

UNIVERSITY FOR DEVELOPMENT STUDIES

**SOCIOECONOMIC ANALYSES OF VEGETABLE PRODUCTION AND MARKETING
IN TAMALE, NORTHERN REGION**

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**SOCIOECONOMIC ANALYSES OF VEGETABLE PRODUCTION AND MARKETING
IN TAMALE, NORTHERN GHANA**

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DECLARATION

Student

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

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We hereby declare that the preparation and presentation of the thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

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ABSTRACT

Globally, vegetable production and marketing serve as a source of livelihood for both urban and rural poor and contribute tremendously to food security. This study evaluates the social and economic relationships between vegetable farmers and marketers as well as the production and marketing related problems that limit farmers and marketers from getting potential benefits across seasons in the Tamale Metropolis. Qualitative individual interviews consisting of 10 and 8 farmers and marketers respectively were conducted and discourse analysis applied to understand the economics of production and marketing of vegetables and also the interactions and the interrelationships between marketers and farmers over the seasons. Also, using a panel data of 300 observations each of farmers and marketers collected over the seasons (rainy season, harmattan season and hot dry season), random effect and mixed effect models were applied to examine socioeconomic and institutional factors that influence vegetable farmers' and marketers' profit. Results revealed that the economic and business relationships between farmers and marketers over the seasons are fragile. Also, vegetable marketers earned a substantial profit from the marketing of vegetables compared to farmers' profit across the seasons. Notwithstanding, the profit of farmers was significantly and negatively influenced by critical institutional factors, which include; cost of irrigation (water bill), cost of petrol (pumping machine), cost of fertilizer, access to credit and cost of seed. On the other hand, transportation cost, credit sale and days used to sell the produce negatively and significantly affect the profit of marketers. Interventions should target the formation of bank of cluster agriculture (vegetables) in order to ensure that cluster actors access goods and services in a commercially viable way.



DEDICATION

I dedicate this piece of work to my family for all their contributions.



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TABLE OF CONTENTS

DECLARATION.....	i
ABSTRACT.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background.....	1
1.2 Problem Statement.....	4
1.3 Research Questions.....	5
1.4 Research Objectives.....	6
1.5 Justification for the Study.....	6
CHAPTER TWO	8
LITERATURE REVIEW	8
2.1 Vegetables Production in Ghana.....	8
2.2 Market Dynamics of Vegetables.....	9
2.3 Marketing of Vegetables, Market Operations and Marketing Margins.....	13
2.3.1 Market and Marketing.....	13
2.3.2 Marketing Margins.....	15





2.4 Determinants of Productivity and Profitability in Vegetable Production and Marketing.....	16
2.5 Interaction between Vegetable Farmers and Marketers.....	22
2.6 Transaction Cost	23
2.7 Discourse Analysis.....	26
2.8 The Design of the Research	27
CHAPTER THREE	30
RESEARCH METHODOLOGY	30
3.1 Study Area	30
3.2 Research Design.....	33
3.3 Research Phases	34
3.4 Source of Data and Instruments of Data Collection	35
3.5 Sample Size and Sampling Technique.....	35
3.6 Data Analysis	37
3.6.1 Analytical Tools.....	37
3.6.2 Analysis of the Interrelationships and Interactions between Lettuce and Amaranths Farmers and Marketers	37
3.6.3 Evaluation of Gross Margins of Lettuce and Amaranths Farmers and Marketers across the Seasons.....	38
3.6.4 The Analytical Models.....	39
3.6.4.1 Analysis of Factors that Affect the Profit of Amaranths Farmers and Marketers across the seasons.....	39



3.6.4.2 Analysis of factors that affect profit of Lettuce farmers across the seasons.....	44
3.6.4.3 Analysis of Constraints Facing Lettuce and Amaranths Farmers and Marketers in the Production and Marketing of Vegetables across the Seasons	49
CHAPTER FOUR.....	51
RESULTS AND DISCUSSIONS.....	51
4.1 Descriptive Results	51
4.1.1 Sex Distribution of Respondents	51
4.1.2 Age Distribution of Respondents.....	52
4.1.3 Educational Distribution of Respondents	53
4.1.4 Respondents’ Farming Experience	54
4.1.5 Distribution of Respondents’ Household Size.....	54
4.1.6 Occupational Distribution of Respondents	54
4.2 Vegetables Produced Over the Seasons	55
4.3 Vegetables Marketed Over the Seasons.....	56
4.4 Sale and Purchase Agreement between Vegetable Farmers and Marketers	58
4.5 Frequency of Credit Sale and Credit Purchase by Vegetable Farmers and Marketers	59
4.6 Renege on Vegetable Sale and Purchase Agreements.....	59
4.7 Upfront payment Made by Vegetable Marketers across the Seasons.....	60
4.8 Perception of Vegetable Farmers and Marketers on who get Larger Share of the Price Consumers Pay for the Produce.....	61
4.9 Interrelationships between Vegetable Marketers and Farmers.....	61



4.10 Price Determination of Vegetables across the Seasons	63
4.11 Record Keeping by Vegetable Farmers and Marketers	64
4.12 Trade-offs and Negotiations in Vegetable Production and Marketing	64
4.13 Activities and rationale of Actions of Vegetable Farmers and Marketers	65
4.14 Gross Margin of Vegetable Farmers and Marketers across the Season.....	67
4.15 Summary Statistics of Variables used in the Mixed Effect Model for Lettuce Farmers and Marketers	71
4.16 Summary Statistics of Variables used in the Random Effect Model for Amaranths Farmers and Marketers	74
4.17 Determinants of Lettuce Farmers’ and Marketers’ Profit Across the Seasons ...	76
4.18 Factors Affecting the Profit of Amaranths Farmers and Marketers across the Seasons.....	85
4.19 Constraints in Lettuce and Amaranths Production and Marketing across the Seasons.....	92
CHAPTER FIVE	97
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	97
5.1 Summary of Key Findings	97
5.2 Conclusions.....	100
5.3 Recommendations.....	101
5.4 Suggestion for Future Research	102
REFERENCES.....	103
APPENDICES	112

LIST OF TABLES

Table 1: distribution of farmers on vegetables produced in tamale metropolis.....	32
Table 2 : Research Phases.....	34
Table 3 : Individual Interviews.....	35
Table 4 : Survey samples.....	36
Table 5 : Cost and Revenue Variables in Vegetable Production and Marketing.....	39
Table 6: Descriptions of variables in the random effect model for amaranths farmers....	42
Table 7 : Descriptions of variables in the random effect model for amaranths marketers	43
Table 8 : Descriptions of variables in the mixed effect model for lettuce farmers.....	46
Table 9 : Descriptions of variables in the mixed effect model for lettuce marketers	47
Table 10 : Sex Distributions of Respondents.....	52
Table 11 : Age distribution of Respondents	53
Table 12 : Distributions of Educational status of Respondents	53
Table 13: Experience and Household size of Respondents	54
Table 14 : Other Occupations of Respondents	55
Table 15 : Distributions of Farmers in Vegetables Produced over the Seasons	56
Table 16 : Distributions of Marketers in Vegetables Marketed Over the Seasons.....	57
Table 17 : Results of Credit Sale and Credit Purchase	58
Table 18 : Distributions of Frequency of Credit Sale and Credit Purchase.....	59
Table 19 : Results of Renege on Vegetable Sale and Purchase Agreements.....	60
Table 20 : Results of Upfront Payment.....	61
Table 21 : Results of Perceptions on who gets Larger Share of Consumer Price	61
Table 22: Gross margin per season of lettuce farmers and marketers	69



Table 23: Gross margin per season of Amaranths Farmers and Marketers	70
Table 24: Summary Statistics of Variables in Lettuce Farmers' and Marketers' Models	73
Table 25: Summary Statistics of Variables in Amaranths Farmers' and Marketers' Models.....	75
Table 26: Results of Mixed Effect Model Depicting the Determinants of Lettuce Farmers' and Marketers' Profit	81
Table 27: Random Effect Model Depicting Determinants of Amaranths Farmers' & Marketers' Profits	89
Table 28: Ranking of Challenges Facing Lettuce and Amaranths Farmers across the Seasons.....	94
Table 29: Ranking of the Challenges Facing Lettuce and Amaranths Marketers across the Seasons.....	96



LIST OF FIGURES

Figure 1 : Conceptual Framework for the Factors that Affect Profit of Lettuce and Amaranths Farmers across the Seasons	48
Figure 2 : Conceptual Framework for the Factors that Affect Profit of Lettuce and Amaranths Marketers across the Seasons	48
Figure 4: Lettuce marketers' random intercepts by seasons	85
Figure 3: Lettuce Farmers' Random Intercept by Seasons	85



CHAPTER ONE

INTRODUCTION

1.1 Background

Approximately 925 million people in the world were estimated to be hungry in 2010. Of this, about 239 million (30%) were in Sub-Saharan Africa (SSA) (FAO 2010. United Nations High Commissioner for Refugees reported in 2008 that, 47 percent of the population of SSA lived on \$1.25 a day or less. This development calls for the evolution of a more proactive and pragmatic strategy towards enhancing agricultural production in the region. Nevertheless, the potential of vegetable crops in meeting the dietary requirements and enhancing the economic status of people have been highlighted by several authors (Okon *et al.*, 2010; Ibekwe and Adesope, 2011), especially in SSA where the achievement of food security is intrinsically associated with reversing agricultural stagnation and safeguarding the natural resource base (Cleaver and Scriber 1994, Braun and Dlamini, 1994).

Ghana's economy has been strengthened by a quarter century of relatively sound management, competitive business environment and sustained reduction in poverty levels. The agriculture sector is central to overall economic growth and development of Ghana. In the national development agenda, agriculture is expected to direct the growth and structural transformation of the economy and maximize the benefits of accelerated development (METASIP, 2010). The agricultural sector makes up over 50% of Ghana's total employment and approximately 25% of the nation's Gross Domestic Product (GDP).





Vegetables are leafy green, stem, and root or even flower stalk portions of an edible plant. They are produced by growing genetically dwarf varieties or by harvesting the product before attaining full maturity. Vegetables serve as major and efficient sources of micronutrients compared to other crops (AVRDC, 1996). Vegetables also provide antioxidants and phytochemicals that may protect people against non-contagious diseases (Yang and Keding, 2009). For illustration, some protective properties against ulcers induced experimentally have been found in African eggplant, making it a cheap and natural anti-ulcer remedy (Chioma *et al.*, 2011).

Increased vegetable production not only improves family diets but also increases family incomes especially the income of women who often grow, preserve and sell vegetables (IITA, 2001). Vegetable production and marketing are valued on account of their growing contribution to the national GDP and expanding areas with potentials to export earning, rural employment and poverty reduction. Such potentials of vegetable farming especially, in smallholders could be harnessed only through improved operation of production and marketing systems (Pokhrel, 2010).

Even though the production and marketing of vegetables are profitable, vegetable marketing has shown very low gross margins due to bulkiness, perishable nature and high risks and uncertainty in the marketing of vegetables in developing countries. Likewise, the point of marketing margin has influenced the magnitude of the component of the consumers' expenditure on vegetables that farmers receive (Alam *et al.*, 2015, Osondu *et al.*, 2014, Anuebunwa *et al.*, 2006; Anuebunwa 2006). Farmers' gross margin is small compared to that of retailers and wholesalers along the market chain. This difference is due to the fact that, the total variable costs incurred by the farmers in vegetables production are



higher compared to that of wholesalers and retailers (Osano, 2010). Scheltema (2002) emphasized that vegetable production is significantly more labour intensive than maize and bean production and this has contributed to the high variable cost incurred by farmers, and hence, the low gross margin received by them.

In Ghana as in many developing countries, vegetable sector offers great opportunities for growth, given the steady increase of high-value domestic markets and export opportunities. Production of fresh vegetables takes place all around the country and is strongly related to the specific weather conditions and market windows. The country is in close proximity to many European countries. Importantly, Ghana's growing middle class with a heightened health awareness of consuming vegetables, coupled with the rise of the supermarket industry, is fueling the gradual growth in the domestic market for vegetables (NABC, 2014).

According to MoFA (2012), Ghana has a comparative advantage in the cultivation of export vegetables but due to low productivity, poor product quality and packaging, poor timing of harvest for export, and poor organization of exporters, her share of the world vegetable market is significantly lower than the potential.

Consequently, Ghana depends largely on regional imports for vegetables during the offseason. For instance, Ghana produces 30,000 tons of onions and imports about 83,000 tons valued at \$60 million from Niger and Burkina Faso annually. Ghana is known to be the second largest importer of tomatoes in the world after Germany. Fresh tomato import from neighboring countries ranges between 70,000 and 80,000 tons per annum. It also imports about 10,000 tons of tomato paste and puree from Europe alone valued at about \$12.5 million and is projected to grow by 13% per annum. Consumption in Accra alone is

100% greater than the total horticultural export in 2011 and about 17% of the total NTE for 2011. This further demonstrates a huge domestic market potential for vegetables (NABC, 2014).

To improve the competitiveness of the sector requires a more holistic analysis of the economy of production and marketing of vegetables in order to identify the systemic and structural factors that affect the productivity and profitability of vegetables.

1.2 Problem Statement

Vegetable production and marketing offer great opportunities for growth and also contribute to gross domestic product (GDP) in Ghana. Agriculture contributed about 30.2% to GDP according to Ghana Statistical Service reports (GSS, 2010). According to the Netherland-Africa Business Council the domestic market alone for vegetables is growing at more than 10% per year and the potential value for export vegetables is estimated at US\$250 million. In general, exports of vegetables in Ghana are believed to have a comparative advantage over competitors like Kenya, given the climatic conditions and relative distance to the EU market (WB, 2011).

Vegetable production is an important source of livelihood for many traders and marketers in Northern region of Ghana. Sustainable vegetable production and marketing is expected to ensure profitability for all actors along the value chain including producers and marketers. However, it has been generally discussed that vegetable farmers do not receive a fair share of the price consumers pay for the produce. Farmers' gross margin is small compared to retailers and wholesalers margin due to high variable cost incurred by farmers



in vegetable production (Osano, 2010). Regarding vegetable marketing, the general remark has been that traders usually try transferring all sorts of price risks to farmers and offer low prices to farmers or by creating a monopsonistic situation, debt-ties and cartel (Thapa et al., 1995).

The foregoing debates are often made without a deeper understanding of the critical transactional relationships that exist between farmers and marketers of vegetables, which could partly explain the rationale behind the differential margins received by the various agents in the vegetable chain. On such note, the evaluation of vegetable production and marketing was carried out across the three recognized seasons in northern Ghana, namely; rainy season (June – September); harmattan season (October- January) and dry hot season (February-May).

1.3 Research Questions

The main research question is what are the social and economic relationships between vegetable farmers and marketers in the Tamale metropolis?

The specific research questions are as follows:

- ❖ What is the nature and rationale behind the socioeconomic activities of vegetable farmers and marketers across seasons in the Tamale metropolis?
- ❖ What transactional interrelationships exist between the farmers and marketers across seasons?
- ❖ How much differences exist in the profitability of vegetable farmers and marketers across season?



- ❖ What factors account for the differences in profits of vegetable farmers and marketers across seasons?
- ❖ What are the challenges that vegetable farmers and marketers face across the seasons?

1.4 Research Objectives

The main objective of the study was to examine the social and economic relationships between vegetable farmers and marketers in the Tamale metropolis.

The specific objectives were to:

- ❖ Investigate the nature and rationale behind the socioeconomic activities of vegetable farmers and marketers across seasons;
- ❖ Examine the transactional interrelationships between vegetable farmers and marketers across seasons;
- ❖ Estimate and compare the profits of vegetable farmers and marketers across seasons;
- ❖ Determine the factors that account for differences in profits of farmers and marketers across crops and seasons; and
- ❖ Explore and rank the constraints facing the production and marketing of vegetables in the Tamale metropolis.

1.5 Justification for the Study

Specifically, in Ghana, research on vegetables tend to focus on consumption across ecological zones and socioeconomic status (Adjei and Kumi-Kyereme, 2014; Darkey *et*



al., 2014). Alhassan (2009) focused on non-traditional vegetable production in Northern Ghana, while Berko and Tavie (1999) concentrated on proximate analysis of some under-utilized Ghanaian vegetables. Sarpong *et al.* (2014) assessed the trace metal levels in commonly used vegetables sold at selected markets in Ghana and Chagomoka *et al.* (2015) studied vegetable production, consumption and its contribution to diets along the urban – rural continuum in northern Ghana.

It is evident from the studies in Ghana and elsewhere that, there is little information on the economics of vegetable production and marketing, and the kind of transactional relationships that intermediate these economic transactions. Also, the factors that militate against the production and marketing of vegetables are not fully explored, especially in the Tamale Metropolis. Therefore, different dimensions of vegetable production and marketing ought to be identified to improve the relationships between vegetable farmers and marketers in the metropolis. On such note, the evaluation of vegetable production and marketing was carried out across the three recognized seasons in northern Ghana, namely; rainy season; harmattan season and dry hot season.



CHAPTER TWO

LITERATURE REVIEW

2.0 Chapter Outline

This chapter reviews literature on topics related to the study. It consists of eight sections. Section 2.2 describes vegetable production in Ghana. Also, market dynamics of vegetables and marketing of vegetables, market operations and marketing margins are outlined in section 2.3 and 2.4 respectively. Empirical studies on productivity, marketing and profitability of vegetable are highlighted in section 2.5 and 2.6 respectively. Finally, section 2.7, 2.8 and 2.9 contain information on interaction between vegetable farmers and marketers, amaranths and lettuce respectively.

2.1 Vegetables Production in Ghana

Ghana's vegetable sector offers outstanding chances for growth given the regular increase of high-value domestic markets and export opportunities. The yield of fresh vegetables takes place all around the nation and is powerfully linked to the specific weather conditions and market windows. In addition, irrigated agriculture is on the increase leading to new production areas around the Volta River and Lake Volta, as well as specific irrigated areas in and around Accra.

The domestic market *alone* is rising at more than 10% per year and the potential value for export vegetables is estimated at US\$250 million NABC, (2014). In order to gain from these developments, the competitiveness of the sector needs to improve. This requires investments and innovations but also improvements in the business climate, from credit





availability to quality inspection services, and from improved export logistics to faster and cheaper importation of agricultural inputs, (NABC, 2014, Yeray *et al.*, 2014). Vegetable cultivation in Ghana also provides an excellent source of employment for both rural and urban dwellers as it is grown in many rural regions as well as in the outskirts of towns and cities to be supplied fresh to the urban markets and for exports. The industry has been found to have three distinct components– Commercial/market gardening, medium scale production for contractors/middlemen and small-scale domestic/backyard gardening. Most of the farmlands in Accra, the capital city of Ghana is used for commercial cultivation of vegetables (tomatoes, okra, cabbage, lettuce) (Yeray *et al.*, 2014).

2.2 Market Dynamics of Vegetables

Fruits and vegetables contain a large and active sub-sector of the world’s agriculture (Briones, 2009). In Philippine, it accounts for 31% of agricultural output (by value). In the past three decades, it has been rising at a pace of 2.8% per year, compared to only 1.8% for agriculture as a whole. On the other hand, Ali (2006) narrated that in Asia, vegetable production grew at a yearly average pace of 3.4% in the 1980s and early 1990s, from 144 million tons in 1980 to 218 million tons in 1993.

Fruits and vegetables represent a significant circle of “high-value” activities, some of which are produced within organized supply chains (Briones, 2009). Briones (2009) pointed out the important role of fruits and vegetables in agricultural diversification and rural growth. According to Dyer *et al.* (2006) agricultural diversification could be pro poor as it may raise incomes of smallholder farmers. This diversification has significant impact



on the dynamics of fruits and vegetables production systems and food supply chains. As the economy develops, fruits and vegetable become increasingly important both as a share in agricultural output and in the food basket. Some of the indicators for this dynamics of changes were addressed by Ali (2006) on the food demand side, whereby emphasis is now shifting from basic nutrients (calories and protein) to balanced diets (calories, protein, and micronutrients). Nevertheless, global retail chains do not invest uniform in all countries and some, especially poor countries; have been left in arrears in the retail revolution (Dolan and Humphrey, 2000). The imports of these changes are that formal markets are replacing informal farmers' produce markets for fruits and vegetable (Briones, 2009).

In addition, Louw *et al.* (2009) insisted that fresh fruits and vegetable markets are restructuring and this is characterized by an increased consolidation and concentration of the industry which lead to a substantial growth of big retailers in the agriculture supply chain in the Southern African Development Community (SADC) region. The restructuring process is likely to turn out farmers from food markets in two ways; firstly, through the translation of traditional markets by formal food chains that will leave smallholder farmers with no alternative markets.

