

UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

SHALLOT VALUE CHAIN IN THE KETA MUNICIPALITY OF GHANA:
ASSESSING THE ROLE OF SMALL SCALE IRRIGATION VEGETABLE
FARMING.

BY

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DECLARATION

Student

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

Candidate's Signature:..... Date:.....

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ABSTARCT

The Keta Municipality has the advantage in the production of a variety of fresh vegetables all year round through irrigation. The Municipality is known for its shallot production. However, if gains from shallot farming are not increasing to enable it compete with other produce; the system will be converted into other vegetable horticultures. This study aimed to assess how small scale irrigation is critical to the shallot value chain and the nature of relationship that exists among the actors of the shallot value chain. The objectives of the study included to assess how small scale irrigation contributes to the shallot value chain, the type of relationships that exist among actors of the shallot value chain and the opportunities and constraints of small scale irrigation. Data was collected using questionnaires, key informant interviews, focus group discussions and observations. The study revealed that irrigation ensures stable market prices and has increased land under cultivation. It was also evident that spot market relations exist between farmers and traders and farmers and input suppliers. Farmer-to-farmer relationships are, however characterized by the persistent network relationship. The use of solar energy, high cost of energy among others was identified as opportunities and constraints of small scale irrigation development in the area respectively. Though there is high potential for an increased production of shallots due to availability of water annually, however, poor access to agricultural inputs coupled with absence of vibrant domestic and external markets, poor linkages among actors renders the value chain less competitive. For a competitive shallot value chain, a detailed market analysis must be conducted.



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DEDICATION

I dedicate this work to the memory of my late father Godwin Kwawu Adzraku.

Daddy, thank you for your support and believing in me.



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LIST OF ACRONYMS

AAGDS	Accelerated Agricultural Growth and Development Strategy
AgSSIP	Agriculture Sector Services Improvement Project
ADF	Africa Development Fund
ACDI-VOCA	Agricultural Cooperative Development International and Volunteers Overseas Cooperative Assistance
FAO	Food and Agriculture Organization
FTE	Full Time equivalent
GCAP	Ghana Commercial Agriculture Project
GPRS	Ghana Poverty Reduction Strategy
GIDA	Ghana Irrigation Development Authority
GIZ	German Agency for Technical Cooperation.
JHS	Junior High School
JICA	Japan International Cooperation Agency
MoFA	Ministry of Food and Agriculture
MTADS	Medium Term Agriculture Development Strategy
NGO	Non-Governmental Organization
NPK	Nitrogen, Phosphorus and Potassium



PPP	Public Private Partnership
SEA	Strategic Environmental Assessment
SHS	Senior High School
SWOT	Strength Weaknesses Opportunities and Threat
WRC	Water Resource Commission
WRI	Water Resource Research Institute



CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

Vegetables play a major role in providing the vital minerals, vitamins and fibre which the body needs, which are not present in significant quantities in staple starchy foods. Vegetable production has the potential of ensuring that the family has a nutritious food and at the same time provide them with the opportunity to market the surplus produce for cash. Households that produce vegetables on their own plot of land are guaranteed fresh vegetables (Nichols & Hilmi, 2009).

The demand and consumption of vegetables have increased greatly over the years due to increased population and urbanization (Figuié, 2004). Farmers in response to the increasing demand and consumption of vegetables have diversified crop production in order to favour vegetable production. Vegetable production has become a key component of farmers' livelihood in rural, urban and peri-urban areas of Ghana (Obuobie et al., 2006). The current land coverage use in vegetable production in Ghana is about 78,000 hectares (Saavedra et al., 2014). Fresh vegetables cultivated are supplied to urban markets and for exports.

Vegetable production requires only a small area of land, with minimal startup capital and can provide access to a valuable food under subsistence conditions; it also has the potential to provide an initial step towards establishing an income base for poorer households. Vegetables provide economic, social and nutritional



benefits and importantly can provide gender advantages and an effective means to enable people with disabilities to make a contribution and be part of the development process (Nichols & Hilmi, 2009). In many developing countries, women and children basically undertake vegetable production. If allowed to share in the proceeds of their labour, it will not only position them to be more self-sufficient, independent, but also improve their social status in their communities (Ibid).

However, key in ensuring increased production and productivity of vegetables is the availability of improved production packages such as improved vegetable seeds, use of good agronomic practices in production and frequency of irrigation (Edossa et al., 2014). Vegetables contain 80 to 95 percent of water (Kemble & Sanders, 2000). Due to their high content of water, they require a constant water supply. The yields and quality of vegetables are often poor in the presence of drought. Thus, in order to ensure high productivity in vegetable production, irrigation is important (Saavedra et al., 2014). Adequate water is instrumental in vegetable production, which identifies irrigation as critical for profitable horticulture. This can be attributed to the critical water requirement of vegetables at certain stages of their growth cycle. Irrigation is therefore highly recommended in vegetable production compared to rain fed conditions (World Bank, 2011).

Irrigation is defined as the artificial application of water to the soil and is commonly used to support crop production, especially vegetables in dry areas and during periods of inadequate rainfall. Irrigation has been instrumental in increasing the agricultural production and productivity in the world. However the



level of adoption and use vary across countries (Takeshima & Adesugba, 2014). The level of irrigation development in Ghana is one of the lowest percentages in Africa. Irrigation began in Ghana about a century ago, but serious irrigation measures were taken to improve the sector fifty years ago (Kyei-Baffour & Ofori). Within the period of its commencement in the 1960s and the year 1980, approximately 19, 000 hectares of irrigated land have been developed. By 2007 the area in irrigation had expanded to 33,800 hectares (Namara et al., 2011b).

Irrigation development in Ghana is presently driven by the Accelerated Agricultural Growth and Development Strategy (AAGDS) and made operational under the Agriculture Sector Services Improvement Project (AgSSIP). The Ghana Poverty Reduction Strategy (GPRS) also recognizes the use of water as a major means of reducing poverty through the development of irrigation. The Strategic Environmental Assessment (SEA) of the GPRS describes water “as a cross cutting thematic issue” and highly relevant to improving the livelihood dimension of Ghanaians (GIDA, 2011: 3).

Irrigated agriculture remains instrumental in the livelihood of many small scale farmers who value the several benefits that it provides. It provides them with stabilized incomes from increased cropping intensities, improves their nutrition and reduces their level of vulnerability (FAO, 1999). Several studies have acknowledged that irrigated agriculture has a great potential in increasing productivity, food security, reducing poverty and increasing rural prosperity (Lipton et al., 2003a, Dittoh et al., 2013 & Domenech & Ringler, 2013). Irrigated agriculture provides the opportunity to extend the growing season as it provides



the opportunity to grow more than one crop in a year and the use of available land (World Bank 2006, Chazovachii, 2012).

Component two of the Ghana Commercial Agriculture Project (GCAP) emphasized securing a transaction for Public Private Partnership (PPP) in agricultural development in the Accra plains. However, despite the substantial potentials and the emphasis placed on irrigated agriculture by government in recent times, the percentage of potential irrigable land actually under irrigation is insignificant. Also, the performance and output of existing irrigation schemes, particularly those that were publicly developed, are generally low (GIDA/JICA, 2004).

The informal irrigation subsector involves private individuals and small groups of farmers irrigating their own holdings with no or minimal public support. Although the significance of informal irrigation is recognized in Ghana's irrigation policy, these systems still receive inadequate public support (GIDA, 2011). Informal irrigation includes inland valley water management; river, stream, and lake water-lifting and groundwater pumping systems; and small reservoir and dugout-based irrigation. These sources are most often used in vegetable production. The subsector presents an opportunity to invest in the development of these emerging systems and unlock the potential of smallholder farming (GIDA, 2011). A survey conducted by the Ghana Irrigation Development Authority (GIDA) describes the Keta Municipality as having the largest informal irrigation system in Ghana with a total of approximately 4000 hectares cultivated all year round (Ahiabor,



2014). However, Capital investments are relatively very small and are provided from the farmer's own resources.

Value chain framework have been identified as one of the strategies to bring more efficiency in the agricultural sector (Kumar et al., 2011). Value chain is define to comprise all economic activities including input supply, production, transformation, handling, transport, marketing, and distribution necessary to create, sell and deliver a product to a certain destination (Tchale & Keyser, 2010). Value chain participants pull efforts together to improve the general effectiveness of the product; however, the participants may also be totally unaware of the relationships between their operations. Efficient markets and marketing are important to producers, more especially vegetable farmers because of the perishable nature of vegetables. Value chain assures farmers of market for their produce (Tchale & Keyser, 2010).

Vegetable chains in Ghana are characterized with little or no knowledge of improved inputs; farmers have limited agronomic skills and practices, poor food safety for both the domestic and export market, poor postharvest management systems, and inadequate linkages between input suppliers, producers and buyers (Saavedra et al., 2014).

Shallot is produced in Ghana through rain-fed agriculture and small scale irrigation, which falls under the informal irrigation subsector. Shallots are cultivated in the Keta Municipality all year round both in the major seasons thus from May to June, August to October, and in the minor season under irrigation



from January to March (Sinnadurai, 1973). Production of shallots in the raining season is characterized by slow plant growth and high incidence of pest and diseases, and the resultant effect is low yields and high percentage of rots. Under these circumstances, irrigation water provides a better alternative as water can be managed more efficiently to increase yields (ACIAR, 2013).

1.1 Problem Statement

In Sub-Saharan Africa, the agricultural sector plays a key role in employment. The sector employs more than half of the working population. Recent surveys suggest that the sector is a source of livelihood for 10% to 25% of urban households apart from its contribution to the employment of rural population (OECD/FAO, 2016).

Agriculture is paramount in the socioeconomic development of Ghana. The sector accounts for about 65 percent of the work force, about 40 percent of the gross domestic product, and about 40 percent of foreign currencies acquired through exports (Namara et al., 2011a). Despite the tremendous contribution of agriculture to the country's economy, the structure of the sector is vulnerable due to its reliance on rain-fed agriculture which forms the larger share of the cropping season. Droughts pose great challenge to farmers, especially in the dry season. Under these circumstances irrigation development will guarantee greater food security and rural development by ensuring yearlong agricultural production (Namara et al., 2011a).



Erratic rainfall patterns have given rise to uncertainty in agricultural production and have emphasized the need for irrigation. The customary system of irrigation involves the use of either rope and buckets to lift and distribute water from shallow open wells or watering cans to lift water from streams. This customary system involves low capital investment which makes them affordable, however, they are labour intensive (Kamara et al., 2004). Also, small-scale irrigation technologies such as sprinkler, drip, motorized pumps with hose have numerous benefits including reduction of rainfall dependency, enhanced production security, additional agricultural income, crop diversification, and employment (Laube, 2008). These technologies are usually used in irrigated vegetable farming, however to effectively apply and reap the benefits of these technologies some level of training and financial investment is needed.

The current demand for vegetables is high, with much of that demand being met by imports. There is abundant cultivable land and sufficient water resources, allowing for irrigated vegetable production in Ghana. However, aligned with these opportunities are a number of challenges or constraints which will need to be addressed to enable farmers take up these opportunities. There seems to be a pervading lack of awareness of either the opportunities or the challenges that irrigation offers (GIDA, 2011).

According to a study conducted by the SEND Foundation only 19.7 percent of smallholders have access to public irrigation programs, and 60 percent of these farmers use non-mechanized irrigation techniques. And to date, government budgetary allocations have been insufficient to maintain and operate public



irrigation infrastructure, and irrigation service fees have not been able to cover maintenance costs (Mendes et al., 2014: 22).

The informal irrigation subsector involves private individuals and small groups of farmers irrigating their own holdings with no or minimal public support. This subsector is estimated to cover about 186 000 hectares comprising the largest part of agricultural water management in Ghana. The subsector presents an opportunity to invest in the development of these emerging systems and unlock the potential of smallholder farming (GIDA, 2011).

Keta Municipality has the advantage in the production of a variety of fresh vegetables all year round through the use of irrigation. This serves as a source of employment for most of the inhabitants of the area, especially in the dry season when the raining season is over. Small scale irrigation in the Keta Municipality is instrumental in ensuring an all year round production and availability of fresh vegetables for the local markets in the area and the country at large.

According to Awadzi et al. (2008), the shallot production system in the Municipality may be under threat and may not be sustained due to economic and environmental reasons. They indicated if the gains from shallot farming are not increasing to enable it to compete with other produce, the shallot system will be converted into other horticultural system which is already emerging. Their study revealed that average shallot yields were low in the dry season compared to the other seasons despite the use of irrigation. They added that factors such as diseases and bad seed bulbs could also reduce yields in some particular seasons.



Nukunya (1972) and Benneh (1972) researched extensively on issues of land tenure in shallot production in Anloga the major shallot producing community in the Keta Municipality. However, their studies did not look at the contribution of small scale irrigation to the shallot value chain as the system largely depends on the use of manure and irrigation. Also, no study has assessed the nature of the relationship that exists between the actors of the shallot value chain.

The shallot value chain in the Keta Municipality is characterized with fluctuating domestic market prices, high incidence of pest and diseases, unavailability of capital, high cost of inputs, inadequate storage facilities, high labour cost and unfavourable weather conditions among others. According to Karlan et al. (2010), fluctuation in local market prices can prevent farmers from investing in production due to the uncertainty in market prices. However, Riddell et al. (2006), asserted that irrigation ensures uniformity of crops between growers and over time. Reduced differentiation in the quality between years lead to marketing advantages such as it permits a group of irrigated farmers to establish a reputation for a particular quality of produce that attracts regular consumers who are willing to pay a premium price for dependable quality.

This research therefore seeks to assess how small scale irrigation contributes to the shallot value chain and the nature of relationship that exist between actors of the value chain.



1.2 Research Questions

1.2.1 Main Research Questions

How does small scale irrigation contribute to the shallot value chain in the Keta Municipality?

1.2.2 Specific Research Questions

1. How important is small scale irrigation in shallot production?
2. What type of agricultural inputs and support services are used in shallot production?
3. What nature of relations exists between actors of the shallot value chain?
4. What are the opportunities and constraints of the shallot value chain?

1.3 Objectives of the Study

1.3.1 Main Research Objective

To examine how small scale irrigation contributes to the shallot value chain in the Keta Municipality.

1.3.2 Specific Research Objectives

1. To establish the importance of small scale irrigation in shallot production
2. To establish the types of agricultural inputs and support services used in shallot production



3. To establish the nature of relations that exists among actors of the shallot value chain.
4. To examine the opportunities and constraints of the shallot value chain.

1.4 Significance of the Study

Most large scale irrigation systems have failed due to poor governance system, minimal agricultural inputs and huge development cost among others. According to the Ghana Irrigation Development Authority (GIDA), informal irrigation in Ghana comprises traditional and community initiated schemes and the sector is characterized by the cultivation of about 2000 hectares of shallots in the southeastern coastline of Ghana (GIDA, 2011). However, there are several challenges as a result of the neglect of the sector. This study examined how small scale irrigation contributes to the shallot value chain.

The findings of the study have contributed to literature on the contribution of small scale irrigation to the shallot value chain. The study has also contributed to baseline information which will enable the government and the Ministry of Food and Agriculture (MoFA) to develop policy alternatives taking into consideration the peculiarities of the irrigation systems in the Keta Municipality in order to improve the shallot production system. Also findings from this study will help in designing interventions to improve the aspects of the shallot chain that need to be improved.



1.5 Scope of the Study

This study was carried out in the Keta Municipality, more specifically in Anloga. The Ghana Irrigation Development Authority (GIDA) describes the Keta Municipality as having the largest informal irrigation system in Ghana with approximately 4000 hectares cultivated all year round with shallot being one of the major vegetables cultivated in the area. This study focused on how small scale irrigation contributes to the shallot value chain with emphasis on input suppliers, producers and traders and the nature of relationship that exist among the actors. The study examined the importance of small scale irrigation, the nature of relations that exist between actors of the value chain, the challenges faced by the actors of the shallot value chain.

1.6 Organization of the Study

The report of the study was organized into five main chapters. Thus, from chapter one to five. Chapter one provides details on the background to the study, problem statement, research questions and objectives, scope of the study, the significance of the study and organization of the report. Chapter two contains literature reviewed on the objectives of the study. Chapter three looked at the methodology of the study. This included methodology, research design, target population, sample size and sample selection procedure, tools for data collection, data analysis procedures, research reliability and validity of the study as well as the profile of the study area. Chapter four covers data analysis and presentation. Finally, chapter five looks at the summary of research findings.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter includes the value chain approach and the social network theory that guided the study. It gives a detailed description of the value chain and the social network theory. Also, other studies that have been conducted that are closely related to the topic were reviewed and findings shared. The literature reviewed provided a framework for establishing the importance of the study and serve as a yardstick for comparing results (Creswell, 2009).

2.1 Definitions of Key Terms and Concepts

2.1.1 Irrigation

Irrigation is defined as the artificial application of water to land in order to ensure double cropping as well as a steady supply of water in regions where rainfall is unreliable (Mutsvangwa et al., 2006).

2.1.2 Small Scale Irrigation

Small scale irrigation is defined as irrigation practiced by individuals who cultivate an area up to about 0.5 hectare or more by using simple structures and equipment for water storage, transportation and disbursement. Small scale



irrigation is completely owned and managed by the farmer or group of farmers (GIDA, 2011).

2.1.3 Vegetable

Vegetables are the edible parts, commonly collected and/or cultivated for their nutritional value for humans (Agudo, 2004).

2.1.4 Value chain

“Value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use” (Hellin & Meijer, 2006:4). They are frameworks that help in understanding how the world of production and exchange works. The value chain approach emphasizes more on practical approach that will assist particular groups to access specific value chains than on central theory and idealistic assumptions (Mitchel et al., 2009).

Webber & Labaste (2010) also defined value chain as a framework for understanding how inputs and services are brought together to grow, transform, or manufacture a product; and the physical way through which the product moves from the producer to the final consumer and how value is added along the way. Value chain analysis focuses on the entire links in the chain (not just on



production) but also all activities in each link, which helps to identify the activities that are subjected to increasing returns, and which are subjected to decreasing returns. The ability to make these distinctions about the nature of returns throughout the chain helps policy makers in identifying and formulating appropriate policies (Sanogo, 2010).

Value chain analysis is built on a market system (specifically the supply chain). It is made up of the structural and the dynamic factors that impact on the contribution of each actor to the chain (Sanogo, 2010). Sometimes, there is the temptation to use the “value chain” and the “supply chain” interchangeably. However, the value chain has a more elaborate scope. In other words, the supply chain management is a subset of value chain analysis. The supply chain model focuses on activities that get raw materials and subassemblies into a manufacturing operation easily and economically. A supply chain is the movement of a commodity from one stakeholder to another in chained manner (Reddy, 2013).

The value chain concept traces product flows and shows value additions at different stages, identifies key actors and their relationships in the chain, identifies enterprises that contribute to production, services and required institutional support, identifies bottlenecks preventing progress, provides a framework for sector-specific action and identifies strategies to help local enterprises to compete and to improve earning opportunities (Sanogo, 2010: 5). The main actors within an agriculture value chain include input suppliers, farmers, traders, processors, transporters, wholesalers, retailers and consumers.



2.1.5 Value Chain Actors

The chain of actors performs a range of activities to bring a raw material through to the sale of the final product. There are basically two main types of value chain actors. They include primary and secondary actors. Primary actors perform functions such as input supply, production, processing, storage, wholesale (both domestic and exports) and retail and consumption. Secondary actors provide services that complement the roles of the primary actors. Their roles include transportation, brokerage and service processing (Mitchell et al., 2009).

2.2 Historical Background of Shallot Production in Ghana

The cultivation of shallot is more labor intensive as compared to onion production. Both shallots and onion do very well in sandy soils. However while shallot bulbs are the means of propagation, onion seeds must be nursed and transplanted (Ocloo, 1996). Most of the agronomic practices are done by hand. Hands are used in planting the seeds in the soil and these seeds must be planted straight into the soil. The high labour intensive nature of shallot production also affects the level of availability of shallots on the market as compared to onions (USAID, 2008).

Within the African region, the shallot is cultivated in Mali, Ethiopia, Togo and Ghana. The shallot is regarded as a cash crop in Mali and is a major ingredient in Malian dishes. The availability of cheap labour, favourable climatic conditions and constant access to the Niger River water are factors that have positioned Mali



as the leading shallot producer in West Africa (USAID, 2008). Shallots are produced in the Volta region specifically Keta Municipality. Despite the fact that the actual beginning of shallot production in the Keta Municipality is not known, history has it that shallot was first introduced in Anloga in 1800. Shallot production became prominent in the Anlo area in the 1930's when there was demand for vegetables across the country, subsequently farmers in the area embarked on an intensive filling and reclamation of the marshy depressions left by the sea and the edges of the Keta lagoon, converting them into vegetable farms especially the production of shallot (Ocloo, 1996).

Shallots were cultivated not only in Anloga but also in other surrounding communities such as Atorkor, Wuti, Dzita, Anyanui, Woe, Tegbui and Vui all in the Keta Municipality. History has it that Togbi Dzisam an Anlo man who was working in Togo as a farm hand brought shallot seeds to Anloga. His master whom he served in Togo cultivated shallots. However, it is difficult to substantiate whether the variety Dzisam brought was the variety that was adopted by the Anlos. However, during the same period other areas such as Kpedze, Kwahu area, Ho, Nyongbor and Saltpond were believed to have also been engaged in shallot production which could also serve as a possible source (Ahiabor, 2014).

During the pre-colonial period the Anlos developed marketing network in fish and salt. Shallots were subsequently added as the same market for fish and salt served as the shallot market because these products were jointly demanded as ingredients for soup. Shallots grow well in sandy soil and due to the sandy nature of the soil



of the coastal areas of the Municipality especially Anloga, shallots were considered appropriate for the area. Shallots were also suitable because of scarcity of agricultural land and shallots could be produced in small scale with simple farm tools and could be harvested in eight weeks as compared to the alternative choices (coconut and sugarcane) which needed a large scale production for profitability (Ocloo, 1996).

