

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI,
GHANA**

**DETERMINANTS OF THE SALE OF CATTLE IN THE BOLE AND SAWLA-TUNA-
KALBA DISTRICTS**

BY:

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(B.ED Social Sciences)

**A THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL
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PHILOSOPHY IN AGRICULTURAL ECONOMICS**

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DECLARATION

I hereby declare that this submission is my own work towards the M. phil. and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

The Thesis is dedicated to all my family members who gave their support to me in the course of my academic career.

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To begin with, I wish to express profound gratitude to my main supervisor, Dr. Robert Aidoo for his guidance, invaluable advice, useful suggestions and the encouragement he gave me to work with determined effort. His continuous encouragement spurred me to make this enviable feat in my life. In fact, this Thesis has been made possible through the immense assistance I received from my main supervisor. I also give special thanks to Dr. Kwasi Ohene-Yankyera, the second supervisor for his fruitful comments during seminars which led to the successful completion of this study.

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ABSTRACT

The overall objective of the study was to examine the determinants of the sale cattle by smallholder cattle producers in the Northern Region of Ghana. Consequently, the study examined the constraints to cattle production and marketing. The study delved into the main reasons why farmers keep cattle. A description of the channels of distribution from the farm to the final consumer was done and attention was paid to the constraints encountered by cattle farmers. The study provided evidence on the factors that influence the sales rate of cattle. The study was conducted in the Bole and Sawla-Tuna-Kalba Districts. A sample size of 120 cattle producers was used. Multi-stage sampling procedure was employed. Purposive sampling technique was used in selecting the districts and the target communities, while the simple random sampling technique was applied to select the respondents. Likert scale ranking was used to examine the constraints of cattle production and marketing whereas Tobit model was used to estimate the factors affecting the sales rate of cattle. The results showed that majority of the respondents were keeping cattle for income (68.6%) and the incidence of animal disease was ranked as the most pressing constraint affecting the production of cattle. The results also showed that access to market information, the selling price of cattle, number of cattle owned, access to extension service and the experience of the farmer significantly and positively influenced cattle producers' sale of animals in the market. However, distance to market and other sources of income had negative influence on cattle producers' sale of animals in the market. The study recommended improved access to market information and technical information to improve cattle producers' sale of animals in the cattle market in the Northern Region of Ghana. The study further recommended an improvement in market infrastructure and the periodic rehabilitation of roads to make them motorable so as to facilitate the movement of cattle producers to remote markets.

TABLE OF CONTENTS

DECLARATION.....	
ii DEDICATION.....	
iii	ACKNOWLEDGEMENT
.....	iv
.....	ABSTRACT
.....	v
CONTENTS	vi
TABLES	ix
FIGURES	x
ABBREVIATIONS	xi
CHAPTER ONE	
1	1.0
INTRODUCTION.....	1
1.1 Background of the study	1
1.2 Problem Statement	2
1.3 Research Questions	3
1.4 Research objectives	
4	
1.4.1 Main objective	4
1.4.2 Specific objectives	4
1.5 Hypotheses	
4	
1.6 Justification of the study	5
1.7 Organisation of the Study	5
CHAPTER TWO	
72.0 LITERATURE REVIEW	
7	
2.1 Cattle Production in Ghana and its Economic Importance	7
2.2 Cattle Marketing System in Ghana	9
2.2.1 Players in the Cattle Marketing Chain and their Roles	10
2.2.2 Cattle Marketing Channels	11
2.2.3 The cattle marketing system in the Northern Region of Ghana	11
2.2.4 Cattle market actors and their roles	13
2.2.5 Constraints in cattle marketing	14
2.3 Factors Affecting the Sale of Cattle	18

2.3.1 Household size	18
2.3.2 Total herd size or number of cattle owned.....	19
2.3.3 Cattle production system adopted	19
2.3.4 Access to Market information	20
2.3.5 Experience of farmer.....	21
2.3.6 Distance to market	22
2.3.7 Education level of farmer	23
2.3.8 Non-farm income/Alternative Sources of Income	23
2.3.9 Access to extension service	24
2.3.10 Sales price of cattle	25
2.4 Chapter summary	25

CHAPTER THREE

27 3.0 STUDY AREA AND RESEARCH METHODOLOGY

27

3. 1 Introduction	
27	
3.2 Study	Area
27	27
3.2.1 Profile of Bole District	27
27	
3.2.2 Profile of Sawla-Tuna-Kalba District	30
30	
3.3 Research	Methodology
32	32
3.3.1 Data types and sources	32
32	
3.3.2 Sample size and Sampling procedure	33
33	
3.3.3 Methods of data collection	33
33	
3.3.4 Data Analysis	
34	
3.4 Econometric model specification	35
35	
3.4.1 Empirical model	38
38	

3.5 Measurement of variables included in the model	39
3.6 Limitations of the study	42
CHAPTER FOUR	
4.0 RESULTS AND DISCUSSION	
43	
4.1 Introduction	43
4.2 Socio-economic characteristics of household heads in the study area	43
4.2.1 Age, household size, education level and gender of household head	43
4.2.2 Religious and Ethnic affiliation of respondents	44
4.2.3 Herd composition and structure	45
4.4 Market information	48
4.5 Major ways of cattle replacement/acquisition among cattle producers	49
4.6 Types of cattle offered for sale among cattle producers	51
4.7 Key players in the cattle market chain	53
4.8 Main marketing channels of distributing cattle	54
4.9 Cattle Sales Rate analysis	57
4.10 Factors that affect the sales rate of cattle	58
4.11 Cattle production and marketing constraints	61
4.11.1 Cattle Marketers' Marketing Constraints.....	63
CHAPTER FIVE	65
5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	65
5.1 Introduction	65
5.2 Summary and Conclusions	65
5.3 Recommendations	67
REFERENCES	70
APPENDIX	
79	

LIST OF TABLES

Table 3.1 Statistics of livestock kept by farmers in Bole District (2006-2010)	29
Table 3.2 Selected communities and household heads for the study	33
Table 3.3 Variable definition and a prior expectation	39
Table 4.1 Age, Household size and Education Level of Cattle keepers in 2013	43
Table 4.2 Gender of respondents by District in April 2013	44
Table 4.3 Religious affiliation of respondents in the study area.....	44
Table 4.4 Distribution of respondents by tribe	45
Table 4.5 Reasons why farmers keep cattle	47
Table 4.6 Key players and their roles in the cattle market chain	53
Table 4.7 Summary descriptive statistics of Sales Rate	56
Table 4.8 Summary statistics of variables fitted into the regression model	57
Table 4.9 Tobit model estimates for factors affecting cattle keepers' sales rate	58
Table 4.10 Constraints of Cattle Production	62
Table 4.11 Cattle producers' marketing constraints	63

LIST OF FIGURES

Figure 4.1 Composition of breeds of cattle raised by respondents	46
Figure 4.2 Major sources of market information among cattle keepers	49
Figure 4.3 Ways of restocking cattle by respondents	50
Figure 4.4 Type of cattle mostly offered for sale	51
Figure 4.5 Main marketing channels of cattle distribution and percentage of cattle flows from one channel to the other	55

LIST OF ABBREVIATIONS

AMA	American Marketing Association
AMP	Animal Movement Permit
ASF	Animal Source Food
°C	Degree Celsius
FGD	Focus Group Discussion
FAO	Food and Agricultural Organisation
GH¢	Ghana Cedis
IFAD	International Fund for Agricultural Development
I T	Information Technology
ILRI	International Livestock Research Institute
LDP	Livestock Development Project
MoFA	Ministry of Food and Agriculture
PHC	Population and Housing Census
SPSS	Statistical Package for the Social Scientists
SRID	Statistics, Research and Information Directorate
TV	Television

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

The modernization of agriculture is to ensure that the country attains food security, reduce poverty and achieve commercial oriented production (Kalemera, 2010). The production of cattle is important in enhancing food security, improving incomes, reducing poverty and improving the socio-economic development of Northern Ghana. In this regard, cattle production is an integral part of rural farming systems in the Northern Region of Ghana. It is estimated by GLSS (2008) that about 84% of Ghana's cattle stock is produced in the three northern regions of Ghana. This is largely due to the guinea savannah vegetation in those areas suitable for cattle keeping. In the Northern Region, cattle farmers in remote communities have limited access to different marketing channels that could earn them higher marketing margins. This constraint is as a result of poor cattle marketing infrastructure and other related marketing barriers. The operations of markets are vitally important because they offer rural smallholder cattle producers' essential opportunities to participate in economic activity (IFAD, 2003). Smallholder cattle farmers can use their available natural, physical and human resources to produce cattle for sale and gain welfare from trading in cattle markets.

Smallholder cattle producers tend not to be organised in the market as they usually sell limited number of animals individually and directly to buyers at the farm gate without access to any alternative marketing channels (Key and Runsten, 1999). In other words, smallholder cattle farmers do not have firm and collective action in marketing their animals. This weakens smallholder farmers bargaining power and renders them

vulnerable to price exploitation by cattle buyers at the farm gate. Unfortunately, the lack of collective action among smallholder cattle keepers denies them entry into market channels that could earn them higher profits.

1.2 Problem Statement

Cattle production is an important agricultural activity in the Northern Region of Ghana. The production of cattle generates income, provides food (meat), animals for traction, manure, and ensures household food security. To attain food security and generate income, smallholder cattle producers in the Northern Region of Ghana need to have access to markets. Kennedy and von Braun (1994) opine that market participation by smallholder farmers has been recognized to bring about agricultural transformation in developing countries. According to Delgado (1999), the participation of rural households in agricultural markets is a key factor to lifting them out of poverty in African countries. However, a key constraint hindering food security, poverty reduction and income generation of smallholder cattle keepers in the Northern Region of Ghana is their inability to access markets.

Smallholder cattle producers in the Northern Region face several barriers that make it difficult for them to gain access to markets and sell their animals directly. One significant barrier that militates against the ability of smallholder cattle keepers' participation in markets is transactions costs (Musemwa *et al.* 2008). In the Northern Region of Ghana, long distances between cattle producing communities and major cattle markets do not only increase transactions costs but also limit farmers' ability to access alternative marketing channels for the sale of their cattle. A large number of smallholder farmers in rural areas usually market their cattle in small numbers. This increases transactions costs because

individually they do not have sufficient volumes of uniform cattle to attract different buyers to their farms.

Other barriers that limit smallholder cattle farmers' participation in agricultural markets include poor market infrastructure, variability in price, limited marketing support services and limited access to market information by cattle keepers (Nkosi and Kirsten; 1993). Poor transport infrastructure and high transport cost also limit cattle keepers' participation in markets (Bailey *et al.* 1999). According to Delgado (1999), high cost of market transactions is the main obstacle to smallholder farmers' ability to access markets (marketing channels) of their choice for their farm produce. If the above constraints persist, cattle keepers in the Northern Region of Ghana will continue to have lower marketing margins, lower income and remain poor since they cannot realize the full benefits of their cattle production. Consequently, this study was conceived to empirically examine the main factors that determine smallholder cattle keepers' participation in the market in order to design strategies and policies to improve their sales rate for the attainment of maximum economic benefits.

1.3 Research Questions

The following questions were formulated to guide the research:

1. What are the main reasons why farmers keep cattle?
2. Who are the key players in the cattle market chain and what channels of distribution are available to cattle keepers?
3. What is the extent of farmers' participation in the cattle market?
4. What are the factors that affect the sales rate of cattle?
5. What are the constraints faced by cattle farmers in the Northern Region of Ghana?

1.4 Research objectives

1.4.1 Main objective

The main objective of this study was to investigate the determinants of market participation by smallholder cattle producers in the Northern Region of Ghana.