Secondly, the restructuring process will exclude farmers through the initiation of private standards which make it difficult for smallholder farmers to achieve compliance. In the illumination of these threats the restructuring process favors large agribusiness to smallholder farming. In addition, less developed rural economies and smallholder farmers find it difficult to participate in commercial formal markets due to factors such as shortage of nearby markets to absorb their produce, low produce prices, a lot of middlemen,

unavailability of marketing institutions to facilitate contract enforcement and coordination among farmers (Emana and Gebremedhin, 2007).

According to Putter *et al.* (2007) other dynamics of the fresh fruit and veggie sub-sector are spot markets whereby it is calculated that 80% of the produced vegetables is sold by the farmers at farm gate to commissioners. Moreover, growing tourism creates a growing demand for high value and high quality vegetables. Ashimogo and Greenhalgh (2007) asserted that fruits and vegetable market are determined by factors like change in market demand, technology, barriers to entry, input supply, profitability of different niches, risks and policy environment.

Furthermore, seasonality in production affects vegetable production not only from year to year, but also from season to season as explained previously. This leads to fluctuating supply of vegetables on the market. However, overproduction as a result of rain fed farming also has problems during the sale of the vegetables such that a great deal of produce rots away due to the perishable nature of the vegetables (Edmond *et al.*, 2008). Moreover, farmers' ability to take part in marketing actions is greatly affected by so many factors. Makhura (2001) noted that physical facilities, proximity to market, shortage of resources such as transport as well as shallow market information are the primary limitations to farmers' market activities. so the inability of farmers to bargain for prices together with limited credit relationships with the buyers lead to farmers being exploited. In most of the cases, marketing cost, marketing margin, transport cost, labour charges are adversely affect marketing efficiency. Nevertheless, open market price, volume of the produce handled and net price received increase marketing efficiency (Dastagiri *et al.*, 2013). In addition, small holder farmers face a lot of challenges in the marketing of vegetables. Some of these





challenges include: lack of access to credit; lack of access to storage facilities; lack of market information; lack of finance for farming; poorly developed village markets; poor producer prices; high perishability of produce; low patronage; inadequate access roads; and small size of transport as well as high transportation costs (Matsane and Oyekale, 2014). The challenges faced by farmers in the marketing of vegetables are rated by Kumar (2012), as high level problems, moderate level problems and low level problems. High level problems include; damage cost; intermediaries' exploitative practices; perishability of product; transportation cost and high storage cost; freight charges; lack of proper grading; high carriage and other handling charges; exploitation of growers by market force; lack of proper quality control; long distance of market access; seasonalization of production; long marketing channel; delay payment; lack of cold storage place; advance sales agreement; inadequate post-harvest care; and monopoly of middleman.

Bulkiness of products and low exports are rated as moderate level problems while irregular supply, primitive method of trading and price fixation, packing and loading problems, quality variation in yield, and packing of products are rated as low level problems. Njaya (2014) asserted that poor infrastructure for storage, transportation cost and inefficient fruits and vegetable marketing system contribute to losses to farmers. Also, smallholder farmers focus on production activities and present relatively little interest in vegetable marketing activities which has contributed to the low net margin of farmers.

2.3 Marketing of Vegetables, Market Operations and Marketing Margins

2.3.1 Market and Marketing

The term market has got a variety of meanings. The following are some of the definitions, according to Weldeslassie (2007), a place where buying and selling take place; an arena in which a good is sold; a group of people carrying on buying or selling; or the commodity traded, such as the corn market, or time market. Kohl and Uhl (1985), put their definition of market in reference to giving answers to questions of what to make, how much to raise, how to grow, and how to distribute. Additionally, Saccomandi (1998) defined market as the exchange, circulation and distribution of commodities between people and spaces. By agricultural market, Saccomandi (1998) referred to the economic place in which agricultural producers sell the products obtained in their farms with the degree of form, space, and time related function required by the buyers.

This study adopts the definition of Weldeslassie (2007) since the commodities can be traded in various places by different chain actors along the markets, as in the farm field, garden, local market as well as in the central market provided buying and selling can take place.

Marketing of agricultural products consists mainly of moving products from production sites to points of final use. In this regard, the market performs exchange functions as well as physical and facilitating functions. The exchange function involves buying, selling and pricing. Transportation, product transformation and storage are physical functions, while financing, risk bearing and marketing information are facilitating marketing (Branson and Norvell, 1983).



Selling in its simplest shape is delineated as the process of satisfying human needs by bringing products to people in the proper form, time and place (Branson and Norvell, 1983). Antwi and Seahlodi (2011) also defined marketing as a business activity associated with the stream of commodities and services from producers to consumers. Bothloko and Oladele (2013) also observed that marketing of agricultural products begins on the farm with planning of production to meet specific need and market expectations. Similarly, Mendoza, (1995) observed that marketing delivers an essential productive value, in that it adds time, kind, place and possession utilities to products and commodities. Through the technical functions of storage, processing and transportation, and through exchange, marketing increases consumer satisfaction from any given quantity of output. Furthermore, Kotler and Armstrong (2006) defined marketing as the task of creating, raising, and delivering goods and services to consumers and commercial enterprises. Lastly, Gill (2006) stated that marketing is a societal process which discerns consumers' wants, focusing on a product or services offered.

However, marketing of fruits and vegetables is quite complicated and risky due to their perishable nature, seasonal production and bulkiness of these crops. Likewise, the range of prices from producers to final consumers, which is an effect of demand and supply of transactions between various intermediaries at different stages in the marketing system, is also unique for fruits and vegetables. Moreover, the marketing arrangements at different stages as well play an important role in price levels at several points from farm gate to the ultimate user. These characteristics form the marketing system of fruits and vegetables to differ from other agricultural goods, especially in providing timely, form and space utilities. While the market base is better trained for food grains, fruits and vegetable

markets are not that well developed and markets are congested and unhygienic (Sharan, 1998).

2.3.2 Marketing Margins

According to Scarborough and Kydd (1992), marketing margin is most commonly used to refer to the difference between producer and consumer prices of an equivalent quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example, between producer and wholesale, wholesale and retail prices. The size of marketing margins is largely dependent upon a combination of the quality and quantity of marketing services, and the efficiency with which they are undertaken and priced. The quality and quantity of marketing services depend on provision and requirement of marketing services and/or the level of competition in the market situation. The monetary values of service provision depend on both exogenous and endogenous factors and the efficiency is determined by the extent of competition between marketing enterprises at each level. Large gross margins may not convey high earnings; this is because the size of marketing margins largely depends upon a combination of the quality and quantity of marketing services, and the efficiency with which they are undertaken and priced. Thus, in using market margin analyses to evaluate the economic functioning of markets, it is invariably preferable to deconstruct them into their monetary value and return elements (Scarborough and Kydd, 1992). Still, the challenges of data available on costs usually create a problem.

Mendoza (1995) warns that precise marketing costs are oftentimes hard to determine in many agricultural marketing chains. The grounds are that these monetary values are often both cash costs and imputed costs, the gross and not the net marketing margin is advised



to be counted. According to Mendoza (1995), “marketing margins” should be interpreted as the gross marketing margins. He advises marketing researchers to emphasize gross marketing margins in reporting their findings.

2.4 Determinants of Productivity and Profitability in Vegetable Production and Marketing

Productivity expresses the varying relationship between agricultural output and one of the major inputs, like, land or labour or capital, other complementary factors remaining the same (Dewett and Singh, 1966).

Productivity of vegetables is greatly influenced by so many factors. Ahmed *et al.* (2003) applied a Cobb Douglas production function to quantify the contribution of various factors in muskmelon production. They noticed that variables such as family size, use of fertilizers and interaction of variety with pesticide sprays were highly significant towards muskmelon productivity. Likewise, selling price of vegetables, fertilizer quantity, access to credit and gender are some genes that are positively connected to the production of vegetable (Amaranthus) while distance to market is negatively related to Amaranthus productivity (Alam *et al.*, 2015). Ahmed *et al.* (2003) discovered that though the amount of seed, plant food and frequency of irrigation were significantly contributing to the productivity of gourd to a sure degree, the coefficients of these inputs in square terms were negative. This indicated that using these inputs above certain level would negatively affect productivity.

According to Kintomo *et al.* (199), significant and sustainable gains in productivity of dry season vegetable production could be attained with the utilization of integrated water, crop,





soil and pest management practices, including organic and inorganic soil management, manual, chemical and cultural weed management and efficient input delivery system. Nosiru *et al.* (2012) assessed the determinants of improved productivity of okra (*Abelmoschus esculentus*) and discovered that male farmers were more productive than their female counterparts; farmers' household size and frequency of contact with extension officials were observed to be the most significant socio-economic variables that affect productivity.

Weston and Brigham (1990) defined profitability as the net surplus of a large number of policies and decisions. Profitability measurement is very important because it is a factor for productivity, growth and equity. Alarm *et al.* (2015) discovered that vegetable (*Amaranthus*) production is a profitable venture and is worth investing in. Also, Ibekwe and Adesope (2010) studied dry season vegetable production in Owerri West Local Government Area of Imo State, Nigeria and found that, the net farm income (NFI) and the return to Naira invested indicated that dry season vegetable production is a feasible and profitable venture.

In addition, the total revenue realized from the total cost of vegetable farming of 2,777,200 naira was 3,960,500 naira giving a net income of 1,183,300 naira. This indicates that vegetable (*Telfairia occidentalis*) production is profitable (Obinaju and Asa, 2015). Moreover, Usman and Bakari (2013) found that vegetable farmers make good farm profit with average gross margin and net farm income per hectare of N125, 500.88 and N105, 012.91 respectively. Although the production of leafy vegetables is tedious, it acts as a major part in defending the livelihoods of the inadequate.

Farmers earned about 750,000 FCFA (US \$1500) for cultivating a 150 m² piece of land (Asongwe *et al.*, 2014). Furthermore, small scale dry season vegetable production is profitable as the rate of return to owner's labour and management is N84,951.88 and the rate of returns to total investment is 97.20% (Tsoho and Salau, 2012). Sanusi and Ayinde (2013) found that vegetable (pepper) production is a profitable venture considering the gain made by farmers as indicated by the Rate of Returns (ROR) value of 3.11 which signifies that every N1 (US\$0.006) invested in pepper production returns a revenue of N3.11 (US\$0.021) to the farmer despite the various constraints being faced by the farmers.

In addition, Owombo *et al.* (2012) analyzed gross margin of amaranth vegetable production in Ondo state, Nigeria from a gender perspective and identified that the total revenue to an average male farmer was N68,003.1 and that of an average female farmer was N81,520.5. The gross margin for an average male farmer was N50,416.1 while that of an average female farmer was N63,245.5. They too found that farm size and credit access positively influenced returns to amaranth vegetable production.

Vegetable (*Amaranthus*) production is a profitable venture in the study area that is worth investing in it but vegetable farmers are constrained by inadequate funds, high cost of irrigation facilities, and poor price of vegetable among others (Alam *et al.*, 2015).

Kainga (2013) in his studies on the determinants of marketing margins of vegetables found that transport cost and age of respondents significantly influence marketing margins of vegetables on watermelon. Price of watermelon showed positive and significant relationship ($t = 8.682$; $p < 0.05$). This suggests that the higher the price of watermelon, the higher the net returns. Onyemauwa (2010) had identified marketing experience,

depreciation cost of marketing equipment, cost of produce and marketing cost as statistically significant variables that influence marketing margin.

Bongiwe and Micah (2013) examined the factors affecting the productivity and profitability of vegetable production and reported that access to credit, selling price, fertiliser quantity and gender were significant and positively related to the productivity of the vegetable farmers while distance to market was negatively related to productivity. Profitability of vegetables was influenced by farmers' level of education and land under vegetable production.

Also, Kainga (2013) in his studies on the determinants of marketing margins of vegetables found that transport cost and age of respondents significantly influence marketing margins of vegetables.

Ayesha and Zafar (2013) in their study on the determinants of gross margin from vegetables production in Abbottabad reported that age had a negative influence on gross margin from vegetable production. Ibekwe and Adesope (2010) in their studies reported that irrigation cost negatively affect the profit of farmers and pointed out that over watering of the plants can lead to water logged farms which can lead to decreased level of vegetable production thus affecting the profit of vegetable farmers.

Moreover, Owombo *et al* (2012) in their studies on the factors that influence the profit of Amaranths farmers found that cost of paid labour negatively influenced the profit of Amaranths farmers. Tahir and Altaf (2013) studied the determinants of the returns from vegetable production in Abbottabad and found that total cost of fertilizer negatively influenced the gross margin from vegetable production in Abbottabad.





Notwithstanding, Mohammed et al. (2016) examined the factors that affect the profit from vegetable production and concluded that access to credit negatively affect the return from vegetable production and suggested that government seldom grants financial credit to large numbers of farmers and when done with high interest rate.

However, Owombo et al. (2012) analyzed the profitability and determinants of Amaranth production in Ondo State and found that access to credit positively influence the gross margin form Amaranths production.

On the other hand, Osondu *et al.* (2014) revealed that marketing of salad vegetables is profitable. They reported that the average selling price of cabbage by producers, wholesalers, and retailers per kg were N104.5, N187.4 and N221.6 respectively, while, their marketing margins were N104.5, N82.9 and N41.1 respectively, and the percentage market share of the producers, wholesalers and retailers of cabbage were 47.16%, 37.41% and 15.43% respectively. This showed that an intermediate producer of cabbage earned 0.47 Naira for every 1 Naira retail price paid by the final consumer in the selling procedure. This sum may be presumed to entail that the producers picked up the highest remuneration from cabbage marketed but they asserted that this sum may not be true but because the producers' production cost was not accounted for in the analysis.

Bakari and Usman (2013) reported that the total average net income of all the vegetable sellers is N10,711.91 with a total average gross margin of N10,871.91 per basket. Thus vegetable marketing is a profitable venture and is worth investing in.

Onyemauwa (2010) studied the factors that influence marketing margins of vegetables and found out that marketing experience, cost of produce and marketing cost statistically and significantly influence marketing margin.

Also, Oladejo and Oladiran (2014) examined the factors that influence the gross margin of vegetable marketers and found out that the cost of the vegetables negatively influences the margins of marketers and emphasized that as cost price of produce increases, the purchasing power of marketers drop and the quantity of vegetable the marketers were able to supply to the market reduces.

Osondu *et al.* (2014) evaluated the factors that influence the gross margin of cabbage marketers (wholesalers) and found that household size, marketing experience, storage cost, product cost and transport cost significantly influenced the margins of cabbage marketers. Marketing experience was positively signed and was statistically significant at 1.0% alpha level of probability which implies that the more experienced a marketer is, the more she is able to take rational decisions that would increase her income, *ceteris paribus*. Besides, storage cost was positively signed and was statistically significant at the 1.0 % level of chance. This means that the rent on stores increases as the holding of cabbage increases, which would result in higher income when the products are sold at premium costs at a high demand. Moreover, product price was found to be positively signed and was statistically significant at 1.0% alpha level of chance. This implies that increase in product cost would lead to increase in net marketing income of the wholesalers and vice versa. Lastly, transportation cost was negatively signed and statistically significant at 5.0% risk level. The negative sign associated with the variable implies that a high transportation cost would reduce the income of the marketers.





2.5 Interaction between Vegetable Farmers and Marketers

Adepetu (2005) examined the interaction between producers and traders in vegetable market and found that producer-trader-consumer interactions in tomato marketing is very complex requiring a great number of actors who are loosely categorized into ten actor-characters. They include: producers, commission agents, assemblers, bulk-purchasers, retailers, packagers, loaders, transporters, porters and dry grass suppliers. He found that eight activities were gender – specialized while only two were not.

Activities, namely, porters, transport, commission agents, packaging, loading, farming and dry grass supplying were wholly male dominated, while the three other activities, namely, assembling, retailing and bulk purchasing were shared almost equally by both genders. Osano (2010) also reported that majority (79.2) of the household farmers (African vegetable farmers) were male and only 25.8% were female while in the case of traders 82.1% were women and 17.9% were male. Studies by Onyango (2007), also found the same and emphasized that vegetable marketing activities were performed only by adult females. Also, literacy level among the vegetable producers and marketers was relatively high. Furthermore, 33.3% of the respondents had Koranic education, 43.3% attended primary school while 23.4% had secondary/post-secondary training.

Adepetu (2005) pointed out that there is no explicit and consistent government policy on helping farmers in developing and marketing their vegetables. Although, the activities of eight of the actor types are extremely organized, unfortunately, the producers as well as consumers do not have any regulatory body. The two groups are thus left very vulnerable to the exploitation by other actors. He also reported that the three most influential actor-

types in tomato marketing are the assembler and commission agent (who interact directly with farmers) and the bulk purchasers (whose interaction with the farmers is indirect).

The assemblers facilitate farm-to-market evacuation of tomato and pay farmers “appropriate” price based on the information provided by both the commission agent and bulk purchaser. The commission agents represent the connection between the farmer and the bulk purchaser/retailer. Nevertheless, among the three most influential groups, the most potent is the bulk purchaser who ships tomato out of the producing region to urban cores. They are better informed than any other group as they receive information, by mobile phone, (every bulk purchaser owns a mobile phone), from their agents in urban centers, on a continuous foundation of price trends. They also reside virtually permanently in the tomato growing region and know the tomato supply situation. This enables the group to effectively dictate the buying price of tomato. The survey also brought out that transport providers, especially, operators of pick-up vans and taxis offer adequate and satisfactory transport service to tomato farmers. Information on where tomato is available for evacuation is well accessed by transport operators either through mobile phones or direct touch with other drivers. This enables them to evacuate freshly harvested tomato to the market promptly and while still in very good condition.

2.6 Transaction Cost

Because recent theoretical statements of the approach of transaction cost economics to the study of economic organization can be found elsewhere (Williamson 1998; 2000), we provide a compact version here. The key conceptual move to transaction cost economics is to describe firms not in neoclassical terms (as production functions) but in organizational





terms (as governance structures). The basic insight of transaction cost economics is to recognize that in a world of positive transaction costs, exchange agreements must be governed, and that, contingent on the transactions to be organized, some forms of governance are better than others.

There are at least three main factors underlying positive transaction costs. First, individuals are limited in their ability to plan for the future and in spite of their best efforts to deal with the complexity and unpredictability of the world around them, they lack the knowledge, foresight and/or skill to accurately predict and plan for all the various contingencies that may arise (Simon, 1957).

Second, even if perfect planning were possible, it is hard for contracting parties to negotiate about these plans due to the difficulty associated with developing a common language to describe actions and states of the world with which the parties have little prior experience (Hart, 1995).

Third, assuming that parties could plan and negotiate for a fully contingent contract, it frequently remains difficult for them to communicate their plans in such a way that an uninformed third-party (e.g., a court) could reasonably enforce them. The upshot is that all contracts are actually and effectively incomplete.

One economic implication of contractual incompleteness is that when circumstances arise that were not accounted for in the original agreement, parties must partake in costly renegotiations and may engage in excessive haggling over how to revise the contractual terms. Particularly problematic are calculated efforts on the part of individuals to mislead, renege, cheat or otherwise take advantage of the vulnerabilities of their trading partners in

hopes of achieving a more favorable distribution of the rents accruing to exchange. Although not everyone is so inclined, the bounded rationality conditions outlined above make it difficult to uncover untrustworthy individuals ex ante (Williamson, 1996).

To safeguard against such opportunistic behavior, parties select institutional arrangements so as to mitigate the expected total cost of consummating the transactions involved. The governance structures that firms employ to guard against these contracting hazards vary in discrete structural ways with reference to their adaptive performance by reasons of differences in incentive intensity, administrative controls and contract law regime (Williamson, 1991). Market forms of organization rely on prices to signal opportunities for autonomous adaptation to changing conditions in order to exploit new profit opportunities. As specialized or relationship specific investments increase, coordinated adaptation becomes more important. The movement from market to hierarchy entails trading off high-powered incentives and autonomous adaptive properties for the added safeguards and centralized coordinating properties of internal organization. Different governance forms, such as markets, hybrids, firms and bureaus, etc., are never examined alone but always in relation to one another. Identifying and explicating the syndromes of attributes that define each generic mode of governance are central to the exercise.

The transaction is named as the basic unit of analysis and the critical dimensions to which transactions differ are also identified and the ramifications worked out. The logic of discriminating alignment according to which “transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, so as to effect a transaction cost economizing result” (Williamson, 1991: 1979) is then employed to derive refutable implications. A final assumption underlying transaction cost economics



is that important dimensions along which transactions differ can be identified and measured, qualitatively if not quantitatively.

The idea that governance is a means by which to induce order, thereby to mitigate conflict and realize mutual gain is a recurrent theme (Williamson, 2000). The basic regularity is this: complex modes of organization are reserved for complex transactions, to which contractual hazards accrue; whereas simple modes of governance suffice for simple transactions, of which the ideal transactions in both law and economies are those for which identity does not matter. To use a simple mode of governance to manage a complex transaction would be to risk contractual breakdown, whereas to use a complex mode of governance to manage a simple transaction would be to incur costs without gain.

