channel of operation, and the linkages between various actors involved in the activities of the tomato value chain. It begins with the supply of inputs by input suppliers. Regarding the delivery of inputs suppliers MOFA, Development partners and Cooperatives are the main actors responsible for the supply of such inputs in the study area.

Tomato production in Kpone-Katamanso District is a small holder scale industry with majority of producers (72.5%) of whom are males. The activities at the production segment involve; preparing the land for crop growth, sowing the seedlings and fertilization, pest and disease management and harvesting. Primary producers carry out the activities on the farm. On the other hand, members of the family are engaged to work on the land to expedite production activities on farm. Also farm hands are engaged when need be in other to reduce cost.

Tomato in Kpone-Katamanso has two planting seasons in a given year. In parts of Michelle Camp and Kpone at Sea some farmers are able to produce all year round with the help of the irrigation dam.

The assembling, wholesaling and retailing of the fresh tomato is predominantly done by women. The women largely dominate the sector. Trade association among members are also very effective in the district. The Kpone-Katamanso tomato wholesalers have an association which is led by the community “queen”. The role of a queen was observed as the figure head who is empowered by her peers to lead; she sets the agenda of the overall activities by the market women and dictate the pace of entry or exit of a member from the group.

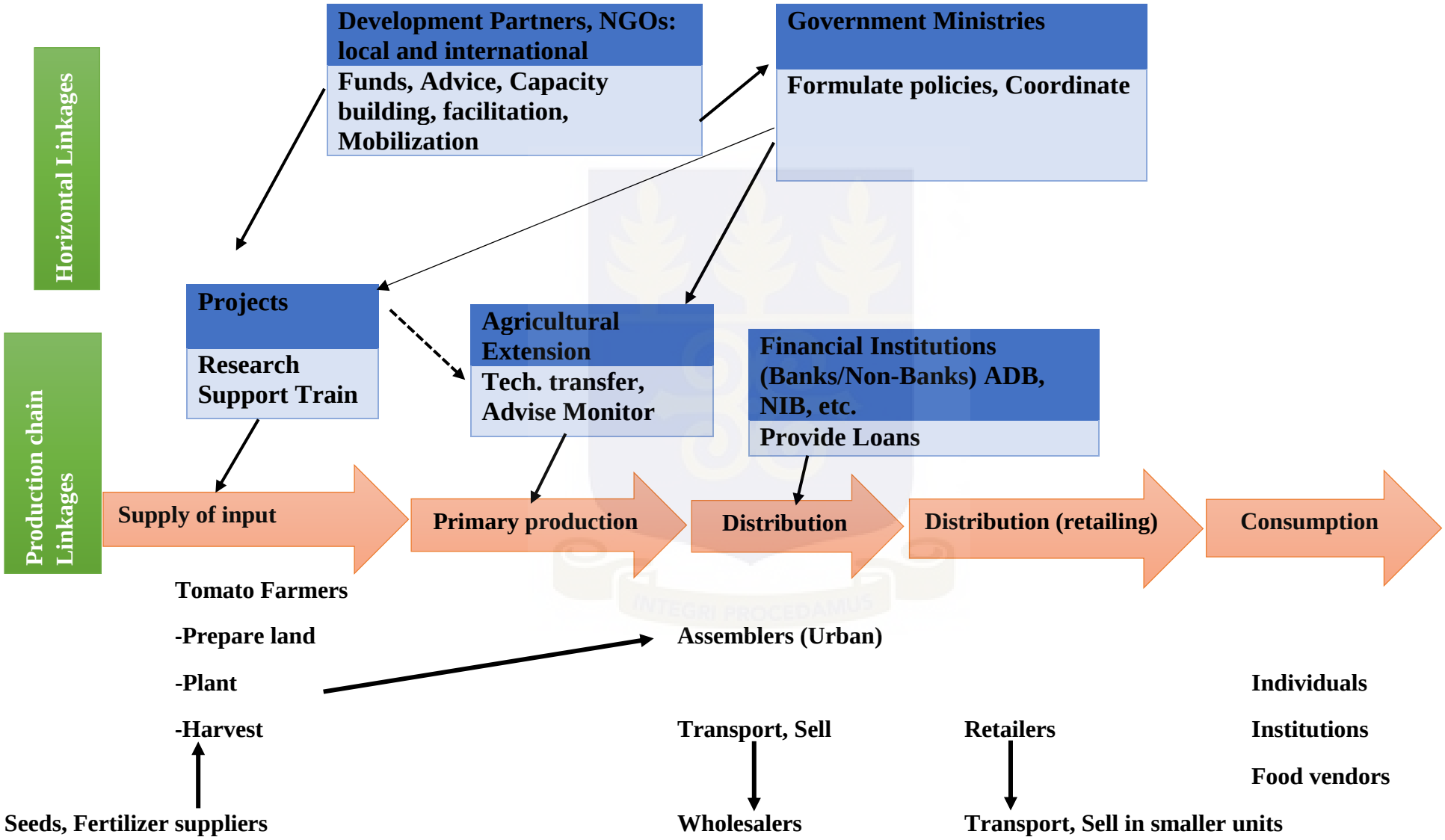
Fresh tomato is sold both within and outside the district. They are either traded on farm or at the local market either at the district or surrounding districts within the metropolis. Aside playing a significant role as a middleman at the market, some wholesalers buy tomato directly from farmers located in production areas and supply to consumers. They are individual entrepreneurs and responsible for transport costs as well as other related costs to the marketing function.

Transaction in the market are mainly based on informal agreements and ethical consideration such as trust and sincerity. The study revealed that, some wholesalers already have an agreement in principle in place to buy tomatoes from farmers.

The institutions and organisations whose activities are not directly involved in the chain but play a significant role in developing an effective framework for the industry. The Ministry of Food and Agriculture together with agricultural related Non-Governmental organisations play an effective role in ensuring that right agronomic practices are administered at all times in the farm. This is rooted in believe that with all the necessary conditions met the country will be on the path to achieving domestic consumption and also lead the path to achieving national food security. All the activities of these development organisations are firmly entrenched in the Government of Ghana's public policy formulation.

The MOFA district officers together with organizations like Yara have been organizing technical advice to farmers in order to scale up production for sufficient output. In a place like Michelle Camp individual farmers come together as groups and call on MOFA's extension officer to offer regular training on agronomic practices. This is usually done before and after the planting season.

Fig 4.1: Value chain mapping



4.3.1 The Input-Output Structure of the Tomato Value Chain

Figure 4.2 presents the entire input- output structure of the tomato value chain that brings the raw tomato from the tomato farmer until it is sold to the final consumer. It presents the structure, flow of goods and services as well as the relationships or linkages existing between the actors in the tomato value chain. The input of the farmer at the beginning of his tomato activities is tomato seedlings and his output at the end of harvesting is raw tomato. The output of the farmer, becomes the input of the assembler and wholesaler. There is no transformation of tomato by this actor in the value chain, thus their output remains the same. The output of the assembler and wholesaler becomes the input of the retailer since there is no processor in the tomato value chain at Kpone. There is no transformation at this stage, thus the output of the retailer remains the same.

Fig 4.2 Mapping of the input-output structure of the tomato value chain.