1.4.2 Specific objectives

The specific objectives that were formulated to guide the study were as follows:

1. To analyse the main reasons why farmers keep cattle.
2. To examine the key players in the cattle marketing chain and describe the channels of distribution available to farmers in the Northern Region.
3. To examine the factors that influence cattle farmers' market participation in the Northern Region of Ghana.
4. To determine the constraints that face cattle farmers in the Northern Region of Ghana.

1.5 Hypotheses

The following hypotheses were tested in the study:

1. Direct market participation is positively influenced by access to market information.
2. Non-farm income and income from crop enterprises has a negative influence on the sales rate of cattle.

1.6 Justification of the study

Cattle are the main livestock kept by smallholder farmers in the Northern Region of Ghana. For smallholder producers to maximise the benefits they derive from their cattle, proper marketing integration with appropriate marketing structures and adequate pricing mechanisms of cattle are crucial. It was estimated by GLSS (2008) that northern Ghana has approximately 84% of cattle stock. These animals play key functions in the livelihood of farmers. These functions include ensuring food security, improvement in incomes and poverty reduction among others. However, the potential of cattle production to improving the livelihoods of farmers in the Northern Region has not been fully exploited due to constraints relating to cattle production and efficient marketing. Consequently, the extent to which smallholder cattle farmers participate in the market is largely unknown. The study therefore sought to fill this gap by empirically examining the factors that influence cattle producers' participation in the market. The findings of the study would serve as useful guide to policy makers to design strategies for addressing the factors that impede the production and efficient marketing of cattle in the Northern Region of Ghana. Additionally, policy makers would use the recommendations of the study to explore the market integration needs of smallholder cattle farmers and the value they would derive from the various marketing channels.

1.7 Organisation of the Study

The study is organised into five chapters. The first chapter dealt with the background to the study and provided a broad analysis of the problem and the specification of the objectives. The second chapter is devoted to the review of related literature to the present study. Chapter three described the study areas and the research methodology for the study. This chapter provided information on the types of data, sources of data, sampling technique

and data collection methods as well as the variables included in the empirical model. The empirical results from the econometric analysis and liker scale are presented and discussed in the fourth chapter. Chapter five provided the summary of the main findings and recommendations.

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CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Cattle Production in Ghana and its Economic Importance

The production of cattle in Ghana consists of an open grazing system where animals are herded daily to graze natural pasture from the early hours of the day and then return to the kraal in the evening. This is the traditional method of cattle production in northern Ghana. Most cattle farmers in northern Ghana have adopted sedentary lifestyle. Rampant bush fires during the dry season in northern Ghana have been causing shortages of pasture. Grimaud *et al.* (2006), report that during the dry season there is an acute shortage of feed supply and what is available is of poor quality and low in protein.

In the Northern Region of Ghana, cattle industry represents a significant economic activity in the lives and livelihoods of many rural smallholder farmers, traders and processors. Cattle provide food for human beings. Cattle can provide nutrient-rich Animal Source Food (ASF) that is a good food supplement and diversity to staple plantbased diets (Murphy and Allen, 2003). Milk has the potential of supplementing the nutrients of humans. In connection with the role of milk, Adam *et al.* (2010) maintain that cattle production plays a key role in helping to balance human nutrition. According to Scoones (1992), in many production systems, cattle are not frequently slaughtered for meat. They are only slaughtered when animals become sick or unproductive, or on occasions such as wedding ceremonies or for hospitality.

Additionally, the production of cattle generates cash income for farmers. Some households own cattle for the express purpose of producing for the market. Sometimes, smallholder cattle producers sell their animals to meet an urgent need for cash. For example, when there

is an urgent need for the payment of school fees or for medical costs to be settled, cattle are sold.

The provision of animal source power is another economic importance of cattle production. Powell *et al.* (1998) observe that in many livestock production systems, larger animals function as farm equipment, providing traction power for transportation and crop production. In the Northern Region, bullocks are used to transport goods, especially farm produce. In the same vein, bullocks are used to plough farmlands in northern Ghana.

Furthermore, cattle are used as a means of storing wealth. In Northern Ghana, most cattle keepers dwell in rural areas. They do not have access to financial institutions like banks where they can save their monies. Consequently, cattle serve as “living savings account” to their owners. Moll (2005) argues that cattle provide a reasonably robust hedge against inflation. Moreover, they can be sold and transformed into cash when the need arises. Similarly, Hoddinott (2006) opines that cattle production is a form of insurance, providing the family with assets that can be sold in times of crisis.

Manure from cattle is used to improve soil fertility in Northern Ghana. This contributes to the enhancement of crop production for food and income. According to Wilson *et al.*, (2005), cow dung is used as fuel in some areas.

Again, in Northern Region, the number of cattle owned by a farmer measures one’s social status. Consequently, cattle producers place a high premium on a family’s cattle holding. A family with small number of cattle is regarded as poor. In Kenya, Sara (2010) explains that the ownership of large herds is an important determinant of social status and prestige. In some communities of northern Ghana cattle serve socio-cultural purposes in the payment of dowry or bride price. They are used to strengthen relationships with in-laws and to maintain family contacts by entrusting them to other family members (Dovie *et al.*

2006). Cattle transfers, whether in the form of sale, barter or exchange, are widely used to meet social obligations. Cattle can be used to settle disputes. They are given as sacrificial offerings to appease avenging spirits (Bayer *et al.* 2004).

2.2 Cattle Marketing System in Ghana

In the Northern Region, smallholder cattle farmers in the villages sell their cattle to middlemen who transport them from the surplus production areas to secondary markets in urban areas. These animals are transported by trucks to southern Ghana and other parts of the country where they are sold to butchers, food vendors, retailers and wholesalers. At this point, cattle are said to be in the secondary markets. In the chain of distribution the animals are moved in larger trucks to terminal markets in Kumasi, Accra and Tema. Middlemen or intermediaries act as price brokers between traders and butchers. Their intimate knowledge of both the traders and the butchers provides some degree of trust that the prices negotiated are fair, the animals sold are not stolen or sick ones and when sales are made on credit, the terms are respected and the payment is honoured. Supply and demand conditions determine the prices of cattle. The prices of cattle are usually high during festive occasions like Christmas, Easter and Ramadan.

It has been estimated that about 70% of cattle slaughtered in Ghana originate from outside the country particularly along the northern border. All the beef produced locally is consumed within the country. Hides and skins are bought and processed for the small local leather market by the private sector in Ghana. Locally produced milk is sold directly to consumers or small scale women processors.

2.2.1 Players in the Cattle Marketing Chain and their Roles

In Ghana, the key players in the cattle marketing system include the cattle producers, traders (cattle dealers), butchers, abattoir operators and exporters. The role of cattle producers is to raise the animals while the traders and other agents are responsible for the purchase and distribution to market outlets. Asfaw *et al.* (2011) identify the major actors in cattle products marketing to include cattle producers, traders, processors, retailers, food service providers, and consumers. Williams *et al.* (2006) in their study classified cattle market players as collectors, intermediaries, market associations and other participants in the cattle marketing channel. The market players facilitate the transfer of live animals from one location or owner to the other. The transportation of animals is done by the use of trucks. In some cases, traders place their orders with intermediaries they trusted. The intermediaries assemble the animals and deliver them to the buyer at his preferred location. Cattle collectors (those who collect cattle for the buyers) often operate in market places as brokers or acting as intermediaries between buyers and sellers.

Cattle traders operate at various levels of the trading chain. There are big-time traders (cattle dealers or wholesalers) who can rely on their high levels of capital and buy their own trucks. They can also have contracts with cattle retailers, including meat processors. Other participants in the cattle trading chain include herdsmen, mostly Fulani herdsmen who may have to move cattle to the market for sale. There are also the loaders whose duty is to load animals onto trucks. Truck drivers are responsible for the transportation of animals to secondary or terminal markets. Lastly, the workers in cattle market yards have the duty of branding or marking animals after they are sold to prove new ownership. These cattle market actors have the skill of selecting a marketing channel that fits their operations and provides the greatest returns.

2.2.2 Cattle Marketing Channels

Marketing channel is described as a business structure of interdependent organizations from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler and Armstrong, 2001). The main marketing channels discussed in this study are the farm gate, primary markets, secondary markets and terminal markets. Cattle producers also have other outlets at the local level which include on-farm sale, abattoirs and local butchers, among others. The analysis of cattle marketing channels is important because it provides a systematic knowledge of the flow of cattle from their origin (producer) to their final destination (consumer). This knowledge is acquired by studying the participants in the process, i.e. those who perform physical marketing functions in order to obtain economic benefits (Getachew, 2002). Cattle marketing channel may be short or long depending on the various marketing actors who are involved in it. The choice of a marketing channel is influenced by a number of factors which include the prices offered, distance to the market and the potential of the market to absorb the stock on sale. In rural areas, smallholder cattle producers prefer to sell their cattle to individuals. In a study by Nkosi and Kirsten (1993), it came to light that cattle farmers in the developing areas of South Africa prefer selling cattle to colleague farmers.

2.2.3 The cattle marketing system in the Northern Region of Ghana

Market structure consists of the relatively stable features of the market that influence the rivalry among buyers and sellers operating in a market. . Some examples of market structure include the number of buyers and sellers in the market, barriers to entry into the market and the nature of trading relations (vertical coordination mechanisms) among market participants. The market structure operated by cattle producers and buyers in the

Northern Region of Ghana can be described as imperfect. Most cattle market actors do not have perfect knowledge of the market in terms of prices and sales volumes of cattle.

Market conduct refers to the behavior patterns that traders and other market actors adopt to affect or adjust to the markets in which they sell or buy. These include price setting behavior, and buying and selling practices.

In cattle marketing, there is a large number of market actors who engage in the trade. The conduct of these actors determine the outcomes of the market. One group of actors is small-scale cattle traders. They buy small quantities of cattle from farm gates or nearby village markets and sell them in primary or local markets to large-scale cattle traders or directly to local butchers. At times, small-scale cattle traders buy from the cattle sellers on credit. There are also large-scale cattle traders who purchase cattle from local markets in the northern towns. They cull the weak or poor quality animals for the local butchers and transport the better quality and strong animals to terminal markets in southern Ghana (e.g. Techiman, Kumasi, Accra, Tema). These cattle traders usually obtain their supplies from frontier markets at border towns such as Paga, Bawku, Hamile or Bongo. In some cases these cattle traders also buy on credit. They only repay after the animals have been resold. The third category is import traders who import directly from Burkina, Niger or Mali in long haulage trucks to southern Ghana cities for sale.

The setting of cattle prices in the market rested with cattle producers, brokers or intermediaries. A problem arises if the prices are to be determined by intermediaries. This gives room for intermediaries and cattle buyers to collude in setting low prices to reduce the incomes of cattle sellers. Generally, cattle prices are influenced by several factors which include period of sale, age, weight, and body condition of the animal, urgency of the household cash needs and the distance producers travel to sell their animals. Aklilu,

(2004) observes that in Ethiopia cattle prices are settled through private individuals, on the spot negotiations between cattle producers and traders except in areas where brokers are involved. In Ethiopia, brokers are involved in the transactions and transportation of cattle and obtain commissions of indefinite amounts from both the sellers, buyers and transporters are reported to be prominent particularly in the live animal markets (Jabbar and Benin, 2005).

2.2.4 Cattle market actors and their roles

Cattle producers: To earn cash income, smallholder cattle producers have to sell their animals. They are the main suppliers of animals to the market. Cattle producers usually sell small volumes of cattle per annum. In Northern Ghana, cattle producers set the prices for their animals or they engage the services of middlemen to do so. The seller and buyer engage in haggling until they agree on a price that is acceptable to both parties. Even though the cattle owner offers a price, the buyer may try hard to beat it down. If cash needs are pressing and alternative markets are too far, cattle owners may accept low prices for their animals in the end.