2.7 Discourse Analysis

Discourse is the general idea that language is structured according to different patterns that people's utterances follow when they take part in different domains of social life, familiar examples being 'medical discourse' and 'political discourse'. Discourse analysis is the analysis of these patterns (Marianne and Louise, 2002).

Discourse analysts do what people in their everyday experience of language do instinctively and largely unconsciously: they notice patterning of language in use and the circumstances (participants, situations, purposes, outcomes) with which these are typically associated. The discourse analyst's particular contribution to this otherwise mundane activity is to do the noticing consciously, deliberately, systematically, and as far as



possible, objectively, and to produce accounts (descriptions, interpretations, explanations) of what their investigations have revealed.

However, discourse analysis is not just one approach, but a series of interdisciplinary approaches that can be used to explore many different social domains in many different types of studies. Discourse analysis can be used as a framework for analysis of national identity. Alternatively, one could choose to explore the significance of national identity for interaction between people in an organizational context such as a workplace (Marianne and Louise, 2002). In discourse analytical research, the primary exercise is not to sort out which of the statements about the world in the research material are right (although a critical evaluation can be carried out at a later stage in the analysis). On the contrary, the analyst has to work with what has actually been said or written, exploring patterns in and across the statements and identifying the social consequences of different discursive representations of reality (Marianne and Louise, 2002).



2.8 The Design of the Research

Research designs are projected and the operations for the research that span from the decisions from broad assumptions with detailed methods of information accumulation and analysis (Creswell, 2009). The overall decisions involve which design to be used to examine a subject. Informing this decision should be the worldview assumptions the researcher brings to the study, procedures of interrogation and the specific methods of data collection, analytic thinking and rendering. The choice of a research intent is likewise

founded on the nature of the research problem or the issues being addressed, the researchers' personal experiences and the audiences for the study (Creswell, 2009).

The three types of research designs are: qualitative, quantitative and the mixed methods. Qualitative research design is a means for exploring and interpreting the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and processes, data typically collected in the participants setting, data analysis inductively building from particulars to general themes and the researcher making interpretations of the significance of the data (Creswell, 2007). Meanwhile, quantitative research design is a means for testing objective theories by studying the relationship among variables. These variables, in turn, can be measured, typically with the instrument, so that numbered data can be analyzed using statistical procedures (Creswell, 2008). On the other hand, mixed method research is an approach to inquiry that combines or associate both qualitative and quantitative courses. It is more than simply compiling and analyzing both kinds of information; it also requires the usage of both approaches in tandem so that the overall effectiveness of the study is larger than either qualitative or quantitative research (Creswell and Clark, 2007). Thus, this work used the mixed method approach as the study design. This is because, a comprehensive understanding of the production and marketing system in the Metropolis can only be achieved through the combined use of both qualitative and quantitative approach.

Moreover, panel survey was undertaken to describe information about the production and marketing of vegetables across the rainy season; the cool, dry, windy Harmattan season and the hot dry season. According to Yaffee (2003), panel data analysis is a method of studying an exacting subject within multiple sites, periodically observed over a defined



time frame. With repeated observations, panel analysis permits the researcher to study the dynamics of change with short time series. The combination of time series with cross-section can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions (Damodar, 2004). Moreover, panel data analysis has the advantage of controlling for individual heterogeneity which occur in time series and cross sectional studies. Failing to check for this heterogeneity runs the danger of obtaining biased results (Baltagi, 1995). Therefore, panel study is really central to explore the dynamics in vegetable production and marketing and also how seasonality in production and marketing influences prices, income and marketing strategy of both farmers and vendors.



CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Chapter Outline

This chapter contains the materials and methods used to collect, process, analyze and present the data. Section 3.2 presents a brief description of the study area. Also, research design, research phases, source of data and instruments of data collection and sampling size and sampling technique are presented in section 3.3, 3.4, 3.5 and 3.6 respectively. Finally, section 3.7 contains the methods of data analysis.

3.1 Study Area

The Tamale Metropolitan Assembly (TMA) is the capital town and administrative home office of the Northern Region. Tamale is in the Northern Region of Ghana with an elevation of 180 meters above seas level. The soil are mostly Savanna Ochrosols that are poor in organic matter, but loamy, well-drained and porous. The climate is characterized by two main seasons, one rainy season from April to October with rainfalls of more than 1000 mm and a dry season from November to March. As a consequence, the urban center is poorly endowed with surface water, with merely a few seasonal streams that dry up during the dry time of year. The Tamale Metropolitan Area population was calculated to be 370,000km (GSS, 2010).

The production and consumption of vegetables in Tamale Metropolis have increased tremendously in recent times. The production of vegetables in the Tamale metropolis is done individually and on a very modest scale, because farmlands in the city are scarce. In general, vegetable cultivation is limited to open spaces (especially on government lands),





parcels around water bodies in backyards and on private undeveloped building plots owned by individuals.

The produce is harvested primarily for commercial purposes. The main vegetables cultivated in the core and peri-urban areas are tomato (*Lycopersicum esculentum*), pepper (*Capsicum*), cabbage (*Brassica oleraceae*), “okra” (*Abelmoschus spp*), “ayoyo” (*Corchorus spp*), kenaf (*Hibiscus sabdariffa*) and lettuce (*Latuca sativa*), “alefu” (*Amaranthus spp*), legumes and other local leafy vegetables (Shaibu, 2002). Pepper (*Capsicum annum*) and okra (*Abelmoschus esculentus*) are the vegetables mainly cultivated in the rural regions, mostly under rain-fed conditions.

Peri-urban farmers cultivate cereals either as a mono-crop or a mix-cropped with cereals, tubers legumes or vegetables. However, farmers who have water source(s) for dry season farming grow only vegetables for sale as opposed to pursuing mixed cropping. Whilst some of the vegetables are cultivated as both irrigated and rain fed crops, others are cultivated solely under rain fed conditions. The ones cultivated as both rain fed and irrigated crops include lettuce, kenaf, “ayoyo”, “alefu” and cabbage. These are usually cultivated more than once within the twelvemonth. Other crops, including tomato, pepper and okro, are mainly cultivated under rain fed conditions and are, thus, grown once in a year. Pepper, for example, is a succession crop planted after the harvesting of maize (Shaibu, 2002).

The table below shows various vegetables that are cultivated in Tamale Metropolis. According to Shaibu (2002) the data were obtained from sixty farmers who were involved in urban farming in seven areas (Bulpeila, Gumbehini/Water works, Nyohin, Sangani, Nyanshegu, Jarkryili, Kpambero/Regional Office) in the Tamale Metropolis.



Table 1: distribution of farmers on vegetables produced in tamale metropolis

Vegetable crop	Percentage of farmers cultivating
Ayoyo (<i>Corchorus Spp</i>)	48.0
Alefu (<i>Amaranthus spp</i>)	38.4
Bra (<i>Hibiscus sabdariffa</i>)	36.8
Pepper (<i>Capsicum spp</i>)	28.8
Cabbage (<i>Brassica oleraceae</i>)	27.2
Lettuce (<i>Latuca sativa</i>)	20.8
Okra (<i>Abelmoschus spp</i>)	11.2
Tomato (<i>Lycopersicum esculentum</i>)	3.2

Source: Shaibu, 2002

The major production sites for these vegetables in the Tamale Metropolis include:

- Builpiela, which is situated to the south of Tamale, about 2 kilometers from the heart of the metropolis. Builpiela’s prominence in vegetable production in Tamale is due to the year-round availability of water from a dam constructed in 1960 to supply water for domestic use, livestock and vegetable cultivation. Also the floodplains to the valley in which the dam is located provide ready land for the farmers since it cannot be applied for construction purposes.
- Sangani, which is situated to the northeast of Tamale and is approximately 2 km from the heart of the metropolis. Like Builpiela, Sangani also contributes greatly to vegetable production in the metropolis. Farmers use water from surface ponds, which are available all year-round. Though situated in the urban core, vegetable farmers in

Sangani whose lands are close to the water sources do not experience encroachment as elsewhere in the urban center.

- “Water Works”, which is situated in a suburb of Tamale called Gumbihini, is so named because of the existence of a dam that was made in the first place to provide pipe-borne water in Tamale. The dam is no longer employed for domestic water provisioning, so affording the occupiers of the country around the dam the opportunity to employ the water for irrigated vegetable production.
- Zagyuri is located about 8 km north of Tamale on the Tamale-Savelugu road. It is opposite Kamina Barracks and farmers use untreated sewage water for vegetable production.

According to Obuobie *et al.* (2006), in improver to these main sites, other minor sites where the vegetable is cultivated include Sakasaka, Kalpohini, Gumani and Ward K.

3.2 Research Design

The mixed method research which comprises both qualitative and quantitative design was used for the study. The mixed method was used because a comprehensive information about the system of production and marketing of vegetables and also a more holistic analysis of production and marketing of vegetables in order to identify the systemic and structural factors that affect the productivity and profitability of vegetables were required and these could not be achieved with the use of either qualitative or quantitative approach, thus, the use of both approaches. Creswell and Plano Clark asserted that mixed method research is more than simply collecting and analyzing both kinds of data, but it also



involves the use of both approaches in tandem so that the overall strength of the study is greater than either qualitative or quantitative research.

3.3 Research Phases

The study involved three phases of data collection. In the first phase, qualitative individual interviews were conducted to understand how the economy of production and marketing of lettuce and amaranths works and also the interactions and the interrelationships between marketers and farmers; as well as to confirm the study and sampling designs and devise an appropriate survey tool for quantitative data collection. In the second phase which is the quantitative data collection phase, questionnaires were administered to collect data on both demographic characteristics and other important variables such as the costs and revenues of farmers and marketers. Also, across all the seasons (rainy season; harmattan season and hot dry season) qualitative data and quantitative data on costs and revenues from farming and marketing activities were collected on the same respondents. Finally, focus group discussions were conducted for the farmers and marketers to explain any trend in vegetable farmers' and marketers' profits across the seasons (Table 2).

Table 2 : Research Phases

Research phases	Activities
Phase 1	Qualitative individual interviews
Phase 2	Quantitative data collection
Phase 3	Focus group discussion





3.4 Source of Data and Instruments of Data Collection

Primary data were used for the study. Primary data were gathered through interview and discussion with farmers and marketers of the two vegetables. The responses from the interviews were captured using questionnaires and interview guides. The questionnaire comprised both open-ended and close-ended questions in order to collect both qualitative and quantitative data. Two types of these questionnaires were administered, one that is designed for farmers and another for marketers. For some qualitative discussions, responses were recorded using audio recorders.

3.5 Sample Size and Sampling Technique

There is all year-round production of vegetables in the Tamale metropolis due to its location as a capital city and demand from consumers. The study considered both producers and marketers of amaranth and lettuce. For the first phase which was the individual qualitative interviews, five (5) respondents each of lettuce and amaranths farmers and marketers were selected purposively and on the basis of their willingness to participate in the interview. However, two of Amaranths respondents declined to be interviewed. This is presented in Table 3.

Table 3 : Individual Interviews

Respondents	Crop	Tamale
Farmers	Amaranths	5
	Lettuce	5
Marketers	Amaranths	3
	Lettuce	5
	Total	18

Moreover, in the second phase which was the quantitative survey, a multistage sampling technique was employed to select the respondents (producers and marketers. Firstly, all markets and open space farming sites in the Metropolis were listed and numbered using a random number generator. In the second stage, four farming sites and three markets were randomly selected. In the third stage, 100 respondents each of vegetable farmers and marketers were selected randomly.

The disadvantage of this method was that the survey did not capture isolated marketers and farmers. The sampled vegetable farming sites include Gumbihini old dam, Gumbihini new dam, Gumani and Gurugu while the sampled markets include Tamale old market, Aboabu market and Lamasgegu market. Table 4 shows the survey samples. Comprehensive information was generated throughout the study; this did not therefore permit a very large sample size. Data were collected on the same respondents and same variables across the three production seasons.

Table 4 : Survey samples

Seasons	Respondents	Crops	Tamale
Rainy Season	Farmer	Amaranths	50
		Lettuce	50
	Marketer	Amaranths	50
		Lettuce	50
Harmattan Season	Farmer	Amaranths	50
		Lettuce	50
	Marketer	Amaranths	50
		Lettuce	50
Hot Dry Season	Farmer	Amaranths	50
		Lettuce	50
	Marketer	Amaranths	50
		Lettuce	50
Total			600

3.6 Data Analysis

3.6.1 Analytical Tools

Qualitative data analytical methods, e.g. discourse analysis, and other summary statistics such as mean, standard deviation, minimum, maximum were used to analyze the nature and reasons behind the seasonal activities of amaranth and lettuce farmers and marketers. Similar techniques were used to examine the interrelationships between amaranth and lettuce farmers and marketers across seasons. Also, gross margin analyses were used in the study to evaluate the profit margins of farmers and marketers in each production season. Determinants of farmers and marketers profit were evaluated using multilevel mixed effect model and random effect model. Also, Kendall coefficient of concordance was used to rank some of the challenges faced by farmers and marketers throughout the production seasons. The data were processed using Stata, Statistical Package for the Social Sciences (SPSS) and Microsoft excel.

3.6.2 Analysis of the Interrelationships and Interactions between Lettuce and Amaranths Farmers and Marketers

Discourse analysis was used to analyze the interrelationships and the interactions between lettuce and amaranths farmers and marketers. With regard to the analysis, audio recordings containing the interviews conducted were transcribed. The transcribed data were prepared and coded and the structure of the text were examined. Moreover, discursive statements were collected and examined and finally the interpretation of the data was done.



3.6.3 Evaluation of Gross Margins of Lettuce and Amaranths Farmers and Marketers across the Seasons

Gross margin analysis was used to estimate the profits of amaranth and lettuce farmers and marketers across seasons. There are various measures of profitability of an enterprise namely: Gross Margin (GM), Return on Investment (ROI), Benefit-Cost Ratio (B/C), Internal Rate of Return (IRR) and Marketing Margin (MM) (Turuka, 2000).

Therefore, to calculate profit, Gross margin was employed at different levels of amaranths and lettuce production and marketing. Gross margin is a gross return minus the total variable expenses, which can be expressed in nominal value, ratios or as a percentage of return (Debertin, 1993). Variable costs are those costs that increase or decrease as output changes whereas fixed cost do not change as output changes (Kohl and Uhl, 1995). In this context, variable cost for farmers includes: seeds, fertilizer, etc. Meanwhile, marketers' variable costs include: cost of the goods, transport etc. The variables cost used in the estimation are presented in Table 5.

The expression which was used to calculate the profit for lettuce and amaranths farmers and marketers was:

$$GP = \sum TR - \sum TVC \quad (3.1)$$

Where:

GP =Gross Profit

TR = Total Revenues = Price of produce *Quantity of produce

TVC = Total Variable Cost = Cost of variable input* Quantity of input



Table 5 : Cost and Revenue Variables in Vegetable Production and Marketing

Revenue		Variable Costs	
Farmers	Marketers	Farmers	Marketers
Revenue	Revenue	Paid non-family labour	Paid non-family labour
		Paid family labour	Paid family labour
		Food purchased at work, including for labourers.	Food purchased at work, including for labourers.
		Seed	Cost of goods
		Fertilizer	Transport cost
		Manure	Market toll
		Pesticide	Costs of plastic bag packaging
		Land rent	Other costs
		Irrigation water bill	
		Fuel for water pump	
		Other costs	

3.6.4 The Analytical Models

3.6.4.1 Analysis of Factors that Affect the Profit of Amaranths Farmers and Marketers across the seasons

Since the data is a panel data and the differences across the seasons may have some influence on the dependent variable (profits), the random effects model is the appropriate model to analyze the factors that affect the profit of amaranths farmers and marketers across the seasons (Greene, 2003). The random effect model (REM) is also called error components model (ECM). According to Greene (2003) random effects model is a regression with a random constant term. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. The random outcome is a function of a mean value plus a random error. But this cross-sectional specific error term V_i , which indicates the deviation from the constant of the cross-sectional unit (in this example, season) must be uncorrelated with the errors of the variables if this is to be modeled. The time series cross-sectional regression model is one with an intercept that



is random. If the unobserved individual heterogeneity however formulated, can be assumed to be uncorrelated with the included variables, then the model may be formulated as:

$$Y_{it} = B_{0i} + B_1 X_{1t} + B_2 X_{2t} + \ell_{it} \quad (3.2)$$

$$B_{0i} = B_1 + V_i \quad (3.3)$$

$$Y_{it} = B_1 + B_1 X_{1t} + B_2 X_{2t} + \ell_{it} + V_i \quad (3.4)$$

Under these circumstances, X_{it} is the independent variable and the random error V_i is heterogeneity specific to a cross-sectional unit, in this case, season. This random error V_i is constant over time. Therefore, the random error ℓ_{it} is specific to a particular observation. V_i is assumed to follow a normal distribution with mean zero and variance. σ_u^2 . Furthermore, it is assumed that V_i is uncorrelated with ℓ_{it} and X_{it} . Under this assumption, it follows that the variance of Y_{it} is $\sigma_u^2 + \sigma_\ell^2$ where σ_u^2 measures the between individual variation and σ_ℓ^2 is the residual within-individual variation. Hence, the proportion of the total variation that can be attributed to the between-individual variation is:

$$\rho = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_\ell^2} \quad (3.5)$$

This ratio is also the within-individual correlation, often called the intra-class correlations. If most of the variation is between individuals, then individuals change little over time and hence the intra-class correlation is large. Conversely, if there is a lot of variability within individuals (relative to the total variability) then the intra-class correlation will be small (ESRC National Centre for Research Methods, 2006). An advantage of random effects is that you can include time invariant variables (i.e. gender).



The empirical model for analyzing the factors that influence the profit of amaranths farmers across the seasons is given below:

$$\Pi_{it} = \sum X_{it}B + u_{it} + \ell_{it} \quad (3.6)$$

Π_{it} is the profit of the farmers at t_{i1} , t_{i2} = rainy season, t_{i3} = harmattan season, t_{i4} = dry hot season

B = is the unknown parameters relating to the explanatory variables to be estimated.

u_{it} = Between-entity error

ℓ_{it} = Within-entity error

In all, two separate random effect models were estimated for both amaranths farmers and marketers across the seasons. Detail description of the explanatory variables for amaranths farmers and marketers are given in Table 6 and Table 7.



Table 6: Descriptions of variables in the random effect model for amaranths farmers

Variables	Variables	Measurement	Expected sign
X ₁	Age of respondent	In years	-
X ₂	Marital status	dummy 1 if respondent is a male; 0 otherwise	+
X ₃	Education	Years spent in school	+
X ₄	Household size	Number of people	+
X ₅	Household head	dummy 1 if respondent is a household head; 0 otherwise	+
X ₆	Experience in farming	In years	+
X ₇	Amount of upfront payment received	Ghana cedi	+
X ₈	Amount of Credit sale	Ghana cedi	-/+
X ₉	Amount of default	Ghana cedi	-
X ₁₀	Cost of paid labour	Ghana cedi/man days	-
X ₁₁	Cost of family labour	Ghana cedi/man days	-
X ₁₂	Cost of fertilizer	Ghana cedi/bowl	-
X ₁₃	Cost of manure	Ghana cedi/bowl	-
X ₁₄	Cost of food	Ghana cedi	-
X ₁₅	Cost of irrigation (water bill)	Ghana cedi	-
X ₁₆	Access to credit	dummy 1 if respondent accessed credit ; 0 otherwise	+
X ₁₇	Other cost	Ghana cedi	-
X ₁₈	Dry hot season	dummy 1 if dry hot season ; 0 otherwise	-/+
X ₁₉	Harmattan season	dummy 1 if harmattan season ; 0 otherwise	-/+



Table 7 : Descriptions of variables in the random effect model for amaranths marketers

Variables	Variables	Measurement	Expected sign
X ₁	Age of respondent	In years	-
X ₂	Marital status	dummy 1 if respondent is a male; 0 otherwise	+
X ₃	Education	Years spent in school	+
X ₄	Household size	Number of people	+
X ₅	Household head	dummy 1 if respondent is a household head; 0 otherwise	+
X ₆	Experience in marketing	In years	+
X ₇	Amount of upfront payment received	Ghana cedi	+
X ₈	Amount of Credit sale	Ghana cedi	-/+
X ₉	Days used to sell produce	In days	-
X ₁₀	Cost of paid labour	Ghana cedi/ man days	-
X ₁₁	Cost of family labour	Ghana cedi/ man days	-
X ₁₂	Packaging cost	Ghana cedi	-
X ₁₃	Cost of market toll	Ghana cedi	-
X ₁₄	Cost of transport	Ghana cedi	-
X ₁₅	Cost of food	Ghana cedi	-
X ₁₆	Access to formal credit	dummy 1 if respondent accessed credit ; 0 otherwise	+
X ₁₇	Cost of good	Ghana cedi	-
X ₁₈	Sells both lettuce and Amaranths	dummy 1 if yes ; 0 otherwise	
X ₁₉	Other cost	Ghana cedi	-
X ₂₀	Rainy season	dummy 1 if dry hot season ; 0 otherwise	-/+
X ₂₁	Harmattan season	dummy 1 if harmattan season ; 0 otherwise	-/+



3.6.4.2 Analysis of factors that affect profit of Lettuce farmers across the seasons

In order to obtain the trend and variations in factors that affect profits of farmers and marketers across the seasons, mixed-effects regression was estimated with random intercept and slope for each season.