Input	Tomato Seeds	Tomato Seedlings	Raw Tomato	Raw Tomato
Out-put	Tomato Seedlings	Raw Tomato	Raw Tomato	Raw Tomato

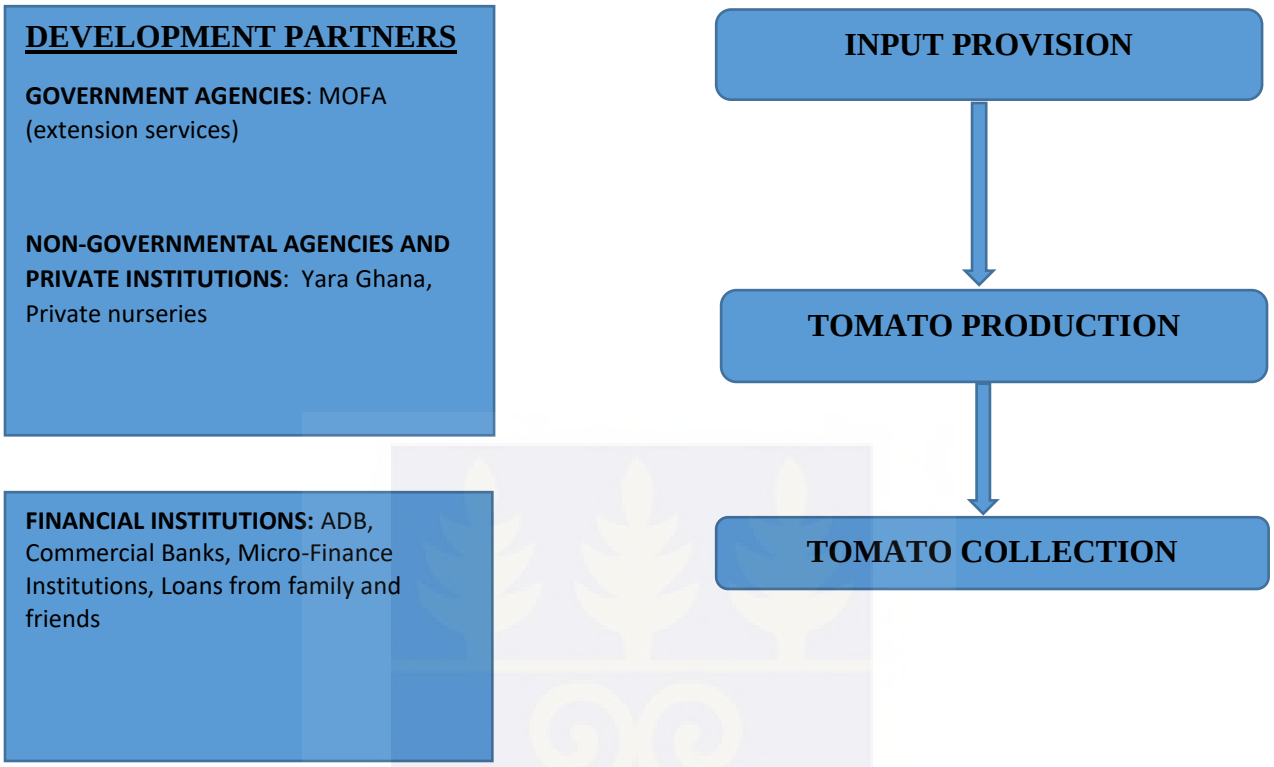
Source: Field survey data, 2013

4.3.2 Mapping Services in the Value Chain

Figure 4.3 presents the institutions and organizations (both government and non-governmental) whose activities influence performance and efficiency of the chain. These institutions are the Ministry of Food and Agriculture (MOFA), Yara Ghana and financial institutions. The Ministry of Food and Agriculture in the district provide extension services to the vegetable farmers in the Kpone-Katamanso district of Ghana. The MOFA extension officer in the district interviewed reported that, training and workshops are held occasionally for farmers to keep them abreast with agronomic practices in tomato production. These trainings and workshops are part of MOFA's assistance to increasing tomato production in Ghana are held at no cost to the farmers. The Yara Ghana Agronomic Officer organised training about how the right amount of fertilizer can be applied to enhance productivity.

Financial services also play an important role in value chains. Credit facilities enable an actor to procure primary inputs and for capital investments among others. As many as 106 (88.33%) tomato farmers did not get credit from financial institutions. However, 32 (82.05%) initial distributors and 26(83.87%) retailers are able to access credit facilities from the financial institutions. Recurring reasons among the farmers for not sourcing credit from such institutions were the unfavorable credit terms and the high interest rates on credit facilities. The other sources of finance were personal savings, friends and relatives.

Fig 4.3: Support services in the tomato value chain



Source: Field data, 2017

4.3.3 Input Supplier

The input dealers supply inputs such as planting materials (seedlings), fertilizers, pesticides among others to the tomato farmer to assist in the production stage of the value chain. The results of this study presented in table 4.2 indicated that 98 (81.67%) farmers purchased their tomato seedlings while 13 (10.83%) nurse seeds from their previous harvest. Again, 5 (4.17%) of them received seedlings as gifts from relatives, NGO's, and other farmers and 4 (3.33%) received theirs from the Ministry of Food and Agriculture (MOFA).

There are three central private tomato nurseries in the district namely; namely the one at Michelle Camp, Appolonia and Kpone at Sea.

Table 4.2: Source of planting materials (seedlings) of tomato farmers

Source	Number of Seedlings	Percent of Seedlings
Purchased	98	81.67%
Previous Harvest	13	10.83%
Gift	5	4.17%
MOFA	4	3.33%

Source: Field Survey data, 2017

4.3.4 Tomato Farmer

Tomato production is an activity in the Kpone-Katamanso District of Ghana which is dominated by 87 (72.5%) men while women make up 33 (27.5%). Activities under tomato production include land preparation which involves clearing the land, planting, application of weedicide and harvesting.

From table 4.3, average tomato farm size of the representative sample of the three districts in the Kpone-Katamanso district was 0.12 hectares on average for a farmer. This estimate means that the area under tomato production is decreasing. This is because the average farm size of vegetable farm for smallholder in the urban/peri-urban areas in Ghana is 0.18 hectares (MOFA, 2011). Table 4.4 present the cost of producing 5kg of tomato in the Kpone-Katamanso district. The total cost of production is the summation of the total variable and fixed costs. Results from the table shows that the cost of producing 5 kilograms of tomato is higher in Kpone at Sea (GHS 9.77) than Appolonia (GHS 8.47) and Michelle Camp (GHS 8.13) respectively. Table 4.5 presents the sources of finance for tomato production in the Kpone-Katamanso District of Ghana. As many as 92 (76.67%) farmers personally finance their tomato activities and 75 (62.5%) determined their raw

tomato prices based on the prices set by the raw tomato distributors in the tomato market per season. Results from the study revealed that 31 (25.83%) farmers belonged to farmer associations while 89 (74.17%) did not belong to any. These results contradict the findings of Robinson and Kolavalli (2010) which reported that 68% of smallholder tomato farmers in Ghana are organized into associations. Farmers reported that prices for raw tomato each season were set based on factors such as the cost of production, profit margins, prices the raw tomato market offers among others. As many as 74 (61.67%) farmers reported that prices of raw tomato were determined based on the prices the assemblers and wholesalers offered in the market. This is consistent with earlier findings by Robinson and Kolavalli (2010) who reported that raw tomato prices vary widely from place to place and within the same season.

Table 4.3: Average tomato farm size

Study Area	Farm Size(hectares)
Michelle Camp	0.06
Kpone at Sea	0.20
Appolonia	0.10
Average Farm Size	0.12

Source: Field Survey data, 2017

Table 4.4: **Average Cost of Tomato Production (5 kg)**

Study Area	No. of Farmers	Variable Cost (GHS)	Fixed Cost (GHS)	Total Cost (GHS)
Appolonia	40	5.20	3.27	8.47
Kpone at Sea	40	5.45	4.32	9.77
Michelle Camp	40	5.12	3.01	8.13
Total	**120**	**5.26**	**3.53**	**8.79**

Source: Field Survey data, 2017

Table 4.5 Source of Finance for Tomato Production

Sources	Frequency	Percent
Commercial Banks	3	2.50
Micro Finance Institutions	12	10.0
Friends/Relatives	13	10.83
Personal Savings	92	76.67
Total	**120**	**100**

Source: Field Survey data, 2017

4.3.5 Raw Tomato Distributor (Assemblers, Wholesalers)

This study revealed that the raw tomato distribution chain in the Kpone-Katamanso District of Ghana is made up of middlemen comprising local assemblers, local traders and wholesalers (market queens) who deal in raw tomato. The market is dominated mostly by 26 (66.6%) women and 13 (43.33%) men.

Raw Tomato from the district are marketed both within and outside the district. Transactions are either between the farmer and the distributor at the farm gate, local market or the farmer directly brings his produce to the assemblers' collection point where it is weighed and priced. Depending

on the nature of the relationship between traders, transactions are mainly based on verbal contracts. Results from the study indicated that of the 39 assemblers and wholesalers interviewed, 27 (69.23%) had contracts (verbal, written) with farmers while 12 (30.77%) had no contracts. The study revealed that the distributors with contracts were usually pre-financed unlike those who had no contract.

Table 4.8 presents the cost of tomato distribution in the three communities in the district. Further calculations from the table indicate that raw tomato distribution activities has the highest profit of GHS 1.05 in the Kpone at Sea than Appolonia with GHS 0.65 and Michelle with GHS 0.56 on every 5 kilogram of raw tomato.