Wholesalers: Wholesalers play a major role in the cattle marketing system. They buy cattle in large quantities and distribute them to various purchasing outlets. They buy animals from various primary markets and transport them to secondary or terminal cattle markets in Southern Ghana for sale. There are times when these cattle dealers misinform cattle producers on the prices in order to cheat them. They give reasons like the cattle are in poor condition or there are low prices offered at the secondary and terminal markets.

The retailers: This is another category of intermediaries. They usually buy meat and sell them to final consumers. They are mostly cold store operators in towns and cities.

Brokers There are other intermediaries called brokers, who are also involved in the sale and purchase of cattle. Brokers buy cattle from producers and resell them to small-scale traders. They get commissions from both sellers and buyers. These brokers charge very high prices in order to earn high commissions. Cattle keepers in Ethiopia for example report that brokers charge very high brokerage fees, misinform on prices paid by buyers, collude with buyers and hinder transactions if they were not allowed to be involved (Gebremedhin et al., 2007).

Butchers: There are formal butchers in urban areas who operate in slaughter houses. They sell beef to food and restaurant vendors. There are also a large number of informal butchers in rural areas who retail beef to final consumers. Their activities are hardly supervised by veterinary and health inspection personnel.

2.2.5 Constraints in cattle marketing

In northern Ghana, several constraints hinder the efficient marketing of cattle. These constraints include but not limited to low prices offered for cattle on sale, limited access to market information, low numbers of traders and default on the part of traders, market inaccessibility and poor road network system. These constraints are discussed in detail.

One key constraint to cattle marketing is the low prices offered for cattle on sale. In the Northern Region, mostly cattle producers do not have the opportunity to set prices. In effect, cattle producers suffer low bargaining power. In Ghana, the physical appearance of cattle is used in determining the prices. During the dry season when there is shortage of feed and water, most animals grow lean and appear unhealthy. The poor condition of cattle is attributable to inadequate grazing. When such animals are sent to the market for sale, they attract low prices. Cattle buyers always raise concerns that they cannot pay competitive prices for animals that are poor in body condition or not ready for the market.

In South Africa, Montshwe (2006) cites the poor body condition of cattle as a factor accounting for lower farm gate prices, especially during the dry season. In the same vein, De Waal (2004) notes that the poor body condition of cattle is an important factor, but the age of animals (too old) at the time of sale, is equally contributing to poor prices. In northern Ghana, most cattle farmers do not have access to agricultural inputs for cattle production, such as vaccines and feed supplement. The low adoption of technology can also cause cattle to suffer from undesirable body condition and may not attract good market prices.

In the same vein, constraint that hinders the marketing of cattle is inaccessibility to market information. Most cattle producers in northern Ghana are located in remote areas. They hardly get access to market information as far as the sale of their cattle is concerned. Poor access to market information remains a major challenge for cattle market actors, especially the producers. Both buyers and sellers need to be well-informed about market prices, sales volumes, disease status of animals and the demand and supply conditions prevailing in the market. In a study by Coetzee *et al.* (2005) in Eastern Cape of South Africa, they highlight the fact that the provision of market information strengthens farmers' negotiating ability during transactions with buyers and consequently prevent possible exploitation by better informed buyers.

According to Fenyes and Groenewald (1985), insufficient market information is common due to the large number of small producers, inefficient communication systems and low levels of literacy as well as information administration. In Kenya, Sara (2010) observes that there is an imbalance in the bargaining power of traders and producers. Cattle traders collude and jointly determine prices ahead of market day while producers have very little or no ability to negotiate prices. Insufficient price information forces producers in rural areas to accept low prices for their cattle from middlemen especially when they are in dire

need for money. Limited access to information was identified as one of the constraints causing low cattle-market off-take in the communal production systems of South Africa (Makhura, 2001). Smallholder cattle farmers in northern Ghana do not have the understanding of how the market operates and are constantly complaining about low prices offered for their cattle and their weak bargaining power. Improved cattle market participation is critical for enhancing the economic growth of Ghana. This will engender an improvement in the livelihoods of rural farmers. The provision of information to smallholder farmers is necessary in order to make markets more accessible. The availability of market information reduces the risk associated with marketing.

Another constraint is market inaccessibility. Most cattle farmers in the northern sector of Ghana are not living closer to towns where there are thriving markets for cattle. They are found in areas that are not accessible and far away from town centres. As a result, most farmers sell their cattle at the farm gate at low prices to avoid high transport, handling and transactions costs. In Eastern Cape of South Africa, Coetze *et al.* (2005), observes that cattle keepers are located in areas remote from the major markets where there is a serious lack of both physical and institutional infrastructure. Sara (2010) of Kenya supports this view by stating that the main producers of cattle are located in remote areas and have no access to markets. Smallholder cattle farmers who do not have access to markets fail to get the full advantage of selling their cattle.

Low traders numbers and traders' default do not also promote the sale of cattle. The numbers of cattle buyers are not usually many in Northern Ghana. There are few cattle buyers who have to transact business with a large number of cattle producers. Consequently, cattle buyers exercise some advantage over cattle sellers in terms of pricing. Traders at times buy the animals on credit with the promise of paying at a particular period

of time. However, some of them fail to pay at the appointed time. This situation does not stimulate cattle producers to sell to cattle dealers who want to buy on credit.

Lastly, poor roads negatively affect cattle marketing. The road network linking farming communities in northern Ghana is poor. These roads have uneven surfaces that do not permit easy movement of vehicles. The bad nature of these roads discourages transport owners and cattle dealers from visiting some cattle producing communities regularly. Those transport owners who manage to go there charge higher fares and the cattle dealers also offer low prices for the cattle they buy. This lowers the profit margins of cattle producers. This poses a serious constraint to the marketing of cattle because cattle producers cannot transport their animals to distant markets for sale where they would otherwise earn higher profits.

According to Nkosi and Kirsten (1993), inadequate infrastructure merely takes away from the farmer the limited incentives that are available to them. According to Bailey *et al.* (1999), inadequate cattle marketing infrastructure seriously impede the physical flow of animals, ultimately creating barriers to domestic trade. The lack of infrastructure can negatively affect the development of initiatives in rural areas. It was for this reason that Ruijs *et al.* (2004) argue that investments in infrastructure have positive effects on development.

Bailey *et al.* (1999) opine that the most important physical infrastructural weakness for rural cattle producers marketing relates to transport and holding facilities. Besides, the distance to the markets and the poor state of the roads in rural areas does not allow cattle producers to attract many cattle buyers. The poor road network is associated with high transport cost (Musemwa *et al.* 2008). The above constraints to cattle marketing ought to be address so as to increase the economic benefits accruing to both traders and producers.

2.3 Factors Affecting the Sale of Cattle

In cattle marketing, households can either sell their animals or buy from other producers. The sale of cattle by smallholder cattle producers in the market is likely to be affected by several factors. Among these factors are:

2.3.1 Household size

Montshwe (2006) in South Africa argues that a household is a useful unit of analysis given the assumptions that within the household resources are pooled, income is shared, and decisions are made jointly by responsible household members. Households are therefore often associated with the farm as a production enterprise (Ellis, 1993). An increase in the household size can influence the participation of farmers in cattle markets in two ways. Firstly, if the household practices are traditional in nature, the number of sons will have a negative effect on the saleable cattle. The use of cattle for traditional rites such as marriage will negatively affect the sales rate when there are many sons in a household. The reason is that many cattle would be reserved by cattle producers for marital purposes of their young sons. In some communities of northern Ghana, cattle are used for the payment of bride price. Secondly, larger households are likely to face an increase in household needs. Wurzinger *et al.* (2008) stress that households with many members are likely to have more needs and demands to be met. In northern Ghana, households with many members normally face an increase in demand for goods and services. Therefore, cattle producers with many household members are likely to increase the sale of cattle in order to meet the high demand for goods and services. This translates into an increase in market participation by cattle keepers.

2.3.2 Total herd size or number of cattle owned

The number of cattle owned by a farmer in the Northern Region of Ghana has a positive influence on his participation in the market. Mendelsohn (2006) argues that a farmer's participation in the marketing system has more to do with the number of cattle owned. According to Fidzani (1993) large herds generate a higher marketable surplus than small herds. Nkhori (2004) of Botswana asserts that when a household owns a large herd of cattle it tends to sell more. His findings suggest that a unit increase in the herd size will increase the probability of selling cattle by 4%. Heierli and Gass (2001) assert that the ownership of productive assets such as cattle can pave the way for participation in economic activities.

2.3.3 Cattle production system adopted

The productivity levels of cattle are lower in traditional farming system. The type of cattle production system adopted influences the reproductive efficiency of cattle. The lack of improved productivity in cattle discourages producers from marketing their cattle in the formal market. Montshwe (2006) estimates that the adoption of improved management system by cattle producers will result in the sale of cattle by 34%. Generally, cattle production can be done under three management systems. These are the extensive, semi-intensive and intensive system of rearing cattle.

The free range or Extensive system

The extensive system is the traditional way of rearing cattle in northern Ghana. This system allows cattle to graze on natural grassland under the care of herdsman. Cattle are usually exposed to cold winds and heat throughout the year. In the night, cattle are housed in kraals. One demerit of this system is the shortage of feed during the dry season. Animals are not also given any feed supplements but drugs are given to cater for common diseases. The

meat supply under this system is very low due to poor feeding, housing and health conditions.

Semi-intensive system

This is an improved system of cattle production. Well-organised houses are provided for animals and are designed to provide enough air circulation. The animals are given concentrated feeds to supplement the grazing and are placed on a well-planned health programme including routine dipping. The pasture is paddocked to allow rotational grazing which helps to reduce worm infestation. The housing prevents stray animals from entering the pasture to infest the cattle with worms and ticks. Salt lick is provided to top up the mineral requirement which they get from grazing.

Intensive system

This system is rare in Ghana. It is an expensive cattle management system. The cattle are well housed in pens with individual compartments. The pens contain feeding and watering troughs. Cattle are fed with concentrated feed, hay and silage. Salt lick is provided as a good source of minerals for cattle. Disease and pest control is given serious attention and cattle, therefore yield more meat. Musemwa *et al.* (2007) note that the development of improved management at cattle posts is a gradual process and producers will require proper advice from extension services on the best development sequence to be followed.

2.3.4 Access to Market information

Market price information can be an incentive for the sale of agricultural produce. Frick (1999) states that access to usable information can have a significant impact on the ability of small-scale farmers to generate sustainable profits. Coetzee *et al.* (2004) further stress that the provision of market information will strengthen farmers' negotiating ability during

transactions with buyers and consequently prevent possible exploitation by better informed buyers. A farmer uses market information such as trends, market conditions, type of product in demand, quality, quantity, price and market opportunities to make crucial management decisions and direct the farming operations (Coetzee *et al.* 2004; Stroebel, 2004). Makhura (2001) identifies access to market information as an important determinant of market participation. The proximity to market information centres influences both production costs and income derived from agricultural produce (Mendelsohn, 2006). The study by Montshwe (2006) in South Africa suggests that about 51% of receivers of market information participated in cattle markets. Montshwe (2006) therefore concludes that the provision of market information will make markets more accessible to cattle producers. In his findings, Sara (2010) estimates that in Ethiopia, about 80% of cattle keepers who received market information participated in the market. In the northern region of Ghana, the likely sources of farmers' market information include extension officers, radio stations, and colleague farmers.