Mixed Effects Models offer a flexible framework by which to model the sources of variation and correlation that arise from grouped data. This grouping can arise when data collection is undertaken in a hierarchical manner, when a number of observations are taken on the same observational unit over time. Mixed Effects Models are seen as especially robust in the analysis of unbalanced data when compared to similar analyses done under the General Linear Model framework (Pinheiro and Bates, 2000). In within subjects designs (repeated measures), subjects on which observations are missing can still be included in the analysis. However, Mixed Effects Models provide an enormous advantage over the General Linear Model in designs where no missing observations are allowed. Mixed Effects Model can be used to model both linear and nonlinear relationships between dependent and independent variables. The Mixed Modeling framework can specify a variety of model types including random coefficients models, hierarchical linear models, variance components models, nested models, and split-plot designs. Under the Mixed Effects Modeling approach factors may be considered to have both a fixed and a random component. The Mixed Effects Modeling approach allows the researcher to determine for which terms an additional random component should be included using multi-model inference (Galwey, 2006). The mixed effect model allows for both random slopes and intercepts. Thus, mixed models refer to models that have both fixed and random components.



The mixed effect model is expressed as:

$$Y_i = X_i\beta + Z_ib_i + \varepsilon_i \tag{3.8}$$

$$b_i \sim N_q(0, \Psi) \tag{3.9}$$

$$\varepsilon_i \sim N_{n_i}(0, \sigma^2 \Lambda) \tag{3.10}$$

where Y_i is the $n_i \times 1$ response vector for observations in the i^{th} group, X_i is $n_i \times p$ model matrix for the fixed effects for observations in the group i , β is the $p \times 1$ vector of fixed-effect coefficients, Z_i is the $n_i \times q$ model matrix for the random effects for observation in group i , b_i is the $q \times 1$ vector of random-effect coefficients for group i , ε_i is the $n_i \times 1$ vector of errors for observations in group i , Ψ is the $q \times q$ covariance matrix for the random effects, $\sigma^2 \Lambda$ is the $n_i \times n_i$ covariance matrix for the errors in group i . In this framework, multiple sources of random variations can be accounted for under the random effects coefficients term b .

The empirical model for the determinants of farmers' and marketers' profits is expressed as:

$$\Pi_{it} = \sum X_{it}B + \sum Z_{it}\varphi + \varepsilon_{it} \tag{3.11}$$

Π_{it} is the daily profits of farmers and marketers at t_{ij}, t_{i1} = rainy season, t_{i2} = harmattan season, t_{i2} = dry hot season

B = is the unknown fixed slopes relating to the explanatory variables to be estimated.

φ = is the unknown random slopes on predictor variables to be estimated.

Z_i = is the random effects variable (season).

ε_{it} = error term.



Detail descriptions of the fixed effects explanatory variables for lettuce farmers and marketers are provided in Table 8 and 9 below.

Table 8 : Descriptions of variables in the mixed effect model for lettuce farmers

Variables	Variables	Measurement	Expected sign
X ₁	Age of respondent	In years	-
X ₂	Marital status	dummy 1 if respondent is a male; 0 otherwise	+
X ₃	Education	Years spent in school	+
X ₄	Household size	Number of people	+
X ₅	Household head	dummy 1 if respondent is a household head; 0 otherwise	+
X ₆	Experience in farming	In years	+
X ₇	Amount of upfront payment received	Ghana cedi	+
X ₈	Amount of Credit sale	Ghana cedi	-/+
X ₉	Default	Ghana cedi	-
X ₁₀	Cost of paid labour	Ghana cedi/ man days	-
X ₁₁	Cost of family labour	Ghana cedi/ man days	-
X ₁₂	Cost of fertilizer	Ghana cedi/ bowl	-
X ₁₃	Cost of manure	Ghana cedi/ bowl	-
X ₁₄	Cost of food	Ghana cedi	-
X ₁₅	Cost of irrigation (water bill)	Ghana cedi	-
X ₁₆	Access to credit	dummy 1 if respondent accessed credit ; 0 otherwise	+
X ₁₇	Other cost	Ghana cedi	-



Table 9 : Descriptions of variables in the mixed effect model for lettuce marketers

Variables	Variables	Measurement	Expected sign
X ₁	Age of respondent	In years	-
X ₂	Marital status	dummy 1 if respondent is a male; 0 otherwise	+
X ₃	Education	Years spent in school	+
X ₄	Household size	Number of people	+
X ₅	Household head	dummy 1 if respondent is a household head; 0 otherwise	+
X ₆	Experience in marketing	In years	+
X ₇	Amount of upfront payment received	Ghana cedi	+
X ₈	Amount of Credit sale	Ghana cedi	-/+
X ₉	Days used to sell produce	In days	-
X ₁₀	Cost of paid labour	Ghana cedi/ man days	-
X ₁₁	Cost of family labour	Ghana cedi/ man days	-
X ₁₂	Packaging cost	Ghana cedi	-
X ₁₃	Cost of market toll	Ghana cedi	-
X ₁₄	Cost of transport	Ghana cedi	-
X ₁₅	Cost of food	Ghana cedi	-
X ₁₆	Access to formal credit	dummy 1 if respondent accessed credit ; 0 otherwise	+
X ₁₇	Cost of good	Ghana cedi	-
X ₁₈	Sells both lettuce and Amaranthus	dummy 1 if yes ; 0 otherwise	
X ₁₉	Other cost	Ghana cedi	-



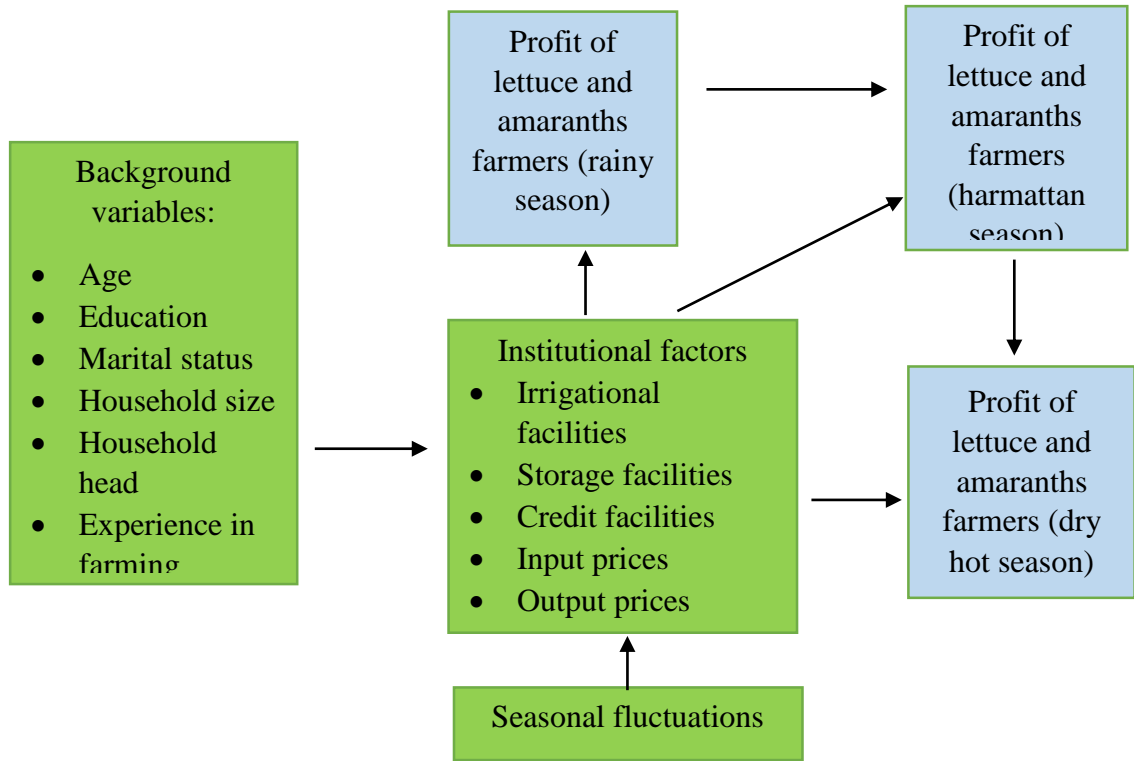


Figure 1 : Conceptual Framework for the Factors that Affect Profit of Lettuce and Amaranths Farmers across the Seasons

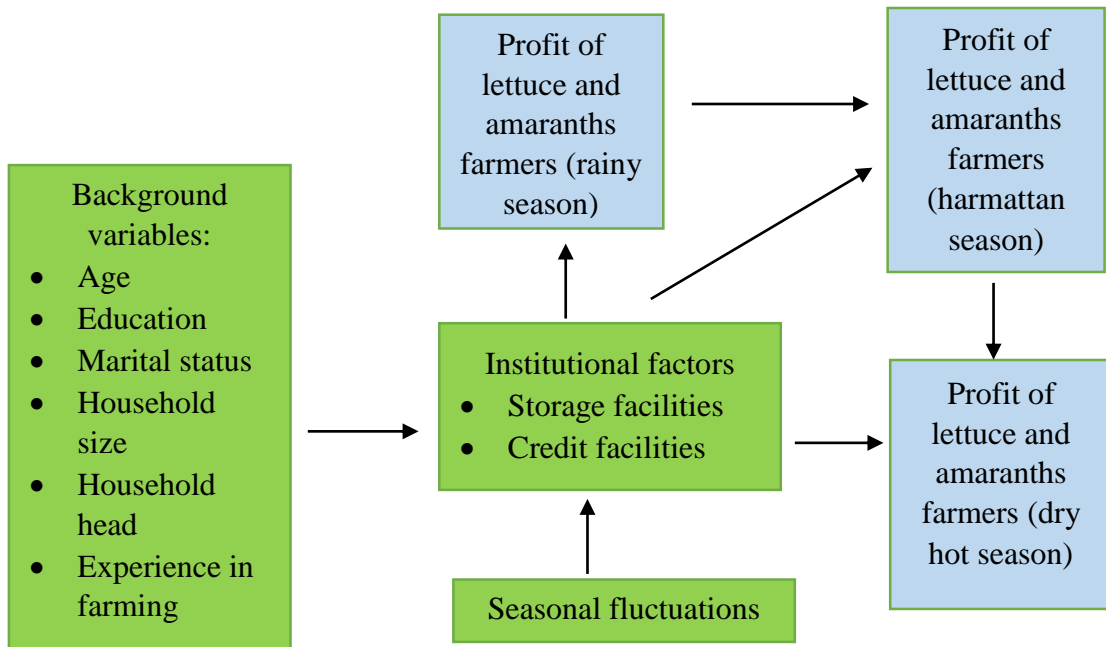


Figure 2 : Conceptual Framework for the Factors that Affect Profit of Lettuce and Amaranths Marketers across the Seasons



3.6.4.3 Analysis of Constraints Facing Lettuce and Amaranths Farmers and Marketers in the Production and Marketing of Vegetables across the Seasons

To examine the constraints of farmers and marketers of amaranth and lettuce, Kendall's Coefficient of Concordance was used to rank and measure the degree of agreement among the stated constraints. The Kendall's coefficient (w) is a measure of the degree of agreements among (m) number of observations of (n) set of challenges (Legendre, 2005). The Kendall's coefficient of concordance is calculated on an ordinal or interval scale. The Kendall's coefficient (w) has a value which ranges between 0.00 to 1.00 Where 0 means perfect disagreement and 1 means perfect agreement. Kendall's coefficient (w) is a non-parametric test (ordered categories) that is used when the result comes from different judges and concerns for ($k \geq 2$) objects. The Kendall's coefficient of concordance measures the ratio of the observed variance of the sum of ranks to the maximum possible variance of the sum of ranks. The formula for computing Kendall's coefficient of concordance is specified below:

$$w = \frac{12 \left[\sum T^2 - \frac{(\sum T)^2}{n} \right]}{nm^2(n^2 - 1)} \quad (3.12)$$

Where: w = Kendall's Coefficient of Concordance

T = Sum of ranks for constraints being ranked

m = Total number of farmers/marketers

n = Total number of constraints being ranked

The Kendall's coefficient of concordance (w) is accompanied by a test using the chi-square distribution. The Kendall's coefficient of concordance (w), tests the null hypothesis of no

agreement among the farmers/marketers on the constraints they face in the production and marketing of lettuce and amaranths across the seasons. The chi-square is used to test the significance among the farmers/marketers on the constraints they face in the production and marketing of lettuce and amaranths across the seasons. The chi-square formula is given as:

$$X^2 = m(n-1)w \quad (3.13)$$

The hypotheses are:

H_0 = farmers/marketers do not agree on the ranking of their constraints.

H_A = farmers/marketers agree on the ranking of their constraints.

The decision rule is that if the chi-square calculated is greater than the chi-square critical, then the null hypothesis is rejected in favor of the alternative hypothesis. This implies that there is agreement among the ranking of the challenges faced by lettuce and amaranths producers and marketers.



CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Chapter Outline

This chapter presents the results and discussions of the field data. The specific sections are as follows: Section 4.2 and 4.3 present the results on respondents' demographic characteristics and vegetables produced over the three seasons respectively. Also, the sale and purchase agreement between vegetable farmers and marketers, perception of vegetable farmers and marketers on who get larger share of the price consumers pay for the produce and interrelationships and interactions between vegetable farmers and marketers are presented in section 4.4, 4.5 and 4.6 respectively. Finally, profit of lettuce and amaranths farmers and marketers across the seasons, regression results for the determinants of Lettuce farmers' and marketers' profit across the seasons, factors affecting the profit of amaranths farmers and marketers across the seasons and challenges in the production and marketing of lettuce and amaranths across the seasons are provided in section 4.7, 4.8 and 4.9 respectively.

4.1 Descriptive Results

4.1.1 Sex Distribution of Respondents

The results in Table 10 provide information on the sex of vegetable farmers and marketers in the study sample. The production of vegetables is done exclusively by men while the marketing is dominantly undertaken by the women. This distribution indicates that majority of vegetable producers and marketers are men and women respectively. The distribution contradicts that found by Owombo *et al.* (2012) that vegetable amaranth



production is female dominated. On the other hand, Onyango (2007) observed that vegetables marketing activities were done exclusively by women while the production were done by majority of the males. Bongiwe and Micah (2013) also pointed out that there was a larger proportion of males (80 %) than females (20%) in vegetable production. However, during a focused group discussion, the farmers acknowledged that besides the main production sites in the metropolis, there exist a few occasional female producers of vegetables in the metropolis.

Table 10 : Sex Distributions of Respondents

Sex	FARMERS		MARKETERS	
	Frequency	Percentages	Frequency	Percentages
Male	100	100	0	0.00
Female	0	0.00	100	100
Total	100	100	100	100

Source: Author's Construct from Field Data, 2017

4.1.2 Age Distribution of Respondents

The average age of vegetable farmers and marketers were 41 and 40 years respectively (Table 11). This indicates that the production and marketing of vegetables were done by the economically active individuals. According to GSS (2010), 71.1% of the population aged 15 years and older are economically active. Oluwemimo (2015) in his study concluded that majority of the respondents were still in their prime age and productive years which should positively affect farm size and earnings. Oladejo and Oladiran (2014) also emphasized that marketers were still active and physically capable of working on their marketing activities which will greatly affect their productivity.





Table 11 : Age distribution of Respondents

Farmers/Marketers	Mean age(years)	Std. deviation	Min	Max
Farmers	41	11.05	18	65
Marketers	40	10.9	20	65

Source: Author’s Construct from Field Data, 2017

4.1.3 Educational Distribution of Respondents

The results in table 12 indicate that majority of farmers and marketers surveyed did not have formal education. The proportions of the population who have never been to school in the northern region were 54.9% (GSS, 2010). It is also observed that farmers were more educated than marketers. The low literacy level among the farmers and marketers may have serious implications on the economic objectives of maximizing profits of both farmers and marketer.

Table 12 : Distributions of Educational status of Respondents

Level	FARMERS		MARKETERS	
	Frequency	Percentages	Frequency	Percentages
No formal	55	55.00	74	74.00
Primary	14	14.00	16	16.00
Secondary	30.00	30.00	10	10.00
Tertiary	1	1.00	0	0.00
Total	100	100	100	100

Source: Author’s Construct from Field Data, 2017



4.1.4 Respondents' Farming Experience

The average years of experience of respondents in the production and marketing of vegetables were 12 years and 11 years for farmers and marketers respectively. It is therefore evident that both of the farmers and marketers have a lot of experience in vegetable production and marketing respectively.

4.1.5 Distribution of Respondents' Household Size

The household sizes of farmers and marketers were moderately high with a mean of 7 and 8 persons respectively. According to the Ghana Statistical Service 2010 Population and Housing Census report, the average household size in the northern region was 7.7 persons. This clearly shows the large number of dependent children of the farmers and marketers.

Table 13: Experience and Household size of Respondents

Experience (Years)	Mean	Std. deviation	Min	Max
Farmers	12	6.34	2	30
Marketers	11	6.90	0.5	
Household Size				
Farmers	7	3.24	1	16
Marketers	8	4.18	2	29

Source: Author's Construct from Field Data, 2017

4.1.6 Occupational Distribution of Respondents

As a way of livelihood diversification, farmers and marketers do not engage in only one livelihood activity. Apart from the vegetable production, about 27% of the farmers engage in other jobs like carpentry and masonry (Table 14). Unlike the farmers, only 2% of the marketers engage in other jobs apart from the selling of vegetables. This is partly due to the inflexible nature of vegetable marketing. It is also evident that majority (73%) of the

farmers and marketers (98%) depend solely on their respective enterprises as their main livelihood activity.

Table 14 : Other Occupations of Respondents

Other Occupation	FARMERS		MARKETERS	
	Frequency	Percentages	Frequency	Percentages
Yes	27	27.00	2	2.00
No	73	73.00	98	98.0
Total	100	100	100	100

Source: Author's Construct from Field Data, 2017

4.2 Vegetables Produced Over the Seasons

The study looked at the trends in vegetables produced over the seasons. The results in Table 15 indicate that the highest quantities of the vegetables were produced in the rainy season compared with the harmattan and dry seasons.

The results reveal that vegetables like amaranths, lettuce, bra, pepper and ayoyo were produced by most of the farmers in the rainy season. However, the production of these vegetables dwindled in the harmattan season and further in the dry hot season.

The decreasing trend in the production of these vegetables over the seasons could be attributed to inadequate irrigation facilities which compelled most of the farmers to quit production of some vegetables during these periods. Some of the farmers pointed out that the intermittent flow of water coupled with the harsh weather greatly affect their ability to produce most of the vegetables during the dry periods. Schieffer and Vassalos (2015) also asserted that vegetable growers are affected substantially by factors beyond their control,



including fluctuations in weather, varying availability of essential inputs such as irrigation water and fluctuating prices for inputs such as fuel.

Table 15 : Distributions of Farmers in Vegetables Produced over the Seasons

Vegetables	RAINY		HARMATTAN		HOT	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Ayoyo	37	37.00	10	10.00	12	12.00
Bra	47	47.00	15	15.00	9	9.00
Cabbage	34	34.00	14	14.00	13	13.00
Okra	20	20.00	3	3.00	2	2.00
Tomatoes	19	19.00	0	0.00	0	0.00
Pepper	41	41.00	3	3.00	1	1.00
Cucumber	57	57.00	51	51.00	50	50.00
Beans leaves	2	2.00	1	1.00	2	2.00
Carrot	14	14.00	0	0.00	0	0.00
Lettuce	70	70.00	80	80.00	65	65.00
Amaranths	98	98.00	85	85.00	70.00	70.00
Others	25	25.00	3	3.00	2	2.00

Source: Author's Construct from Field Data, 2017

4.3 Vegetables Marketed Over the Seasons

Like production, the results in Table 16 indicate that ayoyo (44%), bra (43%) and pepper (60%) were sold by most of the marketers in the rainy season. On the other hand, 13%, 9% and 20% of the marketers sold ayoyo, bra and pepper in the harmattan season. Moreover, in the dry hot season, only 7%, 9% and 10% of the marketers sold ayoyo, bra and pepper



respectively. This depicts a drastic decrease in the marketing trend of these vegetables across the seasons

The reduction in the marketing of these vegetables as the seasons change is obviously due to variations in the supply of these vegetables across the seasons. Thus the marketing of vegetables largely depends on the production of vegetables across the seasons.