From table 4.9, 7 (9.1%) of the respondents indicated that they determine their selling price of raw tomato based on prices the market offers, thus they do not influence the price in any way. According to 42 (54.5%) assemblers and wholesalers of raw tomato, prices are set with the profit they intend to accrue as a point of focus. Finally, 28 (36.4%) indicated that raw prices are set with reference to the total expenses incurred in assembling and distribution. Thus, these results reflect that, 70 (90.9%) of tomato distributors set their own raw tomato prices.

From table 4.7, 6 (15.38%) of the respondents indicated that they determine their selling price of raw tomato based on prices the market offers, thus they do not influence the price in any way. According to 21 (53.85%) assemblers and wholesalers of raw tomato, prices are set with the profit they intend to accrue as a point of focus. Finally, 9 (30.77%) indicated that prices are set with reference to the total expenses incurred in assembling and distribution. Thus, these results reflect that, 33 (84.62%) of raw tomato distributors set their own raw tomato prices.

Table 4.6 Average Cost of Raw Tomato Distribution (5kg)

Area of Study	No. of Distributors	Variable Cost GHS	Fixed Cost GHS	Total Cost GHS
Kpone at Sea	16	11.01	0.58	11.59
Appolonia	14	10.49	0.43	10.92
Michelle Camp	9	10.15	0.19	10.34
Total	**39**	**10.55**	**1.21**	**10.95**

Source: Field Survey Data, 2017

Table 4.7 Determination of Raw Tomato Prices

Factors	Frequency	Percent
Profit Margin	12	30.77
Market Offer	6	15.38
Cost of Procurement & Distribution	21	53.85
Total	**39**	**100**

Source: Field Survey Data, 2017

4.3.6 Retailer of Raw Tomato

Retailing of fresh tomato is undertaken by both male and female. The findings of this study indicate that 5 (16.13%) retailers were males and 26 (83.87%) were females. These actors acquire products directly from the market queen. The results of this study revealed that retailers sell 100% of their raw tomato to consumers. From table 4.9, GHS 4.50 is the profit accrued in retailing raw tomato. Prices of raw tomato are set based on the cost of procurement from wholesalers.

Table 4.8: Average Cost of Raw Tomato Retailing (5kg)

Area of Study	No. of Retailers	Variable Cost (GHS)	Fixed Cost (GHS)	Total Cost (GHS)
Kpone at Sea	16	12.36	_	12.36
Appolonia	9	12.36	_	12.36
Michelle Camp	6	12.36	_	12.36
Total	**31**	**12.36**	_	**12.36**

Source: Field Survey Data, 2017

4.3.8 Costs and Returns Estimation

As presented earlier in figure 4.2, the input-output structure of all the actors in the tomato value chain is not uniform. Thus, it is important to correctly calculate the financial returns for all the actors along the chain on every cedi invested. Therefore, the standard unit employed is 5 kilograms of raw tomato for the farmer, assembler/ wholesaler and retailers. From table 4.9, the total cost of production, distributing and retailing of 5kg of raw tomato in the 2017 season for the tomato farmer was GHS 8.79, assembler and wholesaler was GHS 10.95. The total cost of retailing was GHS 12.36

The analysis considered the major outlay incurred under establishment cost, variable and fixed cost.

4.3.9 Distribution of Profit

Table 4.9 shows the estimates of the profit by the farmer, assembler/wholesaler and the retailer in the Kpone-Katamanso District of Ghana. The retailer of raw tomato accrues the highest profit of GHS 4.50 with a share of chain profit of 78.13% along the chain on every 5 kilograms of raw tomato sold. This is followed by the assemblers/wholesalers of raw tomato with a profit of GHS

0.89 and a chain profit of 15.45% and the assembler/wholesaler earned the least with GHS 0.37 and a chain profit of 6.42%. This is consistent with the findings by Robinson and Kolavalli (2010) in the analysis of the case of tomato in Ghana. They reported that producers accrue less profit and this is as a result of factors such as the size and location of their farms and the degree of farmer organizations.

The results from this study concurs with the results of Agyapong (2011) which revealed that middlemen and specifically assemblers and wholesalers of raw tomato earned more return per investment than the tomato farmers.

4.3.10 Distribution of Value added along the Tomato Value Chain

The value added by each actor in the Kpone-Katamanso District of Ghana is presented in the results of table 4.9. The results reveal that the assemblers/wholesalers add the highest value of GHS 1.79 (44.97%) on every 5 kilograms of raw tomato produced. The farmer adds a value of GHS 1.67 (41.96%) and finally the retailer adds GHS 0.52 (13.07%) on every 5 kilograms of raw tomato sold. This contradicts with the results of a study by Kuwornu *et al*., (2013), on the financial viability, value addition and constraint analyses of certified organic pineapple production and marketing in the Eastern and Central Regions of Ghana. It was realized in that study that the producer of fresh pineapple adds the highest value per metric tonne than the other actors in the value chain.

4.3.11 Return on Investment (ROI) Distribution

Table 4.10 can be concluded that, the tomato farmer earns the least in terms of profit (GHS 0.037) and Return on Investment (GHS 0.0042) compared to distributors and the rest of the actors. Again, comparatively the farmer uses a lot more days in generating a least ROID of GHS 0.00012. This

result concurs with findings by African Cashew Initiative, ACi (2010) on the value chain analysis of cashew in Ghana. It was reported that margins or dividends accrued by cashew farmers is reduced due to the presence of middlemen along the chain. The ROID for the raw tomato assemblers/wholesalers and raw tomato retailers are GHS 0.00022 and GHS 0.0009. Therefore, raw tomato earns the least profit margin in the tomato industry in the Kpone-Katamanso District of Ghana.

Table 4.9: Calculation of Costs, Revenues, Profits and Margins along the Chain

Value Chain Actor	**Costs**					**Revenue**	**Profits**		**Margins**	
	Unit	Unit Total Cost	Cost of Primary Input	Added Unit Costs	% Added Unit Costs	Unit Price	Unit Profit	%of Chain Profit	Unit Gross Margin	% of Gross Margin
Tomato Farmers	5kg	8.79	7.12	1.67	41.96	9.16	0.37	6.42	2.04	20.94
Distributors (Assemblers, Market Queens)	5kg	10.95	9.16	1.79	44.97	11.84	0.89	15.45	2.68	27.52
Retailers	5kg	12.36	11.84	0.52	13.07	16.87	4.50	78.13	5.02	51.54
Total				**3.98**	100		**5.78**	100	**9.75**	100
	Added Unit cost refers to the added cost at each stage of production net of the procurement from the previous stage									

Source: Computed from Field Survey, 2017

Table 4.10: Return on Investment

Actor	Unit Profit	Unit Total Cost	Return on Investment (ROI)	Days	ROID
Tomato Farmer	0.37	8.79	**0.042**	365	**0.0001**
Distributors (Assembler, Wholesaler)	0.89	10.95	**0.081**	365	**0.0002**
Retailers	4.50	12.36	**0.364**	365	**0.0009**

Source: Field Survey Data, 2017

4.4 Governance Structure

The percentages indicate the level of power commanded as "influence and importance" the actors exercise in assessing the governance with a noticeable control over the others.

The percentage level determines the more power a particular group of actors command, in terms of governance along the chain. From table 4.11, it is apparent that the farmer's exhibit of noticeable power in terms of profit made along the chain is 24% that of distributor's profit stands at 35% while the retailer is entitled to 41%. Therefore, it can be concluded that retailers are the actors who command a noticeable control over others along the chain.

This is mainly due to organisation since the structures at this level of the chain is held in high esteem and every meeting regulations are enforced by members as such for the growth and prospect of their product sales on the market. The powers that be in this segment of the chain ensures that information flow is paramount.

The data showed that a higher number of distributors (84%) belonged to one particular association or the other. This makes sharing of information easier amongst themselves. Information such as prices, the source of demand and supply improves their position compared to other farmers.

Farmers were surveyed to ascertain where they access information and 62% said they get information from middlemen or buyers, the remaining 38% get information from association heads and extension officers.

According to Peppelenbos (2005), this organizational strength can be attributed to the typical funnel structure of the Ghanaian food supply system. The smallest group which are the distributors are more able to build organizational power and dominate the chain. Hence, no group is better able

to insulate itself against competition like the distributors by controlling entry and exit into their cooperative organisations.