2.3.5 Experience of farmer

The number of years a farmer kept cattle was used as a proxy for experience in keeping cattle. The long experience of a farmer would improve his knowledge of the factors that determine the sale of cattle. The age of the head of the household is an important factor in determining whether the household head benefits from the experience of an older person or has to base its decisions on the risk-taking attitudes of younger farmers (Makhura, 2001). Habtamu (2012) in Ethiopia estimates that about 53.6% of cattle producers in Ethiopia participated in the market because of their experience in cattle marketing. Nkhori (2004) also found that each additional year of a farmer in Botswana increases the probability of selling more cattle by 3.0 per cent. The experience of the farmer enhances his knowledge of the production, market and marketing system prevailing. According to

Musemwa *et al.* (2008), the higher the age of the head of a household, the more stable the economy of the farm household is, because older people have relatively richer experiences of social and physical environments as well as greater experience of farming activity. The experience of one operating a farm is important for risk taking. This knowledge of the market can be gained either through experience or agricultural marketing training.

2.3.6 Distance to market

In the Northern Region of Ghana most cattle producers are located in remote farming communities. They live many kilometers away from where cattle markets are situated. Therefore, long distances to the markets do not permit farmers to participate in markets as expected. In South Africa, Mahanjana *et al.* (2001) indicate that accessibility to local market has both positive and negative relationships with sales, because when markets are in close proximity farmers will sell more cattle and vice-versa. In a study by Hangaral *et al.* (2011), their results suggest that majority (61.2%) of respondents were likely to participate in markets that had an average distance of 10 km to 30 km from their villages. They also note that respondents were not likely to participate in markets that were farther than 30 km to 50 km. In Namibia, Nkhori (2004) notes that even if farmers are in areas with good road linkages, the distance from the markets tends to influence transaction costs. According to Kyeyamwa *et al.* (2008), distance has a major influence on transaction costs. Ouma *et al.* (2003), opine that the impact of distance which requires transport of cattle to markets results in imperfect and inefficient integrated markets and also reduces producer's profit margin as it results in high transaction costs. To reduce transaction costs for example, a farmer who is not having access to transport infrastructure would invite the buyer to come to his farm for the transaction.

2.3.7 Education level of farmer

The level of education of cattle producers²² and awareness of market conditions play a great role in market participation. Isabella and Steve (2007) opine that there is a positive relationship between the years of formal education and higher bargaining power for cattle keepers who are educated. Nthakheni (2006) asserts that producers who are literate are able to interpret market information and adopt new technologies to meet the market demands. Kalembera (2010) observes that cattle keepers in Uganda who attained some level of formal education adopt better cattle husbandry practices. These include the observance of recommended stocking rates and doing cattle keeping as a business, while the uneducated may not adopt such practices. Education enables cattle keepers to utilize their resources efficiently.

According to Nkhori (2004) of Botswana, education increases the ability of farmers to use their resources efficiently. He further emphasizes that the allocative effect of education enhances farmers' ability to obtain, analyse and interpret information. Highly literate households could access and utilize information at lower costs than non-educated households (Makhura, 2001). Educated cattle keepers are more likely to use market information more efficiently and negotiate for higher prices for their cattle resulting in selling larger proportions of cattle.

2.3.8 Non-farm income/Alternative Sources of Income

In the Northern Region, farmers do not only cultivate crops and keep livestock but also engage in non-farm income generating activities. Cattle producers who earn non-farm income are likely not to participate in market and sell their cattle to meet their household expenditures. However, the amount of the farmers²³ non-farm income in relation to his expenditures also matters. Asfaw and Jabbar (2008) argue that in Ethiopia households with

alternative sources of income were less likely to take the decision to participate in livestock market as sellers but rather positively participated in livestock market as buyers. According to Mendelsohn (2006), the majority of farmers in Namibian communal areas depended on off-farm sources for additional income and valuable safety nets. Nthakheni (2006) observes that access to other sources of income like those from social grants and employment may lead to the farmers not selling cattle to meet daily needs and production costs. The findings of a study by Kalemera (2010) in Uganda showed that an increase in cattle keepers' alternative sources of income by 100 Ugandan shillings would decrease the cattle sales rate by 36%. However, Teweldemedhin and Kafidi (2009) argue that off-farm income is a good injection to livestock farming.

2.3.9 Access to extension service

Extension officers' visits may allow them to offer farmers education on marketing services. The frequency of the visits made by an extension officer to a producer of cattle is critical. The provision of extension services to farmers directly affects their knowledge, productivity and income. The assumption is that an extension officer would not frequently visit the same farmer without at least sharing some useful agricultural information with him or her.

Makhura (2001) and Coetzee *et al.* (2004) observe that the interaction of farmers with extension officers tend to amongst other things, improve farmers' access to information and technical farming skills. Extension officers usually assist farmers to adopt new farming technologies that will lead them to obtaining higher yields.

2.3.10 Sales price of cattle

When a farmer is going to sell his cattle, he decides to whom and where to sell them. He is assumed to have set the price that he expects to receive from the buyer. The prevailing market prices influence the volume of cattle that would be supplied to the market. This notion is held by Alene *et al.* (2007) who assert that output price is an incentive for sellers to supply more in the market. Makhura (2001) in South Africa estimated that households who experienced higher prices sold 45% more of their cattle.

Correspondingly low prices reduce cattle keepers' chances of realizing profits from the enterprise. Gong *et al.* (2007) opine that when selling live animals directly to processors, cattle producers may face great uncertainty in the price. The price is determined only after the animal has been slaughtered. It may be impossible for a farmer to distinguish whether the reason for the low price is due to random shocks to the supply or demand function and to know what to do differently next time (Grosh, 1994).

2.4 Chapter summary

This chapter delved into cattle production and its economic importance in Ghana. The cattle marketing system, the cattle market actors and their roles, the main marketing channels, the structure and conduct of cattle marketing have been also been considered. Literature was reviewed on the constraints of cattle marketing. A review of the factors determining the sale of cattle has been provided in this Chapter.

There are numerous benefits associated with cattle production. Cattle provide food in the form of meat and milk. Other benefits include manure, draught power and for the payment of bride price. The cattle marketing system in Ghana is characterized by a lot of players or intermediaries such as the producers, traders, abattoir operators, truck drivers and food vendors. The presence of many actors give rise to a long chain of distribution which

deprives producers of higher profits. Cattle marketing channels can be traced from the farm-gate to primary markets, then to secondary markets and finally to terminal markets in Ghana. Farmers who sell their animals at the farm-gate do not gain maximum welfare. However, due to the existence of marketing constraints cattle sellers are unable to access other markets that could yield higher benefits to them. Many factors account for the sale of cattle in the Northern Region of Ghana.



CHAPTER THREE

3.0 STUDY AREA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter examined the area of study and the research methodology employed. This section considered the techniques for data collection and analysis. A description of the study area, data types and sources, sampling techniques and methods of analysis have been highlighted. The empirical model and the limitations of the study have been explored.

3.2 Study Area

The study was conducted in two districts (Bole and Sawla-Tuna-Kalba) in the Northern Region of Ghana. These districts are among the most important cattle producing areas in the Northern Region. Ten communities were chosen from each district for the study.

3.2.1 Profile of Bole District

The Bole District covers an area of about 4800 square km; out of the area of 70,384 per km² of the Northern Region. It has an estimated population of about 61,593 (PHC,2010). This population is made up of 31,022 males and 30,571 females. The population growth rate is about 3.6% per annum. The District capital, Bole, is the only biggest town in the district. Other major towns include Bamboi, Maluwe, Tinga, Tasilma, Mandari and Banda/Nkwanta. The district has a heterogeneous ethnicity. The major tribe is Gonja and the other tribal groups are Vagla, Brifor, Safalba, Mo, Dagaaba, Grushie, Fulani and the Pantras. Settlement creation in the district is largely on adhoc basis and usually near and around farms.

The district is drained by rivers such as the Black Volta, dams, streams and dug-outs. These sources of water serve the numerous needs of human beings and animals. These water bodies are predominantly used for agricultural and domestic sources. There are boreholes which provide potable water to the people.

The vegetation of the district consists of guinea savannah with grasses and interspersed with short trees. The vegetation is however dense to the south that borders the BrongAhafo Region. The natural vegetation in most parts of the district especially around the settlements has disappeared. What is seen today has resulted from the interference by man and animals through cultivation, grazing and exploitation for wood. Beyond the major settlements, the grasses are periodically burnt down especially during the dry season which clears the land of much of the vegetation. Grazing by animals has contributed to keeping the vegetation down.

The rains begin around May and end in October. The rainfall is seasonal and is characterized by a single maximum. The mean annual rainfall is about 1100mm. The average rainfall is very low. The months of June, July and August generally record the heaviest rainfall and also the greatest number of raining days. Rainfall is very much unpredictable meanwhile agricultural productivity is dependent upon it.

The district experiences extremes of temperature. The daily and annual range of temperature is wide. The coldest nights in the year are experienced in the months of December, January and February. During these months the air becomes dry, the atmosphere becomes hazy and one cannot see clearly due to the dust in the air. The day temperatures at this period are between 28°C and 40°C but under cloudless skies and the night can be very cold.

Agriculture is the mainstay of the people of Bole. Land in the district is owned by the indigenous citizens. They are mostly the Gonja. Land is either used for crops cultivation or for livestock farming and for purposes of building construction. The major crops grown in the district include maize, millet and sorghum as cereals, while groundnut, cowpea and bambara beans constitute the legumes. Root and tubers are yam and cassava. There are economic trees such as shea nut, dawadawa, teak, cashew and mango grown in the district. The farmers do not only cultivate food crops but also keep livestock, namely cattle, sheep, goats, pigs and poultry. Cattle which are the most prominent farm animals are raised on extensive grazing. In the Bole District, most cattle producers sell their animals in a market at Mandari. Mandari market is vibrant with commercial activities which attract traders from neighbouring Cote d'Ivoire. Table 3.1 shows the statistics on livestock raised by farmers in the Bole District.

Table 3.1 Statistics of livestock kept by farmers in Bole District (2006-2010)

Species	Estimated Numbers				
	2006	2007	2008	2009	2010
Cattle	6,766	6,094	9,592	12,119	12,361
Sheep	6,399	7,735	8,883	13,664	13,712
Goat	8,691	10,586	11,054	13,268	13,666
Pigs	4,317	3,112	5,169	5,812	6,044

Poultry	48,249	39,575	52,663	48,249	48,464

Source: http://mofa.gov.gh/site/?page_id=1595/

3.2.2 Profile of Sawla-Tuna-Kalba District

Sawla-Tuna-Kalba was carved out of the then Bole District in 2004. The total population of the district was estimated to be 99,865 (GSS, 2010). This population is made up of 48,269 males and 51,594 females. Out of the total population, eighty-five percent (85%) of the people lived in rural areas and fifteen percent (15%) lived in urban areas. Sawla, Tuna and Kalba are the main settlements, which qualify to be described as urban areas since their populations are above 5000. There are 268 settlements in the district with varying populations.

The predominant vegetation found in the District is just like any other part of the Northern Region. It is mainly Guinea savanna woodland with wide spread of trees. Some of the common economic trees found in the district are shea-nut, dawadawa, teak, kapok and mango. The natural vegetation of Sawla-Tuna-Kalba District has disappeared, especially around the settlements. This was due to the interference by man and animals through cultivation, grazing and exploitation for wood. In the dry season, the grasses in most part of the district are periodically burnt down to either clear the land for cultivation or hunting of animals. These activities have deprived the land of much vegetation cover and nutrients.

The drainage system of the district is like most rural and Savanna areas. Streams, dams and dugouts are the major sources of water to the human beings and animals. Most of these sources of water dry up during the dry season, leading to inadequate water supply

for human beings and animals. The shortage of water forces farm animals especially cattle to drink polluted water or move long distances to look for water.