Table 16 : Distributions of Marketers in Vegetables Marketed Over the Seasons

Vegetables	RAINY		HARMATTAN		HOT	
	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
Ayoyo	44	44.00	13	13.00	7	7.00
Bra	43	43.00	9	9.00	9	9.00
Cabbage	70	70.00	42	42.00	48	48.00
Okra	39	39.00	7	7.00	7	7.00
Tomatoes	37	37.00	5	5.00	4	4.00
Pepper	60	60.00	20	20.00	10	10.00
Cucumber	52	52.00	46	46.00	29	29.00
Beans leaves	17	17.00	2	2.00	8	8.00
Carrot	93	93.00	89	89.00	84	84.00
Lettuce	65	65.00	70	70.00	65	65.00
Amaranths	85	85.00	67	67.00	63	63.00
Others	15	16.00	29	72.00	88	88.00

Source: Author's Construct from Field Data, 2017





4.4 Sale and Purchase Agreement between Vegetable Farmers and Marketers

The results in Table 17 provides information on the transactional agreement on the sale and purchase of vegetables between farmers and marketers across the seasons. Majority (97%) of the farmers sell their produce on credit while only 3% of the farmers received upfront payment of the produce they sold. About 56% of the marketers also agreed that they purchase the produce from the farmers on credit while 44% purchase the produce and pay upfront (Table 17). Relatively, the transactional agreement that exists between vegetable farmers and marketers in terms of the sale and purchase of vegetables are basically credit sale and credit purchase.

Farmers asserted that they always agitated for their produce to be purchased and paid upfront since they do not purchase the inputs on credit but marketers hardly heed to that. They decide whether they would purchase the produce on credit or pay upfront, and in most cases the former is the case.

Table 17 : Results of Credit Sale and Credit Purchase

Credit sale/ Credit purchase	FARMERS		MARKETERS	
	Credit sale		Credit purchase	
	Frequency	Percentages	Frequency	Percentages
Yes	97	97.00	56	56.00
No	3	3.00	44	44.0
Total	100	100	100	100

Source: Author's Construct from Field Data, 2017



4.5 Frequency of Credit Sale and Credit Purchase by Vegetable Farmers and Marketers

Table 18 shows the distribution of the frequency of credit sale and credit purchase made by both vegetable farmers and marketers respectively. Across the seasons 28% of the farmers always sell their produce on credit while 69% sell sometimes. Similarly, majority (48%) of the marketers purchase the produce on credit depending on the demand and supply of the produce while, 8% of the marketers always purchase vegetables on credit irrespective of demand and supply conditions or the season of production and marketing of the vegetables.

Table 18 : Distributions of Frequency of Credit Sale and Credit Purchase

Frequency	FARMERS		MARKETERS	
	Credit sale		Credit purchase	
	Frequency	Percentages	Frequency	Percentages
Always	28	28.00	8	8.00
Sometimes	69	69.00	48	48.00
Total	97	100	56	100

Source: Author's Construct from Field Data, 2017

4.6 Renege on Vegetable Sale and Purchase Agreements

The sale of vegetables on credit renders the farmers vulnerable to encountering high rates of default. The results indicate that 49% of the farmers experienced default situations across the seasons due to credit purchase made by marketers while 51% of them did not experience any default. This clearly shows how vegetable farmers suffered from high default rate from vegetable marketers which significantly affect their revenue as well as

their production capacity since the farmers rarely default in the payment of inputs to suppliers.

Table 19 : Results of Renege on Vegetable Sale and Purchase Agreements

Default	FARMERS	
	Frequency	Percentages
Yes	49	49.00
No	51	51.00
Total	100	100

Source: Author's Construct from Field Data, 2017

4.7 Upfront payment Made by Vegetable Marketers across the Seasons

Upfront payment made by marketers is conditioned on the period of marketing of the produce. The results indicate that only 5% of the marketers make upfront payment in the abundance period (harmattan and rainy season for lettuce and amaranths respectively). However, in the lean period (hot dry period for both lettuce and amaranths), 69% of the marketers made upfront payment whenever they purchase the produce compared to 5% in the abundance period. This clearly depicts how vegetable marketers transfer risks to farmers during the abundant periods by purchasing the produce on credit so that they would not be liable for any losses that might arise as a result of low patronage of the products or spoilage of the products.

However, in the lean seasons marketers are assured of ready market for the products and so the risks involved in the marketing of the produce during this period are relatively low. In this case the marketers mostly purchase the produce and pay upfront in order to prevent farmers from diverting the products to different buyers.



Table 20 : Results of Upfront Payment

Upfront payment	Frequency	Percentages
Abundance period	5	5.00
Lean period	69	69.00
Always	26	26.00

Source: Author's Construct from Field Data, 2017

4.8 Perception of Vegetable Farmers and Marketers on who get Larger Share of the Price Consumers Pay for the Produce

Table 21 provides information on the perceptions of vegetable farmers and marketers as to who gets a larger share of the price consumers pay for the products across the seasons. While majority (68%) of the marketers said both marketers and farmers get equal shares. 19% opined that farmers get a greater share of the price consumers pay for the products. However, 53% of the farmers indicated that marketers benefit more than the farmers across the seasons.

Table 21 : Results of Perceptions on who gets Larger Share of Consumer Price

Responses	Farmers' Perception	Marketers' Perception
They get equal shares (%)	46	68
Farmers get more (%)	1	19
Marketers get more (%)	53	10
Total	100	100

4.9 Interrelationships between Vegetable Marketers and Farmers

The survey findings indicate that farmers and marketers were able to establish linkages with one another over the seasons. For instance, the traders maintained close relations with farmers, paying frequent visits to monitor the produce on the farm and to ensure that the





farmers do not sell the vegetables to different traders. Marketers usually do that when the produce is scarce. Some marketers maintain this close relation throughout the production seasons.

Also, farmers periodically called the marketers on mobile phones to inform them about the state of the produce and when the produce would be ready for harvest. Farmers try to be civil to the marketers and also relates to them in a good manner. Similarly, farmers try to sell the produce to the marketers at a moderate price in order to keep custom with the marketers throughout the production seasons.

Similarly, some marketers' pre-finance farmers to produce the vegetables when the demand increases. The marketers also give credit to the farmers and the repayment is done when the produce is harvested and sold. Some marketers also buy inputs such as seeds, fertilizer and insecticides for farmers which are repaid through deduction from farmers' revenue when produce is sold to the marketer.

In terms of the production and marketing of lettuce and amaranth, credit is granted depending on the patronage of the produce by consumers. That is, if there is low patronage in the market, marketers find it difficult to give cash to farmers on credit, but if there is high demand of the products, marketers may give money to farmers on credit.

Furthermore, Lettuce and Amaranths farmers usually sell the produces to marketers on credit and the repayment is done after the re-sale of the produce by the marketers. Some marketers also buy the products and pay up front depending on the demand of the vegetables at the market place. Marketers default sometimes and farmers accept those defaults in order to keep the trading relationship across the seasons. Lettuce farmers and

marketers do attend occasions of one another. Such occasions include naming ceremonies, marriage ceremonies, funerals and parties.

Finally, farmers make verbal agreements with the marketers and each of them delivers as agreed upon. The verbal agreement between the farmers and marketers is based purely on trust.

4.10 Price Determination of Vegetables across the Seasons

Determining the appropriate price of the vegetables is through bargaining. The price of vegetables like lettuce fluctuates across the seasons depending on the demand and supply of the lettuce. During the rainy season, lettuce thrives well and the price is also moderate. During the early dry season, lettuce thrives very well and it is during that period that there is a glut and the price also declines drastically. But during the late dry season, the produce becomes very scarce because it is difficult to produce lettuce during that period due to the unfavorable weather conditions. This leads to a hike in the price of lettuce during that period.

With Amaranths, the price remains virtually the same across the seasons, but the quantity of bunches varies across the seasons. The price of a bunch of Amaranths takes some years before it changes unlike lettuce, the price of which varies across the seasons. Also, Amaranths is abundant during the dry hot period. This is because, Amaranths thrives well during the hot period, compared to the harmattan and the rainy periods. In the hamattan period, Amaranths does not grow well and during this period there is a decrease in quantity



supplied which leads to the shortage of the produce. The produce is also abundant during the rainy period, because of the high number of producers.

4.11 Record Keeping by Vegetable Farmers and Marketers

Even though record keeping is very essential in every business transaction, most vegetable farmers and marketers hardly keep records. The most common form of record keeping which majority of the farmers practice is the unwritten form, with which the cost and revenues of each transaction are kept off hand. A few of the farmers keep the written form of record, but it is not done regularly. Majority of the farmers pointed out that if they were to keep records on every expense in the course of production, they would stop the production of most of the vegetables after the sale of those vegetables. The farmers asserted that, their expenses far outweigh the revenues and recording would mean that they may have to stop the production of some of the vegetables. Therefore, the best way is to ignore the records and produce irrespective of the gain or loss they encounter.

4.12 Trade-offs and Negotiations in Vegetable Production and Marketing

Vegetable farmers and marketers make a lot of compromises when it comes to the production and marketing of these vegetables, specifically lettuce and Amaranths. These compromises are made depending on the period of production and marketing of lettuce and Amaranths. For instance, during the harmattan season, lettuce farmers sell the produce at a lower price without necessarily taking into consideration how much they make out of the sale of the produce. They do this as a way of getting rid of the produce before it gets spoilt



on the field. In this case, some marketers also help in selling off the produce quickly to avoid a total loss.

Amaranth farmers and marketers as well make compromises especially during the rainy season where the produce is cultivated by a lot of farmers resulting in excess supply of the produce. During this period Amaranth farmers are forced to increase the quantity of a bundle of Amaranth so that they would be able to sell the produce before it gets spoilt on the field. Also, there is low patronage of the produce at the market making it difficult for marketers to sell all the produce before it gets spoilt. The low demand of the produce during this time is due to the fact that most people cultivate it by themselves and therefore do not need to buy it from the market.

4.13 Activities and rationale of Actions of Vegetable Farmers and Marketers

Marketers purchase the lettuce without paying at the time of purchase but are liable to pay after the sale of the produce. In order to avoid any liability as a result of spoilage or loss, marketers buy the produce on credit. After the sale of the produce, if they are not able to break even or make profit, they go back to renegotiate the price of the produce with the farmers and repay an amount less than the agreed price. This is common when the lettuce is in abundance, but minimal during periods of scarcity.

The story is not different when it comes to the production and marketing of Amaranth. Marketers do renegotiate the amount to repay to the farmers when they encounter spoilage during the sale of the produce or loss after the sale of the produce.



On the other hand, Lettuce and Amaranths farmers allow marketers to purchase the produce without paying at the time of purchase but are liable to repay after the sale of the produce. During the abundance period, both lettuce and Amaranths farmers have no choice than to sell the produce to marketers on credit. Some lettuce farmers also sell the produce to marketers without agreeing on any specific price and it is after the sale of the produce that the marketers repay any amount that they think is due the farmers. Farmers do that so that their produce will be bought early in order to prevent any pre-harvest losses during the abundance periods.

Also, Lettuce and Amaranths marketers stock and sell their produce on a daily basis depending on the demand of the produce at market. Irrespective of the quantity of the produce at the farm gate, lettuce and Amaranths marketers go to the farm on a daily basis to harvest the vegetables that they would be able to sell a day. They do that in order to prevent the influx of the produce at the market and also to prevent any losses they may incur due to spoilage at the market.

In an attempt to persuade farmers to reduce the price of the Lettuce and Amaranths, marketers usually complain bitterly to farmers on a pretext that there is low patronage of the produce at the market which compels farmers to reduce the price of the Lettuce or Amaranths for the marketers. Some also do that when they are to repay farmers so that the price would be reduced for them by the farmers.

Both Lettuce and Amaranths marketers do not trade with only one farmer. They trade with many farmers from different vegetable production sites so that they would be able to influence the price of the produce differently at each production site. As a result, marketers



have higher bargaining power than farmers and they are able to beat down the price of the produce at each of the sites. In the bargaining process, marketers always refer farmers to the price at which they buy the produce at other production sites which compel farmers to sell the produce to them either at the same price or at a lower price. The ability of the marketers to influence the price of the produce is due to the fact that farmers are not organized enough to affect the price of the produce compared to marketers, thus giving marketers an undue advantage over the farmers in terms of bargaining.

Dealing with one's partner is very worrisome to lettuce and Amaranths farmers, especially when the products are in abundant. For instance, during the harmattan period, lettuce thrives well and it is also cultivated by so many farmers leading to glut of the product during that period. Amaranths farmers also face the same challenges during the hot and rainy season when the produce is in abundance. Due to that many farmers are unable to sell their produce as they struggle to get marketers to purchase the produce for them before it gets deteriorated on the field. As a result, lettuce and Amaranths farmers trade with so many marketers so that during the glut period, they would be able to get so many marketers to buy their produce before the product goes bad on the field.

4.14 Gross Margin of Vegetable Farmers and Marketers across the Season

Gross margin analysis was used to evaluate the gross margin per season of the different occupational groups across the seasons. Table 22 and 23 show the gross margin per season of vegetable farmers and marketers across the rainy, harmattan and hot dry seasons. The results reveal that in the rainy season, the gross margin of Lettuce and Amaranths marketers

were GH¢ 438.00 and GH¢ 420.09 respectively. However, the gross margin per season of Lettuce and Amaranths farmers in the rainy season were GH¢327.00 and GH¢ 100.65 respectively. It is observed that marketers of Lettuce and Amaranths gross margin were higher than Lettuce and Amaranths farmers in the rainy season.

Also, in the harmattan season the gross margin of Lettuce and Amaranths marketers were GH¢ 570.00 and GH¢333.00 respectively compared to GH¢ 207.40 and GH¢ 111.00 gross margin made by Lettuce and Amaranths farmers respectively in the same season. The gross margin of Lettuce and Amaranths marketers in the dry hot season were GH¢ 481.90 and GH¢ 305.00 respectively. Lettuce and Amaranths farmers gross margin in the same season were GH¢ 179.95 and GH¢ 128.10 respectively. The results indicate that farmers earned less gross margin compared to marketers across the seasons. These results are in tandem with Osano (2010) who reported that farmers' gross margin is small compared to traders' margin due to high variable cost incurred by farmers in vegetable production.

Analysis of variance showed significant differences in gross margin of vegetable farmers and marketers across the seasons. These variations could be as a result of seasonal fluctuations (weather) coupled with the variation in demand and supply of the two vegetables across the rainy, harmattan and hot dry seasons.

Also, the variable costs incurred by farmers in the production of these vegetables are higher than that involved in the marketing of these vegetables across the seasons. Especially during the dry periods, farmers' costs of production increased drastically compared to that of marketers due to the high cost of irrigation in the dry periods. Also, marketers tend to transfer the risks involved in the marketing of these vegetables to the farmers (Thapa *et al.*,





1995). For instance, marketers purchase the vegetables on credit and are not liable to repay the agreed amount whenever they run at loss, thus losses are transferred to the farmers which negatively affects their margins. On the other hand, farmers are not able to renegotiate the price of the inputs used in the production of the vegetables because most of their inputs are paid for upfront.

Moreover, farmers are faced with production risks across the seasons, which could negatively affect their gross margin. These includes uncertainty in the quantity and quality of the vegetables across the seasons as a results of weather variations, pest and disease infestations, flood, variations in the cost of inputs, variations in the cost of irrigation facilities such as water bill and animals' destructions. Schieffer and Vassalos (2015) suggested that producers may also face uncertainty about production costs, due to fluctuating prices for inputs such as labour or fuel.

Table 22: Gross margin per season of lettuce farmers and marketers

Variable cost (Farmers)	Rainy	Harmattan	Hot Dry Season
Seed cost	70.07	95.42	123.78
Fertilizer cost	22.52	30.84	37.53
Manure cost	0.51	0.00	0.00
Irrigation water bill	1.80	100.53	150.71
Fuel for water pump	0	90.92	105.51
Food cost	165.68	152.71	122.54
Paid labour	15.16	20.20	30.00
Paid family labour	1.44	0.00	0.00
Other costs	10.90	3.64	0.00
Average Total Variable Cost	287.98	494.26	570.07
Average Revenue	614.98	701.66	750.02
Gross Margin Per Season	327.00	207.40	179.95
Variable cost (Marketers)			
Food Cost	102.02	116.33	114.63
Cost of goods	107.42	120.00	150.6
Transport cost	18.38	14.25	14.30
Cost of Market toll	0.43	0.44	0.18
Cost of plastic bags	14.88	23.60	23.26
Paid labour	3.42	0.18	0.20
Paid family labour	0.26	0.00	0.10
Other costs	0.22	0.00	0.00
Average Total Variable Cost	247.03	274.80	303.27
Average Revenue	685.03	845.15	785.17
Gross Margin Per Season	438.00	570.35	481.90

Source: Author's Construct from Field Data, 2017

Table 23: Gross margin per season of Amaranths Farmers and Marketers

Variable cost	Rainy	Harmattan	Hot Dry Season
Seed cost	9.58	10.45	12.00
Fertilizer cost	22.40	70.54	121.4
Manure cost	0.90	1.50	0.00
Irrigation water bill	0.00	163.85	168.20
Fuel for water pump	0.00	99.50	100.20
Food cost	100.24	101.85	114.20
Paid labour	14.58	16.58	20.50
Paid family labour	1.04	0.00	0.00
Other costs	0.20	0.00	0.00
Average Total Variable Cost	148.94	464.27	536.50
Average Revenue	249.59	575.27	664.60
Gross Margin Per Season	100.65	111.00	128.10
Variable cost (Marketers)			
Food Cost	70.42	95.19	132.99
Cost of goods	35.22	83.78	90.57
Transport cost	10.44	22.56	21.96
Cost of Market toll	0.28	0.31	0.13
Cost of plastic bags	15.73	42.07	52.76
Paid labour	0.86	0.30	0.00
Paid family labour	0.10	0.00	0.00
Other costs	0.00	0.00	0.00
Average Total Variable Cost	133.03	244.21	298.41
Average Revenue	553.12	577.21	603.41
Gross Margin Per Season	420.09	333.00	305.00

Source: Author's Construct from Field Data, 2017

A comparative analysis of the gross margin of Lettuce and Amaranths production and marketing revealed that Lettuce farmers and marketers earned more margins than Amaranths farmers and marketers across the seasons. The result indicates that in the rainy season the gross margin of Lettuce farmers and marketers were GH¢ 327.00 and GH¢ 438.00 compared to GH¢ 100.65 and GH¢ 420.09 gross margin made by Amaranths farmers and marketers respectively. Also, in the harmattan season Lettuce farmers and marketers made a gross margin of GH¢ 207.40 and GH¢ 570.35 relative to GH¢ 111.00 and GH¢ 333.00 gross margin made by Amaranths farmers and marketers respectively (Figure 3). Finally, the gross margin of Lettuce farmers and marketers in the dry hot season were GH¢ 179.95 and GH¢ 481.90 respectively. However, the gross margin made by Amaranths farmers and marketers were GH¢ 128.10 and GH¢ 305.00.



The disparity in the gross margin of Lettuce and Amaranths farmers and marketers is basically due to demand and supply of these vegetables across the seasons. The slump in the production of lettuce as the season changes results in its high prices, making the production and marketing more profitable compared to Amaranths, the production of which also decreases as the season changes but not as much as Lettuce.

Lettuce production involves higher cost as the season changes and it requires the purchase of seed rather than the use of own seed. Also, the risk of crop failure and spoilage is higher compared to Amaranths which is an indigenous vegetable and is cultivated by majority of the farmers across the seasons. Lettuce cultivation requires more skills as the season changes, so majority of the consumers are forced to buy it because they are not able to produce it by themselves, hence increasing the market demand for it as compared to amaranths.

4.15 Summary Statistics of Variables used in the Mixed Effect Model for Lettuce Farmers and Marketers

Table 24 shows the summary statistics of variables used in the model for Lettuce farmers and marketers across the seasons. The statistics indicate that on average lettuce marketers made GH¢956.21 profit and shows relatively higher variations over the seasons compared to GH¢ 428.16 profit made by farmers over the seasons. Farmers recorded lower gross margin basically due to the high cost of production and the high rate of default they encountered due to credit sale over the seasons.

On average, farmers lost GH¢ 32.53 of their revenues as a result of the varying credit repayment made by the marketers over the seasons. This represents about 5% of the average amount of credit sale (GH¢ 658.37) farmers made over the seasons. The substantial default rate encountered by farmers over the seasons significantly affects their profit. However, the amount of upfront payment farmers received from the sale of the vegetable averaged GH¢ 9.37 over the seasons which represents just about 1% of the average total sale (GH¢ 635.2) farmers made over the seasons.