Findings show that farmers have no influence in terms of power play. While in the trade, a new entrant needs permission and activities are regulated by the queen, no permission needs to be sought before one can enter into farming in the district.

Also, with regards to bargaining power, it is evident from the field study that they do not seek market outlets. Majority of them wait for traders to come to their site thus remaining unaware of market prices.

Findings show that apart from a select handful of farmers (16%) who sell tomato in the wholesale market, majority sell (70%) sell their tomato on farm and a fewer 14% sell in the local market within the community. These results are consistent with Owusu-Adjei (2017). These results also concur with reports by Fitzpatrick (2011) and Boillereau and Adam (2007). They concluded that the cashew chain in Africa is a buyer driven chain where buyers and traders govern the chain by setting rules that others follow.

Table 4.11: Results of the Scoring Exercise

INDICATORS	Producers (%)	Distributors (Market queens & assemblers) %	Retailers (%)
Share of Profit	24	35	41
Bargaining Power	18	38	44
Information Concentration	23	36	41
Protection from Competition	0	78	22

Source: Field Survey Data, 2017

4.5 Factors Influencing the Purchasing of Raw Tomato

To enable farmers to effectively produce a product that meets the satisfaction of consumers in the final markets, consumers of tomato were asked to evaluate the importance they place on the tomato requirements. Table 4.12 presents the responses of consumers of raw tomato to the factors that influence their purchase. All the respondents interviewed responded to considering factors such as taste and nutritional component. The colour of the tomato was considered by 16 (85.0%) consumers. Availability and proximity also constitute a fair percentage of 11(55.0%) and 12(60.0%) respectively. Finally, 11 (55.0%) considered the price of other alternatives like tomato informing their decision to purchase tin tomato in the open market.

Table 4.12: Factors Influencing the Purchase of Raw Tomato

Factors	Frequency		Percent	
	Yes	No	Yes	No
Taste	20	-	100	-
Price	10	10	50	50
Colour	16	4	80	20
Proximity	11	9	55	45
Availability	12	8	60	40
Nutritional Component	20	-	100	-
Price Alternative	11	9	55	45

Source: Field Survey Data, 2017

4.6 Analysis of Constraints and Opportunities

4.6.1 Constraints in the Production and Distribution of Tomato

Constraints in the value chain is represented in the table 4.13. Farmers agreed with all the constraints of production. All farmers in the tomato producing communities within the three selected areas agreed to lack of credit facilities as being a constraint. This can be said to be the most pressing constraint as its highest mean score is (X=4.83) representing a 96.6% agreement. This is followed by pest and disease (X=4.82) lack of access to market information (X=4.46) seasonal fluctuation (X=3.71), highest cost of input (X=2.93) erratic rainfall (X=2.75) and poor agronomic practices (X=2.21). All the above constraints contribute directly to the issue of low productivity at the farm level. This affect the entire production system and directly or indirectly affect the whole value chain. Farmer's inability to produce in large quantities leads to inadequate supply of tomatoes which can fill in the gaps of short supply of tomatoes from other parts of the country. Hence, the rapid rise of importation of tomatoes from Burkina Faso. The above constraints are by no means unique to production in Ghana. These same constraints are in fact pervasive across crop production in Africa. Similar studies in cowpea and groundnut identified the same constraints in Senegal and Uganda respectively (Mbene, 2005; Emerging Market Group, 2008).

Unlike the production segment where lack of market information and credit facilities are regarded as constraints, they are no constraints in the marketing segments of the chain (X=1.92, X=1.81). Some traders explain that the banks have been reaching out to them throughout their agents to take a loan facility in order to enhance their trade. This readiness from the banks can be attributed to better organisation and coordination on the part of the trader association.

One constraint which stood out is Seasonal Price Fluctuation (X=4.85) with the highest mean score. Traders complain that this is due to the result of the shortage that is recorded on seasonal basis. Though, transportation from farm to market is not far but traders still believe that the fares charged are exorbitant recording a mean score of (X=4.44). However, the mean score less than 2 are not regarded as constraints to marketing.

Table 4.13: Constraint to the Production of Tomato

Constraints of Production	Means Score of Production
Lack of credit Facility	4.83
Pest and diseases	4.82
Lack of access to market information	4.46
Seasonal Price Fluctuation	3.71
Erratic rainfall	2.75
Poor agronomic practices	2.21

Source: Computed from Field data, 2017

Table 4.14: Constraints to Distribution of Tomato

Constraints to Distribution	Mean score to Distribution
Seasonal Price fluctuation	4.85
High Cost of Transportation	4.44
Unreliable source of supply	4.26
Lack of access to credit supply	1.92
Lack of access to market in formation	1.81

Source: Field Survey data, 2017

4.6.2 Opportunities in the Production and Distribution of Tomato

The data on opportunities in the various segments of the chain are presented in the table 4.15 and 4.16. All opportunities presented to the respondents in the various segments off the chain had mean score greater than 3.0 and are therefore regarded as an opportunity to these segments.

With a mean score of 4.80, it informs us that tomato is an important employment sector since there is a ready market for your produce which accounted for a mean score (X=4.98). Both farmers and distributors agreed that Production and Distribution serve us as an employment sector them (table 4.15 and 4.16).

Farmers believe that increasing use of Tomato is as a result of the multiple use of the vegetable in household and commercial use which continues to drive the growth of the tomato value chain in the district.

Also, due to increasing support from development organisations (X=3.95) it is obvious that if the sector continues to benefit from such growth it will increasingly lead to opportunities like increasing employment in the distribution sector of the value chain (X=4.81)

The contribution of the sector to achieving vegetable food security (X=4.31) is very significant since tomato is a staple vegetable that is consumed in every home across the country. This will in the long run contribute to Ghana's export of tomato to other West African countries within the sub-region.

Availability of ready market (X=4.98) for tomato producers is an indicative sign that tomato is regarded highly as a staple vegetable and its production level must increase in the Kpone-Katamanso District and by extension the whole country at large.

Lastly, existence of trade association (X=4.85) which is gaining root and momentum if encouraged can go a long way to encourage a fair trade of raw tomato in district which will benefit farmers, distributors (assemblers and wholesalers) and retailers by improving their levels of income and value addition at each stage of the chain

Table 4.15: Opportunities in the Production of Tomato

Opportunities in Production	Mean Score
Employment Opportunity	4.80
Increasing use of tomato	4.72
Food Security	4.31
Availability of Suitable Land	3.97
Support from Development Organisation	3.95

Source: Field Survey Data, 2017

Table 4.16: Opportunities in the Distribution of the Tomato

Opportunities of Tomato Distribution	Mean Score
Availability of Ready Market	4.98
Existence of Traders Association	4.85
Multiple use of tomato	4.83
Employment Opportunity	4.81

Source: Field Survey Data, 2017

4.6.3 Constraints to raw tomato retailing

There was a 100% agreement among the retailers on all the constraints presents in table 4.17. The constraints agreed in raw tomato retailing are high interest rates on credit facilities, inadequate access critical market information regarding prices and seasonal price fluctuation on the retail market. The retailer revealed that because of the high cost of value added by the assembler/wholesaler, the retail prices for raw tomato were increased accordingly.

Table 4.17: Constraint to Raw Tomato Retailing

Constraint	Mean Score
High Interest Rate	5
Inadequate access to market information	5
Seasonal Price Fluctuation	5

Source: Field survey data

4.6.4 Opportunities of Raw Tomato Retailing

Opportunities to retailing of tomato are presented in table 4.18. Some retailers disagreed on receiving support from government or any other developmental or donor agencies. However, they

agreed on opportunities such as provision of employment opportunity and no specific or strict requirement in terms of labour. Also, availability of ready market and existence of trader associations are huge opportunities that presents itself to retailers in the Kpone-Katamanso district.

Table 4.18: Opportunities in Raw Tomato Retailing

Opportunities	Mean Score
Provision of employment	5.0
Availability of unskilled labour	4.8
Availability of Ready Market	5.0
Existence of Trader associations	3.7

Source: Field survey data

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The key actors along the tomato value chain are the primary producers (farmers), distributors (consisting of the assembler and wholesaler) and retailers of raw tomato in the Kpone-Katamanso District of Ghana. There are developmental partners or institutions (both governmental and non-governmental) who are not directly involved in the core activities from farm to table but their influence and activities affect the efficiency of the chain. Such governmental partners include the Ministry of Food and Agriculture while the non-governmental institutions include Yara Ghana, financial institutions and local money lenders.