Also, due to the 1930 world economic depression coupled with the fall in coconut production as a result of the Cape St Paul disease, the people gave up their old agricultural systems for a more intensive system based on shallot production (Awadzi et al., 2008). A relatively favourable weather condition, labour, suitable soil, and access to irrigation water have positioned the Keta Municipality as the premier shallot producer in Ghana.

2.3 Contributions of Irrigation to Agriculture Value Chains

According to Quartey et al. (2012), aside irrigation guaranteeing an all year round production, the use of irrigation in farming reduces gross margin. Thus, farmers are offered high market prices in communities where irrigation is in existence than in communities where irrigation is non-existent. Irrigation is an essential part of the agricultural system. To ensure an all year production in tropical areas with an annual rainfall less than 900mm coupled with sandy soil irrigation is required. Even during raining seasons, there is still the need for irrigation if there are breaks in rainfall (Awadzi et al., 2008).



Generally, irrigation has a bearing on the quality (size, taste, smell, visual appearance, milling characteristics, and cooking properties) and the structure of the processing and marketing systems between the producer and the final consumer. Riddell et.al, (2006) argued that, as far as irrigation leads to healthier plants, the size and quality are likely to be bigger. But the rapid growth can reduce the level of taste and smell thereby reducing market value. Irrigation ensures uniformity of crops between growers and over time. As the same amount of water is distributed on a timely basis each year, the resultant effect is increased uniformity. But, this depends on how equitable irrigation water is distributed among farmers, which is not always achieved (Riddell et al., 2006).

Irrigation increases the long term sustainability of smaller farm units by boosting yields, facilitating the cultivation of a broad range of higher value crops and minimising financial risks. Also as a result of the high requirement of labour for primary production on irrigated land increases rural populations and contributes to more vibrant communities and greater infrastructure development (Irrigation Water Management Study Committee, 2002).

Irrigation influences the spatial distribution of agricultural production by permitting the cultivation of crops on lands that originally do not support the production under rain-fed condition, more intensive growing of existing crops and the growing of alternative crops. Irrigation also increases the possibility of contract farming and prevents farmers from engaging in undetected side-selling (Riddell et al., 2006).



The availability of irrigation water reduces the risk associated with erratic rainfall patterns. Farmers are better able to plan their cropping season when they are sure of reliable water supply. Irrigation provides farmers with the opportunity to water their farms at the time that is most beneficial to the crop (Schoengold & Zilberman, 2004).

2.4 History of Irrigation Development in Ghana

Historically, irrigated agriculture commenced in Ghana a little over a century ago (Smith, 1969). However, the practice on a small scale dates back to as early as 1880 in the Keta area on land above flood level between the lagoon and the sandbar separating it from the sea. This system of agriculture had to be adopted because natural conditions did not permit shifting cultivation as practiced in parts of the country, thus intensive methods of cultivation by irrigation, manuring and crop rotation had to be used (Smith, 1969). Agodzo and Bobobee's (1994) study indicated shallow tube well irrigation systems were recognized in Southeastern Ghana in the 1930's. There was also the development of some water schemes in the Guinea, Sudan and Coastal Savannah belts which accounted for about 240 earth dams and dugouts in the north and about 66 in the Ho-Keta plains of the south purposely to provide water for domestic use, livestock and for dry season irrigated farming in the 1950's and 1960's (Agodzo and Bobobee, 1994). In the late 1950s, thus soon after independence the irrigation sector obtained an all-round public support. The Dawhenya and Asutsuare projects were among the first batch of irrigation projects that received public support in Ghana (Namara et al., 2010).



The World Bank in 1986 undertook a review of the irrigation sub-sector, which produced a new strategy for irrigation development. The sub-sector review advocated the introduction of a number of changes to promote sustainable development of Ghana's irrigation potential. The review emphasized the importance of focusing future investment on a small scale, low cost irrigation systems, and to improve the operation and maintenance of existing systems in order to improve efficiency and reduce the cost to the government. The review also recommended the building of the capacity of the Ghana Irrigation Development Authority (GIDA) in order to help identify, plan and implement irrigation systems. Even though the recommendations of the review were inculcated in the Medium Term Agriculture Development Strategy (MTADS) prepared in 1991, the latter places far greater emphasis on the need to establish viable farmer organizations to manage irrigation schemes (ADF, 1997).

In 1995, the Ghana Irrigation Development Authority (GIDA) commissioned a consortium of consulting firms to undertake a small scale irrigation study with funding from the African Development Fund (ADF). The study was completed in June 1997 and a detailed report was produced on designs and tender document for 37 identified systems. The Bank after studying the report carried out an appraisal of the project following a request from the Government (ADF, 1997).

There are 22 public irrigation districts currently in Ghana. The government is also currently evaluating a large scale commercial irrigation project known as the “Accra Plains Irrigation Development Project” which is to develop the Accra Plains using water from the Volta River. The project if completed will have an



area twenty times greater than the entire current state irrigated area in the country. It was estimated that the project will accommodate 10,000 modernized irrigation farms (based on a minimum of 20 hectares per farm) with a capacity to give employment to about 100,000 people. It is also expected that the project will provide a gross production value of US\$600million per annum. However, financing the project may be a challenge. Apart from this project, there are also other projects yet to be implemented that are aimed at the refurbishment of non-functioning and underperforming irrigation schemes (Namara et al., 2010).

2.5 Types of Irrigation Systems

Several factors determine the type of irrigation systems adopted in West Africa. These factors include the kind of water source (either surface water or groundwater), the particular forms of water bodies and the length and timing of irrigation practices. Within the West Africa region, location and form of water available greatly limits the choice of irrigation system. More so, the type of irrigation system adopted varies across crops and regions (Takeshima et al., 2010).

Namara et al. (2010) grouped irrigation systems in Ghana into two main types: conventional systems and emerging systems of irrigation. The conventional or public systems are mostly initiated and developed by the government or various Non-Government Organizations (NGOs), and the emerging systems are initiated and developed by private entrepreneurs and farmers either single handedly or with little assistance from the government or NGOs. The Ghana Irrigation



Development Authority has developed a total of twenty two irrigation districts of different sizes spread across the country with a total land cover of 8,800 hectares. There are eight districts irrigated by pump, five districts irrigated both by pump and gravity, and nine districts irrigated by gravity (Miyoshi and Nagayo 2006). Public surface irrigation systems; small reservoirs; wastewater irrigation; residual moisture irrigation; and shallow groundwater irrigation based on traditional lifting technologies constitute the conventional or public systems in Ghana.

Data on emerging systems are very minimal, but they are expanding at a fast rate, mainly fueled by access to relatively affordable pumping technologies and export markets for horticultural crops. These pumping technologies require energy sources such as diesel, petrol, wind, electricity and possibly solar energy. Emerging systems include tube well irrigation, small motor-based irrigation, out-grower systems, private small reservoir systems and others. A distinguishing feature of the emerging system is that they permit farmers to access water based on demand and make independent production decisions. Thus cropping systems differ based on the irrigation system, while high-value crops such as fruits, vegetables and trees are cultivated under emerging irrigation systems; under the conventional irrigation systems rice are mainly grown (Namara et al., 2010).

Namara et al. (2010) established that even though sub-surface and groundwater-based irrigation systems are not evenly distributed across the regions, they are fast spreading beyond traditional enclaves such as the Volta Region's Keta strip. Ground water irrigation specifically has been identified by the actors as one of the major livelihood strategies in the coastal zones of the Volta region, particularly



for those with access to electricity. Despite, the economic potential of groundwater, it faces several challenges including absence of explicit policy support, lack of access to affordable drilling technology, and cost of energy for abstracting water.

2.6 Methods of irrigation

2.6.1 Watering Cans

Watering cans are widely used in vegetable production by smallholder farmers (Nichols & Hilmi, 2009). The use of watering cans is labour intensive and can only be used for small gardens. Apart from being labour intensive, thus delivering water with hands, it can only be used in a small area of land (Smith et al., 2014). When using watering cans, water is fetched manually from nearby water sources into the watering can and applied to the vegetable plant. However, watering cans are accessible, affordable, and easy to use considering the other systems (Drechsel & Keraita, 2014).

2.6.2 Bucket Method

The bucket method of irrigation is one of the traditional methods of irrigation. Bowls and buckets are used to fetch water, usually from various sources of water, but mainly streams, shallow wells and dugouts. The water is then manually carried in the bucket to the fields where it is either applied directly or put in a barrel to be applied later. This practice mostly involves women and children carrying buckets as head loads and is commonly carried out in peri-urban areas.



Women and children are involved because of their traditional role of fetching water for the household (Drechsel & Keraita, 2014).

2.6.3 Small Motorized Pumps

In recent times, vegetable farmers in Ghana are increasingly adopting small motorized pumps in lifting water from sources such as shallow wells and streams (Drechsel & Keraita, 2014). According to Namara et al. (2010) most motor pumps have an engine capacity ranging from 3.5 to 10 Horse Power (HP). Evidence from a survey conducted in 2009, show 170,000 petrol and diesel pumps and 5,000 electric pumps are in use, the authors estimated that on average 12% of the 1.85 million farming households in Ghana own a pump. Small motorized pumps are transferable, after the day's work the pumps are sent home by the farmers. In the field, they are placed near a water source, usually the bank of a stream or near a shallow well and water is pumped through rigid plastic pipes or semi-flexible pipes which are connected to a flexible hosepipe at the end. This method is also associated with water losses from leaking pipes and the use of pumps of higher capacity and pipes of larger sizes than required (Drechsel & Keraita, 2014).

2.6.4 Sprinkler irrigation

This technique of irrigation involves the use of pumps, distribution pipes and mobile laterals on which the sprinklers are placed. Sprinkler irrigation has been widely accepted in communities as a result of its high water efficiency, less difficulty in fixing it and its availability on the market. Despite these advantages, the system is associated with high investment cost and operating cost as a result of



high fuel used to pressure the pumps (Smith et al., 2014). Also the uneven distribution of water is a major challenge of the sprinkler irrigation, which can subsequently lead to inadequate water supply to some part of the field or too much water supply to other parts of the field causing leaching of essential soil nutrients (Nichols & Hilmi, 2009).

2.6.5 Drip irrigation

In recent times, drip irrigation has been identified as the most efficient system of water delivery. The system helps in providing crops with fertilizers and other important crop nutrients. Despite the advantages of this system, it is also relatively expensive. Also, it is important water is filtered to avoid blocking of the drippers as they are small and the water pressure is low (Nichols & Hilmi, 2009).

2.7 Effects of Irrigation on the Rural Poor

The main purpose of irrigation is to improve agricultural productivity in areas where surface soils are naturally drier. Semi-arid regions often have higher agricultural productivity if irrigated (Mwakalila & Noe, 2004). Irrigation systems may affect the poor in varied ways, depending on factors such as the type of technology (drip or sprinkler systems, deep or shallow tube wells, treadle pumps), access to and capacity to apply agricultural inputs (land, credit, seeds, fertilizer, and so on) alongside irrigation, the institutional rules governing water access and maintenance of water systems (Lipton et al., 2003b).



Due to the variations in ages, gender, ethnicity, education, economic activities and location of the poor, irrigation may affect them differently. The use of irrigation in production initially will increase yields and income levels of smallholder farmers, then impact landless labourers through increased demand for agricultural labourers and then on urban poor through cheap food prices and reduction in rural urban migration (Lipton et al., 2003a).

Irrigated Agriculture contributes substantially to the income of rural households. Rural households are often characterised with relatively low incomes which are barely enough to acquire basic commodities and services. The development of irrigation has made it possible for the development of other rural infrastructures such as roads, telephones, schools and clinics to communities which could otherwise be without these facilities (Chazovachii, 2012).

Irrigated agriculture is also a means to good income generation (poverty alleviation), employment and food security. However, the level of income generation through irrigation is highly determined by the types of crops cultivated under irrigation, access to markets and institutional and policy support measures. Crop production in West African countries is highly labour intensive. Irrigated vegetable production is labour intensive right from land preparation to harvesting and marketing of the produce. Thus the expansion of irrigated vegetable production will substantially increase employment opportunities (Dittoh et al., 2013).



Irrigation projects provide two main sources of additional demand for labour. Irrigation projects provide the rural poor with the opportunity to provide labour for construction and subsequent maintenance of canals, wells and pumps (Lipton et al., 2003b). Namara et al. (2011a) estimated that three months of dry-season irrigation using shallow groundwater has created additional demands for labour estimated at 359,511 man days which is 214 Full-Time Equivalent (FTE) jobs per year. The authors added that, annually groundwater irrigation contributes approximately USD1.1 million to the economy of 35 communities in the White Volta. Secondly, increased farm output as a result of irrigation will stimulate demand for farm labour both within the main cropping season and across new cropping seasons, increasing both the number of workers required and length of employment period (Lipton et al., 2003b). The increased demand for labour will reduce the level of unemployment and migration to cities of Kumasi and Accra in the lean season (Namara et al., 2011a). This will reduce the downward pressure on urban wages and the upward pressure on prices of housing and other urban infrastructure (Lipton et al., 2003a).

The use of irrigation and irrigation dams have a positive influence on food security, asset ownership and well-being of rural farm households. The diversification and intensification of crops grown, the non-farm employment through irrigation has increased agricultural production and increased household income (Aseyhegn et al., 2012). Irrigation increases total farm outputs in three ways, firstly, irrigation helps reduce crop loss as a result of erratic, unreliable or insufficient rainwater supply. Also, irrigation encourages multiple-cropping,



which subsequently leads to increased annual output. Additionally, irrigation allows a greater area of land to be used for crops in areas where rainfed production was impossible. Lastly, output may be increased as a result of the use of complementary inputs, such as high yielding varieties in irrigation (Lipton et al., 2003b).

Furthermore, smallholder irrigation systems are mostly characterized with vegetable production in the dry season; subsequently, vegetable consumption among irrigation users and their communities usually increases (Aseyehgn et al., 2012). Vegetables contain essential micronutrients that are beneficial, especially to children. Irrigation systems are also likely to improve the intake of animal-source foods as a result of higher incomes and improved livestock productivity (Domenech & Ringler, 2013).

2.8 Agricultural Inputs and Support Services Use in Vegetable Production

Water is an essential input in crop production. Faurès & Santini (2008) analyzed rural and agricultural water use based on three main components. These components are access, control and management. Access describes the degree to which a household can obtain water from rainfall (in rainfed conditions), surface water sources, groundwater, surface or subsurface return flows from agriculture, or wastewater from urban or peri-urban areas. Control describes how well a household can move water from a source to the location at which the water is applied. The control component might include farmer operated canals and ditches, small pipelines, and sharing arrangements with other farmers. Management



describes the decisions and practices made at the farm level regarding the application of water for crops needs. The farmer must determine the timing and amounts of irrigation deliveries, and the methods used for applying water on the fields. However, the farmer's decisions are influenced by the farmer's human capital, the type of irrigation equipment available and information describing crop water requirements (Faurès & Santini, 2008). However the accessibility of farmers to agricultural inputs varies from one location to another.

Faurès & Santini (2008) established that water is often not the only limiting factor in production. Improving agricultural practices in irrigation or rainfed areas require the availability of affordable complementary inputs, access to markets, and institutional arrangements that promote farm-level investments in land and water resources. Ogunjimi & Adekalu (2002) asserted that high cost of complementary inputs coupled with irregular fuel and electricity supply in rural parts of Nigeria often makes irrigation less profitable than rainfed farming. The poor performance of sub Saharan Africa agriculture is attributable to poor access to reliable services providing inputs and knowledge. Most African farmers are disadvantaged in terms of access to credits, purchase and application of key inputs in a timely fashion (Kelly et al., 2003).

In Ghana, due to the inadequacy of human and financial resources of the Ghana Irrigation Development Authority (GIDA) and the Ministry of Food and Agriculture (MoFA), the quality of service delivery has been compromised, which has further compromised both the development and productivity of the formal subsector. Also institutional mandates on irrigation development are unclear



especially in the areas of informal and commercial irrigation. Coupled with unclear water service and allocation arrangements associated with low awareness and unclear ownership structures lead to low service charge collection rates and hence unsustainable service delivery (GIDA, 2011). Without agricultural inputs such as seed, fertilizer and pesticides, yield and quality are low and the returns to labour are poor. Therefore there is the need for smallholders to access credit in order to purchase these inputs. With access to credit, many farmers may be able to realize higher returns with irrigation (Takeshima et al., 2010).

Ghana has a relatively underdeveloped market for irrigation equipment. Distributors of irrigation equipment in Ghana are based in Accra. Despite the fact that they are based in Accra, they supply irrigation equipment in other parts of the country; however, they tend to operate from their head offices in Accra. There are two main suppliers of irrigation equipment in Ghana. These are Agrimat and Dizengoff, but there are also about 10 smaller companies selling irrigation equipment in Ghana, almost all of which are based in Accra. The two main irrigation equipment suppliers provide technical assistance to their clients, including equipment maintenance services and spare parts, at both wholesale and retail levels. However, this service deteriorates the farther the farmer is from the capital (Mendes et al., 2014).

Absence of efficient water lifting technologies and affordable well drilling technologies is a constraint to the development of groundwater irrigation. Also energy for lifting and distributing water is a challenge. The price of petrol, diesel, and electricity tariffs are high. Intermittent power supply poses a challenge to



areas that rely heavily on electricity for lifting water. Sustainable irrigated farming requires complementary crop-yield-enhancing inputs such as seeds, fertilizers, herbicides, insecticides, in the right quantity, quality, at the right cost and time. These inputs are often unavailable, particularly improved seeds and fertilizers pose a challenge in Ghana (Namara et al., 2011a). More so, majority of the crops produced do not qualify for the government fertilizer subsidy, and those that do qualify (such as rice) are only subsidized during the wet season (Mendes et al., 2014). Certified vegetable seeds are not readily available (Namara et al., 2011a). As a result of challenges associated with the supply of seeds, farmers often retain and reuse seeds due to lack of improved and locally adapted seed varieties, especially in Northern Ghana. In the long run poor quality seeds are produced, which in turn leads to low yields (Mendes et al., 2014).

2.9 Institutional Support in Irrigated Agriculture Production

Generally, formal or informal organizations are the mediums through which goods and services are produced and supplied (Anyonge et al., 2013). It is an undeniable fact that water is one of the most important inputs in crop production in Ghana. Majority of agricultural production in Ghana largely depends on rainfall which is mostly unreliable. As a result, crop yields are invariably poor (Kyei-Baffour & Ofori, 2006).

The Government of Ghana in 1977 established the Ghana Irrigation Development Authority (GIDA) as an autonomous corporate body within the Ministry of Food and Agriculture (MoFA) due to government's realization of the role of agriculture



in development. The functions and the responsibilities of GIDA include formulation of development plans for irrigation farming subsector, development of Ghana's water resources and irrigation projects and preparation of land use plans for implementation of comprehensive support programmes, which entails the provision of agriculture support services. However, GIDA is challenged with inadequate funding from government, recruiting and retaining of qualified and experienced personnel and inadequate facilities (ADF, 1997).

GIDA since its inauguration has focused on conventional and formal irrigation in Ghana. The 2010 national irrigation policy, strategies and regulatory measures expanded GIDA's mandate (Drechsel and Keraita, 2014). Other organizations which have direct or indirect duties on the development of the irrigation sub-sector include Water Resources Commission (WRC), Water Resources Research Institute (WRRI), the Environmental Protection Agency (EPA) and Ghana Meteorological Service (GMS) (ADF, 1997). Also Non-Governmental Organizations (NGOs) provide institutional support to irrigators. They include Japan International Cooperation Agency (JICA), Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI-VOCA) etc. Since 1988 JICA has provided technical support for irrigated agriculture in Ghana. JICA has been working in close partnership with GIDA.

Apart from support from state institutions and Non-Governmental Organizations, farmers can mobilize themselves in order to access support. Farmers being in groups provide them with the opportunity to jointly organize activities or investments they cannot access individually. These could be in the form of joint



ownership of trucks, warehouses among others. These groups are often known as producer groups. Producer groups can perform functions such as lobbying governments at the local, regional and national levels for improved public services and favourable conditions to boost production. Producer organizations can also assist their members with market information which leads to a reduction in transactional cost and promotes a better relationship between farmers and consumers (Bijman, 2002).

Contract farming is a marketing arrangement currently trending and is mostly facilitated by producer organizations. Contract farming refers to a range of initiatives taken by private agribusiness firms to secure access to produce (Eaton et al., 2007:14). In contract farming, companies render services to farmers and in exchange these companies gain access to part or the entire farmer's produce. The services rendered by these agribusinesses include the provision of inputs (seeds, fertilizers and pesticides), extension services, ploughing (in the form of tractor services) and crop spraying. These services are provided on credit bases and repaid after sales of the produce (Eaton et al., 2007).

Markelova et al. (2009) in their study "collective action for smallholder market access" examined collective action in solving inefficiencies, harmonization problems and the obstructions to market access. The paper examined the conditions that ensure or support effective producer organizations for smallholder's market access with emphasis on the features of the groups, institutional arrangements, the types of products marketed (either staples, perishables and others), markets (i.e. local, domestic, international) and the



external environment. Their study revealed that collective action can be of great benefit for smallholder marketing. Smallholders collectively accessing markets reduce transactional cost, eliminate credit markets, and provide market information and pool of resources (labour and finance). The paper however cautioned that despite the numerous advantages provided by collective action, for it to be applied and to ensure its effectiveness, there is the need to develop the necessary incentives and enabling condition that will propel the formation of farmer based organizations. If these are misplaced, collective marketing may be inconsequential (Markelova et al., 2009).

Also dependency comes with producer organizations, members are affected negatively as a result of other members' conduct. For instance, becoming a member can deny you the opportunity of accessing other lucrative markets as a result of compulsory trade (Eaton et al., 2007). Despite these negativities associated with producer organizations, the World Bank is of the view that joint actions by producer organizations will reduce the transactional cost involved in markets, achieve some market power (bargaining) and increase representation in national and international policy forums or platforms. The author believes that producer organizations are important in achieving competitiveness (World Bank, 2007). Farmers coming as united front will help them market their produce, access inputs and credit. Poole and Frece (2010) also established that farmer based organizations provide an opportunity for smallholder farmers to reap the benefits of collective action in order to access markets more effectively to



overcome financial constraints, information asymmetries and to achieve economies of scale in production and marketing.