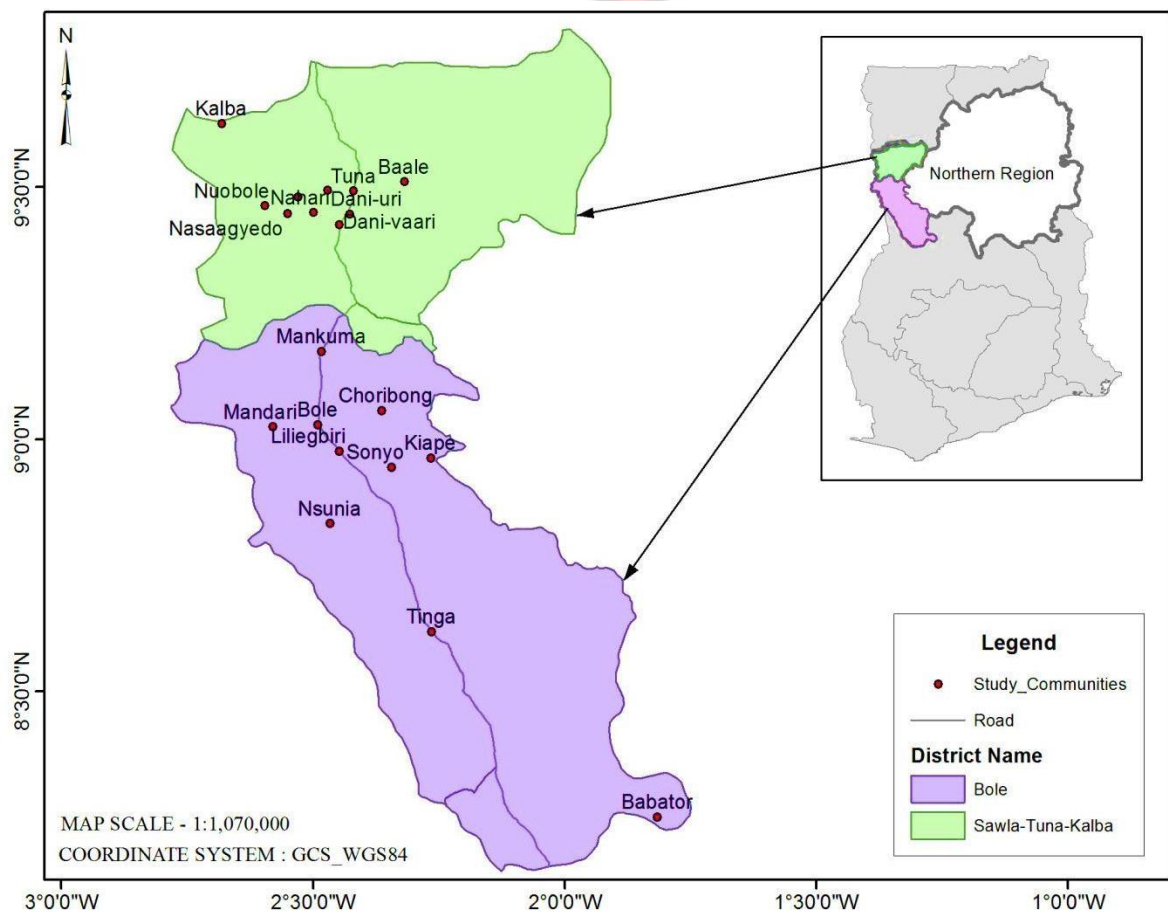
The climate of the district is the tropical continental type. There is only one rainy season in a year, which occurs between early May and late October. The highest rainfall is experienced between July and September. The monthly main rainfall ranges between 200 mm and 300 mm. The period between November and April is the dry season. This season is characterized by the cold harmattan winds with concomitant airborne diseases.

In terms of temperature, the district experiences extremes of it. The coldest nights in the year are experienced in the months of December, January and February. During this period, the air becomes dry and the atmosphere becomes hazy and one cannot see clearly due to the dust in the air. The day temperature within the same period is between 28°C and 40°C but under cloudiness skies. The night can be very cold when the temperature is below 28°C. The temperature suddenly rises in the months of March, April and May when it exceeds 30°C. The nights are usually hot and people prefer to cook, eat and sleep outside. But when the rains start, the mean temperature begins to fall again.

Almost all the settlements in the district are linked by feeder roads. However, these roads are not motorable especially during the rainy season. The poor state of the roads results in high transport cost when farmers are transporting their animals including other farm produce to markets. Agriculture is the main occupation for the people of Sawla-TunaKalba District. Due to the availability of relatively fertile agricultural lands, about 85% of the economically active population (18-54 years) in the district is involved in various farming activities. The major food crops cultivated by farmers include yam, maize, cassava, sorghum, groundnuts, rice, millet, cowpea, bambara beans and soya beans. Several farmers do mix cropping. The production of livestock, especially cattle is an integral part of their

agricultural system. In the months of January to March, cattle usually experience unfavourable weather conditions as a result of bush fires and draught. Cattle become lean during such times owing to inadequate pasture for grazing and shortage of water for drinking. Cattle farmers who sell their animals during the dry season suffer low marketing margins and lower incomes. A map of Northern Region is shown below in Figure 3.1 indicating the study areas with arrows.

Figure 3.1 Map of sampled Districts in the Northern Region of Ghana



Source: Geomatic Engineering Department of KNUST, 2015

3.3 Research Methodology

3.3.1 Data types and sources

Both primary data and secondary sources of information were used for the study. Primary data were collected by the use of questionnaires and interview from cattle farmers in the Bole and Sawla-Tuna-Kalba Districts. Secondary data sources such as books, Ministry of Food and Agriculture (MoFA), journals and the internet were consulted in gathering the relevant information for the study.

3.3.2 Sample size and Sampling procedure

The study targeted all cattle farmers in the Bole and Sawla-Tuna-Kalba Districts of the Northern Region. One hundred and twenty (120) farm households were selected through multi-stage sampling for the study. At stage one, two (2) districts were purposively selected to reflect cattle producing areas in the Northern Region of Ghana. At stage two, ten (10) cattle producing communities from each district were selected by purposive sampling technique to reflect the households that kept cattle in the area. At stage three, the simple random method was employed in the selection of six (6) cattle producers from each community based on a sampling frame provided by MoFA officials at the districts.

Table 3.2 shows the number of communities and the number of households selected from each district for the study.

Table 3.2 Selected communities and household heads for the study

Bole communities	Number of household heads	Sawla communities	Number of household heads
Bole	6	Baale	6
Mandari	6	Kalba	6
Tinga	6	Dani-Uri	6

Mankuma	6	Dani-Vaari	6
Choribang	6	Dakompelaayiri	6
Babator	6	Tuna	6
Nsunia	6	Sagbayiri	6
Sonyo	6	Nasaa-Gyedo	6
Kiape	6	Nahari	6
Liliegbiri	6	Nuobole	6
TOTAL	60	TOTAL	60

3.3.3 Methods of data collection

Data were collected using pre-tested and structured questionnaire. The structured questionnaire consisting of both open ended and closed ended questions was the major instrument used for the data collection. The questionnaire was designed to specifically capture information and enabled the study to identify factors that could influence the farmers' decision to sell his cattle in the market. In addition to questionnaires, other methods of data collection such as observation and key informant interviews with extension officers and cattle traders were also used. Focus group discussion was also used to gather information about the constraints cattle farmers were encountering.

Questionnaires were administered in the vernacular language with the assistance of enumerators. The questionnaire sought information on household size, household head's gender, age, marital status, education level of household head, tribal and religious affiliation, experience in cattle keeping, cattle management systems, visits by extension agents, the number of cattle sold per year, the sales price, the total value of milk sold, the marketing channels frequently used, number of cattle owned (total herd size), access to market information; the distance to the market, off-farm income, and the key constraints faced by cattle keepers among others. Personal face-to-face interviews were conducted using the questionnaire.

3.3.4 Data Analysis

Data from questionnaires were coded and entered into the Statistical Package for Social Sciences (SPSS) version 20 and captured into STATA software version 10 for the analysis.

The data analysis included inferential analysis and descriptive statistics such as percentages, mean, frequency tables, pie charts and graphs. A five-point likert scale ranking was used to examine the main reasons why farmers keep cattle. Added to this, descriptive narration was employed to identify the key players in the cattle market chain and the channels of distribution available to farmers in the Northern Region.

Furthermore, frequency and percentage were used to determine the extent of market participation by cattle keepers in the Northern Region of Ghana. Tobit model estimation was used to examine the important factors that influence cattle producers' market participation in the Northern Region of Ghana. Lastly, to examine the key constraints that cattle producers faced in the Northern Region of Ghana, the likert scale was adopted for that purpose.

To determine the sales rate (dependent variable), the study adopted a formula provided by Asfaw and Jabbar (2008) as expressed below:

Sales Rate (net commercial off-take) = $\frac{\text{Sales} - \text{Purchases}}{\text{Opening stock} - \text{Ending stock}} \times 100\%$

Where:

The Opening stock is the number of cattle available at the kraal at the beginning of the year 2013. The Ending stock is the number of cattle available at the end of the year. The sales in this formula refer to the number of cattle that were sold by the cattle producer within

the year under study while the purchases are the numbers of cattle bought by the farmer within the year. The average stock is computed as a half of the sum of opening stock and ending stock over the past year of 2013.

Asfaw and Jabbar, (2008) argue that in estimating cattle farmers' participation in the market of live animals, net commercial off-take rather than gross commercial off take is a more relevant parameter to be estimated. As a result, the researcher estimated the net commercial off-take (Sales Rate) which is given as the sales minus purchases made by the households as a percentage of the average stock.

3.4 Econometric model specification

To examine the factors influencing the Sales Rate by cattle farmers, a Tobit regression model was fitted to the field data by using the maximum likelihood estimation procedure. The Tobit model was deemed appropriate for the analysis of the determinants of sales rate because some cattle farmers will sell their cattle, while others will not sell any cattle at all. The dependent variable (sales rate or proportion of cattle sold) is censored at a lower limit of zero (Tobin, 1958). According to Maddala (1992) the Tobit model is a censored regression model. Observations on the latent variable y^* are missing (or censored) if y^* is below (or above) a certain threshold level. This model has been used in examples where the dependent variable is observed to be zero for some individuals in the sample.

The Tobit model is specified in Maddala (1992) and Hobbs (1997) as follows:

$$y^* = \beta'X + \epsilon \quad (1)$$

Where y^* is the latent variable (Sales rate),

X is a vector of independent explanatory variables and ε_i

is the error term. The observed sales can be denoted as: y_i

$$y_i = L_0 \text{ if } y_i^* \leq L_0$$

$$y_i = y_i^* \text{ if } y_i^* > L_0 \quad (2)$$

Where L_0 is the unobserved lower limit of zero (i.e. selling is zero). The likelihood

function for this model is

$$L(\beta, \gamma | Y, X, L_0, 0) = \prod_{i=1}^n \left[\frac{L_0}{y_i^*} \right]^{1 - I(y_i^* > L_0)} \left[\frac{y_i^*}{y_i^* - L_0} \right]^{I(y_i^* > L_0)} \exp(-\beta' x_i) \quad (3)$$

Where $\prod_{i=1}^n \left[\frac{L_0}{y_i^*} \right]$ is the product over L_0 lower limit observations of smaller or no sales.

$\prod_{i=1}^n \left[\frac{y_i^*}{y_i^* - L_0} \right]$ the second product over the non-limit observations reflecting different level of sales.