On the other hand, the mean amount of upfront payment lettuce marketers received over the season was GH¢ 154.93 representing about 100% of the average total sale (GH¢ 153.93) lettuce marketers made to the consumers.

This clearly shows the double standard behavior exhibited by the marketers when it comes to the transactional agreement between the marketers, farmers and the consumers. Marketers are reluctant to purchase the vegetables from the farmers and pay upfront but would not sell to the consumers on credit.

Finally, farmers' average total cost of production was GH¢ 207.04 compared to GH¢ 119.13 of marketers for the three transactions in the three seasons. Relatively, farmers incurred more cost in the production of vegetables than marketers do in the marketing of vegetables.



Table 24: Summary Statistics of Variables in Lettuce Farmers' and Marketers' Models

Variables	Farmers			Variables	Marketers		
	Mean	Min	Max		Mean	Min	Max
Profit (per season)				Profit			
Overall (GH¢)	428.16	-528	1695	Overall	956.21	-661	3312
Between		148.78	598.21	Between		341.16	907.20
Within		-464.07	1758.93	Within		-541.51	1011.24
Amount of default				Upfront payment			
Overall (GH¢)	32.53	0	660	Overall	153.93	15	4800
Between		2	66.9	Between		94.44	254.96
Within		-34.37	625.63	Within		-76.03	4698.97
Amount of upfront payment				Credit sale			
Overall (GH¢)	9.37	0	900	Overall	-	-	-
Between		0	28.1	Between		-	-
Within		-18.73	881.27	Within		-	-
Amount of credit sale				Packaging cost			
Overall (GH¢)	658.37	0	2000	Overall	3.91	0.5	60
Between		563.3	865.8	Between		3.24	4.88
Within		-87.43	2082.07	Within		-0.47	59.03
Cost of irrigation				Cost of paid labour			
Overall (GH¢)	6.01	0	50	Overall	1.2	0	35
Between		1.8	10.53	Between		0	3.42
Within		-4.52	45.48	Within		-2.22	32.78
Cost of paid labour/day				Cost of family labour			
Overall (GH¢)	3.45	0	100	Overall	0.09	0	9
Between		1	7.15	Between		0	0.26
Within		-3.70	96.30	Within		-0.17	8.83
Cost of family labour/day				Cost of market toll			
Overall (GH¢)	0.48	0	40	Overall	0.34	0	5
Between		0	1.4	Between		0.16	0.44
Within		-0.96	39.04	Within		-0.10	4.91
Cost of petrol/litre				Cost of transport			
Overall (GH¢)	9.48	0	280	Overall	5.63	0	70
Between		0	14.92	Between		4.25	8.38
Within		-5.44	275.96	Within		-2.75	67.25
Cost of fertilizer/bowl				Cost of food			
Overall (GH¢)	18.63	0	80	Overall	7.65	1.6	100
Between		15.53	22.52	Between		4.59	12.02
Within		-3.98	83.10	Within		-2.37	95.63
Cost of manure/bowl				Cost of lettuce			
Overall (GH¢)	0.17	0	8	Overall	100.41	15	2800
Between		0	0.51	Between		65.8	167.42
Within		-0.34	7.66	Within		-52.01	2732.99
Cost of food*							
Overall (GH¢)	146.98	0	450				
Between		122.54	165.68				
Within		-8.70	431.30				
Other cost							
Overall (GH¢)	4.85	0	70				
Between		0	10.9				
Within		-6.05	63.95				

* Cost of food bought while working on the farm



4.16 Summary Statistics of Variables used in the Random Effect Model for Amaranths Farmers and Marketers

Table 25 compares information on the summary statistics of variables used in the Amaranths farmers and marketers model. The profit of farmers and marketers averaged GH¢322.55 and GH¢ 821.67 respectively over the seasons. With reference to the profit of lettuce farmers and marketers, it is observed that vegetable marketers made triple the gross margin of vegetable farmers over the seasons. This is not surprising since most of the strategies adopted by the marketers over the seasons put the farmers at a great disadvantage of hardly making profit.

The cost structure of Amaranths farmers and marketers also shows that Amaranths farmers incur more production cost than marketers. On average, the average cost of Amaranth production was GH¢ 136.41 compared to GH¢ 34.86 incurred by marketers in the marketing of this vegetable for the three transactions in the three seasons.

However, Amaranths marketers had allowed for a maximum amount of credit sale of GH¢ 15 to the consumers over the seasons compared to a whopping GH¢ 1,938 maximum amount of credit purchase by marketers from the farmers over the seasons. This actually reinforces the double standard behavior exhibited by the other vegetable marketers over the season.



Table 25: Summary Statistics of Variables in Amaranths Farmers' and Marketers' Models

Variables (Farmers)	Farmers			Variables (Marketers)	Marketers		
	Mean	Min	Max		Mean	Min	Max
Profit/per season				Profit			
Overall (GH¢)	322.55	-115	1592.5	Overall	821.67	-453	2541.8
Between		287.77	366.64	Between		711.34	812.23
Within		-85.54	1612.46	Within		-601.2	2021.28
Amount of default				Upfront payment			
Overall (GH¢)	0.06	0	5	Overall	49.587	10	600
Between		0	0.19	Between		35.46	73.74
Within		-0.52	4.87	Within		-10.15	575.84
Amount of upfront payment				Credit sale			
Overall (GH¢)	1.77	0	60	Overall	0.1	0	15
Between		0	5.32	Between		0	0.3
Within		-3.55	56.45	Within		-0.2	14.8
Amount of credit sale				Packaging cost			
Overall (GH¢)	451.92	37.5	1937.5	Overall	2.853	1	16
Between		409.18	476.48	Between		2.07	3.73
Within		19.31	1919.31	Within		0.12	15.12
Cost of irrigation				Cost of paid labour			
Overall (GH¢)	5.99	0	80	Overall	0.387	0	16
Between		0	9.42	Between		0	0.86
Within		-3.34	76.57	Within		-0.47	15.53
Cost of paid labour/day				Cost of family labour			
Overall (GH¢)	4.22	0	84	Overall	0.033	0	4
Between		1.5	6.58	Between		0	0.1
Within		-2.36	81.64	Within		-0.07	3.93
Cost of family labour/day				Cost of market toll			
Overall (GH¢)	0.35	0	40	Overall	0.243	0	2
Between		0	1.04	Between		0.13	0.31
Within		-0.69	39.31	Within		-0.07	1.96
Cost of petrol/litre				Cost of transport			
Overall (GH¢)	17.9	0	240	Overall	2.653	0	15
Between		0	39.5	Between		1.96	3.44
Within		-21.6	218.4	Within		-0.79	15.09
Cost of fertilizer/bowl				Cost of food			
Overall (GH¢)	20.11	0	75	Overall	3.533	0	10
Between		18.54	22.4	Between		2.99	4.42
Within		-2.29	72.71	Within		-0.87	10.54
Cost of manure/bowl				Cost of Alleffu			
Overall (GH¢)	0.8	0	60	Overall	25.19	5	300
Between		0	1.5	Between		17.57	38.22
Within		-0.7	59.3	Within		-8.03	286.97
Cost of food							
Overall (GH¢)	81.43	0	270				
Between		64.2	93.85				
Within		-4.81	265.19				
Other cost							
Overall (GH¢)	0.07	0	10				
Between		0	0.2				
Within		-0.13	9.87				





4.17 Determinants of Lettuce Farmers' and Marketers' Profit Across the Seasons

The mixed effect model was used to analyze the factors that influence the profit of Lettuce farmers and marketers over the seasons. Three separate models were estimated (random, fixed and mixed effect). The results from the three models were basically similar but the Hausman test for the appropriateness of either the random or fixed effect model indicated that neither random nor fixed effect model was appropriate for the estimation, so the mixed effect model which combined both the random and fixed effect model to give more robust estimators was preferred. The coefficients and the robust standard errors of the explanatory variables for both farmers' and marketers' models are presented in Table 26. The upper section of the mixed effect model output in Table 26 shows the fixed-effects part of the model for both farmers and marketers. This model implies three separate intercepts, one for each season. The intercepts for each season is estimated and presented in Figure 3 and 4 for farmers and marketers respectively. Also, the lower section of the mixed effect output gives an information on the estimated standard deviation of the random intercepts along with a standard error and 95% confidence interval for that standard deviation.

With respect to the mixed effect model for the farmers, experience in farming, amount of upfront payment, amount of credit sale, age of respondent, amount of default, cost of seed, cost of irrigation (water bill), cost of petrol (pumping machine), cost of seed, cost of fertilizer, cost of paid labour, cost of family labour, cost of manure, cost of food and other cost were factors that statistically and significantly influenced the profit of Lettuce farmers across the seasons. However, amount of upfront payment, cost of market toll, educational level, cost of transport, cost of paid labour, days used to sell the produce, sale of both Lettuce and Amaranths, cost of produce, access to credit, packaging cost, cost of transport

and cost of food were the main statistical and significant determinants of Lettuce marketers' profit across the seasons.

With regards to farmers, experience in farming has a positive influence on farmers' profit, implying that an increase in the years of experience in vegetable production would lead to an increase in profit from vegetable production. This result is plausible because experienced farmers may become more efficient in the utilization of the resources, which could lead to maximum benefits. They are also better able to understand the dynamics of demand and supply as well as the pricing of the produce. Bongiwe and Micah (2013) emphasized that as farmers become more experienced in the production and marketing of vegetables through their involvement, their probability to participate in economic transactions will be higher. This result supports the findings of Emenyonu *et al.* (2012), Awotide *et al.* (2012) and Akinola *et al.* (2011).

Amount of upfront payment farmers received also has a significant and positive effect on the income of farmers over the seasons. Upfront payment reduces the rate of default farmers encounter as a result of credit sale. The findings from this study indicate that the rate of default farmers encounter for the sale of the produce on credit was about 5%, thus any additional amount of upfront payment farmers received would significantly reduce the rate of default and increase the income of farmers over the seasons.

Another critical determinant of farmers' profit was the amount of credit sale. The results show that amount of credit sale has a positive influence on the profit of farmers over the season. A result that is counterintuitive but is likely because amount of credit sale does not necessarily mean default but only exposes the farmers to the risk of encountering default.





During the glut periods, the only way farmers could get their produce purchased early to prevent pre-harvest losses and also to get more marketers to patronize the produce is to engage in credit sale despite the risk of encountering default.

Also, the results indicate that head of household was statistically significant and positively related to the profit of farmers and the implication is that farmers who are heads of households earn more profit than those who are not. One reason could be that household heads have control over the productive resources and are also good at managing resource.

Nonetheless, the negative *a priori* expectation of age was realized. The negative coefficient of age implies that older farmers earn less profit from the production of vegetables. This is because farmers become less productive as they grow old. This supports the findings of Ayesha and Zafar (2013) who obtained similar outcome in their study on the determinants of margins from vegetables production in Abbottabad and also Obinaju and Asa (2015) who obtained a negative relationship between age and margins from vegetable production in Ibiono Ibom local government area of Akwa Ibom state, Nigeria.

The amount of default farmers encountered as a result of credit sale was negatively associated with the profit from vegetable farming and statistically significant. This implies that an increase in the default rate would invariably reduce the profit of vegetable farmers.

Also, the cost of seed, cost of fertilizer, cost of irrigation (water bill) and cost of petrol (pumping machine) were negatively and significantly related to the profit of farmers over the seasons. This result conforms to *a priori* expectations and imply that an increase in the unit cost of seed, a unit cost of fertilizer, a unit cost of irrigation (water bill) and a unit cost of petrol would reduce the income from vegetable production significantly. These factors



have important policy implications. The negative relationship between profit of farmers and cost of irrigation obtained supports the finding of Ibekwe and Adesope (2010) who had similar result and pointed out that over watering of the plants can lead to water logged farms which can lead to decreased level of vegetable production.

Notwithstanding, cost of manure has a positive influence on the profit of vegetable farmers. This implies that an increase in a unit cost of manure would increase the profit from vegetable production. This result is not in accordance with *a priori* expectation.

The coefficient of the cost of food was negatively related to the profit of farmers and was statistically significant. The result is in accordance with *a priori* expectation and implies that an increase in a unit cost of food significantly reduces the profit of farmers.

Moreover, the negative *a priori* expectation between the cost of paid labour, cost of family and profit from vegetable production were realized. This implies that, an increase in a unit cost of paid and family labour would significantly reduce the profit of vegetable farmers.

The negative relationship between the cost of paid labour and profit supports the finding of Owombo *et al* (2012) who had similar result between the profit of Amaranths farmers and the cost of paid labour.

However, access to credit had no significance influence on the profit of farmers over the seasons.

The result of the random effect parameter of the mixed effect model for farmers indicate that the standard deviation of the random intercept is significantly different from zero. The

value of the standard deviation is substantial (GH¢ 0.3013 points) profit of Lettuce farmers. This shows that the intercepts do vary from season to season.

The best linear unbiased predictions (BLUPS) of random effect (seasons) revealed that at any given level of all the explanatory variables, the profit of Lettuce farmers averaged about 0.29 points lower in rainy season compared to 0.15 and 0.25 points higher in the harmattan season and dry hot season respectively.



Table 26: Results of Mixed Effect Model Depicting the Determinants of Lettuce Farmers' and Marketers' Profit

Variables (Farmers/Marketers)	Coefficients (Farmers) (Robust Std. Error)	Coefficients (Marketers) (Robust Std. Error)
Experience in farming/ marketing	0.0154** (0.0120)	-0.0060* (0.0035)
Educational level	0.0205 (0.0188)	-0.0225** (0.0139)
Marital status	-0.0460 (0.0463)	-0.0078 (0.0291)
Household size	-0.3962 (0.3721)	0.0578 (0.0377)
Age of respondent	-0.0077** (0.0061)	-0.0259 (0.0179)
Household head	-0.3962 (0.3721)	-
Number of days used to sell produce	-	-0.0807* (0.0754)
Amount of upfront payment	1.0005*** (0.0003)	0.9964*** (0.0027)
Amount of credit sale	0.9997*** (0.0002)	-
Packaging cost	-	-1.0126*** (0.0075)
Amount of default	-0.9981*** (0.0007)	-
Cost of paid labour/day	-0.9953*** (0.0059)	-0.9136*** (0.0902)
Cost of family labour/day	-0.9833*** (0.0023)	0.7164 (0.7836)
Cost of seed/bowl	-0.9857*** (0.0122)	-
Cost of fertilizer/bowl	-1.0117*** (0.0101)	-
Cost of manure/bowl	0.8302*** (0.0594)	-
Cost of food	-1.0000*** (0.0004)	-1.0016*** (0.0005)
Cost of irrigation (water bill)	-0.9916*** (0.0084)	-
Cost of petrol/litre	-0.9981*** (0.0016)	-
Access to credit	0.0266 (0.0555)	0.2681*** (0.0786)
Cost of market toll	-	-1.2171*** (0.1657)
Cost of transport	-	-0.9780*** (0.0087)
Cost of produce	-	-0.9955*** (0.0033)
Sells both lettuce and Alleffu	-	-0.0618* (0.0587)
Other cost	-1.0044*** (0.0031)	-0.0626 (0.0718)
Random effect parameters		
Std. dev. (_cons)	0.3013 (0.0548)	9.76*10 ⁻⁰⁹ (1.54*10 ⁻⁰⁶)
Std. dev. (Residual)	0.9542 (0.4249)	1.0724 (0.3166)

***, **, and * are significance levels at 1%, 5% and 10% respectively.





On the other hand, amount of upfront payment marketers received from the consumers positively and significantly influence the profit of marketers. This shows that an increase in the amount of upfront payment marketers received would lead to an increase in profit from vegetable marketing. This result conforms to the theoretical positive relationship between upfront payment and profit. This is because, upfront payment significantly reduces the rate of default and increases profit.

The cost of market toll and packaging cost had a negative influence on the profit of marketers. These findings conform *to a priori* expectation and imply that an increase in the cost of any of these variables would lead to a reduction in the income of marketers over the seasons.

On the other hand, the positive *a priori* expectation of education on profit was not realized. The negative coefficient of educational level implies that an additional year in education would lead to a significant decrease in the profit of Lettuce marketers. The anticipation was that education would influence profit positively as posited by Nwankwo (1999) that the level of educational attainment is likely to affect the degree of one's business alertness and ability to seize business initiatives and advantages, hence increased income.

The cost of transport also had a negative relationship with the profit of Lettuce marketers and was statistically significant. The sign of the variable confirms *a priori* expectation and the implication is that, increase in the unit cost of transport would lead to a significant decrease in the profit of Lettuce marketers. This result agrees with Osondu *et al.* (2014) who in their study of marketing performance of salad vegetables found that the cost of transport significantly decrease the margins marketers get from the sale of cabbage.



Number of days used to sell the produce is also a critical determinant of profit. An increase in the number of days used to sell the produce would lead to a significant decrease in the profit of Lettuce marketers. The reason is that lettuce marketers do not have access to proper storage facilities and due to the perishable nature of the produce, whenever the number of days used to sell the produce increases due to low patronage, the produce deteriorates hence, affecting the profit of lettuce marketers negatively.

The cost of paid labour and cost of produce also influence the profit of marketers negatively and are statistically significant. The implications are that an additional increase in the unit cost of paid labour and a unit cost of the produce would lead to the reduction in the income of marketers. The negative theoretical relationships between the cost of paid labour and cost of produce and the income of marketers were realized. However, the results of the negative relationship between cost of produce and income of marketers is at variance with Osondu *et al.* (2014) who had a positive influence of the cost of the produce on the gross margin of marketers. Also, Oladejo and Oladiran (2014) emphasize that as cost cost of produce increases, the purchasing power of marketers drop and the quantity of vegetable the marketers were able to supply to the market reduces.

The cost of food also had a negative influence on the profit of lettuce marketers and was statistically significant. The sign of the variable was in accordance with prior expectations and the negative coefficient of cost of food implies that, an increase in the unit cost of food would lead to a decrease in the profit of marketers. This finding justifies the stance of the marketers and farmers concerning the inclusion of the amount they spend on food as a variable cost. Both farmers and marketers pointed out that they spend so much on food when at work so it would be reasonable to consider the cost of food as a variable cost.

Access to credit had a positive influence on lettuce marketers' profit. This result is plausible because access to credit enhances the financial capacity of the marketers to purchase vegetables and also acquire a storage facility thus, affecting the profit of marketers positively.

The sale of both lettuce and Amaranths had a negative significant influence on the income of marketers. The implication is that, it is less profitable to sell both Lettuce and Amaranths together than to sell either of these vegetables. This is because, the two vegetables are leafy and highly perishable. Therefore, the risks involved in selling both lettuce and amaranths together is higher than selling either of these vegetables.

Marketers random effect parameter (season) of the mixed effect model revealed that the standard deviation of the random intercept is significantly different from zero. The standard deviation is (GH¢ 9.76×10^{-09} points) profit of Lettuce marketers. This indicates that the intercepts do vary from season to season.

Also, the best linear unbiased predictions (BLUPS) of the random effect (seasons) show that at any given level of all the explanatory variables, the profit of Lettuce marketers averaged about 5×10^{-16} points higher in dry hot season and 2×10^{-17} points higher in the harmattan season compared to -5×10^{-16} points lower in the rainy season (Figure 5).