The retailer of raw tomato along the tomato value chain obtains the highest profit of GHS 4.50. The assembler/wholesaler is next with GHS 0.75. The farmer earns the least profit of GHS 0.37 in the tomato value chain. However, the highest added unit cost, GHS 1.79 was added by the assembler/wholesaler followed by the farmer GHS 1.67 and the retailer GHS 0.52 respectively.

The wholesalers are the dominant or the lead actors in the chain. They set their own conditions under which they operate in tomato activities with the other actors. Such conditions are setting the prices at which they purchase tomato and quantities they require.

From the results and discussion on constraints, the major recurring issues such as the high cost of inputs, high interest rates on credit facilities, weak associations, and inadequate access to current market information were regarded as constraints in the value chain at all levels.

5.2 Conclusion

Retailers of tomato in the Kpone-Katamanso District were dominant. They organise their activities and link up with farmers and distributors to complete the value chain. Their maximization of profit from the chain due to well coordination of their activities. The lack of fair trade and robust agreement in principle which lacks contractual merit implies that the actors cannot be competitive on the national and international market.

However, there was a positive value addition at each stage of the tomato value chain. Each actor had a positive return on investment. This implies that tomato value chain can be used as a means of employment to many in the district to drive out poverty.

The recurring constraints of tomato activities for all the actors are lack of credit facilities, pest and disease, seasonal price fluctuation. Therefore, it can be concluded that the tomato sector is plagued with specific problems irrespective of how well the sector has been developed. Ready market, provision of employment, trade association among others were regarded as opportunities from farm to table. An increase in demand for tomato is therefore relatively proportional to an increase in growth rate of the sector.

5.3 Policy Recommendation

From the study, it was found that farmers had the least returns on investment per day; to help increase their profit margins, government should fashion out a sensitization programme that will provide farmers with information on how to reduce expenditure.

For farmers to increase their profit margin along the chain, they should have a well-organised cooperative body that will constantly inform them about the market value of their on-farm produce.

The cooperative body should liaise with District MOFA Office which gather data about the market pricing of tomato.

In commercialization, MOFA should assist farmers to adopt off season farming using the available small-scale irrigation scheme. This will increase productivity and ensure continuous supply of fresh tomato in the market. The Ministry should make this an utmost priority to enhance the efficiency and productivity of the sector by rolling out effective irrigation schemes in the tomato growing areas in the district.

Non-governmental organisations concerned with food security within the country can support the tomato sector in Kpone-Katamanso in diverse ways to help reduce poverty in the country. For instance, they could collaborate with financial institutions to help farmers by offering a loan scheme to these farmers which will increase their productivity, profitability and sustainability.

MOFA with well-coordinated timetable can engage FBO's and other tomato trade unions to enhance the behavioral systems they have in place. This will enable them to empower the actors to access information regardless of the governance system in place since information privy to all the actors cannot be stifled by the wholesalers along the chain.

REFERENCES

Abiba, Yayah (2014). "*Value Chain Analysis of Cashew in the Brong Ahafo Region of Ghana". A Master's thesis submitted to the Department of Agricultural Economics and Agribusiness, College of Agriculture and Consumer Sciences, University of Ghana, Page 20.*

ACDI/VOCA (2014). *Annual country specific report*, Ghana Advance I. Pg 1-19.

ACi, (2010). *A value Chain Analysis of the Cashew Sector in Ghana*. Germany: African Cashew initiative. Deutsche Gesellschaft Fur Technische Zusammenarbeit GmbH (GTZ). Pg 8-35.

Adazabra, A. N., Appiah – Kubi, K., & Bamford, S. A. (2013). Multielement analysis of fresh tomatoes produced at the Tono irrigation scheme by instrumental neutron activation analysis. *International Journal of Scientific & Engineering Research,* 4(8), 880-884.

Adebooye, O. C., Ajadi, S. O., & Fagbohun, A. B. (2006). *An accurate mathematical formula for estimating plant population in a four-dimensional field of sole crop*. Journal of Agronomy, 5(2), 289-292. DOI: 10.3923/ja.2006.289.292

Adu-Dapaah, H. K., & Oppong-Konadu, E. Y. (2002). Tomato production in four major tomato growing districts in Ghana: Farming practices and production constraints. *Ghana journal of agricultural science.*

Agyapong, G. (2011). "*Analysis of value addition and equity in the pineapple value chains in the Akuapim South Municipality of Ghana". A Master's thesis submitted to the Department of Agricultural Economics and Agribusiness, College of Agriculture and Consumer Sciences, University of Ghana, Legon*. Pg. 35-50.

Austin, J.E (1992). *Agro- industrial Project Analysis*. Critical Design Factors. The Johns Hopkins University, Press, London.

Babu, D., & Verma, N. K. (2010). Value Chains of Milk and Milk Products in Organised Sector of Tamil Nadu - A Comparative Analysis. *Agricultural Economics Research Review*. Vol 23 (*Conference number*), Pg 482- 486.

Beamon, B. M. (1998). Supply chain design and analysis. Models and methods. *International journal of production economics*, 55(3), 281-294.

Biederlack, L., & Rivers, J. (2009). *Comprehensive Food Security & Vulnerability Analysis* (CFSVA) Ghramme, VAM Food Security Analysis. *United Nations World Food Programme, Rome.*

Birachi, E., Karume, K., Kyamuhangire, W., Chiuri, W., Mugabo, J., Tumwesigye, S.Kamugisha, R. (2010). Expanding Market Access and Value Addition in Selected Agricultural Value Chains; the role of IAR4D in the Lake Kivu Pilot Learning Silo. *African Journal of Agricultural and Resource Economics.* Vol 8 No. 3, Pg 135 -144.

Boillereau, N., & Adam, B. (2007). *Cashew Marketing and Consumption in West Africa: Current Status and Opportunities.* West Africa Trade Hub Technical Report. USAID, No. 22, p. 134.

Bortey, H. M. (2010). *Quality of farmer-saved tomato (Lycopersicum esculentum mill.) Seeds and its effect on fruit yield in Ghana* (Unpublished master's dissertation). Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Bratianu, P., & Schwontkowski, D. (2013). *How to benefit from everyday herbs – A beginner's guide to homemade natural herbal remedies for common ailments and good health*. Simple Media works.

Brown, S., J. Beassant & R. Lamming (2000). *Strategic Operations Management.* Oxford: Butterworth Heinemann.

Bull, D. (1989). *A growing problem: Pesticide and the third world poor farmers.* New York, NY: Oxford Press.

Cox, A., Ireland, P., Lonsdale, C., Sanderson, J., & Watson, G. (2002). *Supply chains, markets and power*: mapping buyer and supplier power regimes, 2002.

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

Dekker, H. C. (2003). Value Chain analysis in interfirm relationships: a field study. *Management Accounting Research 14. www.elsevier.com/locate/mar*, Pg 1-19.

Owusu-Adjei, Richard Baah-Mintah, and Baba Salifu, *"Analysis of the Groundnut Value Chain in Ghana." World Journal of Agricultural Research,* vol. 5, no. 3 (2017): 177-188. doi: 10.12691/wjar-5-3-8.

Emerging Market Group (2008). *Stabilization-driven value chain analysis of rice, groundnuts and maize in Northern Uganda*. A report submitted to USAID Uganda. Kampala.

FAO (2005a): EASYPol. On-line resource material s for policy making. Analytical tools. Module 043. Commodity Chain Analysis. *Constructing the Commodity Chain, Functional Analysis and Flow Charts* www.fao.org/docs/up/easypo l/330/cca_043EN.pdf (accessed: November, 2007)

Fitzpatrick, J. (2011). *Competitiveness of the African Cashew Sector.* Eschborn: Deutsche Gesellschaft Fur Technische Zusammenarbeit GmbH (GTZ), African Cashew initiative.

Foreign Investment Advisory Service (FIAS). (2007). Moving Toward Competitiveness: A Value Chain Approach. *The World Bank Group*.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). *The governance of global value chains*. Review of international political economy, 12(1), 78-104.

Gereffi, G., & Fernandez-Stark, K. (2011). Global Value Chain Analysis: A Primer. *Center on Globalization Governance and Competitiveness (CGGC). Durham, North Carolina,* USA., 8-15.

Ghana, M. (2007). Food and Agriculture Sector Development Policy (FASDEP II). Accra, Ghana.