2.10 Theoretical Foundations

2.10.1 Value Chain Approach

The concept of value chain was used in the 1960s and 1970s by analyst championing a path of development for mineral exporting economies (Girvan, 1987). The main concepts of the value chain are filière approach, conceptual framework elaboration and the global approach proposed (M4P, 2008).

Filière approach which implies thread or chain comprises of various school of thoughts and research traditions. Originally, the approach was employed in analyzing the agricultural system of the French colonies (M4P, 2008). The French agricultural policy for its colonies concentrated on the development of selected cash crops like rubber, cotton, coffee and cocoa. The framework focused on how local production systems, were linked to the processing industry, trade, and final consumption. It was used to map the flow of commodities and to identify actors and activities (M4P, 2008). However, later in the 1980's areas such as international trade and processing were subsequently looked at.

Porter a prominent writer also worked extensively on value chain. His work has been considered as one of the primary sources of prominence of the value chain as an analytical tool when he identified two constructs that are necessary for upgrading national capacities (Kaplinsky, 2000). Porter's work (competitive



advantage) used the value chain framework to examine how a firm should position itself in the market and in its relationship with suppliers, buyers and competitors. Porter argued that the foundations of competitive advantage of a firm cannot be determined by looking at the firm as a whole. Instead the firm should be separated into a series of activities and the competitive advantage can be seen in the activities. He differentiated between the activities by classifying the activities that add direct value to the production of a product as primary activities and the activities that have an indirect effect on the final product as support activities. Porter argued that a firm's competitiveness goes beyond the production process, in fact enterprise competitiveness can be evaluated by observing the value chain which includes product design, input procurement, logistics, outbound logistics, marketing, sales, after sales and support services, such as strategic planning, human resource management and research activities. Subsequently Porter's value chain framework mainly aimed at providing support management decisions and strategies (M4P, 2008).

The third concept of the value chain (global approach) was applied to the analysis of globalization in recent times. The literature used the framework of the value chain to study the ways in which firms and countries are globally integrated and assessed the determinants of global income distribution. Value chain analysis has become imperative in this era of rapid globalization because of growing division of labour and the global dispersion of the production components, which have made systemic competitiveness crucial. Also for successful entry into global markets, efficiency in production is a necessary condition and making the best of



globalization requires an understanding of dynamic factors within the whole value chain (Kaplinsky & Morris, 2001).

Value chain approach in recent times has become a very useful approach that many development intervention organizations have adopted as an important entry point for small farmers into local and export markets (GTZ, 2007). Many development practitioners have also invested heavily in analyses using the framework (Mitchell et al., 2009).

2.11 Agricultural Value Chain

According to Anandajayasekeram & Gebremedhi, (2009) agricultural value chain is usually defined by a particular finished product or closely related products and includes all firms and their activities, such as input supply, production, transport, processing and marketing (or distribution) of the product or products. Food production value chain activities include farm production, trade and support to get food commodities to the end consumer (Sanogo, 2010).

The value chain concept involves the addition of value as the product moves from input suppliers to producers and consumers. At each stage of the value chain, value is added to the product. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally some form of value is added (Anandajayasekeram & Gebremedhi, 2009).



2.11.1 Major Concepts Guiding Agricultural Value Chain Analysis

There are four key concepts that guide agricultural value chain analysis. They include effective demand, value chain governance, leverage and impact, and vertical coordination.

2.11.1.1 Effective demand

Effective demand is seen in the agricultural value chain analysis as the force that pulls goods and services through the vertical system. Therefore, the dynamics of how demand is changing at both domestic and international markets and the implications for value chain organization and performance need to be understood in value chain analyses. Value chain analyses also need to assess obstacles to the transmission of information on the changing nature of demand and incentives back to producers at various levels of the value chain (Anandajayasekeram & Gebremedhi, 2009).

2.11.1.2 Value chain governance

Kaplinsky and Morris (2001) defined governance as the role of coordination and complemented roles by identifying dynamic, profitable opportunities and assigning roles to key players. Governance means interactions between firms along a value chain which gives a reflection of the organization, rather than simply random. The value chain governance influences the various activities of the chain, activities within firms and between firms. Value chain governance originates from the need to set product, process, and logistic standards, which impact both upstream and downstream chain actors and results in activities, roles



and functions (Kaplinsky and Morris, 2001). Thus, power asymmetry is essential in value chain governance (Kaplinsky and Morris, 2001). This implies that some actors in the chain have the duty to assign roles and improve functions (Anandajayasekeram & Gebremedhi, 2009).

Kaplinsky and Morris (2001) identified three categories of power in value chain governance. This includes setting basic rules for participation in the chain, monitoring the performance of chain actors in complying with the basic rules, and assistance to help chain actors adhere to the basic rules. It is noteworthy that some value chains may reflect no governance at all or very thin governance. Most value chains are characterized with multiple points of governance, involved in setting rules, monitoring performance and or assisting producers (Anandajayasekeram & Gebremedhi, 2009). Value chain governance should also be seen from the point of ‘richness’ and ‘reach’ thus in terms of its depth and pervasiveness (Evans & Wurster 2000).

2.11.1.3 Leverage and Impact

Value chain analyses should have the goal of identifying interventions that can have a substantial effect on the value chain. In situations where large firms are involved in the chain, it may be challenging developing interventions to assist each individual firm, as a result of the cost involved in contacting each firm (Anandajayasekeram & Gebremedhi, 2009). Therefore, value chain analysis seeks to pinpoint the key nodes in the chain where actions are needed to assist a large number of firms at a go. These kinds of interventions are known as the leverage



(Holtzman, 2002). Indicators such as system nodes, geographic clustering or policy constraints help in identifying sources of leverages (Haggblade & Gamsler 1991).

Large input suppliers and output distributors often function as system nodes. Clustering offers the possibility to reach many firms in a go. Policies can be the most powerful lever, as they can likely affect a multitude of firms spread geographically and in size. In summary, leverage interventions involve working through large intermediary firms, delivering service to geographically clustered farms, or policy reform (Anandajayasekaram & Gebremedhi, 2009).

2.11.1.4 Vertical Coordination

The success of agricultural value chains is subject to how well the actors in the value chain are organized and coordinated. Verticality in value chains implies that the conditions at one stage in the value chain are likely to strongly impact conditions in other stages of the value chain, both directly and indirectly, and through expected and unexpected means. An enhanced vertical coordination of value chains ensures better matching of supply and demand between value chain stages, leading to efficient, low exchange, maintenance of product quality (reduced spoilage, losses), productive transformation (processing, packaging) that adds value, convenience, quality and other attributes, and overall good information on supplies and prices at different levels of the value chain. Coordination implies the harmonization of the functions of the value chain. Coordination of value chains occurs at different stages of the chain to ensure that



the outcomes of interactions are as required. Value chain coordination can be done in several ways. Firms at specific key stages of a value chain (e.g. wholesalers and processors) can be coordinated agents, by handling or processing large volumes of commodity, thereby coordinating assembly, transformation and distribution. Also, government and non-governmental organizations that render desired services and producer, processors and traders associations can also serve as coordinating organizations (Anandajayasekeram & Gebremedhi, 2009).

The uncertainty and risk associated with, and the perishable nature of agricultural commodities and the increasing demand of quality and safety standards by consumers provide incentives to develop effective coordinating institutions and arrangements. Value chain analysis lays emphasis on the vertical dimension. The ways of harmonizing the vertical stages of input supply, production, processing and marketing, and the interest is on how productive, efficient and effective commodity subsystems are in the production, assembly, transformation (processing) and distribution of commodities (Anandajayasekeram & Gebremedhi, 2009).

2.12 Importance of Value Chains Analysis for Agricultural Development

Globalization has provided producers in developing countries with the opportunity to take advantage of emerging domestic and global markets, however, for producers in developing countries to make use of these opportunities there is the need to adopt good production methods in order to deliver quality and value added products demanded by these markets. Also, farmers need the assurance of



a reliable market for their produce (Dolan and Humphrey 2004). Value chains are mainly well-matched to understanding how the poor people in developing countries can engage with national, regional and international markets and benefit from such markets (Trieneken, 2011).

The organization of agriculture along the value chain framework has been identified as one of the strategies to achieve the full potential of the agricultural sector (Kumar et al., 2011). Value chain analysis provides a framework for understanding the different business relationships that exist among value chain actors, tools for increasing efficiency, productivity and value addition. Understanding the production and the consumption pattern of a specific food commodity helps in identifying the weaknesses within the chain and the most critical areas of intervention (Sanogo, 2010).

The value chain framework is important in establishing how inputs and services are merged together and transformed or manufactured into a product. How the product moves from the point of production to the final consumer. The value chain framework can also contribute to the development of pro-poor initiatives that seeks to create market, increase productivity and competitiveness of small and medium scale enterprises (Webber & Labaste, 2010).

Value chain analysis plays an instrumental role in understanding the need and the scope of systemic competitiveness. The ability of a firm to identify its core competencies is principal for the firm outsourcing for those roles that it has no unique capabilities to perform. A sketch of the flow of inputs (goods and services)



in a production chain provides the firm with the opportunity to identify the role of other key player's towards its success (Kaplinsky & Morris, 2001). Also, global markets have become increasingly demanding of variety and quality, and the resulting chains of production have become increasingly suffused with standards. And in order to meet these requirements, the chain needs to be linked together (Mitchell et al., 2009).

Value chain analysis is both conceptually and practically important. Conceptually, the value chain approach clearly indicates that production is not the sole means to create value. Before a product gets to the market, there is a blend of activities that contribute to the final value. Thus, conceptually the value chain approach presents a perfect image of the process of value creation. Also, the value chain concept helps people to appreciate the manner in which trade takes place in present day (McCormick and Schmitz, 2001).

2.13 Limitations of the Value Chain Approach

Value chain analysis is very useful in outlining product flows, value added along the chain, identifying key stakeholders and the business relationships that exist among the key stakeholders. The value chain guarantees the actors market, however, these actors operate in markets governed by rules and standards. Value chain analysis often fails to provide information on the trade rules that apply in distant countries. The value chain analysis needs to be complemented with information on these rules (Schmitz, 2005).



Mostly, value chain analysts do not adequately study the business environment in which value chains function. This may lead to failure in the identification of potential interventions for an enhanced business and value chain performance. More so, government regulations, international standards, trade regulations, and market forces typically shape the business environment (Webber and Labaste, 2010).

Also, some value chain interventions are characterized with shifting value within the value chain, instead of creating more value. Donor agencies and governments have often used value chain analysis to identify and protect feeble links along the chains. Also, a session of stakeholders perceives value chain analysis as a “zero-sum game” aimed at shifting value from one link of the chain to another. This derails the opportunity to upgrade the whole system to the benefit of all value chain actors (Webber and Labaste, 2010).

2.14 Shallot Value Chain: Experiences from Indonesia

Shallot is the third largest vegetable produced in terms of land area in Indonesia. Between 90,000 to 100,000 hectares of shallot is produced annually. According to ACIAR (2013), growers and on-farm labour makes substantial income from shallots. Few years ago, shallot yields changed around 9.5 tonnes per hectare. In Indonesia, shallots are mostly cultivated in the dry season because production of shallots in the raining season are characterized with slow plant growth and high incidence of pest and diseases. The variety of shallot cultivated by farmers in Indonesia depends on the local agro-climatic conditions, planting season,



availability of planting material and the producers' relative strengths and weaknesses of different cultivars. ACIAR (2013), also indicated farmers share information about shallot production among themselves. Shallots are sold in domestic markets in Indonesia. However, demand often exceeds supply especially in the first six months of the year. The excess demand is met through import of shallots from Thailand, the Philippines, and Vietnam, India and Myanmar. The study also identified poor access to water, an underdeveloped local input retail network, poor knowledge of varieties and areas such fertilization, pest management and control, high labour cost and limited capital as challenges confronting the shallot value chain in Indonesia (ACIAR, 2013).

2.15 Relationships and Linkages between Value Chain Actors

Relationships can exist between value chain actors at different process steps. For instance, producer and trader relationships, farmer to farmer relationships etc. The nature of the relationships that exist among actors is essential in determining factors such as bargaining power within the value chain, thus potentially assist in determining the benefits and income which each actor gains (Sanogo, 2010). According to Sanogo (2010), relationships or linkages between similar actors can be mapped based on three typologies:

- **Spot market relations:** Spot market relations are relations that are established on the spot. Commodity price, volume and quality are negotiated and conclusions are made on the spot. This type of relationship



is mostly typified with the fresh vegetable market place. Where the buyer and the seller converge, reach an agreement and transactions are finalized.

- **Persistent network relations:** Persistent network relations occur when actors have the preference for transacting with each other constantly. It is characterized with a greater level of trust and interdependence. In some circumstances, these relations are formalized through contracts.
- **Vertical integration:** Vertical integration goes beyond “relationships”, since both actors share the same (legal) ownership. One and the same organization (this can be a parent company or a cooperative) deals with different processes throughout the value chain.

2.16 Constraints of Value Chain Actors

Producers of agricultural value chains often have difficulties accessing markets as a result of lack of market information and skills to meet market demands. Due to poor information flow coupled with challenges within value chains, producers are limited in entering new markets and this minimizes the benefits they obtain from entry (Folke et al., 2010). Most farmers are usually forced to sell their produce either on the farm or immediately after harvest due to financial constraints and storage problems. Consequentially, farmers have difficulty in acquiring planting materials during planting seasons and are obliged to purchase planting materials at high prices whose quality they are not sure of. In order to avoid this, some farmers store their own seeds tied into a bunch and keep them above the hearth in the kitchen for 3 to 5 months. However, the use of these seeds promotes diseases,



viruses, fungi, bacterial pathogens and nematodes (Currah and Proctor, 1990 as cited in Aklilu, 2014).

For many vegetable farmers in Sub-Saharan Africa, spot markets constitute the default option for marketing their vegetables. Such market transactions continue to be the dominant allocation mechanism within the region. These markets are considered more important than allocations through hierarchies such as governmental organizations (Eaton et al., 2007). Also, the perishable nature of vegetables and unreliable market information force most farmers to sell their produce in spot markets, even though they are characterized with high transaction costs. Most often, spot markets are filled with collectors who buy produce from farms directly. These collectors sometimes assist farmers in harvesting the produce in order to meet their demand (Sonko et al., 2005). In such circumstances, farmers have little bargaining power and accept the prices offered by the rural traders (Eaton et al., 2007).

IFAD (2003) analyzed market access within three dimensions: physical access to markets; structure of the markets; and producers' lack of skills, information and organization.

- **Physical access to market:** this refers to distance to markets and unavailability of roads. Most developing countries are characterized with inaccessible roads at certain periods of the year. The bad nature of road undermines ability of producers to buy their inputs and sell their crops. This results in high transportation costs, both to buyers and sellers and it



leads to uncompetitive markets. Also, remote areas are characterized by increased uncertainty and reduced choices, its consequences are less marketing opportunities, reduced farm gate prices, post-harvest losses and increased input costs. Market access is therefore an important factor of household production systems.

- **Market structure:** Most rural markets are characterized by extreme asymmetry of relations between numerous producers with few market intermediaries. As a result, these markets are uncompetitive, unpredictable and highly inequitable. Producers are price takers because of low bargaining powers. Producers who cannot access markets rely on traders who buy their produce from their communities and sell inputs and other consumer goods to them. The situation is worsened when the trader is the sole provider of market information.
- **Lack of skills, organization and information:** As a result of poor understanding of market, how it functions, why prices vary, limited information on market conditions, prices and the quality of goods, lack of collective organization that can give them the power they require to interact on equal terms with others, generally larger and stronger, market intermediaries coupled with no experience of market negotiation and little appreciation of their own capacity to influence the terms and conditions upon which they trade makes poor producers disadvantaged and vulnerable. Consequently they become passive participants of the market,



instead of being active players, which can be exploited by other players with knowledge and information.

ACIAR (2013) in their study identified poor access to water, poor technical knowledge in production (fertilization, pest management and disease control) and government extension services to be weak. Local input dealers have no relevant information to offer, chemical companies provide no research and extension services and traders are poorly positioned to contribute to technical innovation processes because they themselves lack the required know-how. They have poor understanding of different varieties and are not much more knowledgeable about shallot cultivation than the average local farmer. High labour cost was also identified as one of the constraints of the shallot value chain in Eastern Indonesia. Their study also revealed that financial constraints affect both farmers and traders. In Ghana, despite the presence of Community and Rural Banks, Ghana Commercial Bank, and Agricultural Development Bank, access to credit remains a major challenge to producers, due to lack of collateral.

2.17 Constraints and Prospects of Irrigation Development in Ghana

Ghana has adequate water resources to promote irrigation development. Ghana's irrigation water ranges from 0.36 to 2.9 million hectares depending on the degree of water control. Ghana is drained by the Volta, Southwestern and Coastal River systems, with a mean annual runoff of 39.4 billion cubic meter, thus if properly managed, may be sufficient to support domestic and irrigation purposes. About 652 million cubic meter of water was used for irrigation, approximately 66% of



total withdrawals in 2000. Largely, Ghana has a huge potential in irrigation, however this potential is underexploited (AgWater Solutions, 2010).

Marketing and marketing facility is one of the most powerful factors greatly stimulating agricultural productions of a locality. Therefore, there is a positive link between efficient market and development of irrigation agriculture. Vegetables are perishable and often bulky crops, so an efficient marketing channel is necessary. Market and price information to producers must be location specific, timely and accurate, dynamic and available in local language that can be easily understood by the rural population. Improved communications such as radios and mobile phones play an important part in information asymmetries (IFAD, 2003). The existence of community radios in Ghana provides the avenue to disseminate market information and prices without difficulties.

The emergence of super markets in Africa provides small scale farmers with the opportunity to increase marketing channels for their produce both nationally and regionally. Fifty five (55) percent of the national food retail is supplied by supermarkets in South Africa and in Kenya supermarket output account for 30% of all food retail (Poole and Frece, 2010). In Ghana, the demand for high-quality vegetables by supermarkets, hotels and restaurants provides another marketing avenue for vegetable farmers. For instance, Shoprite has 4 outlets, but will expand in the coming years to 13 outlets. Also, the establishment of the West Hill Mall provides marketing opportunities for vegetable farmers. However, these production outlets demand high agronomic knowledge and skills, alongside postharvest management (Saavedra et al., 2014). Contract farming is mostly



applied with respect to supermarkets, hotels and restaurants. With a reliable water system for vegetable production, smallholder farmers can take advantage of these emerging markets.

Despite these opportunities, irrigation development in Ghana is hampered by numerous systemic and market barriers. Systemic barriers include infrastructure, land tenure, trade duties and taxation, labour availability, and water access. Access to finance, lack of farmer knowledge and supply chains constitute the market barriers (Mendes et al., 2014).

2.17.1 Access to Finance

Access to credit is the greatest challenge to irrigation sector expansion in Ghana. Many small farmers access credit through informal loans from family members, due to exorbitant interest rates charged by banks and their preference to service commercially oriented farmers (Mendes et al., 2014). Financial challenges can be seen at irrigation-scheme level and at farm-household level. At irrigation scheme level, money is required to maintain, operate and/or rehabilitate the infrastructure. However, as a result of inadequate government budgetary allocation, and funds generated through irrigation service fee collection are also insufficient, the resultant effect is the deterioration of irrigation infrastructure, the breakage of canals, and the leakage of the weir's sluice gate. At the farm-household level, farmers require credit for developing wells, acquiring water lifting devices, and financing expenses for crop production inputs. But these are often limited due to



financial challenges. Generally, there is lack of support for farmers in acquiring inputs, and farmers purchase these inputs at high prices (Namara et al., 2011a).

Quartey et al. (2012) asserted that most small scale farmers are limited in accessing credit from formal and informal institutions. Credits from formal institutions aside being limited and unavailable, comes with the demand for huge collaterals. The informal institutions are also characterized with high interest rates which makes their credit expensive. With the challenges associated with the formal and informal institution in accessing credit, other ways through which farmers' access credit is through middlemen. Middlemen in the supply chain give farmers credit through pre-harvest contracts. Under this arrangement, producers and middlemen (wholesalers and retailers) enter a contractual agreement in which the middlemen make an advance payment before the produce is harvested at an agreed price. The middlemen provide cash and inputs to support the farmer in production. Though this system provides an alternate means of financing production by smallholder farmers, they are rarely available.

2.17.2 Labour Availability

The labour intensive nature of most of the practices also pushes the farmers to rely on expensive labour-saving technologies such as herbicides for weed control. In circumstances where water is manually lifted (using buckets) and distributed, irrigated farming becomes labour intensive. The lack of casual labour can cause severe problems in production. For instance, crops such as shallot, involve



cumbersome post-harvest processing routines. The high frequency of irrigation in sandy coastal areas, contributes to labour demand (Namara et al., 2011b).

2.17.3 Access to Inputs and Services

Unavailability and high cost of inputs are among the most important constraints to commercial agriculture in Ghana. The development of groundwater irrigation is hampered by lack of efficient water-lifting and well-drilling technologies. Majority of irrigation equipment suppliers are based in Accra. Irrigation equipment is often not available to farmers in the right quantity or quality desired. In situations where farmers do have access to equipment, they may not have the technical knowledge needed to utilize it effectively. Also extension services in the irrigation sector are inadequate, and most often extension personnel are not conversant with the details of emerging irrigation systems (Mendes et al., 2014).

Studies in Nepal and Bangladesh, have demonstrated the positive impacts of irrigation on social and economic development of poor rural areas. These studies also established that optimum benefits from irrigation require that farmers master other innovations, like improved seed varieties and fertilizer technology (Brabben et al., 2004).

Namara et al. (2011a) in their study on “smallholder shallow groundwater irrigation development in the Upper East region of Ghana” observed that high cost of essential inputs such as fertilizers, pesticides, herbicides and improved seeds contributes either to outright financial loss or significant reduction in the profit margin of farmers, thus reducing farmers’ incentives. They also indicated



that most of groundwater irrigated crops do not qualify for government fertilizer subsidy policy. For example, certified shallot seeds are difficult to come by in Ghana. Also, the availability of storage facility to the farmer reduces his gross margin, as it enables the farmers to store their produce when prices are low. Subsequently, they are able to receive relatively high prices for their produce (Quartey et al., 2012).