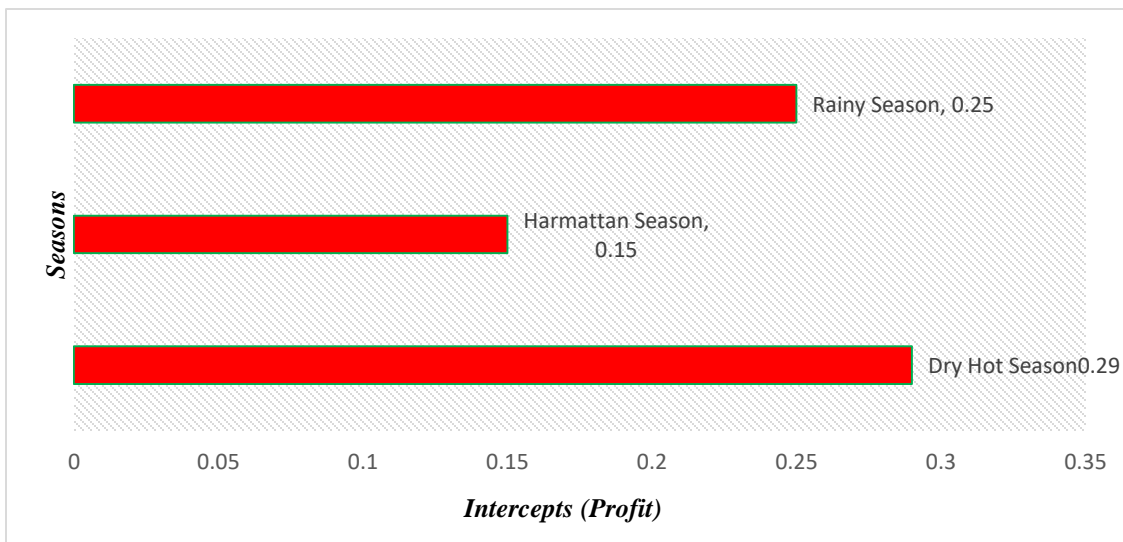


Figure 4: Lettuce Farmers' Random Intercept by Seasons

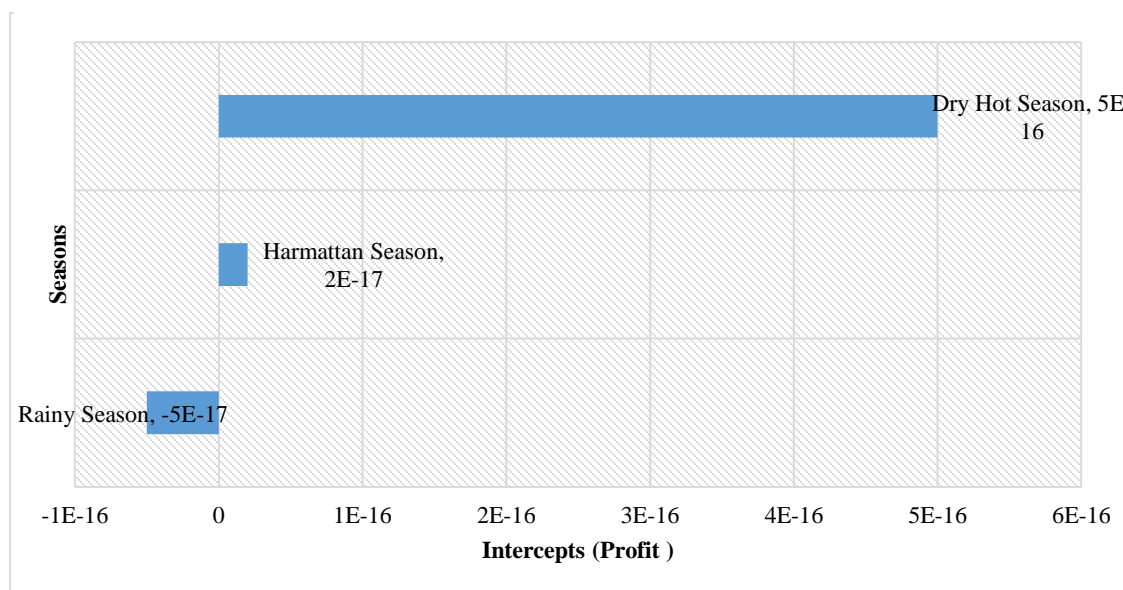


Figure 3: Lettuce marketers' random intercepts by seasons

4.18 Factors Affecting the Profit of Amaranths Farmers and Marketers across the Seasons

The random effect model was used to analyze the factors that influence the profit of Amaranths farmers and marketers over the seasons. Two separate random effect models were estimated for both farmers and marketers. First, both random and fixed effect models

16. Cost of vegetable (lettuce) production

A	B	C	D	e	F	G
Item/ Activities	Used? Yes/ no	Quantity used on lettuce during this period (it may be a proportion of a tin or a sack that was bought earlier in the season)	Cost of that quantity	How many beds was this used on? (it may be the whole farm, not just the transacted beds)	Cost per bed (d/e)	Total cost for the transaction (f x number of beds sold, which should be as in q.7)
Seed			.....Ghc			
Fertilizer			.....Ghc			
Insecticide/ Pesticide			.....Ghc			
Paid Labour – it may be that they were not paid a day-rate but just given a fixed amount			.....people.....Ghc/day			
Family labour – probably it was free			.....people x.....Ghc/day			
Land rented (it could be called 'greeting')		Remember to calculate the proportion of yearly rent that is for this period for lettuce GhC (proportion of land that is farmed with lettuce) =GhC				
Food, including that bought for workers		Food bought for ....days	.....Ghc/day.....days food was bought=...GhC			
Water for irrigation		Remember to calculate the proportion of yearly or monthly bills that are for this period for lettuce GhC (proportion of land that is farmed with lettuce) =GhC				
Fuel to power the motor pump			.....Ghc/day days petrol was used =GhC			
Other costs						
Your time		.....hours spent in the farm on the lettuce sold/day x.....days in the farm for the life of this crop =.....hours				

Cost of vegetable (amaranths) production

Item/Activities	Used? Yes/ no	Quantity used during this period only on the amaranths sold (it may be a proportion of a tin or a sack that was bought earlier in the season)	Cost of the quantity used on the amaranths sold alone.
Seed			.....Ghc x =.....Ghc
Fertilizer			.....Ghc x =.....Ghc
Insecticide/ Pesticide			.....Ghc x =.....Ghc
Paid Labour – it may be that they were not paid a day-rate but just given a fixed amount			.....people x.....Ghc/day .....days worked =GhC
Family labour – probably it was free			.....people x.....Ghc/day.....days =GhC
Land rented (it could be called ‘greeting’)		Remember to calculate the proportion of yearly rent that is for this period for alefo. GhC x (Time) x (proportion of land that is farmed with alefo) =GhC	
Food – including what you provided to workers		Food bought for days	.....GhC per day x.....days food was bought =GhC
Water for irrigation		Remember to calculate the proportion of yearly or monthly bills that are for this period for alefo. GhC x x (proportion of land that is farming alefo)= .....GhC	
Fuel to power the motor pump		petrol bought for days	.....GhC per day x.....days petrol was used =GhC
Other costs			
Your time – just in hours, not the cost.		.....hours spent in the farm on the lettuce sold/day x.....days in the farm for the life of this crop =.....hours	



were used to estimate the factors that influence the profit of both Amaranth farmers and marketers over the seasons. However, Hausman test for appropriate choice of model revealed that the random effects model produced more efficient and robust estimators, hence the choice of the model.

The overall R-square of 0.999 and 0.9993 for farmers and marketers respectively show that about 99% of the variations in the dependent variable are explained by the explanatory variables of farmers and marketers. Also, the within R-square of 0.9999 and 0.9993 for farmers and marketers respectively indicate that 99% of the variations in the dependent variable are explained by the variations in the explanatory variables of farmers and marketers observed over time. In addition, the between R-square of 1.00 for both farmers and marketers implies that 100% of the variations in the dependent variables for both farmers and marketers are explained by seasonal variations.

The coefficients and the robust standard errors of the explanatory variables are presented in Table 27. The coefficients of amount of upfront payment, amount of credit sale, harmattan season, hot dry season, cost of irrigation (water bill), cost of petrol, cost of fertilizer, access to credit, cost of paid labour, cost of family labour, cost of seed, cost of manure and cost of food significantly influenced the profits of Amaranth farmers over the seasons. On the other hand, the coefficients of experience in marketing, educational status, household size, age of respondent, upfront payment received for the sale of the produce, sale of both Amaranths, days used to sell the produce, credit sale, cost of paid labour, packaging cost, cost of food and cost of Amaranths statistically and significantly influenced the profit of Amaranth marketers over the seasons.



The amount of upfront payment and amount of credit sale had positive influence on the income of Amaranths farmers over the seasons. These findings support similar results in this study on the factors that influence lettuce farmers' income.

The positive and significant coefficient of harmattan season and hot dry season suggest that the production of Amaranths in the harmattan season and hot dry season is more profitable than in the rainy. This could be attributed to unfavorable conditions during rainy season which greatly affect the Amaranths growth since it is a temperate crop.

The coefficients of cost of irrigation (water bill) and cost of petrol (pumping machine) exhibit a negative and significant influence on the profit of farmers. This indicates that a unit increase in the cost of irrigation and cost of petrol would lead to a decrease in the profit of farmers. This consolidates similar findings in this study on factors influencing lettuce farmers' income and reinforces the policy implication of these variables. In contrast to other studies like Tahir and Altaf (2013) who obtained a positive relationship between total cost of fertilizer and gross margin from vegetable production in Abbottabad.

Cost of fertilizer and cost of seed had a significant negative influence on the profit of farmers. The empirical results indicate that a unit increase in the cost of fertilizer and cost of seed would lead to a significant decrease in the profit of farmers. The result also conforms to a priori view of a negative outcome.

The coefficient of access to credit also significantly and negatively influence the income of farmers, implying that farmers who have access to credit have less profit compared to those who do not have access to credit. This could be attributed to the high cost of borrowing; hence farmers end up repaying a huge sum of money as interest which affect

their profit negatively. Mohammed *et al.* (2016) also had similar results and suggested that government seldom grants financial credit to large numbers of farmers and when done with high interest rate. The result of the study contradicts Owombo *et al.* (2012) who obtained a positive relationship between access to credit and profit of Amaranths farmers.

Also, the negative theoretical relationship between cost of paid labour, cost of family labour, cost of food and cost of manure and the income of farmers were realized. Thus, a unit increase in the cost of any of these variables would lead to a significant decrease in the income of farmers. Education and experience had no significant influence on the income of farmers over the seasons thus, would not be discussed into details.



Table 27: Random Effect Model Depicting Determinants of Amaranths Farmers' & Marketers' Profits

Variables (Farmers/Marketers)	Coefficients (Farmers)	Coefficients (Marketers)
Experience in farming/ marketing	0.0608 (0.0563)	0.0028 ^{***} (0.0027)
Educational level	-0.0199 (0.0196)	0.0257 ^{**} (0.0259)
Marital status	-0.1894 (0.5728)	0.0605 (0.0845)
Household size	0.0222 (0.0333)	0.0245 ^{***} (0.0074)
Age of respondent	-0.0730 (0.0515)	0.0151 [*] (0.0148)
Household head	1.5202 (1.3953)	-
Number of days used to sell produce	-	-0.0960 ^{***} (0.0081)
Amount of upfront payment	1.0049 ^{***} (0.0043)	0.9921 ^{***} (0.0140)
Amount of credit sale	0.9998 ^{***} (0.0002)	-0.0212 ^{**} (0.0015)
Amount of default	-0.7896 (0.0136)	-
Cost of paid labour/day	-0.0085 ^{***} (0.0017)	-0.9853 ^{***} (0.0164)
Cost of family labour/day	-0.9097 ^{***} (0.0232)	-0.0109 (0.0325)
Cost of fertilizer/bowl	-1.0553 ^{***} (0.0553)	-
Cost of seed/bowl	-1.1002 ^{***} (0.1150)	-
Cost of manure/bowl	-1.0358 ^{***} (0.0380)	-
Cost of food	-0.9924 ^{***} (0.0042)	-1.0095 ^{***} (0.0043)
Cost of irrigation (water bill)	-0.9412 ^{***} (0.0545)	-
Cost of petrol/litre	-0.9993 ^{***} (0.0010)	-
Access to credit	-0.0517 ^{**} (0.1309)	0.0624 (0.0852)
Packaging cost	-	-0.9956 ^{***} (0.0052)
Cost of market toll	-	-0.9628 (0.1403)
Cost of transport	-	-0.9826 (0.0189)
Cost of Amaranths	-	-0.9856 ^{***} (0.0261)
Sale of both lettuce and Amaranths	-	0.0174 ^{***} (0.0189)
Other cost	0.0663 (0.2394)	
Rainy season	-	0.0709 (0.1127)
Hot dry season	7.1388 ^{***} (0.8601)	0.1971 (0.0221)
Harmattan season	7.2207 ^{***} (0.6488)	-
R-square overall	0.9999	0.9993
R-square within	0.9999	0.9993
R-square between	1.0000	1.0000

^{***}, ^{**}, and ^{*}, are significance levels at 1%, 5% and 10% respectively. Robust Standard Errors in bracket





On the other hand, experience and education of marketers conform to a prior view of positive outcomes. The positive influence of experience on profit indicates that the profit of marketers would increase significantly with an increase in the years in vegetable marketing. This could be due to the fact that as marketers become more experience in vegetable marketing they try as much as they can to partake in profitable transactions thus increasing their incomes. Isibor and Ugwumba (2014) obtained similar outcome in their study on determinants of water melon marketers while Osondu *et al.* (2014) emphasized that the more experienced a marketer is, the more he is able to take rational decisions that will increase his income.

Nwaru, (2004) pointed out that education helps unlock the natural talents of the vegetable farmers and inherent enterprising qualities. Therefore, the positive coefficient on education indicates that the profit of marketers would significantly increase with an additional year spent in school.

However, age had a significant positive influence on the income of marketers. Thus, older marketers realize more profits than younger ones. Nwaru and Iwuji (2005) reported that entrepreneurship gradually becomes less as the age of the entrepreneur increases because, the innovativeness and optimism of the entrepreneur as well as his mental capacity to cope with the challenges of his business activities and his mental and physical abilities to do manual work decrease with age. Thus age was expected to be negatively related to marketers' profit.

The amount of upfront payment and the sale of both lettuce and amaranths also had a significant positive influence on the income of marketers. The positive coefficient on amount of upfront payment indicates that profit of marketers would increase with an

increase in the amount of upfront payment while the empirical results show that the sale of both lettuce and amaranths is more profitable than marketing only one of them.

The number of days used to sell the produce and amount of credit sale are also critical determinants of marketers' profit. The results demonstrate that increase in the number of days used to sell the produce would reduce the profit of marketers significantly. This is plausible because, due to the lack of storage facilities at the markets, the probability of the produce deteriorating when it is not bought early at the market increases, thus affecting the profit of the marketers.

The negative coefficient on the amount of credit sale indicates that profit of marketers would decrease with an additional increase in the amount of credit sale to the consumers. This is because, credit sale increases the chances of default which eventually affect the profit of marketers.

The cost of paid labour, packaging cost, cost of food and cost of produce had a negative significant influence on the profit of marketers.



4.19 Constraints in Lettuce and Amaranths Production and Marketing across the Seasons

The constraints in vegetable production are numerous and varied from season to season. The farmers reported that they face challenges such as scarcity of land, lack of finance for farming, lack of irrigation facilities, difficulty in regulating supply, pest and disease control, exploitative practices by the marketers and low price of the produce. They pointed out that the issue of land is greatly affecting their production due to the fact that most of the land they used to farm on are sold out for residential purposes. They also complained bitterly that in the harmattan and hot dry seasons they find it difficult to irrigate their vegetables due to the intermittent flow of water and also the high cost of water. However, those who do not have access to pipe borne water are compelled to use the untreated waste waters to irrigate the vegetables during the dry periods. The farmers also held a common view that marketers also exploit them when it comes to the marketing of produce. They asserted that the marketers hardly purchase the produce and pay upfront. As a result, whenever they are unable to make profit or the produce get deteriorated at the market, they come back to re-negotiate the price of the produce which affect the amount they receive from the sale of the produce.

The Kendall's coefficient of concordance was employed to analyze the constraints in lettuce and amaranths production across the seasons. The results in Table 27 ranks the constraints in lettuce and amaranths production across the seasons. The Kendall's coefficients of concordance for lettuce farmers in the rainy, harmattan and dry hot seasons are 0.393, 0.638 and 0.622 respectively while that of amaranths farmers are 0.478, 0.638 and 0.407 for rainy, harmattan and dry hot season respectively. These demonstrate that



both lettuce and amaranths farmers agreed to a reasonable extent in the ranking of these constraints across the seasons.

In the rainy season, exploitative practices by the marketers, scarcity of land and low price of the produce were ranked first, second and third respectively by the lettuce farmers compared to scarcity of land, pest or insect infestation, lack of irrigation facilities which were ranked first, second and third respectively by amaranths farmers in the rainy season. However, in the harmattan season low price of the produce, lack of irrigation facilities and scarcity of land were ranked first, second and third respectively by lettuce farmers relative to lack of irrigation facilities, scarcity of land and lack of finance that were ranked first, second and third respectively by amaranths farmers in the harmattan season.

Moreover, in the dry hot season, lettuce farmers ranked lack of irrigation facilities, scarcity of land and lack of finance as first, second and third respectively. Meanwhile amaranths farmers ranked lack of irrigation facilities, low price, difficulty in regulating supply as first, second and third respectively in the dry hot season.

Comparatively, it is observed that the most pertinent constraints that impede the production of lettuce and amaranths across the seasons include lack of irrigation facilities, exploitative practices by marketers, scarcity of land and low price of produce.



Table 28: Ranking of Challenges Facing Lettuce and Amaranths Farmers across the Seasons

Challenges	Lettuce Farmers						Amaranths Farmers					
	Rainy		Harmattan		Dry Hot		Rainy		Harmattan		Dry Hot	
	Mean Ranks	Ranks	Mean Ranks	Ranks	Mean Ranks	Ranks	Mean Ranks	Ranks	Mean Ranks	Ranks	Mean Ranks	Ranks
Scarcity of land	2.99	2 nd	3.50	3 rd	2.48	2 nd	2.05	1 st	3.08	2 nd	3.78	4 th
Lack of finance for farming	5.32	6 th	5.73	6 th	3.43	3 rd	5.21	5 th	4.00	3 rd	5.00	6 th
Lack of irrigation facilities	3.30	4 th	2.26	2 nd	1.24	1 st	2.86	3 rd	1.34	1 st	2.06	1 st
Difficulty in regulating supply	5.14	5 th	3.70	4 th	5.53	6 th	5.38	6 th	4.54	4 th	3.74	3 rd
Pest or insect infestation	5.74	7 th	6.80	7 th	5.46	5 th	2.43	2 nd	6.24	7 th	6.16	7 th
Exploitative practices	2.35	1 st	3.92	5 th	4.24	4 th	5.41	7 th	4.60	5 th	4.52	5 th
Rank low price	3.16	3 rd	2.09	1 st	5.62	7 th	4.66	4 th	5.20	6 th	2.74	2 nd
Goodness of fit statistics												
Kendall's concordance		0.393		0.638		0.622		0.478		0.638		0.407
Chi-square		118.0		191.4		186.6		143.3		191.5		122.2
Asymp. Sig		0.000		0.000		0.000		0.000		0.000		0.000

Source: Author's Estimation from Field Data, 2017



On the other hand, marketers reported that they are faced with numerous challenges when it comes to the marketing of lettuce and amaranths. These challenges include lack of storage facilities, the perishable nature of the produce, transportation cost, low patronage and competitive nature of the market. Haruna *et al.* (2012), Kumar (2012) and Oladejo, and Oladiran (2014) concluded that perishability of product, lack of cold storage place, transportation cost and low patronage were some of the constraints in vegetable marketing. The results in Table 28 ranks these challenges in lettuce and amaranths marketing across the seasons.

In the rainy season, perishability of the produce, lack of storage facilities and competitive nature of the marketer were ranked first, second and third respectively by both lettuce and amaranths marketers.

Also, in the harmattan season, lettuce marketers ranked low patronage, competitive nature of the market and lack of storage facilities as first, second and third respectively while amaranths marketers ranked lack of storage facilities, perishability of the produce and the competitive nature of the market as first, second and third respectively.

In the hot dry season, lettuce marketers ranked lack of storage facilities, perishability of the produce and competitive nature of the market as first, second and third respectively.

With regard to amaranths marketers, low patronage, lack of storage facilities and the competitive nature of the market were ranked first, second and third respectively in the hot dry season. Hence, lack of storage facilities, competitive nature of the market and the perishable nature of the produce are really imperiling the marketing of lettuce and amaranths across the seasons. Therefore, these are major issues of concern to vegetable marketers.

Table 29: Ranking of the Challenges Facing Lettuce and Amaranths Marketers across the Seasons

Challenges	Lettuce Farmers						Amaranths Farmers					
	Rainy		Harmattan		Dry Hot		Rainy		Harmattan		Dry Hot	
	Mean	Ranks	Mean	Ranks	Mean	Ranks	Mean	Ranks	Mean	Ranks	Mean	Ranks
Perishability of produce	1.71	1 st	3.26	4 th	1.82	2 nd	1.55	1 th	2.14	2 nd	2.52	3 rd
Competitive nature of the market	2.90	3 rd	2.64	2 nd	3.14	3 rd	2.82	3 rd	2.26	3 rd	3.40	4 th
Storage facilities	2.45	2 nd	2.68	3 rd	1.24	1 st	2.56	2 nd	1.74	1 st	2.38	2 nd
Low patronage	3.34	4 th	1.46	1 th	4.24	4 th	3.72	4 th	4.24	4 th	1.74	1 st
Transportation cost	4.60	5 th	4.96	5 th	4.56	5 th	4.35	5 th	4.62	5 th	4.96	5 th
Goodness of fit statistics												
Kendall's concordance		0.446		0.651		0.848		0.467		0.704		0.620
Chi-square		93.1		130.3		169.6		93.5		140.7		124.1
Asymp. Sig		0.000		0.000		0.000		0.000		0.000		0.000

Source: Author's Estimation from Field Data, 2017.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Chapter Outline

This chapter comprises three sections. Section 5.2 presents a summary of key findings of the study based on which the conclusions are drawn in section 5.3. The recommendations (section 5.4) are formulated based on the conclusions in section 5.3.