After maximizing the log of (3) to calculate the effects of changes in the explanatory variables on the dependent variable, the expectation of y can be derived. The conditional expectation of y , based on the information that y^* lies above the limits,

$$E(y | y^* > L_0) = \beta' x + E(y | L_0 < y^* < \infty) = \beta' x + \frac{L_0}{\beta' x + L_0} \quad (4)$$

Where $\beta = \frac{\partial \ln L_0}{\partial \beta' x} / \frac{\partial \ln L_0}{\partial \beta' x}$ with corresponding definition for γ .

The unconditional expectations of y without restricting y^* to lie below the lower limit is,

$$E(y) = P_y L(0). L_0 = P_y (y^* = L_0). E(y | y \geq L_0) = L_0 + \beta' x + \sigma \quad (5)$$

Substitution in the values for L_0 (zero), the effect of changes in the explanatory variables on the dependent variable becomes

$$\frac{\partial E(y)}{\partial x} = \sigma \beta + (prob[y \geq 0]) \sigma \quad (6)$$

Equation (6) gives the marginal effects of changes in the explanatory variables on the sales rate, given the censoring of the dependent variable. The effect of a change in the explanatory variables on the level of sales rate consists of two parts. Firstly, it is the change in the dependent variable of those observations over the limits, weighted by the probability of being over the limits. Secondly, the change in the probability of being above the limits, weighted by the expected value of the dependent variable if it is above the limits (Hobbs, 1997). Based on the above, the empirical model for the determinants of Sales Rate was specified as:

3.4.1 Empirical model

The multiple linear regression model is specified as;

Where

$$Y = f(X_1, X_2, X_3 \dots X_n)$$

Y = Sales rate (dependent variable)

X_1 = Household size

X_2 = Education level of household head

X_3 = Access to market information

X_4 = Distance to the nearest market (km)

X_5 = Sales price of cattle

X_6 = Access to non-farm income

X_7 = Experience of farmer (number of years)

X_8 = Number of cattle owned (total herd size)

X_9 = Improved cattle production system

X_{10} = Access to extension service

Definitions of the explanatory variables and their a priori expected signs have been provided in Table 3.3.

Table 3.3 Variable definition and a priori expectation

Variable	Definition of variable	Apriori expectation
HHSIZE	Household size (number of household members)	+
MKTINFO	Access to market information (1= access to market information; 0 = otherwise)	+
DTNCMKT	Distance to nearest market (km)	-
SPRICE	Sales price of cattle (GH¢)	+
NONFARM	Income received from non-farm activities (GH¢) per annum	-

TTHERD	Total herd size (number of cattle owned)	+
EXPER	Experience of farmer (years of keeping cattle)	+
IMPROD	Improved cattle production system (1= yes; 0 = otherwise)	+
EXTSERVE	Extension service (1= access to extension service; 0 = otherwise)	+
EDUHH	Education level of farmer (years of formal schooling)	+/-

3.5 Measurement of variables included in the model

Household size: It was coded as a continuous variable. Household size was expected to positively influence the market participation of farmers and sales rate of cattle. This is evident from the many consumption needs of larger households who may have to sell many cattle in order to meet their expenses.

Access to market information: This was treated as a dummy variable (access to information=1 and zero if otherwise). Access to market information was measured by the ability of the household's head to receive market price information before selling his cattle. It is hypothesized that if a farmer has better access to market information he would make a high supply of cattle to the market for sale. Access to market information was hypothesized to have a positive relationship with the sale of cattle.

Distance to market: It was treated as a continuous variable. It measured the distance cattle sellers have to travel before reaching the market. Farmers who are nearer to the market will incur less transportation costs while those far away will incur more costs. Distance to market was hypothesized to have a negative relationship thereby resulting in a decline in the sales rate.

Cattle production system adopted: It was treated as a dummy variable. It took the value of 1 for the adoption of improved cattle production system and zero if otherwise. This variable sought information on whether smallholder cattle producers adopted an improved method of cattle production or not. It was expected to positively influence the farmers' sale of cattle if an improved system of cattle production was adopted. The assumption is that farmers who adopt intensive and semi-intensive methods will be able to increase their herd sizes and supply more cattle to the market.

Total herd size or the number of cattle owned: It was a continuous variable measured in number of cattle. This variable was measured by asking cattle producers how many cattle they owned. The variable was expected to have a positive relationship with the sale of cattle. Cattle farmers who produce or own more cattle were likely to supply more to the market for sale than those who produce less.

Sales price of cattle: It was a continuous variable. This variable was expected to have a direct relationship with cattle producers' sales rate. When the price is high in the market, farmers are motivated to take their cattle to the market for sale. The prices were measured in Ghana cedis (GHC).

Non-farm income/Alternative sources of income: This was measured as a continuous variable. Cattle producers' total amount of income obtained from non-farm activities was considered. Non-farm income was hypothesized to have a negative relationship with the sale of cattle because the income needs of farmers can be met from other sources of income instead.

Education level of household head: It was measured as a continuous variable. It referred to the number of years of formal schooling of the respondent. Formal education was hypothesized to positively influence the sale of cattle by the household head. Literate

household heads are likely to adopt new ideas and learn about market price information and this enhances farmers' willingness to produce more and increase the volume of sales.

Experience of farmer: It was a continuous variable measured in number of years. This variable was expected to have a positive influence on cattle farmers' sales rate. As the years go by, longer experience of cattle farmers enable them to be abreast of marketing dynamics. The experience of farmers may let them gain better knowledge of the market situation and adopt proper marketing strategies.

Access to extension service: It was measured as a dummy variable. It took the value of 1 = access to extension service and 0 = no access to extension service by the household head. Extension service was hypothesized to have a direct relationship with farmers' sales of cattle because extension officers usually introduce farmers to improved methods of production and marketing services.

3.6 Limitations of the study

The researcher encountered some difficulties in the course of the study. There were no proper records on cattle producers' activities. The absence of proper records on cattle farmers' activities made it quite difficult for the researcher to obtain adequate data on the opening and closing stocks of cattle. Added to this was the problem of different sizes of cattle which were treated the same way. Cattle vary in sizes and their selling prices cannot be the same. However, the sales rate was largely measured in terms of the number of animals sold per year instead of the actual amount realised from the sale of cattle. This is likely to affect the results since farmers selling the same number of cattle of different sizes were treated the same way based on the method used for the analysis.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

The results and findings of the study are presented and discussed in this Chapter. A description of the socio-economic characteristics of cattle producers has been provided. The reasons why farmers keep cattle have been discussed. Furthermore, the constraints faced by cattle producers have been analysed as well as the factors influencing the sales rate of cattle.

4.2 Socio-economic characteristics of household heads in the study area

This section gives a descriptive analysis of the socio-demographic characteristics of sampled cattle keepers in the Northern Region of Ghana. The socio-demographic characteristics of sampled households included the respondent's level of education, age, household size, gender, religion and tribe.

4.2.1 Age, household size, education level and gender of household head

The various characteristics of the Respondents selected for the study were expected to have an influence on the sale or marketing of cattle. Table 4.1 provides the descriptive statistics on age, educational level and the household size of respondents.

Table 4.1 Age, Household size and Education Level of Cattle keepers in 2013

Characteristic	N	Minimum	Maximum	Mean	Std. Deviation
Age (in years)	120	25	59	43.67	8.31
Household size	120	3	17	8.32	3.23
Education level	120	4	15	7.18	2.61

Source: Survey data, 2013

As depicted in Table 4.2, 95% of the respondents interviewed in the Bole District were males while 5% represented female respondents. In the Sawla-Tuna-Kalba District all the respondents were males who headed the households. This implies that the production of cattle is a male dominated agricultural activity in the study areas. Kalempera (2010) notes that majority of the household heads were males in Uganda.

Table 4.2 Gender of respondents by District in April 2013

	Bole		Sawla-Tuna-Kalba		Pooled Sample	
Sex	Freq.	%	Freq.	%	Freq.	%
Male	57	95	60	100	117	97.5
Female	3	5	-	-	3	2.5
Total	60	100	60	100	120	100

Source: Survey data, 2013

4.2.2 Religious and Ethnic affiliation of respondents

Table 4.3 provides the distribution of respondents according to their religious affiliations. The respondents who belong to Islamic religion were the majority, 59%, followed by Christianity, 22% and traditional believers constituted only 19% of the respondents in the study area. In the Sawla-Tuna-Kalba District, the religion of the majority of respondents was traditional.

Table 4.3 Religious affiliation of respondents in the study area

	Bole		Sawla-Tuna-Kalba		Pooled Sample	
Religion	Freq.	%	Freq.	%	Freq.	%
Islam	34	57	9	15	43	36
Christianity	14	23	22	37	36	30
Traditional	12	20	29	48	41	34
Total	60	100	60	100	120	100

Source: Survey data, 2013

Ghanaians belong to different types of ethnic groups distributed throughout the nation. Ethnic distribution of respondents has been provided in Table 4.4. In the Bole District, the sample of cattle producers involved in the study has Gonja as the predominant ethnic group. While the Brifor is the predominant ethnic group captured in the sample of cattle keepers in the Sawla-Tuna-Kalba District.

Table 4.4 Distribution of respondents by tribe

Ethnic group	Bole		Sawla-Tuna-Kalba		Pooled Sample	
	Freq.	%	Freq.	%	Freq.	%
Gonja	30	50	4	7	34	28
Brifor	9	15	39	65	48	40
Dagaaba	4	7	8	13	12	10
Vagala	2	3	6	10	7	6
Others	15	25	3	5	19	16
Total	60	100	60	100	120	100

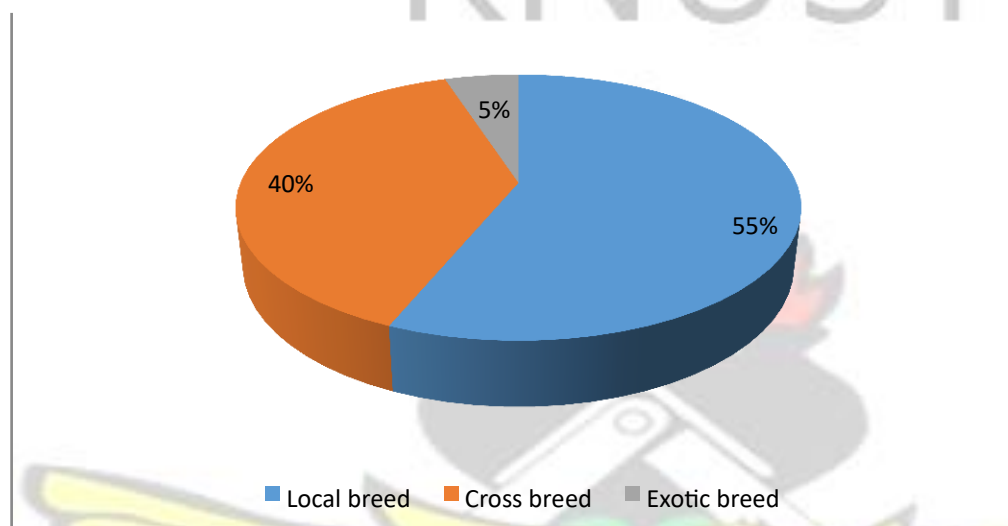
Source: Survey data, 2013

4.2.3 Herd composition and structure

Figure 4.1 shows that 55% of cattle producers kept indigenous breeds, 40% raised cross breeds and only 5% produces exotic breeds. Respondents who kept local breeds or indigenous breeds of cattle explained the advantages of keeping them. In their opinion, the indigenous breeds are hardy, can survive on poor grazing lands and endure extensive walk to water points and in search of grazing lands although they mature slowly and have low productivity rate. Similar reasons were cited by Kalemera (2010) in his study on the factors affecting the level of commercialization among cattle keepers in the pastoral areas of Uganda. In Uganda, Mpairwe (2005) notes that pastoralists carry out breed improvement to increase productivity especially milk output following the introduction of Holstein-Friensian cows to rehabilitate the dairy sector and meet urban market demands. Cattle

producers indicated their preference for cross breeds to pure exotic breeds because of their ability to attract higher prices than local breeds. The cross breeds have better body weight. They can also tolerate harsh climatic conditions and are resistant to diseases as compared to pure exotic breeds.