Ghana Statistical Services, GSS, (2000a), "*Ghana Living Standards Survey: report of the fourth round (GLSS 4*)," Accra.

Gilbert, C. L., 2006. *Value chain analysis and market power in commodity processing with application to the cocoa and coffee sectors*. Presentation Paper for the FAO Workshop on Governance, Coordination and Distribution along Commodity Value Chains. April, Rome, Italy, FAO

Growth and Poverty Reduction Strategy (GPRS II) 2006-2009 (2006). National Development Planning Commission (NDPC)

GTZ (2007): Value Links Manual. The Methodology of Value Chain Promotion, Eschborn. http://www.value-links.de/manual/distributor.html (accessed: December 2007)

Haruna, I., Nkegbe, P. K., & Ustarz, Y. (2012). Structure, conduct and performance of tomato marketing in Ghana. *Journal of Economics and Sustainable Development*, 3(10), 156-163.

Hinson, R. (2010). The Value Chain and e-business in exporting: Case studies from Ghana's nontraditional export (NTE) sector. *Telematica and Informatics 27. www.elsevier.com/locate/tele., Pg 325 -342.*

Humphrey, J., 2006. *Global value chains in the agri-food sector*. Working Paper on Global Value Chains and Production Networks: Prospects for Upgrading by Developing Countries. Institute of Development Studies University of Sussex, Brighton.

International Food Policy and Research Institute (IFPRI) (2010). *The economic importance of agriculture for sustainable development and poverty reduction: A case study of Ghana*. Washington, DC: IFPRI.

Irawati, R. H., Melati, M., & Purnomo, H. (2009). Analysis of value chain governance: scenarios to develop small-scale furniture producers. *Journal Manajemen Hutan Tropika*, 15(3), 96101.

Joseph, Korley K (2014). "*An analysis of small-holder Pig Value Chain in Kassena Nankana East District of Ghana". A Master's thesis submitted to the Department of Agricultural Economics and Agribusiness, College of Agriculture and Consumer Sciences, University of Ghana*, Page 16-22

Kaplinsky, R. and M. Morris (2000). *A handbook for Value Chain Research.* Bellagio; IDRC

KIT, I. (2008). Trading up: Building cooperation between farmers and traders in Africa. Amsterdam (The Netherlands): KIT—*Royal Tropical Institute/Nairobi (Kenya): IIRR— International Institute of Rural Reconstruction.*

Koenig, T., Leader, T., Blatt, J., Brakel, K., Kloss, K., Woellert, F., & Beckmann, G. (2008). *Market-driven development and poverty reduction: A value chain analysis of fresh vegetables in Kenya and Printing.*

Kumar, R., Alam, K., Krishna, V. V., & K., S. (2012). Value Chain Analysis of Maize Seed Delivery System in Public and Private Sectors in Bilhar. *Agricultural Economics Research Review. Vol.25 (Conference number),* Pg 387 - 398.

Kuwornu, J. K., Nafeo, A. A., & Yaw, B. O. (2013). Financial viability, value addition and constraint analyses of certified organic pineapple production and marketing in Ghana. *African Journal of Basic & Applied Sciences*, 5(1), 12-24.

KwaZulu-Natal Department of Agriculture and Environmental Affairs (2003). *Vegetable production in KwaZulu-Natal: Tomato. Retrieved from http://www.kzndard.gov.za/Portals/0/Horticulture/Veg%20prod/tomato.pdf*

Liang, Q., Hendrikse, G. W., & Huang, Z. (2010). Value Added and governance structure: Evidence from the poor industry in China's Zhejiang province. "*Institutions in Transition- Challenges for New Modes of Governance" IAMO Forum*., (pp. 2 - 8). Halle (Saale), Germany.

Likert, R. (1932). *A Technique for the Measurement of attitudes*. New York: Archives of Psychology. pg 1-53.

Lundy, M., Becx, G., Zamierowski, N., & Amrein, A. (2012). Link Methodology: *A Participatory Guide to Business Models that Link Smallholders to Markets.* International Center for Tropical Agriculture, CIAT. Publication No.380. Pg 22-36.

Masters, W. A., Ghosh, S., Daniels, J. A., & Sarpong, D. B. (2013). *Comprehensive Assessment of the Peanut Value Chain for Nutrition Improvement in Ghana.* Gerald J. and Dorothy R. Friedman School of Nutrition, Science and Policy. Pg 22 - 50.

Mbene D. F. (2005). *Investigation of key Aspects of Successful Marketing of Cowpea in Senegal.* Phd Thesis in Department of Agricultural Economics, University of the Free State, Bloemfontein. South Arica

McCormick and Schmitz (2000). *Manual for Value Chain Research on Homeworkers in the garment Industry.* Nairobi and Brighton. Institute for Development Studies, University of Nairobi and University of Sussex.

Meyer-Stamer, J., & Wältring, F. (2007). *Linking Value Chain Analysis and the" making Markets Work Better for the Poor" Concept.* Mesopartner.

M4P, (2008). *Making Value Chains Work Better for the Poor: Toolbook for Practioners of Value Chain Analysis. Version 3*. Phnom Penh, Cambodia: UK Department for International Development (DFID). Agricultural Development International. Pg 7-142.

MoFA. (2007). *Status of Ghana Cashew Industry. Ministry of Food and Agriculture.* Retrieved from Retrieved from www.ghanacashewproducts.com on 20/10/2013.

Ministry of Food and Agriculture (MOFA) (2009). *Agriculture Sector Plan, 2009 2015*. Accra, Ghana.

Ministry of Food and Agriculture (MOFA) (2011). *Agriculture in Ghana: Facts and Figures (2010)*. Statistics, Research and Information Directorate (SRID), Ministry of Food and Agriculture, Ghana.

ODI (2005). Overseas Development Institute ODI and Center for Policy Analysis (CEPA) 2005. *Economic Growth in Northern Ghana Revised Report for DfID*, Accra, Ghana

Osman, D. T. (2012). "Analysis of Value Addition in Soybean Supply Chain in Northern Ghana". *A Master's thesis submitted to the Department of Agricultural Economics and Agribusiness, College of Agriculture and Consumer Sciences, University of Ghana, Legon.* Pg. 30-78.

Peppelenbos, L. (2005). Market Queens of Ghana: The Potential for Cooperation with Smallholder Farmers. *The Netherlands: KIT Royal Tropical Institute.*

Popescu, M., & Dascalu, A. (2011). Value chain analysis in quality management context. *Bulletin of the Transilvania University of Brasov. Economic Sciences. Series V, 4(2), 121.*

Porter, M. E. (2008). *Competitive advantage: Creating and sustaining superior performance.* Simon and Schuster.

Puozaa Z. F.(2015). *"Allocative Efficiency of Irrigated Tomato Production in the Upper East Region, Ghana". A Master's thesis submitted to the Department of Agricultural Economics and Agribusiness,* College of Basic and Applied Sciences, University of Ghana.

Purseglove, K. O (1979). *Tropical crops dicotyledons*. London: Longmans, pp: 199 – 237.

Redden, J. P., Mann, T., Vickers, Z., Mykerezi, E., Reicks, M., & Elsbernd, S. (2015). Serving first in isolation increases vegetable intake among elementary school children. PLoS ONE, 10(4), 1-14. doi:10.1371/journal.pone.0121283

Reddy, G. P., Murthy, M. R., & Meena, P. C. (2010). Value Chains and Retailing of Fresh Vegetables and Fruits. *Agricultural Economics Research Review. Vol. 23 (Conference number).*, Pg 455- 460.

Robinson, J. Z. E., & Kolavalli, S. L. (2010a). *The case of tomato in Ghana: Productivity* (Ghana Strategy Support Program (GSSP) Working Paper No. 19). Accra: IFPRI.

Robinson, J. Z. E., & Kolavalli, S. L. (2010b). *The case of tomato in Ghana: Marketing*. (Ghana Strategy Support Program (GSSP) Working Paper No. 20). Accra: IFPRI.

Sacco, A. (2008). Genetic mechanisms underlying tomato quality traits. *Università Degli Di Napoli Federico*, 2, 1–16

Schipmann, C. (2006). *Value Chain for a Better Integration of Smallholders to Trade. The case of Chilli in Ghana.* Master's Thesis. Humboldt University, Berlin

Schmitz, H. (2005). *Value Chain Analysis for Policy-Makers and Practitioners.* International Labour Organization, Geneva. ISBN 92-2-117738-6.