2.17.4 Irrigation Infrastructure

Due to the inadequate government budget allocation to public irrigations, most public irrigation infrastructure has deteriorated due to poor maintenance. In the long run most of these public irrigation system work as rain fed systems. Poor planning and faulty designs have worsened the problems confronting Ghana's irrigation infrastructure and equipment. The design of most irrigation projects does not take into consideration location peculiarities such as topography, soils, crops grown, and the skills of the farmers involved, standards are rather followed (Mendes et al., 2014). Power tariffs in Ghana are an impediment to the economic viability of irrigation systems that are not fed by gravity or close to perennial surface water sources. Due to the high cost of energy (petrol, diesel and electricity) for pumping, irrigation has generally developed in areas naturally endowed with readily available water, such as in the south along the Volta region (Mendes et al., 2014).



2.17.5 Land Tenure and Availability

Land tenure is a challenge in irrigation development in Ghana. Namara et al. (2011a) in their study indicated that land for development of public schemes are acquired by the government, and limited compensation is paid to the land owners, and as a result disputes still exist in many areas. Due to land tenure insecurity, many farmers resort to seasonal rather than permanent shallow wells, despite the inefficient drudgery of digging and refilling wells every season (Namara et al., 2011a). The southeastern coastal regions are characterized by inadequate land for intensive groundwater irrigation. In coastal areas, most farms are located near townships, so there is little room for expansion (Mendes et al., 2014). Farm size in the area is very small, but irrigation has significantly enhanced its carrying capacity. In the Northern regions of Ghana, where land is more abundant, per capita irrigated land size is limited because irrigation schemes are designed to benefit as many households as possible. This results in lower per capita and per household irrigated area. Hence, farmers cannot make a living from irrigated agriculture, and they consider it a supplement to other more important livelihood strategies (Namara et al., 2011a).

2.17.6 Technical Constraints

Poor planning and faulty design is sometimes the cause of the deplorable nature of irrigation equipment and systems. Most irrigation projects are designed based on standards, despite differences in topography, soils, crops grown, skills of the users, etc. The design related problems range from over-designing, over-



estimation of the realizable command area, and the faulty layout of canals and laterals. By default or design, irrigation infrastructure is used for multipurpose, where irrigation water is used for livestock watering, domestic use, crop production and fishing. However, irrigation infrastructure designs fail to consider the multi-functionalities and the crop-livestock interactions. Livestock pose a challenge for irrigated agriculture, as often livestock destroy irrigated crops during the dry season, when feeds are limited (Namara et al., 2011b).

Most farmers in Ghana lack knowledge and skills to expand irrigation. They often do not have adequate knowledge on cultivation practices and they have challenges accessing quality inputs such as certified seeds and fertilizers (Mendes et al., 2014). Even those who can assess these inputs sometimes do not know how to apply them. More so the availability of farm machines influences cropping intensity, timeliness, and the size of the area the farmer cultivates. Farmers require expert advice to find appropriate seed and type and rates of agrochemicals for diverse irrigated crops. However, these services are not readily available for the irrigation sector (Namara et al., 2011a).

2.17.7 Post-harvest and Marketing Issues

Several post-harvesting and marketing issues prevent farmers from maximizing the productivity of irrigated land (Mendes et al., 2014). Due to limited marketing channels or market participants, farm produce is often sold on credit at very low preconceived prices. Often, buyers provide input credits to their customers as a way of guaranteeing output supply. Storage facilities for vegetables are often



scarce, however the perishable nature of vegetables require the use of good storage facilities. The inadequacy of storage facilities compels farmers to sell their farm produce once they are matured and gives power to middlemen and women to influence prices. Poor post-harvest handling of food crops also reduces its quality and competitiveness (Namara et al., 2011b).

2.18 Social Network Theory

Social network is defined as a set of entities (actors and nodes) and the set of ties that represent a designated type of relationship among them (Mc Gee & Warms, 2013: 2). Social network approach is grounded in the assumption that the structure of social relationships among a collection of nodes embedded has significant consequences. The nature of relationships in which a node is embedded can either enable or constrain the behaviour and the final outcomes of that node. Key among the theoretical concepts of the network theory is two fundamental social capital perspectives. Social capital is the benefits of network connectedness. Social capital is seen as the determinant of the success of individual or collective entities. The social capital perspective argues that at the individual level, actors can use their social ties to access or control resources such as information or financial capital which they do not have individually. And at the group level, network characteristics can enable actors to pursue goals collectively. (Mc Gee and Warms, 2013).

Scott (1991) outlined three main research that contributed to the formulation of the social network theory in its initial development. This include sociometric



tradition, the interpersonal relations tradition and the anthropology tradition. The sociometric tradition depend on graph theory methods from mathematics. The interpersonal relations tradition concentrates on the formation of cliques among a group of individuals. And the anthropology tradition looks at the nature of community relations and less advanced communities (Scott, 1991).

Applying the social network theory in analyzing the shallot value chain, the assumption is that actors of the shallot value chain benefits from their connectedness. Actors of the shallot value chain can use their social ties to access or control resources such as market information, good agronomic practices, irrigation water management among others. Also the benefits of social capital will enable actors to access capital which they may not have individually.

2.19 Conceptual Framework

The organization of food production along the value chain framework is very important in determining the value that is added at each stage of production. Each stage of production is important (input supply, production, distribution and consumption). As the product moves from input suppliers to farmers to distributors through to consumers, value is added to the product. As shown in figure 2.1, the production of agricultural commodities starts from input supply and moves to production to distributors and to the final consumer. The availability of agricultural inputs such as seeds, agrochemicals, farm equipment, irrigation equipment and water and extension services to farmers/producers in the right quantity and quality ensures increased production and yields. The resultant effect



of increased production or yields with a guaranteed market is higher profits for farmers. Also, timely and consistent delivery of agricultural produce to distributors (wholesalers and retailers) will ensure availability of farm produce at moderate prices to consumers. Each actor in the value chain has specific roles to play within the chain. However, how coordinated and organized value chain actors are determine the success or failure of the value chain. Input suppliers supply agricultural inputs to farmers to undertake production. After production, the commodity is passed on to distributors (such as wholesalers and retailers) who deliver it to consumers. Within the chain, distributors ensure that commodities are available to consumers in the right quantity which subsequently leads to timely and consistent delivery of food commodity.

Adequate market information (thus rules and regulations that govern the market) assists producers to meet the demands of the market especially international markets. The unavailability of this information to producers may affect their delivery in these markets. The unavailability of market information renders producers price takers and buyers price makers.



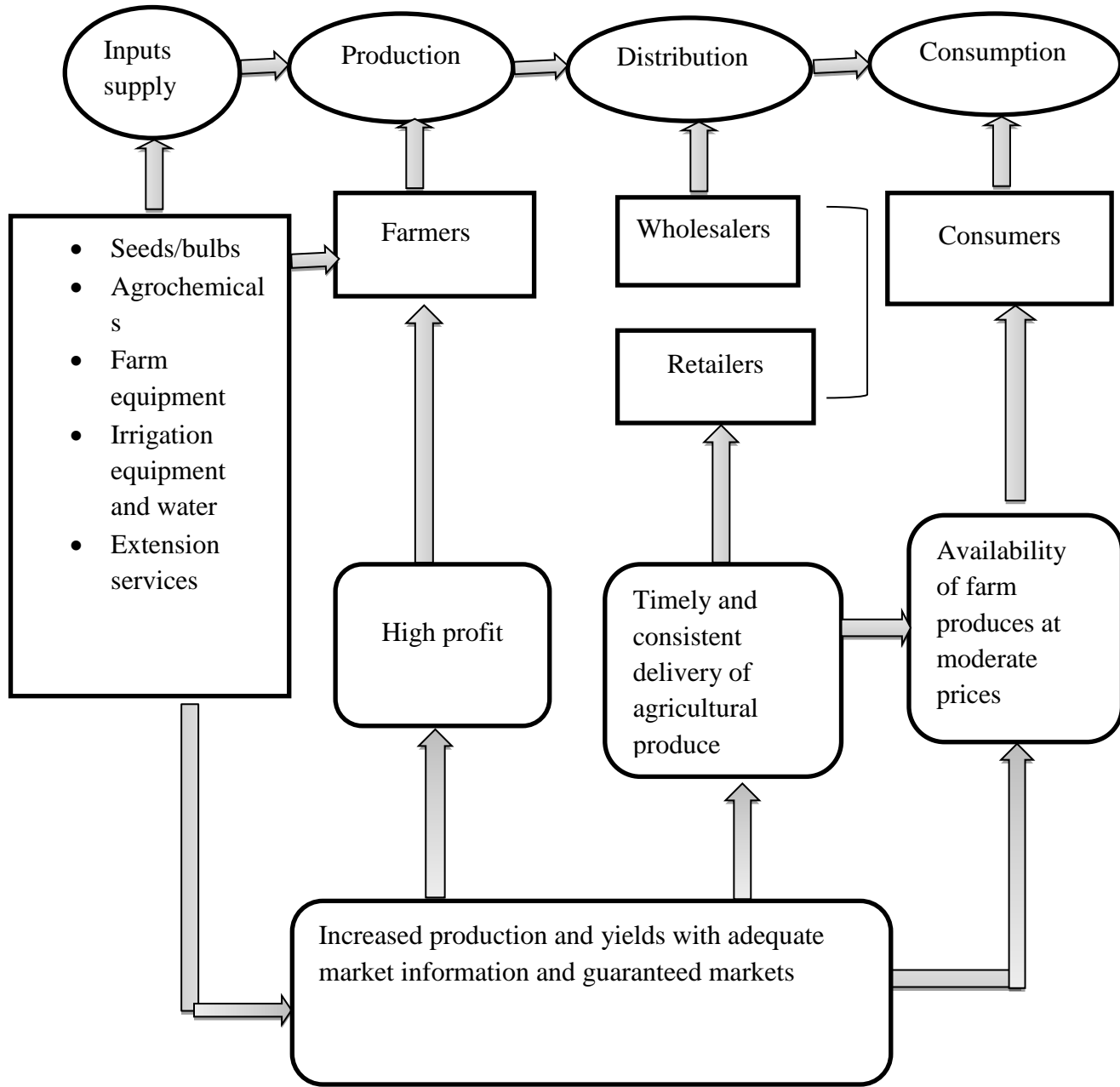


Figure 2.1 Conceptual Frameworks of Small Scale Irrigation and Competitive Value Chain

Source: Authors construct 2016

2.20 Gaps in Literature

Kortatsi et al. (2005) in their study “potential impact of large scale abstraction on the quality of shallow groundwater for irrigation in the Keta strip Ghana” came out with the following conclusions, that large scale irrigation of all suitable agricultural lands will require minimum of 2.0 x10⁷ cubic meter water through the dry season, and the abstraction of this quantity of groundwater in the dry season could lead to a depression in the water table by 1m. As a result, the current shallow groundwater will no longer be ideal for medium salt tolerant crops such as shallot currently cultivated in the area. And this will have socio-economic implications on the area. Despite indicating that large-scale irrigation is not appropriate for the area as a result of future depletion in the water table, the study did not look at the role of the irrigation system on the shallot value chain in the area.

According to Zikpui (1997), farmers naturally acquire valuable agricultural knowledge from either their colleague farmers or through farmer based organizations which are established for the purposes of extension services and engagement of institutions that sell farm inputs. Findings from Zikpui’s study titled “the effects of extension services on shallot farming in the Anloga area with respect to the adoption of innovations” revealed that majority of farmers have limited access to extension services. Even the pieces of advice provided to the farmers were not related to the improvement of shallot farming. This problem was attributed to extension agents not having the relevant knowledge and recommendations on shallot farming to introduce to the farmers. The study



identified fertilizers, insecticides, knapsack sprayers, water pumps as innovations that are being used in shallot farming. However, the study did not look at the types of irrigation (as innovations) used in shallot farming considering the high dependence of shallot farming on irrigation and manure. The study also failed to establish, the nature of relationship that exist between farmers and service providers.

Awadzi et al. (2008), established in their study “The Soil-Land use System in a Sand Spit Area in the Semi-Arid Coastal Savanna Region of Ghana-Development, Sustainability and Threats”, that the current shallot system may be under threat and may not be sustained due to economic and environmental reasons. They indicated if the gains from shallot farming are not increasing to enable it to compete with other produce, the shallot system will be converted into pepper-okro-tomatoes horticultural system. The paper identified environmental problems such as depletion of the aquifer as a result of increased domestic use of water, which are also taken from the aquifer in addition to irrigation due to increased population, and the pollution of the aquifer by pesticides and nutrients. However, their study did not look at the impact of the irrigation systems on the shallot value chain, to examine whether the irrigation system makes the shallot value chain competitive or reduces its economic gains. This study also to identify the prospects and constraints of shallot value chain.

Benneh (1972) also researched extensively on issues of land tenure in shallot production in Anloga. His study examined the various land tenure systems practiced in the area and how these systems and other environmental factors affect



shallot farming. However, his study did not look at the contribution of irrigation on shallot production, as the system largely depends on the use of manure and irrigation. Also, the study assessed land tenure which is only one of the numerous challenges confronting shallot farmers in the area.

2.21 Conclusion

Even though quite a number of studies have been conducted on shallot production, most of these studies focused on identifying the challenges of shallot production, in terms of land tenure, extension services and the quality of shallow ground water used for irrigation. No study was identified to have assessed the contribution of small scale irrigation to the shallot value chain, the types of agricultural inputs and supportive services in ensuring used in shallot production, the relationship and linkages between value chain actors, the constraints of these actors and the opportunities and constraints of small scale irrigation in the area.

Input suppliers and service providers are important links in the value chain. It has been established that aside ensuring an all year round production, irrigation reduces gross margin. Irrigation influences the quality and the structure of the processing and marketing system between the producer and the final consumer. It changes the quality in terms of size, taste, smell, visual appearance, milling characteristics and cooking properties. As a result of improvement in product quality, there is a reduction in the level of differentiation in quality between producers. It has also been established that technologies are important in irrigated agriculture; however organizational improvement in production, marketing,



processing and consumption of vegetables is above technologies. Irrigation therefore, increases the stability and predictability of output as a result of organizational improvement occasioned by the irrigation. This subsequently stabilizes producer incomes.

Finally, the success of small scale irrigation partly depends on appropriate application of improved farm inputs such as fertilizers, improved seeds, herbicides and other support services.



CHAPTER THREE

RESEARCH METHODOLOGY

This chapter captures the profile of the Keta Municipality. It also looks at the methodology that was used in collecting and analyzing the data for the study.

3.1 Methodology

According to Ahiadeke (2008), methodology is the general principles behind the research. The methodology directs the criteria that the researcher chooses to use for collecting and interpreting data. The assessment of the shallot value chain was done successfully with the adoption of a research approach which guided the study. A mixed method approach was adopted, but more concentration was on qualitative methods. The mixed method assisted the researcher to fully understand the problem studied. Quantitatively simple random sampling was used in selecting samples for the study and questionnaires were designed and administered to shallot farmers, input suppliers and traders. Qualitatively snow ball sampling and purposive sampling was used in sampling traders and input suppliers. Other tools such as key informant interviews, focus group discussions and observations were also adopted in the study. These tools were used in soliciting information from producers/farmers, input suppliers, traders (wholesalers and retailers), staff of the Ministry of Food and Agriculture (MoFA) and German Agency for Technical Cooperation (GIZ).



Hellin & Meijer (2006) argued that mixed method is often appropriate in value chain analysis because quantitative methods such as questionnaires often fail to capture many of the degrees of actors' realities, the reason being that their knowledge systems are often not verbally or numerically codified. In this circumstance, qualitative data, which can be obtained through the use of observation, focus group discussions and semi structured interviews better articulate their views, perceptions and realities.

Furthermore quantitative data permit a more objective assessment and facilitate an assessment of larger-scale patterns, trends and relationships among different value chain actors. Questionnaires focused on what value chain actors are doing, qualitative research tools not only provide a means to check the reliability of data from questionnaires, but can also give more insight into why actors are doing what they do and how they formulate their decisions (Hellin & Meijer, 2006).

3.2 Profile of Study Area

Keta Municipality is one of the 25 administrative Districts of the Volta Region of Ghana. Keta is the district capital. The Municipality was carved out of the former Anlo District. It was established by Legislative Instrument (L.I. 1868) of 2007. Keta was an important trading post between the 14th and late 20th century via a port and fort Prinzenstein built by the Dutch in 1784 (GSS, 2014). According to the 2010 Population and Housing Census, the population of the municipality stands at 147,168 representing seven percent (7.0%) of the region's total population. Keta Municipal is mainly an agricultural district, with the majority



(67.7%) of the population engaged in crop farming, livestock keeping, fishing and other related trading activities.

The Municipality lies within Longitudes 0.30°E and 1.05°E and Latitudes 5.45°N and 6.005°N. It is located to the east of the Volta estuary, about 160km from Accra. It shares borders with Akatsi South District to the north, Ketu North and South Districts to the east, South Tongu District to the west and the Gulf of Guinea to the south as shown in plate 3.1. The Municipality has a total surface area of 753.1km² (GSS, 2014).

Temperatures in the area are quite high with a mean monthly temperature of about 30°C in the warmest month, March, and about 26°C in the coldest month, August. The average minimum diurnal temperature is about 25°C and the average maximum is about 33°C. Average annual rainfall is below 900 mm (Awadzi et al., 2008). This annual rainfall is often unevenly distributed over the year. The harmattan dominates with winds from northeast and gives rise to a long dry season from November to February.

From March, the winds blow from southwest and the monthly precipitation increases and reach a peak between April, May and June, the major rainy season. In August and sometimes July, the precipitation is very low representing the minor dry season. September to November is the minor rainy season, which often is not reliable.





DISTRICT MAP OF KETA MUNICIPAL

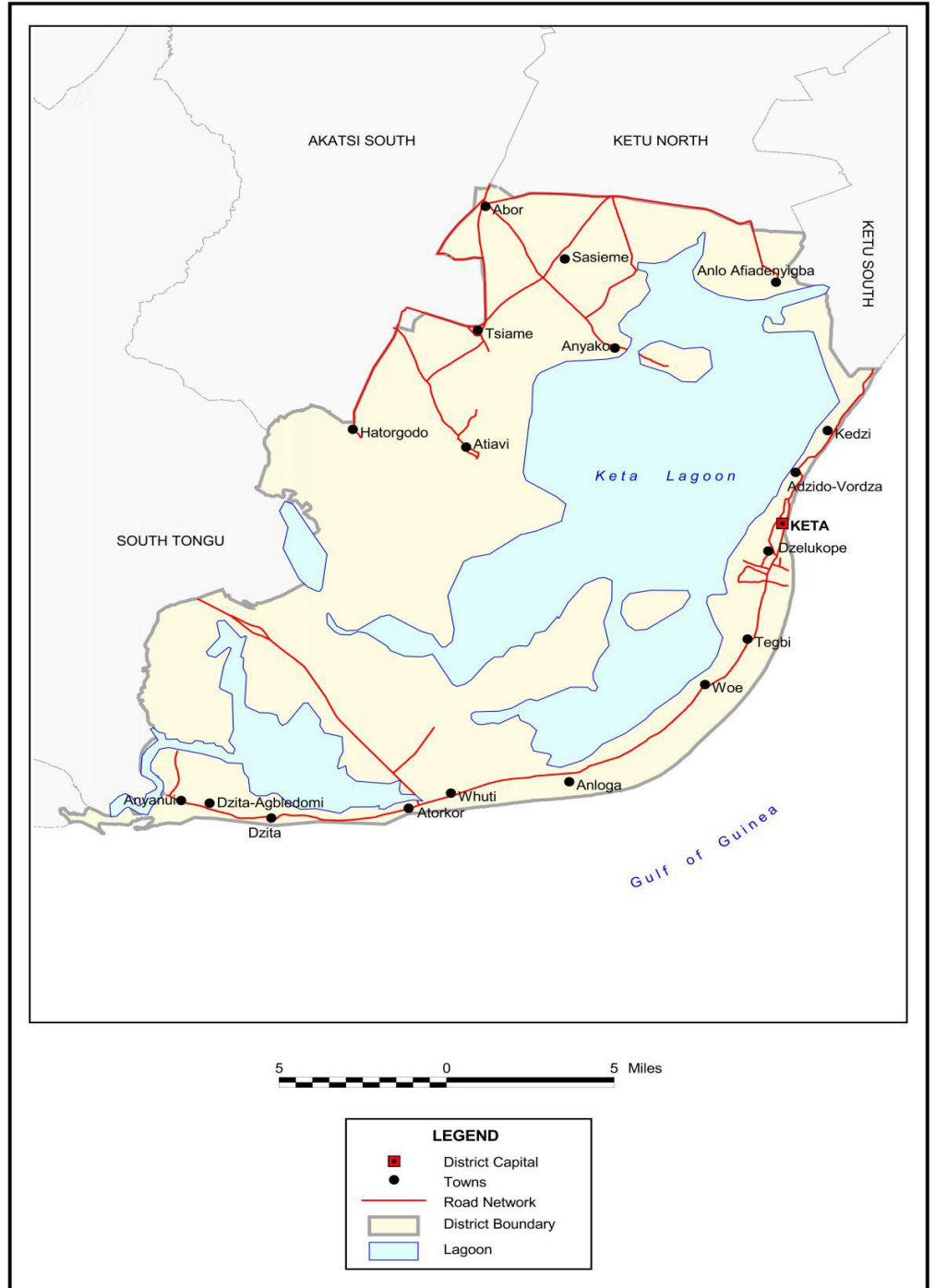


Plate 3.1 Map showing the Communities in the Keta Municipality

Source: GSS, 2010

The rain falls mainly in few heavy showers. As these showers are erratic and unreliable, the year-to-year pattern of the peak rainy season fluctuates as well as the total rainfall. In some years, the peak rainy season starts as early as March, and in other years it starts in June (Awadzi et al., 2008).