5.1 Summary of Key Findings

Vegetable production and marketing are a major source of livelihood for many people in the urban areas. The main objective of the study was to examine the social and economic relationships between vegetable farmers and marketers. Also, the factors that militate against the production and marketing of vegetables were quantitatively assessed. The constraints that vegetable farmers and marketers face in the production and marketing of vegetables were also identified and ranked.

Purposive sampling technique was used to select 18 respondents (producers and marketers of lettuce and amaranth) and a qualitative individual interviews was conducted. Also, 50 respondents each of lettuce and amaranths producers and marketers were selected using a multistage sampling technique. The same data was collected on the same variables and the same respondents over the three seasons using questionnaires.

Descriptive statistics such as means, standard deviations, minimum, maximum and discourse analysis were employed to evaluate the data on the interrelationships and interactions between vegetable farmers and marketers.





Also, gross margin analysis was used to estimate and compare the profits of lettuce and amaranths farmers and marketers over the seasons. Moreover, random effects model was used to analyze the factors that influence the profit of vegetable (amaranths) farmers and marketers across the seasons while the mixed effect model was used to evaluate same for farmers and marketers across the seasons. Finally, the level of agreements in the constraints that vegetable farmers and marketers face in the production and marketing of vegetables were revealed using the Kendall's coefficient of concordance.

The findings of the study indicated that:

Farmers and marketers were able to establish linkages with one another throughout the production seasons and also cooperation and competition are highly embedded in farmers' and marketers' linkages across the production seasons.

In the rainy season, the gross margins of Lettuce and Amaranths marketers were GH¢438.00 and GH¢420.09 respectively while the gross margins of Lettuce and Amaranths farmers in the rainy season were GH¢327.00 and GH¢100.65 respectively.

Also, in the harmattan season Lettuce and Amaranths marketers' gross margins were GH¢570.35 and GH¢333.00 respectively compared to GH¢207.40 and GH¢111.00 gross margins made by Lettuce and Amaranths farmers respectively in the same season.

Lettuce and Amaranths marketers' gross margins in the dry hot season were GH¢481.90 and GH¢305.00 respectively. However, the gross margins Lettuce and Amaranths farmers made in the hot dry season were GH¢179.95 and GH¢128.10 respectively.

The mixed effect model also indicates that experience in farming, amount of upfront payment, amount of credit sale, cost of manure and head of household were statistically

significant and positively related to the income of Lettuce farmers while age of respondent, amount of default, cost of seed, cost of irrigation (water bill), cost of petrol, cost of fertilizer, cost of paid labour, cost of family labour, other cost and cost of food had a negative significant influence on the income of Lettuce farmers.

With regards to marketers, amount of upfront payment and access to credit were statistically significant and positively related to Lettuce marketers' profit. Meanwhile, educational level, cost of transport, cost of paid labour, days used to sell the produce, sale of both Lettuce and Amaranths, packaging cost, cost of produce and cost of food were significantly and negatively related to the profit of Lettuce marketers.

On the other hand, the random effect model revealed that amount of upfront payment, amount of credit sale, hot dry season and Harmattan season were positive and significantly related to profit of Amaranths farmers while cost of irrigation (water bill), cost of petrol (pumping machine), cost of fertilizer, cost of seed, access to credit, cost of paid labour, cost of family labour, cost of manure and cost of food were negative and significantly related to the profit of Amaranths farmers.

However, experience in marketing, years spent in school, household size, age of respondent, upfront payment received for the sale of the produce and sell of both Amaranths and Lettuce were positively and significantly related to the profit of Amaranths marketers. Meanwhile, days used to sell the produce, credit sale, cost of paid labour, packaging cost, cost of food and cost of Amaranths were statistically significant and negatively related to profit of Amaranths marketers.





Moreover, the findings revealed that the most pertinent constraints that impede the production of vegetables across the seasons include; lack of irrigation facilities, exploitative practices by marketers, scarcity of land and low price of produce. Meanwhile, lack of storage facilities, competitive nature of the market and the perishable nature of vegetables are really imperiling the marketing of vegetables across the seasons.

5.2 Conclusions

Vegetable production and marketing in the study area serve as a livelihood activity for most of the dwellers (urban poor). Vegetables produced and marketed in the study area range from the indigenous vegetables such as bra, ayoyo to the exotic ones such as lettuce and cucumber over the seasons. The study concludes that:

Vegetable marketers earned a substantial profit from the marketing of vegetables compared to farmers across the seasons.

Also, stable social relationships exist between vegetable farmers and marketers over the seasons. However, the economic and the business relationships between farmers and marketers over the seasons are fragile.

Notwithstanding, the profit of farmers was significantly and negatively influenced by critical institutional factors, which include; cost of irrigation (water bill), cost of petrol (pumping machine), cost of fertilizer, access to credit and cost of seed. Also, transportation cost, credit sale and days used to sell the produce negatively and significantly affect the profit of marketers.

Among the factors that militate the production of vegetables over the seasons. that were identified and ranked, lack of irrigation facilities, exploitative practices by marketers, scarcity of land and low price of produce were the most pertinent ones while lack of storage facilities and the perishable nature of the of vegetables greatly hinder the marketing of vegetables.

5.3 Recommendations

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

1. Government and NGO's should facilitate the formation of bank of agricultural cluster (vegetables) in order to ensure that cluster actors access goods and services in a commercially viable way and also the economic objective (maximize added value), equity objective (sharing of the added value) and social objective (good interrelation) of the actors are realized.
2. At least one cold storage facility should be constructed for the marketers in order to help extend the period of marketing some of the vegetables, therefore, making vegetables available throughout the year.
3. Government and NGO's should establish a special credit facility for vegetable farmers so that the high interest rate farmers face for accessing credit from commercial banks would be minimized.
4. Dams should be constructed for the farmers at production sites where untreated waste water and the costly pipe borne water are being used for irrigation so that the government policy of "one village one dam" would be realized.



5.4 Suggestion for Future Research

Future research should analyze the economic and marketing efficiencies of vegetable production and marketing.



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APPENDICES

Appendix 1: Vegetable Farmers' and Marketers' Questionnaires

Qualitative Survey

Date of interview. /..... /...../ Season..... ..Contact.....

Interview Guide

1. Could you tell us more about your work?
2. Could you tell us about the frequency of stocking and sale?
3. Could you tell us about any record keeping that you do?
4. How do you keep your cash?
5. How do you deal with your stocks?
6. How do you calculate whether you have made profit or loss and over what time scale?
7. Any credit. How frequent is it?
8. Repayment. How frequent is it done and over what time scale?
9. Any default and how do you deal with that?
10. We want to record your profit for a certain period of time/ a transaction, how do you suggest we do that?
11. Who do you work with?
12. Describe the abundance and the price of the produce through the season.
13. Who do you think benefits at different stages and seasons? Why and how?
14. Describe how you and your trading partners manipulate each other to try to get deals and stuffs and what other stuffs are these? Like trying to maintain relationships. Get connections to other traders.
15. How do you persuade people to buy stuff from you when you overstocked?
16. How do you persuade people to give you some stock when you are lacking?
17. How do you persuade people to trade with you rather than another person?
18. How do you persuade people to keep them as customers when you can't buy from/ sell to them?
19. How do you persuade people to reduce the price/increase the price or increase quantity/reduce quantity?
20. Could you talk about any trade-offs and compromises you make? Especially instances where you do not take into accounts only profits but other factors that influence your activities equally.
21. How do you make arrangements about the quantity they want to buy/sell and at what price?
22. Do you know your partner outside work?
23. Could you talk about the fidelity and loyalty between you and your partner?
24. Describe the relationship with others who do the same work as you. (Competition and cooperation.
25. What are some of the challenges you face as a farmer/marketer?



Quantitative Survey

Lettuce and Amaranths Farmers Questionnaires

Part A: Profile of Respondent

Date of interview /...../...../Season.....Code.....

1. Name of respondent
2. Name of farm site
3. Name of farmer's home community
4. Sex a. Male b. Female
5. Number of years in lettuce farming
6. Do you engage in any off-farm job? 1. Yes 2. No
7. Number of years spent in school.....
8. Highest level of education 1. None/Informal School 2. Primary 3. Secondary
(e.g. Middle School, Junior High School, Secondary School, Senior High School)
4. Tertiary (e.g. University, College, Polytechnic or college of education)
5. Other (Specify).....
9. Marital status 1. Never married 2. Married 3. Divorced 4. Widow 5. Other
(specify)
10. Are you a household head? 1. Yes 2. No
11. Number of household members eating from the same pot.....
12. Age of respondent

Part B: Production Information

13. Number of beds made for the production of lettuce in total in the farm at the moment.....

We are now going to talk about a recent transaction that you made. It should be one where you can tell how much someone (buyer) finally paid for the lettuce.

14. How many beds of lettuce was that transaction`?.....
15. What was the life period of that crop (including nursing)?days/
weeks/ months



16. Cost of vegetable (lettuce) production

A	B	C	D	e	F	G
Item/ Activities	Used? Yes/ no	Quantity used on lettuce during this period (it may be a proportion of a tin or a sack that was bought earlier in the season)	Cost of that quantity	How many beds was this used on? (it may be the whole farm, not just the transacted beds)	Cost per bed (d/e)	Total cost for the transaction (f x number of beds sold, which should be as in q.7)
Seed			.....Ghc			
Fertilizer			.....Ghc			
Insecticide/ Pesticide			.....Ghc			
Paid Labour – it may be that they were not paid a day-rate but just given a fixed amount			.....people.....Ghc/day			
Family labour – probably it was free			.....people x.....Ghc/day			
Land rented (it could be called 'greeting')		Remember to calculate the proportion of yearly rent that is for this period for lettuce GhC (proportion of land that is farmed with lettuce) =GhC				
Food, including that bought for workers		Food bought for ....days	.....Ghc/day.....days food was bought=...GhC			
Water for irrigation		Remember to calculate the proportion of yearly or monthly bills that are for this period for lettuce GhC (proportion of land that is farmed with lettuce) =GhC				
Fuel to power the motor pump			.....Ghc/day days petrol was used =GhC			
Other costs						
Your time		.....hours spent in the farm on the lettuce sold/day x.....days in the farm for the life of this crop =.....hours				

Cost of vegetable (amaranths) production

Item/Activities	Used? Yes/ no	Quantity used during this period only on the amaranths sold (it may be a proportion of a tin or a sack that was bought earlier in the season)	Cost of the quantity used on the amaranths sold alone.
Seed			.....Ghc x =.....Ghc
Fertilizer			.....Ghc x =.....Ghc
Insecticide/ Pesticide			.....Ghc x =.....Ghc
Paid Labour – it may be that they were not paid a day-rate but just given a fixed amount			.....people x.....Ghc/day .....days worked =GhC
Family labour – probably it was free			.....people x.....Ghc/day.....days =GhC
Land rented (it could be called ‘greeting’)		Remember to calculate the proportion of yearly rent that is for this period for alefo. GhC x (Time) x (proportion of land that is farmed with alefo) =GhC	
Food – including what you provided to workers		Food bought for days	.....GhC per day x.....days food was bought =GhC
Water for irrigation		Remember to calculate the proportion of yearly or monthly bills that are for this period for alefo. GhC x x (proportion of land that is farming alefo)= .....GhC	
Fuel to power the motor pump		petrol bought for days	.....GhC per day x.....days petrol was used =GhC
Other costs			
Your time – just in hours, not the cost.		.....hours spent in the farm on the lettuce sold/day x.....days in the farm for the life of this crop =.....hours	

17. Revenue from vegetable (lettuce) production.

To whom	Number of beds sold (should be same as q.7)	Expected Price Per bed	Actual Price Per bed	Paid up front	Total Expected Revenue	Total Actual Revenue

Revenue from vegetable (amaranths) production

To who the alefo was sold or at which harvest – e.g. first week, second week etc.	Number of bunches sold	Expected Price Per bunch	Actual Price Per bunch	Paid up front	Total Expected Revenue	Total Actual Revenue

18. Which of the following crops do you produce in this season? Tick as many as apply.

Crop	AREA ALLOCATED FOR THE CULTIVATION OF THIS VEGETABLE IN THIS SEASON Enumerator estimates
LETTUCE	.....m length x .....m width =m ²
ALEFO	
AYOYO	
BRA	
CABBAGE	
OKRO	
TOMATOES	
PEPPER	
CUCUMBER	
CARROT	
MAIZE	
RICE	
GROUNDNUT	
YAM	

19. Do you do any of the following activities before you sell your produce? [Tick all that apply to mean a yes response]

Sorting/Grading [] Processing [] Packaging (you can know this from above) []

Others [] specify

20. Do you get any agricultural information from extension officers or others like researchers or NGOs?

1. Yes 2. No

21. If yes, how many times per production season?.....

22. Are you a member of a farmers' association? 1. Yes 2. No



23. Do you have access to credit? 1. Yes 2. No
24. If yes to question 18, what is the source of the credit
25. If no to question 18, why don't you have access? 1. I don't need it. 2. I don't have collateral.
26. Rank the following problems you face in vegetable production.

CHALLENGES	1	2	3	4	5	6	7
Scarcity of land							
Lack of finance for farming							
Lack of irrigation facilities							
Difficulty in regulating supply/Overproduction							
Pest/Insect infestation							
Exploitative practices							
Low price							

27. Do you keep records of your farm operations? 1. Yes 2. No
28. Do you sell the produce on credit? 1. Yes 2. No
29. If yes to q29, how often do you sell on credit? 1. Always 2. Sometimes 3. Not at all
30. If yes to q29, why do you sell on credit?.....
31. If you sell on credit, when is the repayment done?
32. Have you encountered any default before? 1. Yes 2. No
33. If yes, how did you deal with that?
34. When is the produce abundant? 1. Rainy season 2. Harmattan season 3. Dry hot season
35. When is the produce scarce? 1. Rainy season 2. Harmattan season 3. Dry season
36. Which period do marketers buy the produce and pay upfront?
1. Abundance period 2. Lean season 3. Always
37. Which period do marketers buy the produce on credit?
1. Abundance period 2. Lean season 3. Always
38. Why do you sell on credit during this period.....?
39. How many people do you trade with?
40. How is the price of the produce determined?
1. Bargaining 2. Marketer 3. Farmer association
41. Who do you think benefit at different in this seasons?
1. Farmers 2. Marketers 3. Both
42. Are your partners faithful and loyal? 1. Yes 2. No
43. How do you get connections to other traders.....?
44. How do you persuade people to buy from you when you are overstocked?
1. Increase the quantity 2. Decrease the price 3. Both 1 and 2 4. Look for new marketers
45. Do you make compromises, especially when you do not take into account only profits but often factors that influence your activities especially? 1. Yes 2. No
46. If yes, which seasons do you make such compromises?
1. Rainy season 2. Harmattan season 3. Dry hot season

THANKS FOR YOUR TIME!



Lettuce and Amaranths Marketers Questionnaires

Part A: Profile of Respondent

Date of interview /...../...../SeasonContact.....

1. Name of respondentCode.....
2. Name of market
3. Name of marketers' home community
4. Sex a. Male b. Female
5. Number of years in Amaranths/Lettuce marketing
6. Do you engage in any other job apart from the vegetable marketing? 1. Yes 2. No
7. Number of years spent in school.....
8. Highest level of education 1. None/Informal School 2. Primary 3. Secondary (e.g. Middle School, Junior High School, Secondary School, Senior High School)
4. Tertiary (e.g. University, College, Polytechnic or college of education)
5. Other (Specify).....
9. Marital status 1. Never married 2. Married 3. Divorced 4. Widow 5. Other (specify)
10. Are you a household head? 1. Yes 2. No
11. Number of household members eating from the same pot.....
12. Age of respondent

We are going to talk about a recent transaction that you made. It should be one where you bought the amaranths/lettuce from one place and have sold all the amaranths/lettuce already.

PART B: MARKETING INFORMATION

8. From buying it to selling it all, how long did it take you to sell the amaranths?
.....days



9. Cost of items for amaranths marketers.

Item/Activities	Used? Yes/no	Quantity	PER BUNCH COST	TOTAL COST OF TRANSACTION
Alefo		.....bunches	.....GhC per bunch	..... GhC
Transportation				Was the transport for the alefo alone? if there were other items, get the proportion of the transport costs that was for the alefo.....GhC
Paid Labour – maybe they were not paid daily but just given a fixed amount				.....people x .....GhC/day x.....days worked =GhC
Family labour – probably it was free				..... People x GhC/day.....days worked =GhC
Food – including what you provided to workers				.....GhC
Market toll/tax – if monthly/yearly, calculate proportion for the days of the transaction				.....GhC
Packaging – calculate the cost of a polythene bag first				..... bags used x .....GhC /bag =GhC
Other cash costs				
Your time – just in hours, not the cost, spent in the farm and market on this alefo		.....hours spent in the farm and market for the whole transaction.		

Item/Activities	Used? Yes/no	QUANTITY	PER BED COST	TOTAL COST
Lettuce		.....BEDS	.....GhC per BED	..... GhC
Transportation				Was the transport for the lettuce alone? if there were other items, get the proportion of the transport costs that was for the lettuce.....GhC
Paid Labour – maybe they were not paid daily but just given a fixed amount				.....people .....GhC/day.....days worked=.....GhC
Family labour – probably it was free				..... People x GhC/day.....days worked =GhC
Food – including what you provided to workers				.....GhC
Market toll/tax – if monthly / yearly, calculate proportion for the days of the transaction				.....GhC
Packaging – calculate the cost of a polythene bag first				..... bags x .....GhC /bag =GhC
Other cash costs				
Your time – just in hours, not the cost, spent in the farm and market on this lettuce		.....hours spent in the farm and market for the whole transaction.		

Cost of items for lettuce marketers

10. Revenue for amaranths marketers. Note: It may be necessary to use the lines for multiple transactions or they may remember all they sold.

Sold to who	Number of bunches amaranths sold	Price per bunch	Total expected	Amount paid cash up front	Total actually received

Revenue for lettuce marketers. Note: It may be necessary to use the lines for multiple transactions or they may remember all they sold.

Sold to who	Number of lettuces sold	Price per bunch	Total expected	Amount paid cash up front	Total actually received

11. Which of the following vegetables do you sell? Tick as many as apply.

VEGETABLES		VEGETABLES	
ALEFO		PEPPER	
LETTUCE		CUCUMBER	
AYOYO		BEAN LEAVES	
BRA		CARROT	
CABBAGE			
OKRO			
TOMATOES			

12. Do you do any of the following activities before you sell your produce? [Tick all that apply to mean a yes response]

Sorting/Grading [] Processing i.e. cutting [] Packaging (you can know this from above) [] Others [] specify

13. Are you a member of marketers' association? 1. Yes 2. No

14. Do you have access to credit? 1. Yes 2. No

15. If yes to question 17, what is the source of the credit



16. If no to question 17, why don't you have access? 1. I don't need it. 2. I don't have collateral.
17. Rank the following problems you face in vegetable marketing.

CHALLENGES	1	2	3	4	5
Perishability of the vegetable					
Competitive nature of the market					
Lack of storage facilities					
Low patronage					
Transportation cost					

18. Do you keep records on your marketing operations? 1. Yes 2. No
19. Do you buy the produce on credit? 1. Yes 2. No
20. If yes to q27, how often do you buy on credit? 1. Always 2. Sometimes 3. Not at all
21. If yes to q27, why do you buy on credit?
22. If you buy on credit, when is the repayment done?
23. Have you defaulted before? 1. Yes 2. No
24. If yes, how did you deal with that?
25. When is the produce abundant? 1. Rainy season 2. Harmattan season 3. Dry hot season
26. When is the produce scarce? 1. Rainy season 2. Harmattan season 3. Dry season
27. Which period do you buy the produce and pay upfront?
1. Abundance period 2. Lean season 3. Always
28. Which period do you buy the produce on credit?
1. Abundance period 2. Lean season 3. Always
29. How many people do you trade with?
30. How is the price of the produce determined?
1. Bargaining 2. Farmer 3. Marketers' association
31. Who do you think benefit in this season?
1. Farmers 2. Marketers 3. Both
32. Are your partners faithful and loyal? 1. Yes 2. No
33. How do you get connections to other farmers?
34. How do you persuade people to buy from you when you are overstocked?
1. Increase the quantity 2. Decrease the price 3. Both 1 and 2 4. Look for new marketers
35. Do you make compromises, especially when you do not take into account only profits but often factors that influence your activities especially? 1. Yes 2. No
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THANK YOU FOR YOUR TIME!