Simchi-Levi, D., Wu, S. D., & Shen, Z. M. (2004). Supply Chain Analysis and E-business: An Overview. *INTERNATIONAL SERIES IN OPERATIONS RESEARCH AND MANAGEMENT SCIENCE*, 1-12.

Srinivasan, R. (Ed.) (2010). Safer tomato production methods: A field guide for soil fertility and pest management. AVRDC – The World Vegetable Centre, Shanhua, Taiwan. *AVDRC Publication No*. 10 – 740. Pp 2 - 97.

Steduto, P., Hsiao, T. C., Fereres, E., & Raes, D. (2012). Crop yield response to water. (FAO Irrigation and Drainage Paper No. 66). Rome: FAO. UNIDO, (2009). *Agro-Value Chain Analysis and Development. The UNIDO Approach*. United Nations Industrial Development Organization, Vienna. Pg 1-37.

Tamasese, E. (2009). An Analytical Study of Selected Fruit and Vegetable Value Chains in Samoa. *All ACP Agricultural Commodities Programme (AAACP) Paper Series. No.10.*

UNIDO, (2009). *Agro-Value Chain Analysis and Development. The UNIDO Approach*. United Nations Industrial Development Organization, Vienna. Pg 1-37.

USAID, (2010). Women Empowerment in Agriculture. Feed the Future. *United States Agency for International Development. Country Report - Ghana.*

USAID, (2013). *Getting to Zero. A Discussion Paper on Ending Poverty. United States Agency for International Development Pg. 1-11*

Van den Berg, M., Marije, B., Ivan, C., Luigi, C., Nico, J., Paule, N., Laura, P., Tim, P., Dominic, S. & Van Wijk, S. (2008). *Making Value Chains Work Better for the Poor*. A Toolbook for Practitioners of Value Chain Analysis, Version 3. Making Markets Work

Verhoef, P. C. (2003). Understanding the effect of customer relationship management efforts on customer retention and customer share development. *Journal of marketing*, 67(4), 30-45.

Webber, M and P. Labaste (2007). *Using Value Chain Approaches in Agribusiness and Agriculture in Sub Saharan Africa; A methodological Guide.* J.E. Austin Associates and the World Bank, Washington DC

Will M. (2007). *Value Chain Development and Possible Approaches for Up Scaling within the Framework of FASDEP II.* A Paper Presented at a FASDEP Meeting, Accra. 30th October, 2007

World Bank (2008). *Agriculture for Development*. World Development Report, Washington

APPENDIX

UNIVERSITY OF GHANA DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS, LEGON

This study titled **VALUE CHAIN ANALYSIS OF TOMATO IN THE KPONE-KATAMANSO DISTRICT OF GHANA**, is carried out by Enoch Kumi, a graduate student at the University of Ghana, Legon in partial fulfillment of the requirements for the award of Master of Philosophy degree in Agricultural Economics. He is soliciting information for this study and need your consent. Your survey responses will solely be for academic purposes and will be highly confidential. Your support and contributions will be very much appreciated. If you have any questions about the survey or procedures, you may contact him at: ekumi005@st.ug.edu.gh or call 0246413950. Thank you.

QUESTIONNAIRES FOR PRODUCERS

Personal Data

1. District …… .
2. Community ……
3. Name of respondent ……
4. Sex……..Male =1 Female= 2
5. Age
6. Marital status …… Married =1 Single =2 Divorced =3 Widow =4 Other=……5
7. What is your level of education? ……
8. What is your main occupation? ……..

A. PRODUCTION

9. List the crops you produce and put them in the order of importance (based on your limited resources)

1. …… 2. ……..

3……... 4……..

5…… 6……..

10. Which year did you start producing tomato? .....

11. What tomato variety / varieties do you cultivate? .....

12. Which variety did you grow last season (2015/2016 cropping season)

0= local 1= improved

13. How long have you been growing this variety? .....

14. Why do you grow this variety?

.....

.....

15. Which variety(s) do consumers prefer?

.....

Codes for sources of seed; purchased =1 previous produce = 2 trader /buyer =3

Relative / friend = 4 Other (specify)…….=5

16. How did you get land for your tomato farming activities? Family land=1 Rented =2

Leased =3 1 and 2 above =4 All the above =5

17. What form (s) of labour do you use for farming activities? Family labour =1 Hired =2

Both =3

18. Where do you always obtain purchased input (e.g. fertilizer, seeds, pesticides, fungicides, weedicides)? Private input dealers= 1 MOFA =3 NGOs=4 Other (Specify)……=5

19. When the inputs listed are not supplied by the private input dealers, what then is (are) always the terms of supply? Subsidized= 1 Free=2 Contract=3 other

(specify).....

20. Are agro inputs readily accessible? Yes=1 No=2

21. Are Agro input readily available in the markets when needed Yes=1 No=2

22. What size of land did you cultivate on last year? .....

23. How would you describe your yield in tomato production over the years? Stagnant=1 Increasing=2 Decreasing=3 Fluctuating=4

24. What do you think is the reason(s) for the answer given for question (21)?

.....

.....

25. How do you acquire land for your production? Rent=1 Inheritance=2 Purchases=3 others (specify).....=4

26. How do you finance your production? : Loan from a bank=1 Own Capital=2 Borrowing from relatives or friends=3 others (specify).....=4

27. Did you take a loan for the 2013/2014 production season? Yes=1 No=2

28. If yes to question 27, how much? .....

29. At what interest rate? .....

30. Did you receive any visits from extension officer? 0= No 1=yes

31. What was/were the visit(s) about?.....

.....

.....

COSTS OF PRODUCTION LAST YEAR

Fixed Cost Inputs	**32**. Quantity (indicate unit	**33.** Unit Cost (Gh¢)	**35**. Total Cost (Gh¢)	**36.** Useful life (yrs.)
Land				
Hoes				
Cutlasses				
Others (specify)				

Variable Costs Inputs	**37.** Quantity /acreage (please indicate units)	**38**. Cost per unit (Gh¢)	**39.** Total Cost (Gh¢)
Ploughing /ridging (tractor service)			
Seed			
Stalking			
Weedicide			
Fertilizer			
Insecticide			
Manure			
Fuel Cost			
Maintenance Cost			
Others (specify)			

Variable Cost Inputs (Labour in Man days)

Inputs (labour man days **)**	**40.** Family (Quantity)	**41.** Hired (Quantity)	**42.** Family (Unit Cost)	**43.** Hired (Cost)
Land Clearing				

Sowing				
Fertilizer Application				
Manure application				
Weeding (1st weeding)				
Watering				
Harvesting (number of days used)				
Bagging				
Transportation (to market)				
Others (specify)				

How many boxes sold right after harvesting	Price per box	How many (boxes) did you store/	Length of storage	Price per box sold

A. Marketing and Distribution

44. Where do you sell your tomato? On the farm = 1 Farmer's residence =2 Local market =3

45. Are some customer groups better than others in terms of your revenue growth? Yes =1

No. =2 if yes which ones? .....

46. If tomatoes are sold outside farmer's residence what is the marketing cost?

Marketing Activity	Cost
Transport charge tomato from farm to market	
T&T from community to market	
Taxes in market	
Others……	

47. Price range last year, what is the lowest and highest price you ever received from sales

	Lowest			Highest		
	Price	Units	When	Price	Units	When
Fresh Tomato						

E . POWER RELATION

What is the level of your "importance and influence "in the tomato value chain in regards to the following indicators (enumerator to note; let respondent distribute the 10 chits on labeled card (3 cards representing producers, processors and distributors)

	48. Producers	49. Distributors(Market Queens)	50. Retailers
Profit			
Bargaining power			
Protection from competition			

Information concentration			

51. List 3 major things you use income from the sale of tomatoes for (in order of importance in terms of well-being)?

1st ……

2nd …….

3rd ……..