Figure 4.1 Composition of breeds of cattle raised by respondents



Source: Survey data, 2013

4.3 Respondents' reasons for keeping cattle

Table 4.5 provides the various reasons why farmers in the study area keep cattle. The results show that income (68.6%) is the main motivation for cattle rearing among the respondents. This means that cattle are kept to serve the income needs of farmers in the study area. These needs may include consumption expenditure, payment of children's school fees and meeting other social responsibilities.

Table 4.5 Reasons why farmers keep cattle

Variable	SD (1)	D (2)	U (3)	A (4)	SA (5)	Mean	Std. dev.
						Rank	
Prestige	58(49.2)	15(12.7)	8(6.8)	15(12.7)	4(3.4)	1.63	1.36

Draught	9.0(7.5)	38(32.2)	15(12.7)	20(16.9)	14(11.9)	2.37	1.61
Store of wealth	1.0(0.8)	11(31.4)	37(25.4)	30(11.9)	14(11.9)	2.75	1.65
Security	0(0.0)	2(1.7)	14(11.9)	49(41.5)	44(37.0)	3.92	1.34
Income	3(2.5)	4(3.4)	1(0.8)	25(21.2)	81(68.6)	4.86	4.79

N = 120 SD (1) = Strongly Disagree, D (2) = Disagree, U (3) = Undecided, A (4) = Agree, SA (5) = Strongly Agree

Figures in parenthesis are percentage responses.

Source: Field survey, 2013.

A five-point likert scale was employed in ranking the reasons why farmers kept cattle. A score of 1 was assigned to the reason that farmers strongly disagreed to be why they kept cattle. A score of 2 implied that farmers disagreed and a score of 3 meant that they were undecided. A score of 4 and 5 implied agreement and very strong agreement respectively among cattle farmers on the reasons why they kept cattle.

The production of cattle in northern Ghana serves many purposes. Düvel (2001) asserts that individuals keep cattle in order to realise several needs and can subsequently be considered to be more attractive than if it had only one purpose. It may be evident from the results of the study that most farmers kept cattle with the main aim of obtaining income with a mean score of 4.86. The provision of security/insurance (37.3%) with a mean score of 3.92 was cited by respondents as the next reason why they kept cattle. This was followed by keeping cattle for the purpose of store of wealth and finally draught power/ploughing (11.9%).

The findings of the present study are consistent with Nkhori (2004) who observed in Botswana that the principal contribution of cattle to rural households is the provision of family income. Nkhori (2004) also observed that most rural households have few assets apart from livestock, particularly cattle which they rely on in times of need for cash income. Kosgey *et al.* (2008) also observe that most pastoralists in Kenya kept livestock

(small stock) for regular cash income or as an insurance against emergencies.

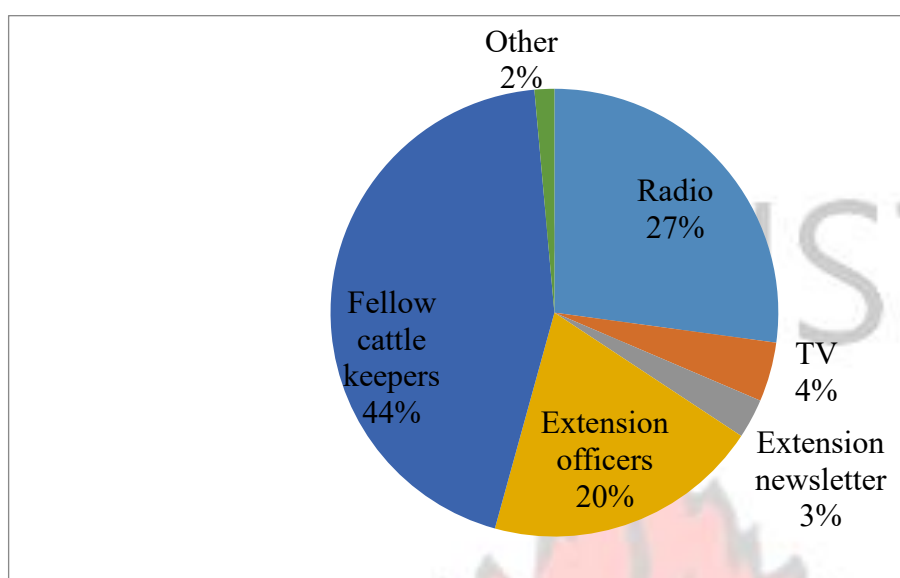
Serunkuuma and Kent (2001) in their study observe that pastoralists in Nyabushozi, Uganda used cattle as store of wealth instead of banking service.

Fafchamps (1998) of Niger contends that herders will tend to cling onto their assets as highly imperfect forms of insurance unless they have access to alternative saving institutions so that they can liquidate cattle if they fear losing their animals. Daniel (2008) points out that the pastoralists of Borana, Ethiopia sold their cattle to meet critical cash needs. The results of the current study suggest that the respondents attached very little importance to keeping cattle for prestige.

4.4 Market information

Figure 4.2 provides the sources of cattle producers' information. It was observed from the field survey that 44% of cattle producers received market information from fellow cattle producers and 27% got it through FM radio stations. This is possible because of the proliferation of FM radio stations in the country in recent times. It was also observed that 20% of cattle producers received information from extension officers, 4% received it from Television stations while 3% obtained it from extension newsletters.

Figure 4.2 Major sources of market information among cattle keepers



Source: Survey data, 2013

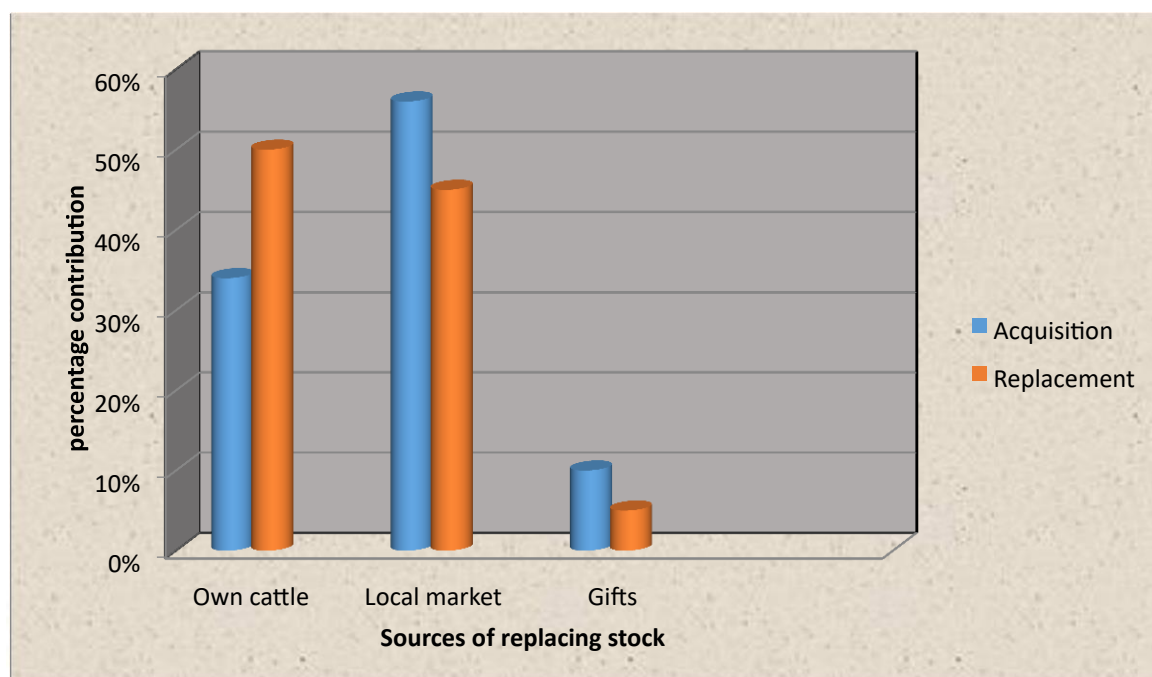
Cattle producers usually share information on cattle production and marketing among themselves. This implies that cattle producers rely on information from experienced cattle producers to market or manage their farms. Getting information from fellow cattle producers is ready available and cost free. Apart from obtaining information from fellow cattle producers, the use of radio set is cost effective and can easily be acquired by cattle producers. In spite of the introduction of modern methods of information dissemination, cattle producers do not make extensive use of these sources. It likely that some cattle producers may not have access to other sources of information such as radios, television sets, extension newsletters and extension officers.

4.5 Major ways of cattle replacement/acquisition among cattle producers

In Figure 4.3 it is estimated that about 56% of cattle keepers acquired their cattle by buying from the local market, 34% obtained theirs through inheritance and 10% of the respondents got their stock through gifts. It was also revealed that 50% of cattle keepers replaced their

herding stock through the births of their own cows, 45% bought them from the local market and 5% replaced their stock through cattle exchange.

Figure 4.3 Ways of restocking cattle by respondents



Source: Survey data, 2013

It was observed that respondents depended mainly on the birth of cattle for restocking, expanding and maintaining the size of the cattle herd. Cattle producers scarcely buy animals from the local market for restocking. The study of Wurzinger *et al.* (2008) corroborates with the findings of the present study. They report that majority of pastoralists in Uganda replace their breeding stock from their own herd and to a lesser extent through purchases at the local markets. Wurzinger *et al.* (2008) further observe that cattle keepers in Uganda have generous compensation for one another in times of total loss of cattle. If a cattle producer loses all his cattle through disease, he has the assurance of getting at least a partial compensation from friends and relatives. Relatives and friends would donate animals to the one who has lost all his cattle. They exercise this kind gesture in the hope that should they ever suffer such losses, those who had been helped will reciprocate.

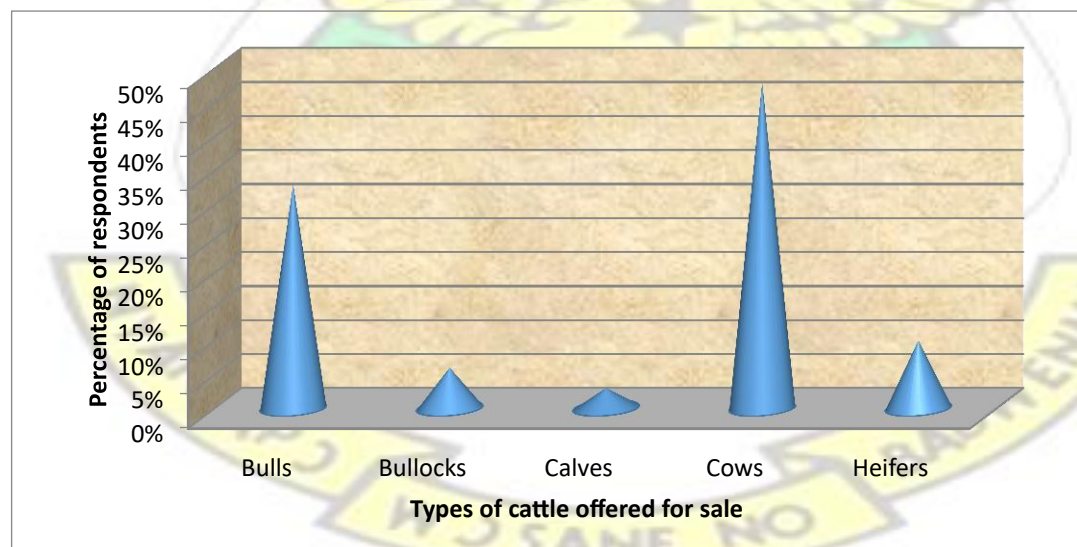
Barrette *et al.* (2004) observe a similar practice among the pastoralists in Ethiopia and this may be partially due to the lack of cash liquidity since most cattle keepers sell to satisfy their immediate cash needs.