The district is one of the major vegetable producing districts in the Volta region. The district is well known for its shallots, which are produced in the flood plains along the Angaw and Keta lagoon and on the dispersion created by some wealthy farmers. Other vegetables such as okro, tomatoes, and pepper are also produced. The district is one of the most densely populated districts in Ghana. The area is characterized with limited land particularly in the coastal areas of the District. The types of land tenure system in the area include sharecropping, lease of farm beds and use of the bed as collateral.

Due to the sandy nature of the area and the scarcity of agricultural land, the Municipality has developed a very intensive farming system which involves irrigation, manuring, and rotation of crops (Benneh, 1972). The main crop which is cultivated under this system of farming is shallot. The principal shallot producing town in the Municipality is Anloga. In the past buckets were used in fetching water from shallow tube wells in watering the shallot beds. This traditional method of irrigation together with the use of organic manure such as cow dung, bat droppings, poultry manure and anchovies (Keta school boys) were used which made it possible for farmers to cultivate three to four times in a year. However, in 1990 the area witnessed an improvement in technology when the tube well pump technology was introduced in the area by a soil scientist and an



irrigation expert (Ahiabor, 2014). This resulted in the cultivation of the uplands which were originally uncultivated. Again in 2010, drip irrigation was introduced to the area by a group of researchers from the University of Copenhagen in Denmark. The shallots produced in the area are marketed in marketing centres in and around the Municipality (Ahiabor, 2014).

3.3 Research Design

According to Sarantakos (2005), a research design explains in detail how a researcher intends to carry out a research. He indicated that there are various forms of research designs. Some designs focus on the process of data collection only while others extend their boundaries to cover data analysis. Thus research design focuses on the process of data collection and data analyses. Also, the manner in which a research will be conducted is determined by the methodology that underlines the research. This research used both quantitative and qualitative research designs.

Quantitative tools of data collection such as questionnaires were used in soliciting quantitative data, while qualitative data collection tools such as key informant interviews, focus group discussions and direct observation was used to solicit information and assisted the researcher to fully answer the research questions. Data was analyzed both quantitatively and qualitatively. Qualitative data was analyzed both during and after data collection. Qualitative data was analyzed by organizing data into categories on the bases of themes, concepts and similarities. Quantitative data was analyzed using the Statistical Package for Social Scientist



and Microsoft excel. Data was presented using bar graphs, pie charts and percentages. Data gathered from focus group discussion was also analyzed using SWOT analysis to identify the Strengths, Weaknesses, Opportunities and Threats of the small scale irrigation and the prospects and constraints of the shallot value chain.

3.4 Target Population

The target population of the study is the population from which information was sourced. According to the Ministry of Food and Agriculture, Keta Municipality has a total of 96,110 farmers. The main shallot producing community is Anloga with a farmer population of 9,615. Farmers, private input vendors and vegetable traders form the target population. Also the Keta Municipality was selected for the study because is the main shallot producing district in Ghana through the use of small scale irrigation and Anloga is the main shallot producing community in the Municipality.

3.5 Sample Unit

According to Sarantakos (2005), sample units are the persons, groups, systems that are chosen to be studied. Key players involved in the shallot value chain in the Keta Municipality such as input suppliers, farmers, traders, representatives of farmer based organizations formed part of the sample unit. Also other key players such as the Ministry of Food and Agriculture officials formed part of the sample unit.



3.6 Sample Size

The sample size was determined through sample selection. Farmers list was used to select shallot farmers randomly and private input vendors were selected purposively. Private input vendors were selected purposively because though there were sixteen (16) input vendors in Anloga but the researcher was interested in input vendors that sell irrigation equipment in addition to other agricultural inputs. In all one hundred and thirty nine (139) farmers, five (5) private input vendors and five (5) traders were interviewed. Also due to the non-existence of a sampling frame for shallot traders in the Municipality, snowball sampling was employed. Five shallot traders were selected because the five were the total number of shallot traders that participants knew who share the same characteristics that qualify their inclusion in the study.

Gregg's (2009) statistical formula for determining sample size was adopted for determining the sample size for farmers, the formula is given as $n = z^2 * P(1 - P) / e^2$ where; n=sample size z= z test for the significance level (1.96), e = error estimate (5%), p= the proportion of the population represented by the sample (10%).

Calculating the sample size for farmers in Anloga

Total population of farmers in the Keta Municipality = 96110

Total population of farmers in Anloga = 9615

The proportion of the population represented by the sample = $9615 \div 96110$
= 0.1



$z = z$ test for the significance level (1.96)

$e =$ error estimate (5%)

$e =$ error estimate $n =$ sample size (?)

Substituting the above into the formula, $n = z^2 * P(1 - P)/e^2$ the sample size obtained for Anloga is (139).

The researcher used a margin of error of 5% due to quality control issues, resources and time factor.

3.7 Sampling Techniques

3.7.1 Simple Random Sampling

Simple random sampling was employed in selecting farmers for the study. The list of farmers (sampling frame) was obtained from the District Department of Food and Agriculture. From the sampling frame, the total number of farmers' in the Keta municipality and Anloga stands at 96110 and 9615 respectively. The list of farmers provided information on names and house numbers of farmers. Farmers were sampled from the farmers list through assigning numbers to the house numbers of farmers, the numbers were mixed and put in a container. The researcher randomly selected until the desired sample of 139 was reached.



3.7.2 Purposive Sampling

According to Neuman (2007), purposive sampling is used in situations in which an expert uses judgement in selecting cases with specific purpose in mind. He added, purposive sampling is appropriate in three instances. The first is where the researcher uses it to select unique cases with a specific purpose in mind. The second is where the researcher uses it to select difficult to reach, specialized populations and finally when the researcher wants to identify particular types of cases for in-depth analysis. The first reason applies to this research, the researcher used this sampling technique to select two and one key informants from the District Ministry of Food and Agriculture and the German Agency for Technical Cooperation (GIZ) respectively that have in-depth knowledge and expertise on the topic studied. Also the researcher used this sampling method in selecting input vendors because the researcher was not only interested in input vendors, but input sellers that sell irrigation equipment in addition to other agricultural inputs.

3.7.3 Snowball Sampling

Snowball sampling also known as network, chain referral, or reputational sampling is a non-probability sampling method for identifying and selecting cases in a network (Nueman, 2007). This method was used by the researcher to sample shallot traders. The interconnectedness of shallot traders and the non-availability of a sampling frame for shallot traders informed the researcher's choice of sampling technique. One shallot trader was identified in Anloga market and she referred the researcher to another trader and the process continued until the sample size of five (5) traders was reached.



3.8 Data Collection Tools

3.8.1 Interviews

3.8.1.1 Key Informant Interviews

This method was used to solicit information from institutions such as the Ministry of Food and Agriculture and German Agency for Technical Cooperation about their role in the shallot value chain. It was also used to establish the levels of the chain that these institutions support and their challenges in delivering these services. Key informants are individuals with in-depth knowledge and experience in the issues that were studied. Checklist was designed and it guided the discussions with the key informants. This method allowed the researcher to explore a wide range of issues in an in-depth manner based on the specific knowledge and willingness of the key informants.

3.8.1.2 Structured Interview

Structured interview in the form of questionnaires were used in soliciting information from individual farmers, private input vendors and traders. Separate questionnaires were designed for farmers, input suppliers and traders. This method was used to collect data on their demographic characteristics, socio-economic status, production and other information that were relevant to answering the research questions.



3.8.2 Observations

According to McCormick and Schmitz (2001:131), all good research involves some element of observation. Much can be learned by observing what people actually do, how they do it, and the setting in which they do it. Observation involves all four human senses. Observations give the researcher the opportunity to watch, listen and take note of what he or she sees on the field. There are basically two types of observations: participant observation and the non-participant observation. Participant observation involves the researcher watching the situation from the inside by being a member and being part of the group he intends to observe. He/she interacts with the group members, participates in activities as he observes the group. This type of observation provides the researcher the opportunity to be close to the group he intends to study and provide him better understanding of the situation. The non-participant observation means the researcher watching the situation from outside. The researcher becomes a passive member of the group and he/she does not take part in the activities of the group. The non-participant observation was used in this study. This provided the researcher with the opportunity to observe the group that was studied. In all, the researcher undertook three field visits. During these visits, the researcher used the opportunity to identify the variations in the adoption of irrigation technologies, inputs used in farming, production techniques and agriculture practices employed in shallots farming.



3.8.3 Focus Group Discussions

Focus group discussion is a qualitative research method that allow for people to be interviewed informally. A focus group discussion was held for farmers. This method was used in soliciting farmers' perceptions of the impact of irrigation technologies on shallot farming in Anloga. Also the focus group discussion was used in obtaining qualitative information on strengths, weaknesses, opportunities and threats for irrigation development in the area and the shallot value chain. It was also used in soliciting the views of farmers on the importance of agricultural inputs such as water, fertilizer, land, labour, capital etc., the role of farmer based organizations in shallot production and policy issues. This tool was used to triangulate and validate data collected through the use of other tools such as key informant interview and questionnaires. The focus group discussion was held on 17th March, 2016 at Anloga farmer's clinic for farmers. Ten farmers participated in the discussion, with a representation of two (2) females and eight (8) males.

3.9 Methods of Data Analysis

Data analysis is the process of bringing order, structure and meaning to the mass of information collected (McCormick and Schmitz, 2001). Quantitative data was analyzed using descriptive tools in Statistical Package for Social Sciences version 20.0 and Microsoft excel. The data was first coded for easy analyzes by the computer. For accuracy to be guaranteed, the data was cleaned. According to Nueman (2007), accuracy is extremely important when coding data. He indicated that even though the researcher's sample measures can be perfect and no errors



committed in data collection, however errors in coding or entering of data into the computer can result into errors. For this reason data cleaning is important.

Qualitative data analysis involves collecting open ended data, based on general questions and developing an analysis from the information supplied by participants (Creswell, 2009). In this research, qualitative data collected was read through and coded in order to understand and make meaning out of the information provided by the participants. The data was grouped into categories and themes for analysis. Also the following tools were used in analyzing qualitative data.

3.9.1 SWOT Analysis

According to Webber & Labaste (2010), SWOT which stands for Strengths, Weaknesses, Opportunities and Threats analysis is not a very precise tool. It is however useful in characterizing the current state of an industry, it helps in identifying the issues, and generates discussion. For this research, the SWOT analysis was used in identifying the strengths, weaknesses, opportunities and the threats of small scale irrigation in the study area. This helped to identify the future threats and opportunities of small scale irrigation in the study area.

3.10 Research Reliability and Validity

The validity and reliability of a research refers to the steps the researcher intends to take in order to ensure accuracy and credibility of the research findings (Creswell, 2009). Neuman (2007) defines reliability as dependability or



consistency while validity implies truthfulness. There is the absence of reliability when there is a poor fit between the construct a researcher uses to describe or analyze the social world and what actually happens in the social world. Based on the fact that this research was conducted using a mixed approach, steps were taken to ensure validity in both designs.

To ensure validity of the research, different strategies were adopted. Different methods of data collection and data sources were used in the study. Data was gathered from key informants, farmers, input suppliers and traders. Perspectives of several participants were taken into consideration in conducting the study. Also in conducting interviews and focus group discussions, the interviewer ensured that she talked less to ensure that the participants participated fully in the discussions. Also the researcher spent much time on the field in order to observe and develop an in-depth understanding of the study area and techniques and practices used in production. Also reliability was ensured through cross checking of data by the researcher and other colleagues.



CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter presents the major findings of the study. Descriptive statistical tools such as frequencies and percentages were used to analyze the demographic data of shallot farmers, input suppliers and traders. The study examined the contribution of small scale irrigation to the shallot value chain and the types of inputs and supportive services used in shallot production. The study identified the actors, their roles, strength and weaknesses and the nature of relationships that exist between actors of the shallot value chain. Finally, the study examined the strengths, weaknesses, opportunities and the threats of small scale irrigation and the shallot value chain in the study area.

4.1 Background of Respondents

This provides the profile of the respondents of the study. This comprises their gender, age and their educational level. Three sets of respondents were sampled for the study. This includes farmers, input suppliers and traders. A total of 139 farmers, 5 input suppliers and 5 traders were sampled for the study.

4.1.1 Age and Sex of Farmers

From Table 4.1, out of the total number of 139 farmer respondents ; 24.5% were between the ages of 51-60; 22.3% were between the ages of 41-50 years; 21.6 %



were between the ages of 20-30 years; 18% were between the ages of 31-40 years and 13.7% of the respondents were 60 years and above. Out of the total number of 139 farmers interviewed, 74.8% were males and 25.2% were females.

Table 4.1 Age and Sex of Farmers

Variable	Frequency	Percentage
Sex		
Male	104	74.8
Female	35	25.2
Total	139	100
Age		
20-30	30	21.6
31-40	25	18.0
41-50	31	22.3
51-60	34	24.5
60 and above	19	13.7
Total	139	100

Source: Field Data, 2016



It is evident that more males are into shallot production than females in the study area. Thus more men are involved in production and perform production functions than women in the shallot value chain. Also, from the data though majority of farmers (24.5%) were between the ages of 51-60 years, it is also noteworthy that quite a substantial number of youths (21.6% and 18% of farmers were between the ages of 20-30 and 31-40 years) perform production functions within the shallot value chain. Considering the fact that youths are innovative, with a substantial number actively involved in the shallot value chain will go a long way to improve the performance of the chain.

4.1.2 Age and Sex of Input Suppliers

From Table 4.2, out of the total number of five input suppliers interviewed, 80% were males and 20% were females. From the data, 20% of the respondents were between the ages of 20-30 years; 40% were between the ages of 31-40 years and 40% were also between the ages of 51-60 years. From the table, it is evident that more men dominate in the supply of agricultural inputs than their female counterparts.



Table 4.2 Age and Sex of Input Suppliers

Variable	Frequency	Percentage
Sex		
Male	4	80.0
Female	1	20.0
Total	5	100
Age		
20-30	1	20.0
31-40	2	40.0
51-60	2	40.0
Total	5	100

Source: Field Data 2016

4.1.3 Age and Sex of Traders

From Table 4.3, 100% of the respondents interviewed were females. From the data, 40% of the respondents were between the ages of 31-40, 40% were between the ages of 41-50 and 20% were between the ages of 51-60 years.



Table 4.3 Age and Sex of Traders

Variable	Frequency	Percentage
Sex		
Male	0	0
Female	5	100
Total	5	100
Age		
31-40	2	40
41-50	2	40
51-60	1	20
Total	5	100

Source: Field Data 2016

Based on the personal profile of farmers, input suppliers and traders it is evident that more males are into shallot cultivation and the supply of agricultural inputs than females. While men dominate in performing primary functions such as input supply, production, harvest and post-harvest handling, women dominate in trading and perform functions such as wholesaling and retailing of shallots. These findings were attributed to the roles that society has assigned to both male and



female. Farmers also indicated that because of the level of skills needed to cultivate shallots and the time involved, most women do not have the skills and time to venture into shallot production. The input suppliers interviewed also stated that due to the huge capital required in the same sale of agricultural inputs, limits women from venturing into the business. Finally more women being shallot traders was attributed to the role society has assigned to women, where women are assigned the responsibility of marketing farm produce.

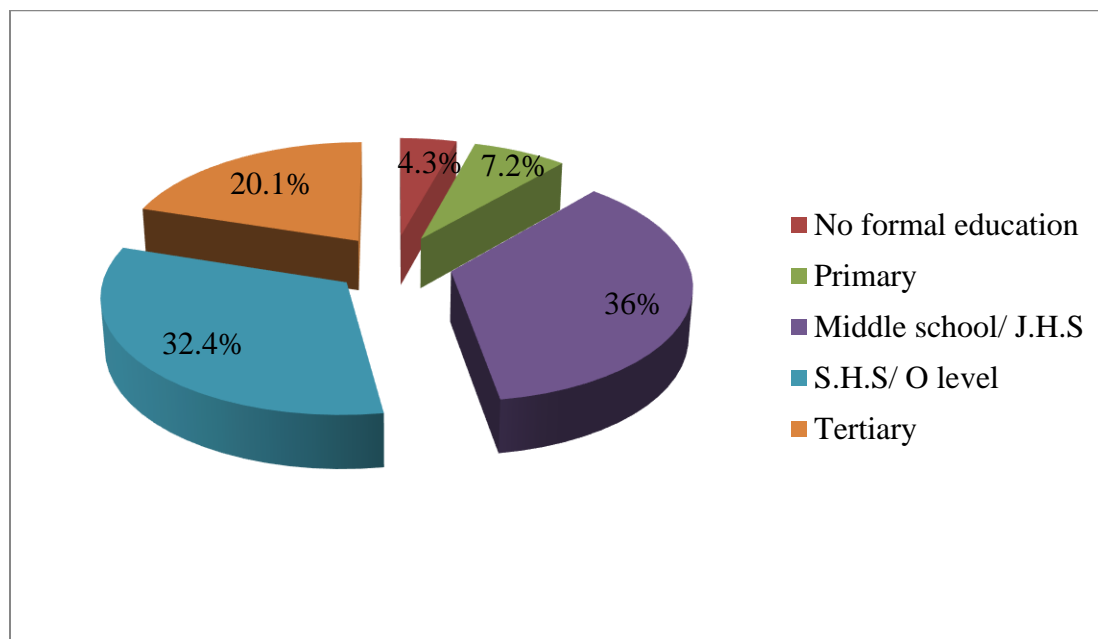
4.2. Educational Background of Respondents

4.1.2.1 Educational Levels of Farmers

According to Figure 4.1, from the total of 139 farmers interviewed; 36.0% have attained middle school or Junior High School (J.S.S) level, 32.4 % attained Senior High School (SHS) /O level, 20.1% attained tertiary, 7.2% have attained primary and 4.3% have no formal education.



Figure 4.1 Educational Levels of Farmers



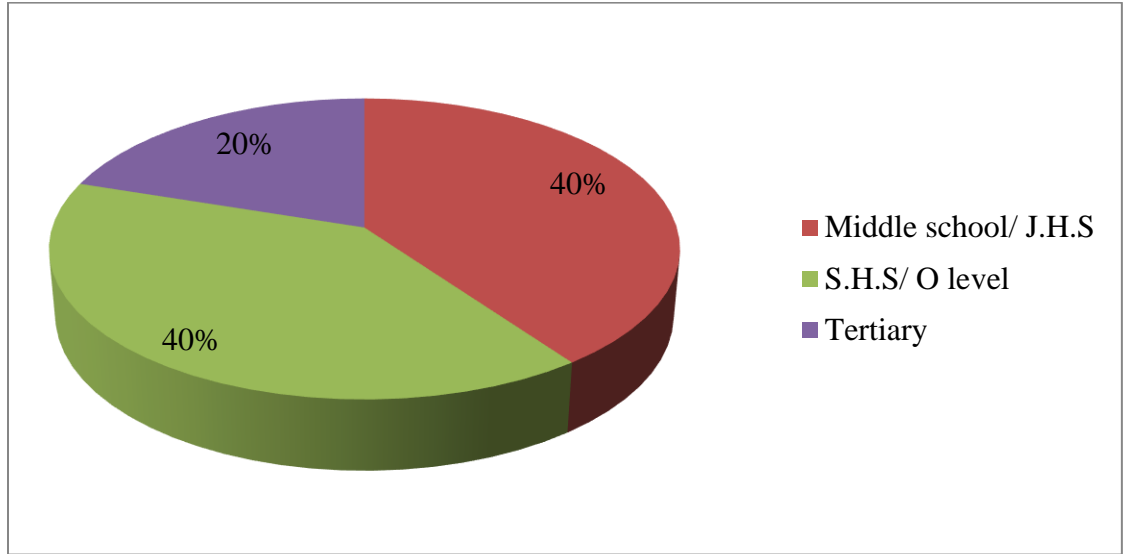
Source: Field Data 2016

4.1.2.2 Educational Levels of Input Suppliers

With regard to the educational level of input suppliers, Figure 4.2 indicates 40% attained middle school/Junior High School (J.H.S), 40% attained Senior High School (S.H.S) /O level and 20% attained tertiary education.



Figure 4.2 Educational Levels of Input Suppliers

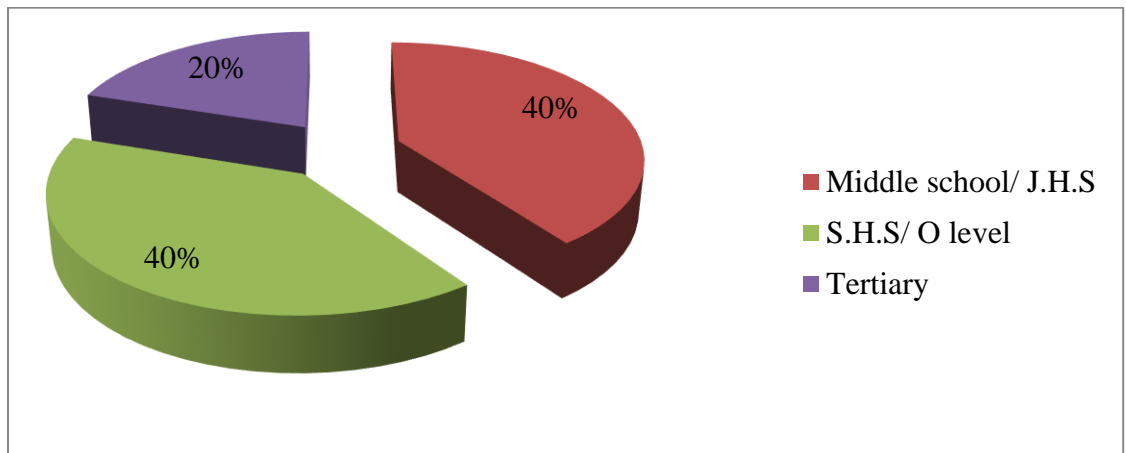


Source: Field Data 2016

4.1.2.3 Educational Levels of Traders

From Figure 4.3, 40% of traders attained middle school/junior high school, 40% attained senior high school/O level and 20% attained tertiary education.

Figure 4.3 Educational Levels of Traders



Source: Field data 2016



Generally, all three sets of respondents have attained some level of education. Though most of the respondents have not attained tertiary level education, the majority of farmers have attained middle school/ or Senior High School/O level. Most input suppliers have either attained middle school/Junior High School or Senior High School/O level and the majority of traders have also attained middle school/Junior High School or Senior High School/O level.