F. OTHER SUPPORT SERVICES

52. Do you have any kind of saving account Yes = 1 No =2

55. How do you pay back loan? In cash =1 in kind =2 others (specify)…….=3

56. Do government policies for the sector affect your operation? Yes =1 No =2

57. If yes which of these actions of government affect your operations?

1. Incentives Yes=1 No=2 If yes how ……..

58. Do you have other income sources Yes = 1 No=2

59. If yes please specify ……

60. Are there transporters organization networks groups or association in the community?

Yes =1 No =2

61. If yes what are their functions? .....

62. Are you a member of any of them? Yes =1 No=2

63. If No why ……

64. If yes what direct benefits of get from these associations? ……..

66. What additional services should they provide? 1 …….

2……..3……

F. THREATS AND OPPORTUNITIES OF TOMATO VALE CHAIN

66. How much do you agree, strongly agree or disagree, strongly disagree with the existence of the following threats and opportunities of tomato production?

(Enumerator should note; circle only one answer in each now)

Constraints	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Lack of credit facilities	1	2	3	4	5
Erratic rainfall pattern	1	2	3	4	5
High cost of input	1	2	3	4	5
Poor agronomic practice	1	2	3	4	5
Pests and diseases	1	2	3	4	5
Lack of access to current market information	1	2	3	4	5
Seasonal price fluctuations	1	2	3	4	5
Others (specify)	1	2	3	4	5

Opportunities	**Strongly Disagree**	**Disagree**	**Agree**	**Agree**	**Strongly Agree**
Availability of suitable land for cultivation	1	2	3	4	5
Can be produce in comparatively low fertile soil	1	2	3	4	5
Provision of employment opportunities	1	2	3	4	5
Availability of unskilled labour	1	2	3	4	5
Food security	1	2	3	4	5
Ready market for tomato	1	2	3	4	5
Increasing use of tomatoes	1	2	3	4	5
Support from Development project	1	2	3	4	5
Others (specify)	1	2	3	4	5

B. POWER RELATION

77. Who determines the prices of the tomato transported?

Buyer =1 Seller (you) =2 Consensus (buyer and seller) =3

78. What is your level of satisfaction for the prices you receive for the tomatoes transported to the market?

High =1 medium =2 low =3

79. Are there tomato producers association? Yes = 1 No. =2

80. What is the level of your importance and influence in the tomatoes value chain in regards to the following indicators (enumerator to note: let respondents distribute chit on regards to the following indicators (enumerator to note : let response distribute chit on labeled cards (3 cards representing Producers, Distributors (Queens), Transporters and Retailers)

	Producers	**Distributors(Queens)**	**Retailers**
Profit			
Bargaining power			
Protection from competition			
Information concentration			

.

G. THREATS AND OPPORTUNITIES OF TOMATO TRANSPORTERS

81. How much do you agree or disagree with the following threats and opportunities pertaining to tomato transporters?

Constraints	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Inadequate access to credit facilities to retool the truck	1	2	3	4	5
Inadequate access to the farm	1	2	3	4	5

Delayed payment of transport services	1	2	3	4	5
Inadequate access to modern trucks	1	2	3	4	5
Competition from other transporters	1	2	3	4	5
Others(specify)	1	2	3	4	5

Opportunities	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Provision of employment opportunities	1	2	3	4	5
Availability of unskilled labour	1	2	3	4	5
Readily available of tomato on time (consistent with demand)	1	2	3	4	5
Others (please specify)	1	2	3	4	5

QUESTIONNAIRES FOR TOMATO DISTRIBUTORS (ASSEMBLERS, WHOLESALERS, RETAILERS)

B. **Marketing and Distribution**

82. Which varieties of tomato do you trade in? ……

83. Which varieties do buyer/ consumers prefer most? ……..

C. Marketing Cost

Fixed Cost Inputs	**Quantity (indicate Units)**	**Cost (GH¢)**	**Useful life (in yrs.')**
Basins			
Crates			
Bowls			

Others specify			

Variable Cost Inputs	**Average Quantity bought /month (please indicate units)**	**Cost per unit (bag)**
Bags (Crates)		
Transport charge of tomatoes		
Transport charge of marketer in and out		
Storage cost		

Labour Cost

Operating cost inputs (labour in man days)	Family (number)	Hired (number)	Family (unit cost)	Hired (Unit Cost)
m. Purchasing cost: - loading charge - offloading				
n. processing cost/bag - cleaning - grading (if any)				

84. Where do you sell your tomatoes? Distributor's residence = 1 local market =2

Wholesale market within the district =3

85. If tomatoes are sold outside distributor's residence what is the marketing cost?

Marketing Activity	**Cost**
Transport charge of tomatoes from farm to market	
T&T of farmers from farm to market	
Taxes in market	
Storage charges at market place	
Others …….	

86. What is the unit of sale? Box = 1 Bowls =2 Crates=3 others……..=4

Price range last year; what are the lowest and highest prices ever received for sales of tomatoes

	Lowest		Highest	
Tomatoes	Price	When	Price	When

C. Power Relations

87. What is the level of your importance and influence in the tomato value chain in regards to the following indicators (enumerator to note: let respondents distribute chits on labeled cards.)

	Producers	Distributors(Market Queens& Assemblers)	Retailers
Profit			
Bargaining power			
Protection from competition			
Information concentration			

88. What are your market information needs?

	Prices? Yes =1 No=2	Quantities Yes =1 No=2	Buyer preferences Yes = 1 No=2
Market information required			

89. Do you have any kind of savings account/ Yes =1 NO=2

90. Do you get credit or support for tomato marketing Yes =1 NO =2

91. If yes state the sources(s) of the credit……..Friends/Relatives =1 Banks=2

Non-bank financial institution =3 local =4 NGOs =5 others…….=6

92. How do you pay back loan or grant? In Cash = 1 In Kind =2 others (specify)……..=3

93. What are some of the credit –related challenges you face……

94. Are there marketing /trade associations or groups in your community / Yes = 1 No =2

95. If yes what are their functions? .....

96. Are you a member of any of them Yes= 1 NO= 2

If no, why? .....

97. If yes what direct benefits do you get from these association ……..

98. What additional services should they provide?

1……2……..

F. CONSTRAINTS AND OPPORTUNITIES OF TONMATO MARKETING

99. How much do you agree or disagree with the existence of the following constraints and opportunities to tomato marketing?

Constraints	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Poor road networks	1	2	3	4	5
High cost of transportation	1	2	3	4	5
High cost of input	1	2	3	4	5
Unreliable sources of supply / many smallholder scattered farmers	1	2	3	4	
Lack of access to current market information	1	2	3		5
Seasonal price fluctuations	1	2	3	4	5
Others……..	1	2	3	4	5

Opportunities	Strongly Disagree	Disagree	Undecided	Agree	Strongly
Provision of employment opportunities	1	2	3	4	5
Available market for tomato and its derivatives	1	2	3	4	5

Existence of trader –associations	1	2	3	4	5
Others (specify)……..	1	2	3	4	5

CONSTRAINTS TO TOMATO RETAILING

100. How much do you agree or disagree with the existence of the following constraints and opportunities to tomato retailing?

Constraints	Strongly Disagree	Disagree	Undecided	Agree	Strongly
Seasonal Price Fluctuation	1	2	3	4	5
Inadequate Access to Market Information	1	2	3	4	5
High Interest rate	1	2	3	4	5
Others (specify)……..	1	2	3	4	5

OPROTUNITY IN TOMATO PRODUCTION

Opportunities	Strongly Disagree	Disagree	Undecided	Agree	Strongly
Provision of employment opportunities	1	2	3	4	5
Available market for tomato and its derivatives	1	2	3	4	5
Existence of trader –associations	1	2	3	4	5
Availability of unskilled labour					
Others (specify)……..	1	2	3	4	5

QUESTIONNAIRE FOR CONSUMERS

Probe to ascertain if respondent consumes raw tomato before you start.

1. Name of respondent ……..
2. Sex male =1 female =2
3. Main occupation ……..Age ……..

What factors influence your choice of raw tomato?

1. Taste Yes No
2. Price Yes No
4. Proximity Yes No
5. Availability Yes No

Vi. Nutritional Component Yes No

viii. Other…… Please indicate…….

7. How important are these critical success factors to you in relation to buying raw tomato?

	1 Very Unimportant	2 Unimportant	3 Neither important Nor Unimportant	4 Important	5 Very Important
Taste					
Price					
Proximity					
Availability					
Nutrients					

Other					

9. In your own opinion, which of the following characteristics of the tomato you consume do you think needs improvement?
   ……
   ……
   ……

		Local	Imported
i.	Taste	…….	…….
ii.	Pricing	…….	…….
iii.	Proximity	…….	…….
iv.	Availability	…….	…….
v.	Nutritional component	…….	…….
vi.	Other	……..	…….