From the data, it is evident that most of the actors within the shallot value chain can read and write. This implies that both input suppliers and farmers would be able to read instructions on irrigation equipment, chemicals and apply them appropriately. Also, considering producers, input suppliers and traders have some level of formal education, actors can formalize their business agreement with one another thereby promoting the efficiency of the shallot value chain.

4.2 Production Overview

From the data gathered from the field, 100% of the farmers indicated they cultivate other vegetables apart from shallots. Apart from shallots, other vegetables such as okro, tomatoes, pepper, carrots, spring onions, garden eggs, onions, spinach and cabbage are being cultivated in Anloga. Generally, okro, pepper, tomatoes are vegetables that are produced more. This may be because the farmer households also largely depend on these vegetables as they form part of their daily meal. Carrots, onions, spring onions, spinach and garden eggs are also produced by a few farmers compared to the four main vegetables (shallots, okro, pepper and tomatoes). Farmers indicated they grow different vegetables to take



advantage of the availability of water throughout the year since they cannot cultivate the same crop continuously. They also indicated they grow different vegetables to counterbalance the effects of fluctuation of market prices as a result of increased production of one food commodity.

According to Sinnadurai (1973) shallots are cultivated in the Keta Municipality all year round both in the rainy seasons thus from May to June, August to October, and in the dry season under irrigation from January to March. This was evident in this study as 80.6% of farmers indicated that they prepare the land and cultivate shallot all year round. However, 10.1% of the respondents, indicated they prepare the land and cultivate shallots after every two months, but this, however depends on the demand for shallots in the market, 5% indicated they cultivate any month of the year except November and December and 4.3 % indicated lands are prepared and shallots are cultivated in December, January and March. From the study, it was evident that due to low rainfall, supplementary irrigation is done in the raining season as amount of rainfall is often not adequate for the crop's requirement. Simple farm equipment such as hoes, cutlass, line and pin and rake are used in preparing the land for shallot cultivation.

In terms of land tenure system, the majority of farmers representing 73.4% lease farm beds for cultivation, 20.1% cultivate on their own land, 5% practice share cropping and 1.4% practice use of beds as collateral.



4.2.1 Types of irrigation systems

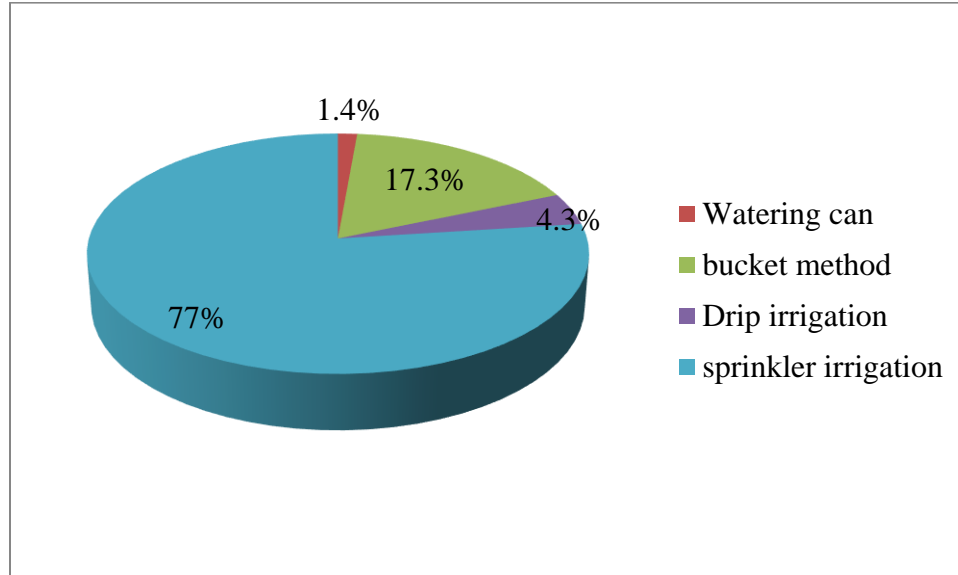
The study area is characterized with emerging systems of irrigation, where irrigation systems are financed by farmers with or without support from government or non-governmental organizations. According to Namara et al. (2010), the emerging systems require energy sources such as diesel, petrol, wind, electricity and possibly solar energy. Farmers in Anloga depend on energy sources such as electricity, premix fuel and manpower depending on the method of irrigation being adopted by the farmer. Out of the total of 139 farmer respondents, 54.7% indicated they use electricity in pumping water, 44.6% indicated they use premix fuel and 0.7% use petrol/diesel. The data also revealed that the form of energy used in pumping water has a bearing on the cost of production. As 84.9% of the total farmer respondents indicated the type of energy used in production affects their cost of production while 15.1% indicated it does not affect their cost of production.

4.2.2 Methods of Irrigation in Anloga

From the study, the main methods of irrigation adopted in Anloga include a watering can, bucket, drip irrigation and sprinkler irrigation. From Figure 4.4, the sprinkler method is the most widely used method in Anloga representing 77% of the total respondents, with the bucket method representing 17.3%, 4.3% representing drip irrigation and 1.4% representing watering can. Farmers added that the watering can method is mostly used during nursery of seedlings.



Figure 4.4 Methods of Irrigation



Source: Field Data 2016

From the data, despite the use of mechanized irrigation methods such as the sprinkler and the drip irrigation, the bucket method is still being used by farmers especially farmers who cultivate low lands. The buckets are used to fetch water from shallow wells and carried manually to the shallot beds and applied directly on the shallot. Though farmers were of the view that the bucket was more labour intensive and requires more time and energy, however poor access to electricity at where the low lands are located have necessitated the continuous use of the bucket method. The types of sprinkler methods being used include overhead sprinkler and tube splash sprinkler irrigation. There is low adoption of the drip irrigation method due to the high cost involved in installing and operating the drip method as was indicated by respondents. Water is transported to irrigation fields through pumping of water from boreholes dug and connected to pipes and valve pump which are connected to either electricity/ motorized pumps to pump water.



Also, from farmers' focus group discussion, farmers added sprinkler irrigation specifically the tube splash method is the appropriate method for shallot production.

“Sprinkler irrigation is appropriate for shallots especially the tube splash method. The sprinkler is also efficient for okro cultivation as it allows water to get to the leaves of the crop before the root. Drip irrigation is efficient for carrot and tomatoes and onion” (FGD Participant, 17th March, 2016).

4.3 Importance of Small Scale Irrigation in Shallot Production

From the study, irrigation has expanded land under cultivation. Majority of the lands (up lands) under mechanized irrigation methods in Anloga originally do not support production under rainfed conditions. Subsequently, there has been intensive cultivation of different kinds of vegetables aside shallots. It has also provided job opportunities for producers in the dry season. Irrigation influences the spatial distribution of agricultural production by permitting the cultivation of crops on lands that originally do not support production under rainfed condition, more intensive growing of existing crops and the growing of alternative crops (Riddell et al., 2006).

From the data analysis, 95.7% of farmers indicated irrigation supports shallot farming with the reason that irrigation assists them to cultivate both in the raining and dry seasons. The following were revealed during a focus group discussion with farmers. It was evident that traders pay more for shallots in the dry season than in the raining season. Whiles the raining season is characterized with over



production thus more farmers cultivate shallots; supply often exceeds demand coupled with lack of storage facilities (rafters). Farmers indicated a sack of shallot is bought domestically between GH¢150.00 to GH¢200.00 in the raining season while in the dry season between GH¢250 to GH¢300 for a sack of shallot depending on the size of the shallots. These prices however may vary from one year to the other. Shallots are often more abundant on the market in August which are harvest from the raining season. Nevertheless, shallots are expensive in May as a result of availability of shallots in small quantities in the dry season. Farmers indicated the high prices for shallots in the dry season is attributed to the use of shallots by homes in preparing “shito” for students when school resumes in May and the use of shallots by food vendors in schools. Also shallots are scarce as few farmers cultivate in the dry season mostly by farmers who have access to uplands where improved irrigation methods are used. Thus farmers do not cultivate on low lands in the dry season in order to allow the land to fallow and to avoid insect infestation. Farmers indicated that in the dry season, through the use of irrigation they are assured of a ready market and stable market prices.

From Table 4.5, a farmer who intends to cultivate an acre of shallot through the use of the sprinkler irrigation method will initially incur a total cost of seventeen thousand, four hundred and forty five Ghana cedis (GH¢17, 445.00). However, total cost of production will reduce in subsequent years as the farmer will no longer incur the cost of layout.



Table 4.4 Cost of Production of Shallots on One Acre of Land

Cost Items		Amount (GHS)	
Cost of seed		3000.00	
Land rental		300.00	
Variable Expenses		5000.00	
Transportation of Water to the Farm			
Lifting water by Electric pump and distribution by sprinklers. Bill for 2 months		400.00	
Cost of layout		8,745.00	
Grand Total		17,445.00	
Items for Layout			
Item	Unit Cost	Quantity	Total cost
2 inch pressure PVC pipe	60.00	2	120.00
1 inch PVC	20.00	15	300.00
2 inch PVC T	4.50	80	360.00
1 inch valve socket	4.00	100	400.00
1 inch facet	1.20	100	120.00
4 inch PVC	24.00	3	72.00
2inch PVC	24.00	120	2880.00
PVC Glue	14.00	3	42.00
Union	18.00	2	36.00



2 inch PVC Elbow	4.00	20	80.00
2 x 1 inch reducers	3.00	100	300.00
Water pump one	1500	1	1500
Foot valve	35.00	1	35.00
Sprinkler	25.00	100	2500.00

Source: Field Data 2016

Sales Estimates for shallots

The annual report of MoFA (2014) estimated that output from an acre of shallot under irrigation is about 7.2 metric tonnes of shallot.

- 1 kilogram of shallots = GHC 2.5
- 1000 kilograms = 1 metric tonne
- 7.2 metric tonnes = 7200 kilograms
- Total sales = 2.5 x 7200 = GHC18,000

From the data above, it is evident that at the initial stage of production the farmer will break even or earn little income from production.

From the study, it is evident that there is limited access to external markets for shallots. Although the production of shallot can be increased, this can only be achieved if there is a vibrant domestic market and farmers have access to external markets. For low-value perishable commodities, for which markets clear domestically, quantity and price movements tend to be offsetting (Riddell et al., 2006).



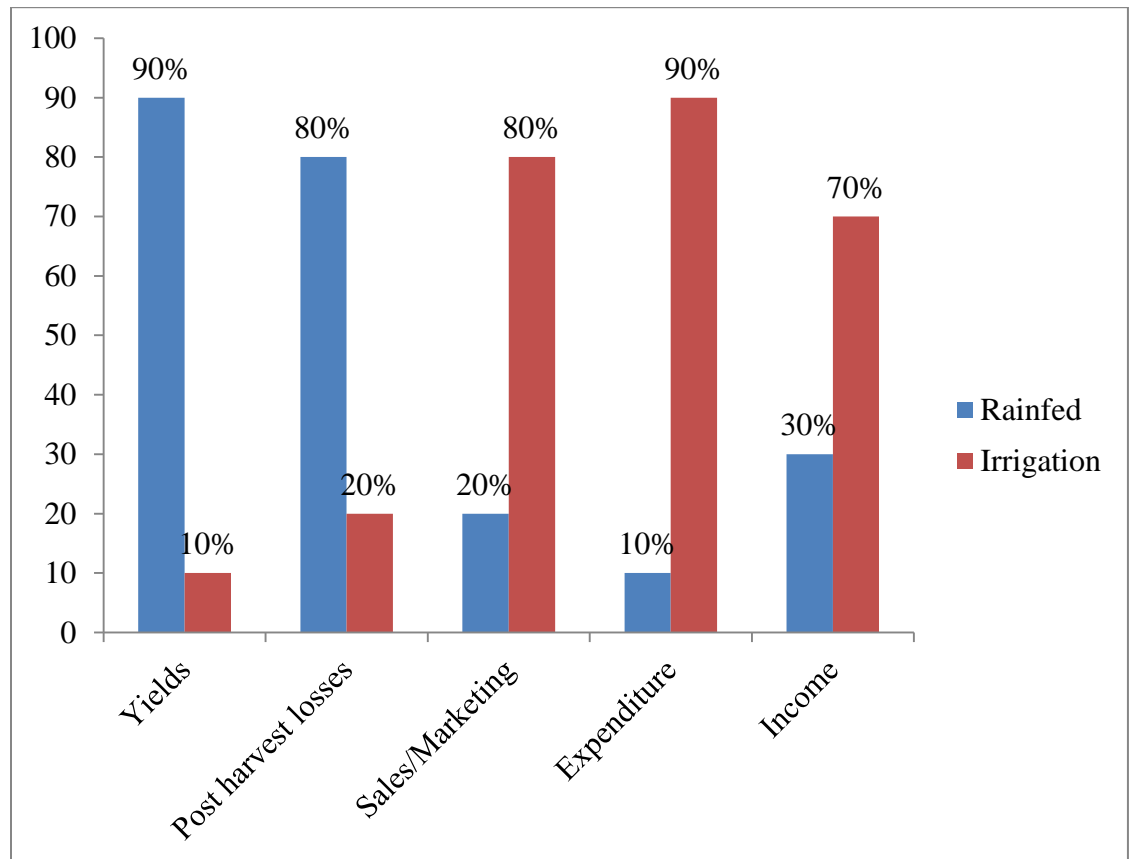
Also, a focus group discussion held for farmers revealed that water is available throughout the year although in smaller quantities coupled with high concentration of salt in the water in the dry season.

A participant at a focus group discussion held for farmers stated that “*Less rainfall can prevent the use of irrigation because the community is closer to the sea which makes the land salty in the dry season. When this happens we may need to get water from another source closer to the farm*” (FGD Participant, 17th March, 2016).

Figure 4.5 reveals how farmers rated yields, post-harvest losses, sales/marketing, income and expenditure under irrigation and under rainfed conditions. The rating was done during a focus group discussion that was held for farmers. The findings revealed that yields are higher in the rainy season compared to the dry season. Post-harvest loss was rated higher under rainfed conditions. Participants rated sales/marketing, expenditure and income higher under irrigation.



Figure 4.5 Farmers views of Production Outcomes under Irrigation and Rainfed Condition



Source: Field Data 2016

A study conducted by ACIAR (2013) reveals production of shallots in the raining season is characterized with slow plant growth and high incidence of pest and diseases, and the resultant effect is low yields and high percentage of rots. Findings from this study however differ from this assertion. From the figure farmers are of the view that yields are higher under rainfed conditions.



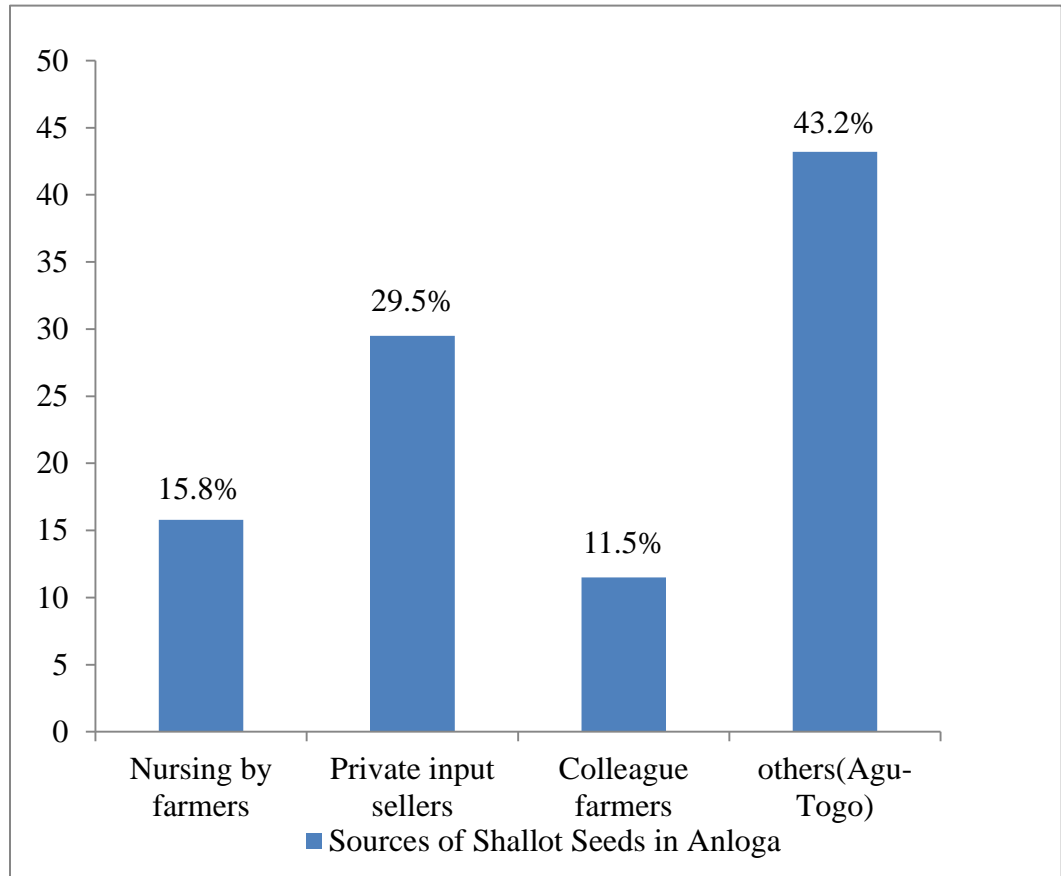
4.4 Types of Agricultural Inputs and Support Services used in Shallot Production

4.4.1 Seeds

From the study, it was evident that certified shallot seeds are not produced in Ghana. The possible sources of shallot seeds include Agu a town in Togo, private input vendors and seeds stored by farmers themselves and from their colleagues. According to Namara et al. (2011a) certified vegetable seeds are not readily available. As a result of challenges associated with the supply of seeds, farmers often retain and reuse seeds due to lack of improved and locally adapted seed varieties. In the long run poor quality seeds are produced, which in turn leads to low yields (Mendes et al., 2014). Figure 4.6 indicates that 43.2% of farmers acquire shallot seeds from Agu in Togo, 29.5% buy shallot seeds from private input vendors, 15.8% nurse their own seeds and 11.5% acquire seeds from their colleague farmers. During a focus group discussion, farmers indicated that because they have to buy shallot seeds from Togo, they prefer to store some of their harvest as seeds for the next season. They added certified shallot seeds should be cultivated in Ghana so as to avoid procuring seeds from Togo.



Figure 4.6 Sources of Shallot Seeds in Anloga



Source: Field Data 2016

4.4.2 Fertilizers

With regard to fertilizers, farmers indicated they use both organic and inorganic fertilizers. The organic fertilizers are used during land preparation thus before planting. Farmers use organic fertilizers such as cow dung, pig droppings, poultry dropping, and sometimes fecal matter from humans. Farmers indicated they use more chemical fertilizers than organic manure. They added with consistent rainfall “aborbi” Keta school boys are used. Chemical fertilizers such as Nitrogen,



Phosphorus and Potassium (NPK), Ammonia, Urea, fertilizers are used after planting. The main sources of fertilizers for farmers include private input vendors and the district MoFA office.

MoFA in Anloga provides farmers with subsidized fertilizers (NPK) but these are often not consistent. According to the District Directorate, as at April 2016, farmers were asked to pay GH¢85 instead of GH¢125 the market price for a bag of NPK. Which implies that a subsidy of GH¢40 was provided to farmers. However, the fertilizers are not sold directly by MoFA to farmers. MoFA assigns private input vendors who are registered with them in the district to carry out the distribution and sales on their behalf. Farmers who benefit from the subsidized fertilizers have to be registered with MoFA. MoFA provides a maximum of 5 bags of NPK and urea to farmers at subsidized prices. Currently farmers are encouraged to form groups in order to access government subsidized fertilizers.

A participant at the focus group discussion held for farmers stated “MoFA used to subsidize fertilizers for us but now it does not happen again. We now have to be in groups with minimum of eight members. In 2014 we received the subsidized fertilizers more often but currently it does not happen. This has increased our cost of production and reduce our gains” (FGD participant, 17th March, 2016).

4.4.3 Extension services

Both MoFA and farmers indicated that limited agricultural extension services are provided by MoFA to shallot farmers. Though the department provides technical



advice to farmers in general, they indicated due to logistical challenges they cannot reach a wider coverage.

From the data, 74.8% of farmers interviewed indicated they have never received any advice or training on shallot cultivation. This they attributed to the inability of MOFA to provide such services. However, 25.2% said they have received advice or training on shallot cultivation. This was however provided by their family members (fathers, brothers and uncles).

Also, 65.5% of farmers acquire knowledge on operation of irrigation equipment from their colleague farmers, 4.3% from MoFA and 30.2% from other sources such as from relatives, based on prescription on the equipment and internet sources. Majority of farmers rely on their colleague farmers as a result of the unavailability of personnel of the Ghana Irrigation Development Authority to provide farmers with information on the use irrigation equipment.

Takehima et al. (2010) asserted that the poor performance of sub Saharan Africa agriculture is attributable to poor access to reliable services providing inputs and knowledge. Though MoFA provides few farmers with limited practical experiments such as demonstrations farms and farmer field schools on certified seeds, this however does not include shallots. This includes tomatoes, maize, okro, water melon and butter nut squash. These demonstrations and farmer field schools according to the agency are often donor funded. Aside these initiatives by the agency, the agency also collaborates with other agencies such as non-governmental organizations whose mandates and interventions are tailored around agricultural development.



This current study revealed that majority of farmers (74.8%) have never received any advice or training on shallot cultivation. This findings are in line with findings from Zikpui (1997) study which indicated that majority of farmers have limited access to extension services. Even the pieces of advice provided to the farmers were not related to the improvement of shallot farming.

According to Zikpui (1997), farmers naturally acquire valuable agricultural knowledge from either their colleague farmers or through farmer based organizations which are established for the purposes of extension services and engagement of institutions that sell farm inputs. One major challenge in the study area is the inability of farmers to form strong and formidable farmer based organizations, though MoFA in a key informant interview indicated they encourage farmers to form farmer based organizations, these groups are formed on short term basis purposely to receive benefits from government (subsidized fertilizers) and other developmental agencies. From the discussions, it was revealed that currently there are 51 farmer based organizations in the Keta Municipality; however most of these groups were formed as a result of benefiting from one intervention or the other. Although some farmers in the study area belong to farmer based organizations, most of the groups have collapsed. The data gathered, further revealed that one farmer based organization which is solely for shallot farmers is located in Anyanui. When the group was contacted, it was revealed that the chairman of the group had died and the group is on the verge of collapsing. There is currently no functional farmer based organization in Anloga.



When farmers were asked the question “do you think farmer based organizations play key role in the shallot value chain?” Farmers at the discussion indicated farmer based organizations can assist them in search for market for shallots and also provide advice on shallot production.

A farmer from Dornorgbor stated at the focus group discussion held for farmers “Yes, they can help look for markets for our products and advice on how to promote crop production. But our leadership will not take these initiatives” (FGD participant, 17th March, 2016).

4.4.4 Institutional Support

The Ghana Irrigation Development Authority since its inauguration has focused on conventional and formal irrigation in Ghana. The 2010 national irrigation policy, strategies and regulatory measures expanded GIDA’s mandate (Drechsel and Keraita, 2014). The policy also made provisions for informal irrigation. From the farmers’ focus group discussion, participants indicated they have never heard or receive any support from the Ghana Irrigation Development Authority (GIDA). They added they know and receive some limited support from the Ministry of Food and Agriculture in the form of fertilizers and chemicals through private input vendors.

“When MoFA has chemicals for us, we expect MoFA to sell to us directly not give to input sellers to sell to us. MoFA sometimes sells to us the day they will speak to us at lower prices. We want the chemicals to be with MoFA for us to buy. MoFA does not move round on our farms to enquire about what is happening. They



prefer we come to them. They complain they do not have fuel and other incentives to go round our farms. We want MoFA's assistance to be consistent because fertilizers are expensive". (FGD participant, 17th March, 2016)

Apart from support from state institutions and non- governmental organizations, farmers can mobilize themselves in order to access support. Being in groups provide farmers with the opportunity to jointly organize activities or investments they cannot access individually (Bijman, 2002). Lack of access to credit facilities was identified by farmers as one of their main challenges. Out of the total farmer respondents, 68.3% indicated they finance production with their personal savings, 7.2% through loans, 7.2% from friends and relatives and 17.3% uses both personal savings and loans. Farmers indicated the difficulty in accessing loans in the banks deter them from doing so. They were of the view that forming associations will assist them access credit, however due to issues relating to leadership they cannot do so.

"We can access loans from our associations but we are not doing it" (FGD participant, 17th March, 2016).

Farmers coming as united front will help them market their produce, access inputs and credit (World Bank, 2007). There is the need for smallholders to access credit in order to purchase agricultural inputs. With access to credit, many farmers may be able to realize higher returns with irrigation. Without agricultural inputs such as seed, fertilizer and pesticides, yield and quality are low and the returns to labour are poor (Takeshima et al., 2010).



4.5 Relationships and linkages between Value Chain Actors

From the study, it was evident that the relationship and linkage between farmers and traders is spot market relations, where farmers and traders meet at the market to negotiate prices and quantity of shallots and conclusions are drawn there and then. Most producers transact business with buyers after every harvest and do not sell to one particular buyer. Even though producers indicated they prefer persistent network relations with traders, however due to mistrust between the two actors, they are reluctant in transacting business with each other constantly.

From the data analysis, prices of shallots are determined by both producers and traders. Majority (54.7%) of the respondents indicated both producers and traders determine the price of shallots, 25.9% indicated they determine the price of shallots, 19.4% indicated buyers.

Also from the study, there is a spot market relationship between shallot producers and input suppliers. As majority (60%) of the input suppliers interviewed stated they have constant and good working relationship with shallot producers while 40% indicated their relationship is strictly just buying and selling. Prices of inputs are determined by the input suppliers without consultation with the producers. Prices are based on the market prices of the inputs from source or manufacturers.

Farmer to farmer relations was analyzed as persistent network relations. Farmers transact business with each other on daily basis. Though farmers do not sign contracts with each other, they provide each other with knowledge they require to operate irrigation equipment and on good agronomic practices. Farmers who are



also educated rely on internet sources, notes from school, specifications on irrigation equipment and a soil science and an irrigation expert in the area who is also a farmer provides information to farmers.

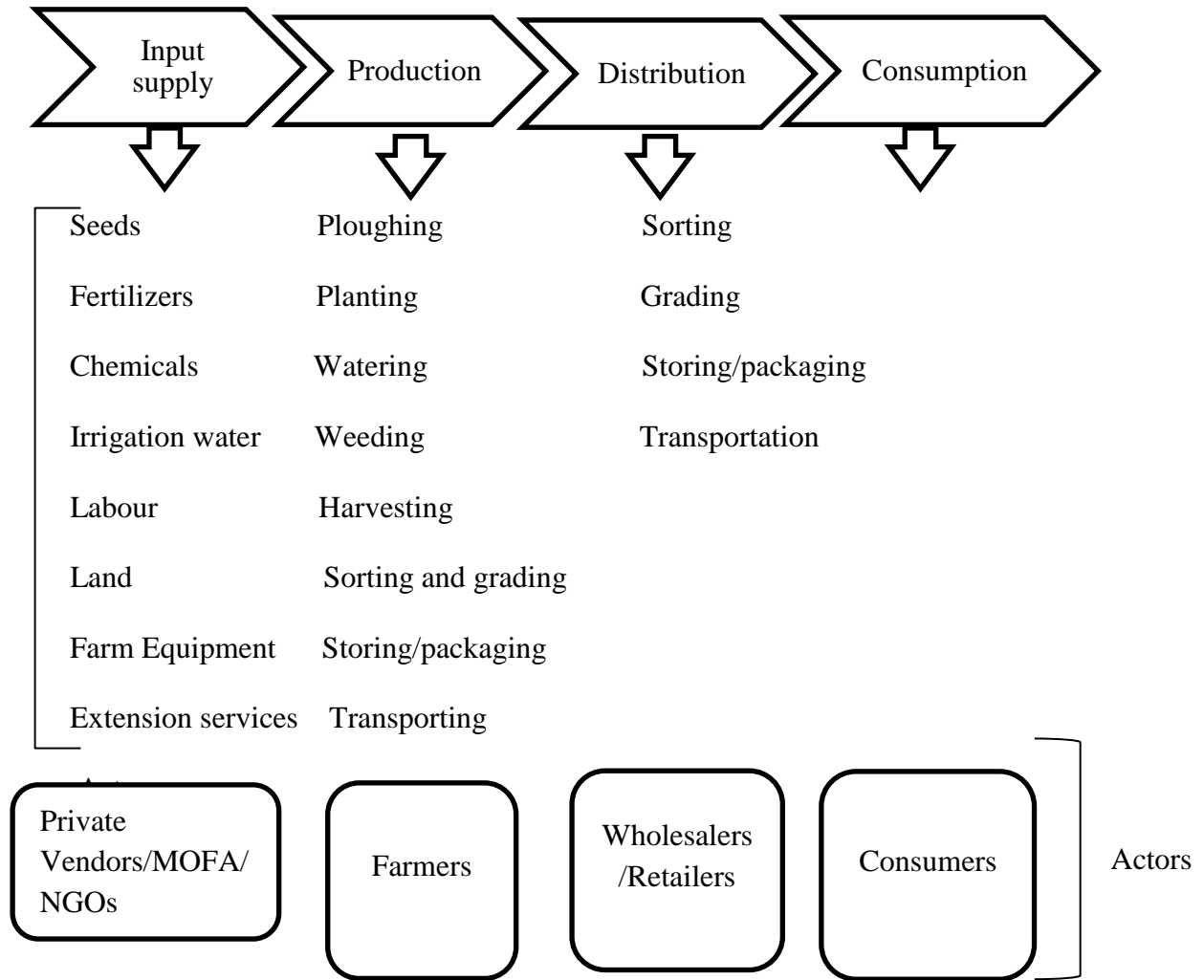
Value chain analysis provides a framework for understanding the different business relationships that exist among value chain actors, tools for increasing efficiency, productivity and value addition (Sanogo, 2010). The nature of the relationships that exist among actors is essential in determining factors such as bargaining power within the value chain, thus potentially assist in determining the benefits and income which each actor gains (Sanogo, 2010).

The value chain concept traces product flows and shows value additions at different stages, identifies key actors and their relationships in the chain, identifies enterprises that contribute to production, services and required institutional support, identifies bottlenecks preventing progress, provides a framework for sector-specific action and identifies strategies to help local enterprises to compete and to improve earning opportunities (Sanogo, 2010: 5).

Figure 4.7 shows the shallot value chain. The shallot value chain analysis reveals the processes and the functions that are performed by the actors of the chain. The chain starts from input supply and ends with consumption. Different actors perform different functions within the chain. Each function performed by actors adds value to the commodity.



Figure 4.7 The Shallot Value Chain in Anloga



Source: Field Data 2016

4.5.1 Primary Actors

The primary actors in the shallot value chain include input suppliers, farmers, traders and consumers. Actors within the chain perform diverse functions; however some functions are performed by more than one actor.



4.5.1.1 Input suppliers

Input suppliers and service providers are an essential link in the value chain as with regard to the provision of inputs and knowledge (Saavedra et al., 2014). The supply of agricultural inputs in the study area includes seeds, fertilizers, herbicides, pesticides, manure, and irrigation equipment.

The main sources of input supply in the shallot value chain include private input vendors, Ministry of Food and Agriculture and farmers themselves. The Ministry of Food and Agriculture provides subsidized fertilizers and extension services to farmers. Also farmers store shallot seeds themselves for cultivation and manure for land preparation. Private input vendors procure irrigation equipment from Tema, shallot seeds are procured from Niger and Togo and other chemicals from France and the Netherlands. Farmers use both organic manure and chemical fertilizers. Organic manure is used to improve the water holding capacity of the soil and to improve soil fertility. Irrigation equipment, chemicals (pesticides and herbicides) and fertilizers are often supplied by private input vendors. Input suppliers require permit from Environmental Protection Agency, the Keta Municipal Assembly and the Internal Revenue Service in order to sell inputs. From the data gathered, 40% of input suppliers interviewed have been selling agricultural inputs for between 1-5 years, 40% also have been selling for over 20 years, and 20% have been selling between 6-10 years.

Selling price of inputs is determined based on current market prices of inputs. Also 80% of input suppliers indicated farmers demand fertilizers most and 20%



indicated mostly irrigation pipes but this however depends on the farming season. Input sellers sell inputs on daily bases.

4.5.1.2 Producers

Producers are one of the main actors of the shallot value chain. From the value chain analysis, it is evident that most of the functions within the chain are performed by producers. The core functions performed by shallot producers include ploughing, planting, irrigating (watering), weeding, pest and disease control, harvesting and post-harvest handling (sorting, grading, packaging, storing, transporting). However, if shallots are sold at the farm gate, the trader performs all the post-harvest handling functions mentioned above. From the study majority of farmers perform post-harvest handling as 55.4% of farmers interviewed indicated they sell their harvest (shallots) in Anloga, 33.1% at the farm gate, 6.5% at the house and 5% at both farm gate and the market. Thus most producers' transport their shallots to the Anloga market for selling.

4.5.1.3 Traders

Traders in the shallot value chain are made up of wholesalers and retailers. Wholesalers buy shallots from farmers in large quantities for onward supply to retailers or direct sales to consumers. Retailers on the other hand buy shallots in smaller quantities either directly from producers or from wholesalers. Retailers sell in smaller quantities to consumers. They serve as the last link between producers and consumers. Shallots are purchased both at the farm gate and at the district market. From the data gathered, majority of traders do not only sell



shallots. Traders do not buy shallots from one specific producer, but from different producers. Prices of shallots are determined by both producers and traders. The study revealed that producers do not sign contracts with traders neither do traders sign contracts with producers. The relationship between the two actors is strictly spot market relationship. Traders indicated they buy more shallots in the raining season as compared to the dry season as the raining season is characterized with lower prices for shallots where supply exceeds demand. In the dry season, shallots are more expensive as demand exceeds supply.

4.5.2 Secondary Actors

Secondary actors provide services that complement the roles of primary actors. They provide services such as training and extension services, financial assistance among others. Within the shallot value chain, secondary actors include the Ministry of Food and Agriculture (MoFA) and GIZ, a non-governmental organization. The district MoFA occasionally provides farmers with subsidized fertilizers through private input vendors who are registered with them. The Ministry of Food and Agriculture is an autonomous government institution responsible for providing producers with technical, practical knowledge and advice on crop production through the use of good agronomic practices. However, due to inadequate human resources coupled with inadequate logistics the department provides producers with limited services.



GIZ is currently providing financial assistance to some farmers to be connected to the national grid to enable them pump water for their irrigation farms. However, these farmers must be registered with the organization and is open to all farmers.

4.6 Opportunities and Constraints of the Shallot Value Chain

4.6.1 Input Supply/ Suppliers

From Table 4.6, it is evident that as a result of production throughout the year, input suppliers have the advantage to sell throughout the year. An all year round production has translated into high demand for fertilizers, irrigation equipment, chemicals and farm tools. Other opportunities include farmers recommending input suppliers to other farmers, feedback from farmers on the use of chemicals and other inputs. High cost of inputs, high cost of transportation, farmers' refusal to pay for credit purchases, bearing the cost of expired products, poor access to credit and non-adherence to prescriptions provided to farmers were identified as constraints.



Table 4.5 Constraints and Opportunities of Input suppliers

Constraints	Opportunities
High cost of inputs	All year round production provides the opportunity for input suppliers to sell all year round
High cost of transportation	Recommendation of input suppliers by farmers to their colleague farmers
Farmers refusal to pay for credit purchases	Feedback from farmers on use of inputs
Bearing the cost of expired products	High demand for fertilizers, irrigation equipment, chemicals and farm tools
Poor access to credit	
Non-adherence to prescriptions provided to farmers	

Source: Field Data 2016

4.6.2 Production/Producers

Producers within agricultural value chains often have difficulties accessing markets as a result of lack of market information and skills to meet market



demands. Due to poor information flow coupled with challenges within value chains, producers are limited in entering new markets and this minimizes the benefits they obtain from entry (Folke et al., 2010). The findings of this current research are not far from the observations made by the aforementioned authors. At a focus group discussion held for farmers, as shown in Table 4.7, farmers identified lack of market information, external markets and fluctuation of market prices, poor access and high prices of inputs (fertilizers, seeds, extension services and water), inadequate land for expansion, poor storage facilities (rafters), high price of premix fuel, electricity tariffs and intermittent power supply and high cost of production as their constraints.

More so, marketing and marketing facility is one of the most powerful factors greatly stimulating agricultural productions of a locality. Therefore, there is a positive link between efficient market and development of irrigation agriculture. Market and price information to producers must be location specific, timely and accurate, dynamic and available in local languages that can be easily understood by the rural population. Improved communications such as radio and mobile phones play an important part in informational asymmetries (IFAD, 2003). Even though there is a local radio station in Anloga, producers and other key actors of the shallot value chain have not utilized this opportunity due to the cost involved in advertising on the radio.

“There is radio Hogbe but we do not utilize it” (FGD Participant, March, 2016)



Table 4.6 Constraints and Opportunities of producers of the shallot value chain

Constraints	Opportunity
Poor access and high prices of agricultural inputs (fertilizers, seeds, extension services and water).	Government and NGOs interest in promoting agricultural value chains.
High cost of premix fuel, electricity tariffs and intermittent power supply.	Increasing demand for shallots.
Lack of market information, external markets and fluctuation of market prices.	Sharing of knowledge and experience by farmers on good agronomic practices in shallot production.
Lack of access to credit facilities	Availability of labour
Poor storage facilities (rafters).	Availability of water all year round
Salinity of water in dry season	

Source: Field Data 2016



From Table 4.7, Government and NGOs interest in promoting agricultural value chains, the increasing demand for shallots, sharing of knowledge and experience by farmers on good agronomic practices in shallot production, availability of labour and water all year round if tap into would promote a competitive shallot value chain in Anloga.

4.6.3 Traders

From Table 4.8, it is evident that apart from the availability of shallots throughout the year, traders are constrained with lack of capital, high cost of transportation, high rate of shallots spoilage due to overuse of chemicals by producers, lack of linkage among chain actors, lack of market information and unstable market prices.

Table 4.7 Constraints and Opportunities of Traders

Constraints	Opportunities
Lack of capital	Availability of shallots throughout the year
High cost of transportation	
High rate of shallots spoilage due to over use of chemicals by producers	
Lack of linkages among chain actors	



Lack of market information	
Unstable market prices	

Source: Field Data 2016

4.6.4 Challenges of the Ministry of Food and Agriculture

- Apathy and disinterest among farmers
- Non adherence to instructions and guidance provided by extension officers to farmers.
- Inability of farmers to meet market specifications deter MoFA from linking farmers to buyers
- Inadequate logistics in the form of motor bikes and fuel for monitoring
- Inadequate personnel to mount operational areas.

Due to the apathy and disinterest of farmers in the work of the District Department of Food and Agriculture, non-adherence to the practical knowledge and guidance provided by extensions officers to farmers, the inability of farmers to meet market specifications deter MoFA from linking farmers to buyers, inadequate logistics in the form of motor bikes and fuel for monitoring and inadequate personnel to mount operational areas limit the work of the District MoFA and effectively delivering on its mandate towards achieving a competitive shallot value chain.



4.6.5 Opportunities and Constraints of Small Scale Irrigation Development in Anloga

Financial challenges pose a great risk to the development of irrigation as seen in Table 4.9. According to Namara et al. (2011a) financial challenges can be seen at irrigation-scheme level and at farm-household level. At the farm-household level, farmers require credit for developing wells, acquiring water lifting devices, and financing expenses for crop production inputs. But these are often limited due to financial challenges. Generally, there is lack of support for farmers in acquiring inputs, and farmers purchase these inputs at high prices. The lack of casual labour can cause severe problems in production. For instance, crops such as shallot, involve cumbersome post-harvest processing routines (Namara et al., 2011a). From this current study, farmers indicated they pay GH¢10.00 to labourers for between three to four hours of work on their farms.

Power tariffs in Ghana are an impediment to the economic viability of irrigation systems that are not fed by gravity or close to perennial surface water sources. Due to high cost of energy (petrol, diesel and electricity) for pumping, irrigation has generally developed in areas naturally endowed with readily available water, such as in the south along the Volta region (Mendes et al., 2014). More so, most farmers in Ghana lack knowledge and skills to expand irrigation. They often do not have adequate knowledge on cultivation practices and they have challenges accessing quality inputs such as certified seeds and fertilizers (Mendes et al., 2014).



Table 4.8 SWOT Analysis of Small Scale Irrigation

<p>Strengths:</p> <ul style="list-style-type: none"> • Availability of underground water • Low cost (GHS150.00) of digging boreholes • Nature of the soil (sandy) • Availability of labour • Limited alternative uses of water (urban and industrial) • Sharing of knowledge and experience on best irrigation practices among farmers 	<p>Opportunities :</p> <ul style="list-style-type: none"> • The use of solar energy in pumping water • Government and NGOs interest in irrigation development • Increasing awareness of the role of informal irrigation in agriculture development • Effective implementation of the Ghana Irrigation Development Policy.
<p>Weakness:</p> <ul style="list-style-type: none"> • Lack of marketing opportunities • High cost of inputs • Increased domestic use of water due to population growth • Poor rainfall pattern • Climate change • Shortage of underground water in the dry season 	<p>Threats:</p> <ul style="list-style-type: none"> • High cost of energy (electricity tariff, diesel, petrol and premix fuel • Lack of external markets for irrigated vegetables • Lack of government commitment to informal irrigation • Lack of knowledge on water management by farmers





<ul style="list-style-type: none">• Shortage of farm land• Lack of GIDA official to advice farmers• Lack of access to credit facilities• High labour cost• Salinization of aquifers	<ul style="list-style-type: none">• Lack of implementation of the Ghana Irrigation Development Policy.• Growth of alternative demands for water such as urban, household and industrial use.
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Source: Field Data 2016

Table 4.9 provides the strengths, weaknesses, opportunities and the threats of small scale irrigation development and its sustainability in Anloga. The strengths provide an overview of the internal potentials for small scale irrigation development in Anloga. The availability of underground water, low cost of digging boreholes, nature of the soil, availability of labour, limited alternative uses of water (urban and industrial uses) and sharing of knowledge and experience among farmers promotes the development of small scale irrigation. However, increased domestic water use as a result of population growth, poor rainfall pattern, high cost of inputs, lack of marketing opportunities, shortage of underground water in the dry season, climate change, lack of GIDA officials to advice farmers on best irrigation practices, shortage of farm lands and lack of finance are internal factors that may limit the development and expansion of small scale irrigation in Anloga.

Also the development and sustainability of small scale irrigation in Anloga may be hindered by external factors such as high cost of energy (electricity tariffs,

diesel, petrol and premix fuel), lack of external markets for irrigated vegetables, lack of government commitment to informal irrigation, lack of knowledge on water management by farmers, lack of implementation of the Ghana Irrigation Development Policy and growth of alternative demands for water such as urban, household and industrial use.

However, despite these threats, with Government and Non-Governmental Organization's interest in small scale irrigation, increased advocacy for the contributions of irrigation to economic development and poverty reduction, use of solar energy in pumping water and effective implementation of the Ghana Irrigation Development Policy provides opportunities for sustaining small scale irrigation in Anloga.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of the major findings and conclusions of the study. It also provides recommendations that will lead to an improved and competitive shallot value chain in the Keta Municipality. The study set out to examine the contribution of small scale irrigation to shallot value chain in the Keta Municipality. The specific objectives of the study was to assess the types of agricultural inputs and support services used in shallot production, to establish the nature of relations that exist between actors of the shallot value chain and to examine the opportunities and constraints of the shallot value chain in the Keta Municipality.

5.0 Summary of Findings

Shallot is one of the main vegetables produced in the study area. With a production period of two months, shallots are produced all year round in Anloga. The study adopted a simple random sampling technique, 139 farmers (104 males and 35 females) were sampled for the study based on the total number of farmers in Anloga. Five (5) input suppliers (4 male and 1 female) were also sampled purposively. Also using snowball sampling 5 traders (5 females) were identified and interviewed. Majority of the farmers have either attained middle school or Junior High School or Senior High School/O level, majority of input suppliers have either attained middle school/Junior High School or Senior High School/O



level and majority of traders have also attained middle school/Junior High School or Senior High School /O level. Out of the total number of farmer respondents, 24.5% were between the ages of 51-60 years, 22.3% were between the ages of 41-50 years, 21.6 % were between the ages of 20-30 years, 18.0% were between the ages of 31-40 years, 13.7 % of the respondents were 60 years and above. Majority of input suppliers and traders age fall within the age bracket of 31-40 and 41-50 years.

Based on the personal profile of the farmers and input suppliers, it is evident that generally males are involved in shallot cultivation and the supply of inputs than their female counterparts in the study area. While men dominate in performing primary functions such as input supply, production (including ploughing, planting, weeding, watering and harvesting) and other post-harvest-handling activities, women dominate in trading and perform functions such as wholesaling and retailing of shallots. This was attributed to the roles society has assigned to both males and females in the shallot or vegetable value chain in the study area, where men are supposed to cultivate shallots and women are to market the produce from the farm. The study also revealed that females who are into shallot cultivation are individuals who are willing to commit their financial resources, time, energy and the requisite skills required for cultivating shallots.

Apart from shallots, farmers in Anloga grow a variety of vegetables such as okro, carrots, onions, spring onions, garden eggs and spinach. Farmers grow different vegetables to counterbalance the effects of fluctuating market prices and availability of water throughout the year.



Emerging irrigation system is being practice in the area where farmers/producers finance the design and implementation of the irrigation systems. Sprinkler irrigation is the most widely used irrigation method in Anloga. Other methods being use include drip irrigation, bucket method and the watering can method; however watering cans are used during nursing of seedlings. The sprinkler irrigation system and the bucket systems are mostly used in shallot cultivation. The study revealed that farmers cultivate shallots on low lands through the bucket method of irrigation as a result of their inability to extend mechanized systems such as the sprinkler and drip irrigation to areas where the low lands were located. The use of irrigation has expanded land under cultivation as lands which originally did not support production under rainfed conditions are being cultivated through mechanized irrigation systems. The study also revealed that the use of irrigation ensures stable market prices in the dry season.

The main sources of shallot seeds for farmers include farmers themselves, Agua town in Togo, and private input vendors. The study revealed that certified shallot seeds are not produced in Ghana but rather imported from Togo. Farmers are mostly challenged with high exchange rates and high custom duties which results in high cost of shallots seeds though bought at reduced prices in Togo. Both organic manure and chemical fertilizers are used in production. Organic manure such as cow dung, poultry dropping, pig dropping and human excreta are used in land preparation to increase soil fertility and increase the water holding capacity of the soil and chemical fertilizers such as NPK, Ammonia and Urea fertilizers are used after planting and are applied where and when necessary. Shallot producers



occasionally access government subsidized fertilizers. Farmers have to be registered with the district office of the Ministry of Food and Agriculture and be in groups to access fertilizers. The distributions of the fertilizers are done by registered private input vendors in the district.

Both the Ministry of Food and Agriculture and the farmers attested to the fact that poor quality and quantity of agricultural extension services affects production outcomes. Though MoFA provides technical advice to farmers in general, they indicated due to challenges associated with human resources and logistics they cannot reach a wider coverage. Demonstration farms and farmer field schools are also organized by MoFA but are mostly tailored around crops such as tomatoes, maize, okro, water melon and butter nut squash which are mostly sponsored by donor funds. From the study, MoFA currently only provides limited services at input supply and production (extension services) levels of the shallot value chain.

Shallots are mostly purchased by wholesalers and retailers from Accra, Kumasi, Koforidua and Ada and other surrounding towns and villages in the Keta Municipality. Shallots are sold both at the farm gate and in the market. Yields are higher in the raining reason compared to the dry season. Currently, shallots are not being processed in Ghana. The study revealed that buyers pay more for shallots in the dry season as compared to the raining season. Raining seasons are characterized with over production where supply exceeds demand coupled with lack of storage facilities for producers to store shallots for sale at a later date. However, the dry season is characterized with higher demand and with limited supply.



From the study, farmers are of the view that farmer based organizations play key roles in crop production. They indicated farmer based organizations can assist in scouting for markets for shallots, provide advisory services that promote efficient production. However most farmer based organizations are challenged with poor leadership and management.

The main actors identified in the shallot value chain include farmers/producers, input suppliers, traders (wholesalers and retailers) and consumers. It was also evident that spot market relations exist between farmers and traders, even though farmers indicated they prefer persistent network relationships. However, due to issues of mistrust this type of relationship is currently not being practiced. The kind of relationship that exists between farmers and input suppliers is also spot relationship due to issues of mistrust. Farmer to farmer relationship is characterized with persistent network relationship as farmers learn how to operate their irrigation equipment and apply chemicals and fertilizers from their colleague farmers through observation.

Producers/farmers in the value chain identified poor access and high prices of agricultural inputs, high cost of premix fuel, electricity tariffs and intermittent power supply, lack of market information, external markets and fluctuation of market prices, lack of access to credit facilities as their challenges.

Finally, the study revealed that the use of solar energy in pumping water for irrigation, Government and Non-Governmental Organizations interest in irrigation development, increasing awareness of the role of informal irrigation in agriculture



development and effective implementation of the Ghana Irrigation Development Policy provide opportunities for the development of small scale irrigation in the Keta Municipality. However, the high cost of energy, lack of external markets for irrigated vegetables, lack of government commitment to informal irrigation, lack of knowledge on water management by farmers, lack of implementation of the Ghana Irrigation Development Policy and the growth of alternative demands for water such as urban, household and industrial use may limit the development of small scale irrigation in the Municipality.

5.2 Conclusion

Though there is a high potential for an increased production of shallots, due to the availability of water throughout the year, however, poor access to agricultural inputs such as seeds, land, fertilizers and extension services coupled with the absence of vibrant domestic markets and access to external markets and buyers has resulted into low competitiveness of shallots. This has necessitated the cultivation of other vegetables such as okro, carrots, onions, spring onions, garden eggs, spinach.

Also, despite the fact that there are few farmer based organizations in the study area, lack of leadership skills and knowledge has rendered the groups ineffective. These groups can serve as linkage between farmers and other secondary actors such as government, non-governmental organizations, Ghana Irrigation Development Authority, buyers in negotiating for supports and prices of shallots.



The success of small scale irrigation partly depends on access to and appropriate application of improved farm inputs such as fertilizers, improved seeds, herbicides and other support services. Even though irrigation provides water to shallot farmers throughout the year, poor access and high prices of agricultural inputs (fertilizers, seeds, extension services, and poor storage facilities (rafters) coupled with financial challenges have increased cost of production and reduced gains from irrigated shallot farms.

Technologies are important in irrigated agriculture, however organizational development in production, marketing, processing and consumption of vegetables are above technologies. Poor integration or linkage between the actors of the shallot value chains has made the chain less competitive. Aside farmer to farmer relationships, which are characterized with persistent network relations, input suppliers to farmers/producers, producers/farmers to buyers are characterized with spot market relations.

More so, institutional supports for small scale irrigators are often not forthcoming. Farmers finance irrigation systems without support from the Ghana Irrigation Development Authority. Farmers rely on their own knowledge and their colleague farmers to manage their irrigation systems which may lead to high cost of production as most of them lack knowledge in irrigation water management. Also small scale irrigation in the study area is constrained with high cost of premix fuel, electricity tariffs and intermittent power supply, lack of external markets for irrigated vegetables, lack of government commitment to informal irrigation, lack of implementation of the Ghana Irrigation Development Policy and growth of



alternative demands for water such as urban, household and industrial use pose as threat to the sustainability of small scale irrigation in Anloga.

Finally irrigation has expanded land under cultivation. Majority of lands (uplands) under mechanized irrigation methods in Anloga originally do not support production under rainfed conditions. Also, the use of irrigation ensures ready and stable market prices for shallots. Buyers pay more for shallots in the dry season than in the rainy season.

5.3 Recommendations

For a competitive shallot value chain, the study recommends other researchers/ NGOs interested in the shallot value chain to conduct a detailed market analysis looking at existing markets, emerging markets and their related constraints and opportunities for shallot producers and buyers in Anloga and other shallot producing communities in the Keta Municipality. There is also the need to strengthen the linkage between the value chain actors.

The Ministry of Food and Agriculture need to be resourced and strengthened to provide farmers/producers with market information and linking farmers to more reliable markets and buyers. Thus the District MoFA should intervene and provide support to the shallot value chain at input supply, production and marketing stages of the chain. Government should support MoFA and other research institutions to produce certified shallot seeds in Ghana. This will go a long way to reduce challenges such as high exchange rates, thefts in exchange of the Ghana cedis into CFA and high custom duties among others.



Expansion in small scale irrigation in the study area requires an analysis of the environmental factors in order to determine the capacity of the aquifer to support expansion in irrigation. Also consideration has to be given to the impact of irrigation on alternative uses of water such domestic and industrial water use. The study recommends the Ghana Irrigation Development Authority conduct a study on the capacity of the aquifer to support expansion in irrigation.

Non-Governmental Organizations and the Ministry of Food and Agriculture should train farmer based organizations and build their capacity in leadership and management skills in order to equip them with the requisite skills to assist farmers in soliciting support and serving as the link between producers and traders/buyers in marketing shallots and other vegetables.

Also, there is the need for government to resource the Ghana Irrigation Development Authority with both human resources and logistics to enable them provide technical and advisory services to shallot farmers and other vegetable farmers in the study area.

Additionally, government and other non- governmental organizations should encourage the use of solar energy and assist farmers acquire solar panels for pumping irrigation water.



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Appendix I

Mildred Edinam Adzraku is my name. I am a student of the University for Development Studies, pursuing MPhil Development Studies. I am conducting a study on small scale irrigation vegetable farming in the Keta Municipality of Ghana: assessing the shallot value chain. I will like to ask you some few questions relating to the study. I want to assure you that the information you will provide will be treated confidential and will be used only for the purpose of this study.

Farmers Questionnaire

Section A

Background Information of Respondent

Please tick [✓] in the appropriate space provided below and provide answers where required

1. Sex [1] Male [2] Female
2. Age [1] 20 – 30 [2] 31 – 40 [3] 41 – 50 [4] 51 – 60 [5] 60 and above
3. Educational status [1] No formal education [2] Primary [3] Middle school/J.H.S. [4] S.H.S. /O level [5] Tertiary [6] others (specify).....

Section B

Production Overview

4. Apart from shallots do you cultivate any other crop through irrigation? [1] Yes [2] No



If yes specify them.....

5. Which periods of the year do you usually start land preparation for irrigation shallot farming?
6. What farm equipment do you use in preparing the land? [1] Tractors [2] Hoe [3] Hoe and cutlass [4] others (specify).....
7. What form of land tenure system are you practicing? [1] Sharecropping [2] lease of farm beds [3] use of the bed as collateral [4] others (specify).....
8. What methods of irrigation are used most in the district? [1] Watering can [2] Bucket method [3] Sprinkler irrigation [4] Drip irrigation [5] others (specify).....
9. What method of irrigation do you use in shallot farming? [1] Watering can [2] Bucket method [3] Sprinkler irrigation [4] Drip irrigation [5] others (specify).....
10. What form of energy do you use in pumping water for the field? [1] Electricity [2] petrol/diesel [3] solar [4] others (specify).....
11. Does the particular type of energy used affects the cost of production? [1] Yes [2] No

The importance of Inputs and Support Services in Shallot Production

12. Does the use of irrigation support shallot farming? [1] Yes [2] No

If yes give reasons

If no give reasons.....



13. Why do you use a particular method of irrigation for production? Give reasons
.....
.....
14. Where do you acquire your shallot seeds from for farming? [1] Nurse my own seed [2] MoFA [3] private input sellers [4] colleague farmers [5] others (specify).....
15. Which of the following fertilizers do you apply to your farm?
[1] Organic manure [2] Inorganic fertilizers [3] Both organic and inorganic fertilizers [4] None [5] others (specify).....
16. What are the reasons for the use of the type of fertilizer selected above?
.....
.....
17. Where do you acquire other inputs such as fertilizer, pesticides, herbicides and other forms of inputs? [1] Private input vendors [2] Supplied by MoFA [3] Supplied by friends [4] others (specify).....
18. Who provides you with the knowledge you need in order to operate the irrigation equipment? [1] Colleague farmers [2] irrigation equipment supplier [3] MoFA [4] others (specify).....
19. Do you have easy access to that knowledge you require? [1] Yes [2] No
20. Have you receive any advice or training on the cultivation of shallots? [1] Yes [2] No



21. If yes, where? [1] MoFA extension officers [2] Agro- input dealers [3] Colleague farmers [4] private firms/persons [5] others (specify).....
22. Did you pay for the services rendered? [1]Yes [2] No
23. Are you satisfied with the services provided? [1] Yes [2] No
24. Do you belong to any vegetable growers association or group? [1]Yes [2] No
25. If yes, what form of support does the group provide you?
.....
.....
26. Which farming season do you have higher yields? [1] raining season [2] dry season
27. How much do buyers pay per bag of shallot in dry and rainy season?
.....
28. How do you finance production? [1] Personal savings [2] loan [3] Both personal savings and loan [4] Friends/relatives [5] others (specify).....
29. How do you store your shallot seeds? [1] I own a store [2] cooperative/group store [3] I don't store [4] others (specify)

Relationship and linkages between actors of the value chain

Please tick [√] the option that best reflects your relationship with buyers

30. How often do you transact business with buyers? [1] Daily [2] Weekly [3] Monthly [4] others (specify).....
31. How long do you transact business with buyers? [1] Short [2] medium [3] long [4] very long



32. Do you always sell to the same buyer? [1] Yes [2] No
33. Who sets the selling price for shallots? [1] Me [2] buyers [3] both of us [4] others (specify).....
34. Do you trust buyers? [1] Yes [2]No
If yes why.....
If no why.....
35. Do you sign contracts with buyers? [1] Yes [2]No
36. Do you stick to contracts signed with buyers? [1] Yes [2] No
If yes why.....
If no why.....
37. If Yes why?
38. Do you have access to market information? [1] Yes [2] No

Constraints of Shallot Farmers

39. Does the price of energy affect your level of production? [1]Yes [2] No
40. Are you constrained when accessing agricultural inputs such as fertilizers and pesticides? [1] Yes [2] No
If yes what are some of these challenges.....
41. What are the main causes of post-harvest losses? [1]Transportation [2] Moisture in the stores [3] Insects [4] reduction in quantity due to long storage [5] others (specify).....
42. How do you sell your shallot? [1] As an Individual [2] As a group
If as a group, how is the selling done?
.....



If as an individual, how is the selling done?
.....

43. Where do you sell your shallots? [1]At the farm-gate [2] At the house [3]
At the district market [4] others (specify).....

44. Who do you sell your shallots to? [1] Wholesalers [2] Retailers [3] Both [4]
others (specify)

45. What are the challenges you face in the use of irrigation?
.....
.....

46. Would you like to produce and sell more? [1] Yes [2]No

If yes what do you suggest should be done in order for you to produce more, at a
better quality and lower cost?.....



Section B

- 5) Where do you buy your shallots? [1] Farm-gate [2] market [3] Both [4] others (specify).....
- 6) Apart from shallots do you buy other vegetables? [1] Yes [2] No
If yes, which other vegetables
- 7) Do you always buy shallots from the same person? [1] Yes [2] No
If yes why?
If no why?
- 8) In which month of the year are shallots available or scarce?
.....
- 9) Who determines the price of the commodity? [1] Me [2] the farmer
[3] both of us [4] others (specify).....
- 10) What form of payment do you use to pay farmers? [1] cash [2] credit
[3] Both
- 11) Do you have supply contracts with farmers? [1] Yes [2] No
- 12) Do you transport the commodities? [1] Yes [2] No
If yes how do you transport it?.....
- 13) Does the cost involved in transporting the commodity affect prices?
[1] Yes [2] No
- 14) How many kilograms/tons/bags of crops do you buy in the raining
season?
.....



15) How many kilograms/tons/bags of shallots do you buy in the dry season?.....

16) How much do you pay per bag of shallot in dry and rainy season?

.....

17) What are your strengths?

.....

.....

18) What are your main challenges in buying and selling of shallots

.....

.....

.....

19) What are your suggestions to help farmers produce better quality shallots?

.....

.....

.....

.....



SECTION B

- 5) Which of the following inputs do you sell? [1] Seeds [2] Fertilizers [3] Herbicides [4] Pesticides [5] Irrigation equipment [6] Others (specify)
- 6) Where do you get your inputs from? [1] MoFA [2] Manufacturers [3] others (specify)
- 7) Do you need permit to sell the inputs? [1] Yes [2]No
- 8) How long have you been selling these inputs? [1] 1-5 years [2] 6-10years [3] 11-15years [4]16-20years [5] 20 years and above
- 9) How do you store your inputs? [1] I own a store [2] cooperative/group store [3] others (specify).....
- 10) Do you sort and sell the inputs based on quality levels? [1] Yes [2] No
- 11) How do you establish your selling price? [1] By other vendors [2] based on demand [3] based on location [4] others (specify).....
- 12) What kind of sales arrangements do you have? [1]Cash [2] credit [3] both
- 13) What type of input do farmers demand most? [1] Seeds [2] fertilizers [3] herbicides [3] pesticides [4] irrigation equipment [5] others (specify).....



14) Why do farmers choose specific inputs? [1] Based on input's attributes [2] the existence of government subsidies for those inputs [3] others (specify)

15) How often do farmers purchase inputs? [1] Daily [2] weekly [3] monthly [4] others (specify).....

16) What are your strengths?
.....
.....

17) What are your challenges?
.....
.....
.....



Appendix IV

Mildred Edinam Adzraku is my name. I am a student of the University for Development Studies, pursuing MPhil Development Studies. I am conducting a study on small scale irrigation vegetable farming in the Keta Municipality of Ghana: assessing the shallot value chain. I will like to ask you some few questions relating to the study. I want to assure you that the information you will provide will be treated confidential and will be used only for the purpose of this study.

Focus Group Discussion Guide for Farmers

1. What are the strengths, weakness, opportunity and threats for irrigation development in the keta municipality?
2. Which irrigation method is more efficient and appropriate in shallot production?
3. Why do you consider that method of irrigation as the most appropriate?
4. How important are agricultural inputs such as fertilizer, water, seeds, labour, and supportive services among others to shallot production?
5. What forms of support do the Ministry of Food and Agriculture provide to you?
6. How often do you receive such supports?
7. Have you heard of the Ghana Irrigation Development Authority?
8. If yes what relationship exists between you and the GIDA?
9. What kinds of relationship exist between farmers and input dealers?
10. What kinds of relationship exist between farmers and traders?
11. What kinds of relationship exist among farmers?



12. Do you think Farmer Base Organizations play key role in shallot production?

13. If yes, what are some of the roles of FBOs?

14. How will you rate production outcomes under rainfed and irrigation conditions

Indicators	Use of irrigation (Dry season)		Rainfed	
	High	Low	High	Low
Yields				
Post-harvest losses				
Sales/Marketing				
Expenditure				

15. How much do you sell shallots in the rainy and dry seasons?

16. What challenges are you confronted with?

17. How much will you spend on the following items required in producing shallot through sprinkler irrigation system on one acre of land?

I. 2 inch pressure PVC?





- II. 1 inch PVC?
- III. 2 inch PVC?.....
- IV. 2 inch PVC T?.....
- V. 1 inch valve socket?
- VI. 1 inch facet?
- VII. 4 inch PVC?
- VIII. 2 inch PVC?.....
- IX. PVC glue?.....
- X. Union?.....
- XI. 2 inch PVC elbow?.....
- XII. 2x 1 inch reducers?
- XIII. Water pump?.....
- XIV. Foot valve?.....
- XV. Sprinkler?.....
 - a. Who much will you spend on the following inputs
 - I. Seeds?
 - II. Land?
 - III. Labour?.....
 - IV. Fertilizers?
 - V. Pesticides?.....
 - VI. Ploughing?.....
 - VII. Harvesting?
 - VIII. Storage and Packaging?.....

- IX. Transportation to the market?.....
- X. Government levies?.....
- XI. Lifting water by electric pump and distributing by sprinkler?.....



Appendix V

Mildred Edinam Adzraku is my name. I am a student of the University for Development Studies, pursuing MPhil Development Studies. I am conducting a study on small scale irrigation vegetable farming in the Keta Municipality of Ghana: assessing the shallot value chain. I will like to ask you some few questions relating to the study. I want to assure you that the information you will provide will be treated confidential and will be used only for the purpose of this study.

Interview Guide for District Ministry of Food and Agriculture and GIZ

- 1) What form of support do you provide to shallot farmers?
- 2) How often do you provide support to farmers?
- 3) Do you work with all shallot farmers?
- 4) What challenges, limit your work in providing shallot farmers with support?
- 5) Do you solve problems that farmers bring to you?
- 6) What do you do to solve the problems?
- 7) Have the supports you provided shallot farmers over the years brought any changes in shallot farming?
- 8) If no, why have your support not produce outcomes?
- 9) If yes, what changes have been recorded as a result of your support to the shallot farmers?
- 10) Do you subsidize production?
- 11) Where do you see strengths and weaknesses of the irrigation system practice in the area?



- 12) At which stage of the chain (production/collection/processing/retailing) do you intervene specifically?
- 13) Do you think farmer base organizations play key role in supporting shallot farming?
- 14) What improvements do you suggest should be done in irrigation?
- 15) Which policies do you think would help poor farmers produce more, at a better quality and lower cost?
- 16) What are the challenges and opportunities you face in undertaking those roles assigned to your organization?
- 17) Do you have any other information you would like to share with me aside the information I have requested.**



Appendix VI

Pictures Showing Shallots Cultivated in the Study Area