However, the situation in Ghana is different. Cattle producers do not compensate one another for losing all their cattle through mortality resulting from disease or theft. Sympathizers may only give verbal consolations to their counterparts who are hit by calamities. However, there are instances where some cattle producers can give cattle to their relatives and friends as gift.

4.6 Types of cattle offered for sale among cattle producers

It is evident from Figure 4.4 that about 48% of the respondents sold their cows. This was followed by 33% of respondents who sold their bulls, while 10% of them sold their heifers.

Figure 4.4 Type of cattle mostly offered for sale



Source: Survey data, 2013

It is important to note that the maturity of animals counts when it comes to their sale. Kalemera (2010) argues that the age of farm animals can influence their sale. In the Northern Region of Ghana due to low levels of nutrition coupled with the slow growth of local breed of cattle, animals do not reach marketable age in good time thus contributing to a low off-take rate.

Cattle producers owned herds that were dominated by cows (48%). Therefore, cattle keepers sold culled cows because they are the majority of cattle. The sales were also influenced by the magnitude of the cash needs of the respondent cattle keeper, namely, payment of school fees and medical bills which mostly require large sums of money and immediate payment. Kalemera (2010) observes that pastoralists in the cattle corridor of Uganda kept dual purpose breeds (i.e. mix of milk and meat animals) therefore pastoral herders offer cull cows, low or poor milk producing cows and infertile heifers for sale as a way of balancing the market preferences. Accordingly, cattle producers sell these animals against the fundamental consideration of securing the future reproduction of the herd and maximizing milk flows. John (1987) argues that when the need arises for cattle owners to sell cattle, they prefer to restrict off-take to non-productive elements such as sterile heifers, non-breeding males and bull yearlings. Kalemera (2010) maintains that the sale of immature bulls was reported to be influenced by the farmers' strategy to reduce pressure on the pastures, reduce milk consumption and allow quick improvement in the body condition of lactating cows. Marshall (2000) observes that when cattle keepers are in critical need of cash, they may be forced to cull male animals shortly after birth to reduce competition with humans and female calves for milk. However, Marshall (2000) notes that when cows are sold and bulls are weaned to reduce pressure on grazing pastures, usually they fetch low prices compared to when they have been fattened and sold at a later date when prices are high. In the Northern Region of Ghana for example, cattle dealers can buy

weaned bulls and castrate them. Then, groom them as bullocks and use them for ploughing their farmlands. Cattle dealers can also purchase cows with poor body condition, then fatten and sell them at better prices at a later time.

4.7 Key players in the cattle market chain

In the Northern Region, the players along the cattle marketing chain perform many business activities. The players in chain include primary producers, middlemen and wholesalers among others. Their activities include the movement of cattle from the production areas (cattle keepers) to the final consumers. The actors at various cattle marketing channels perform different roles. All these activities by market actors have implications on the pricing mechanism of the animals. The roles played by actors in different types of cattle markets are spelt out in Table 4.6 below.

Table 4.6 Key players and their roles in the cattle market chain

Type of market	Activities of key players in marketing channels
Farm gate	Most of the animals offered for sale are directly owned and sold by primary producers, either to other producers or to cattle collectors and small-scale traders, for sale in primary markets or for breeding purposes.
Primary	Animals sold by producers or small-scale traders are bought by other producers, medium-scale traders and cattle collectors, for fattening, breeding, onward sale to secondary and terminal markets and for slaughtering.
Secondary	Cattle are sold by medium-scale traders to large-scale traders who purchase animals for onward sale in terminal markets.
Terminal	Final markets located in major cities and capitals, where large-scale traders sell animals either to middlemen or butchery agents for slaughter in local abattoirs, or to export traders.

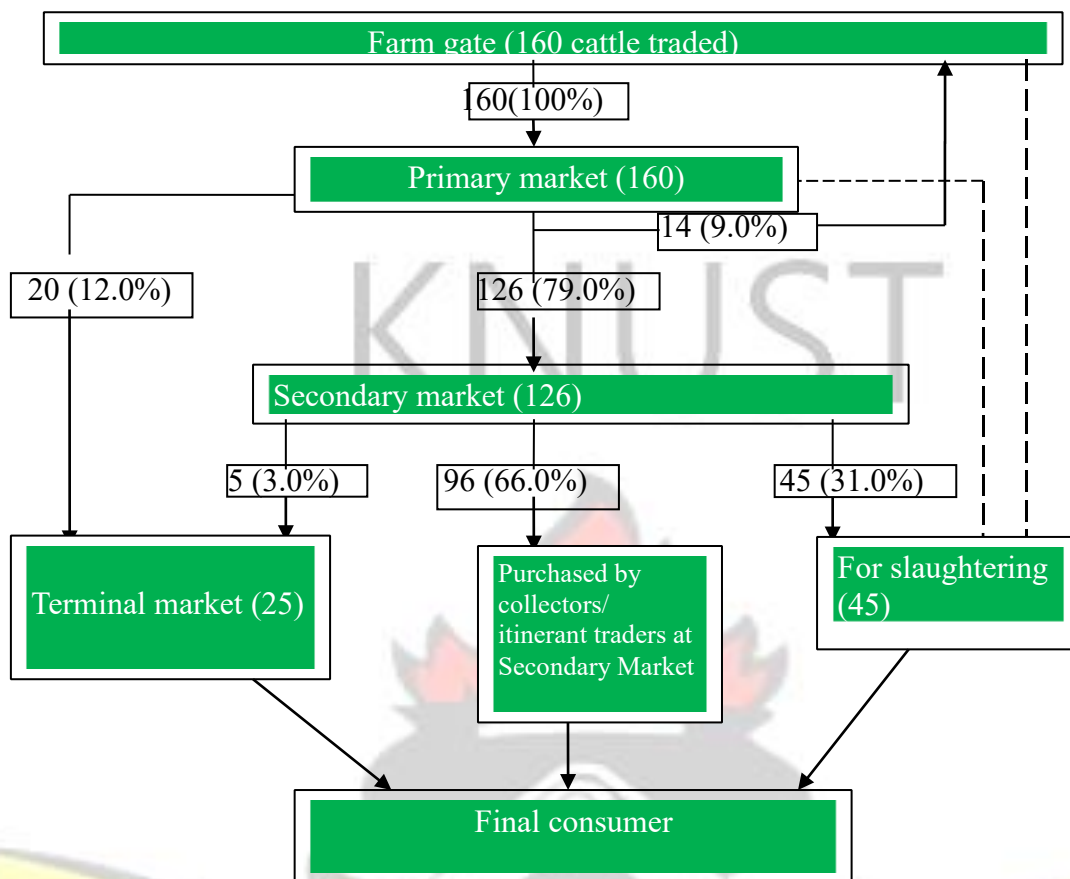
Source: From study area, 2013

The trade in cattle involves the transport of live animals from one location to another. The transportation of cattle from one place to another is the major value added activity of collectors, traders and abattoir dealers. It was observed that both cattle producers and traders were engaged in the sale and purchase of animals. Cattle were mostly sold by producers on individual basis and they sold their animals to buyers who offered higher prices. This was a strategy of earning more profits on their sales.

4.8 Main marketing channels of distributing cattle

The marketing channel for cattle distribution in the Northern Region of Ghana is not a definite one. As such, the flow of cattle through the channels reflected efforts by producers to sell their animals through channels that provided better prices and the strategies of traders to buy through channels where they had a higher chance of making more profit. The channels of distribution and percentage flow of animals through each of the channels are shown in Figure 4.5.

Figure 4.5 Main marketing channels of cattle distribution and percentage of cattle flows from one channel to the other



Source: Survey data, 2013

From the farm gate, 160 (100%) cattle were traded in collection or primary markets. Market actors from secondary market bought one hundred and twenty-six (79.0%) cattle from primary markets. Twenty (12.0%) animals flowed to terminal market while 14(9.0%) cattle were bought by cattle producers at the farm gate probably for breeding or traction purposes. Finally, from the secondary market, 5(3.0%) cattle were sold to actors from terminal market, 96 (66.0%) to cattle collectors or itinerant traders and 45 (31.0%) sold to other dealers for purposes of slaughtering. The dotted line arrows imply that those who are buying cattle for slaughter can also purchase them directly from the farm gate or primary markets.

The marketing channels of cattle in the Bole and Sawla-Tuna-Kalba Districts begin with the collection of animals from farm gates and surrounding village markets (i.e. primary or collection markets). Primary markets operate on weekly basis. At the farm gate or primary

markets cattle are sold to middlemen who transport them to secondary or regrouping markets. These are fairly thriving markets at Mandari and Kalba in the Bole and Sawla-Tuna-Kalba Districts respectively. On reaching secondary markets, cattle are sometimes sorted into groups based on body condition, sex, age among other characteristics. In these markets, cattle are then sold to wholesalers, butchers and final consumers. From secondary markets, cattle are further transported to terminal markets in capital cities such as Kumasi, Accra and Tema. Terminal markets are usually in the form of slaughter houses in big towns and cities in Ghana, abattoirs and cross border trade. From terminal markets, animals are bought by final consumers.

Table 4.7 Summary descriptive statistics of Sales Rate

	N	Minimum	Maximum	Mean	Std. Deviation
Opening stock	120	6.00	28.00	10.79	4.41
Closing stock	120	4.00	25.00	7.42	4.64
Purchases of cattle	120	2.00	21.00	8.61	3.03
Sales of cattle	120	1.00	16.00	4.23	2.65
Sales Rate	120	0.00	2.00	0.34	0.38

Source: Survey data, 2013

4.9 Cattle Sales Rate analysis

Table 4.7 provides summary statistics of the explanatory variables used in the model.

The average number of cattle owned was 28.0 while the mean price of cattle was GH¢ 948.4. The average non-farm income amounted to GH¢ 770 while the mean household size was approximately ten (10) members. The longest distance of a farmer to the cattle market was 250 kilometres in the study area.

Table 4.8 Summary statistics of variables fitted into the regression model

Variable name	N	Minimum	Maximum	Mean	Std. Deviation
Household Size	120	4.00	28.00	10.00	4.54
Education level	120	6.00	17.00	9.31	1.10
Distance to market (km)	120	1.00	250.00	20.22	44.66
Average price of cattle sold (GHC)	120	620.00	2500.00	948.41	347.81
Non-farm income(GHC)	120	500.00	1450.00	770.12	247.04
Experience (in years)	120	29.00	59.00	43.67	8.31
Improved production sys.	120	0.00	1.00	0.20	0.40
Number of cattle owned/herd size	120	2.00	200.00	28.54	36.46
Market information	120	0.00	1.00	0.38	0.49
Extension Service	120	0.00	1.00	0.13	0.32

Source: survey data, 2013

Table 4.8 provides information on cattle sales rate in the study area. The mean sales rate of cattle in the study area was estimated to be 34%. That was the net commercial off-take rate of cattle in the year 2013. The maximum opening stock of cattle has a value of 28.0 while the closing stock was 25.0. The average number of cattle purchased was approximately 9.0 while four (4.0) was the mean number of cattle sold per year.

4.10 Factors that affect the sales rate of cattle

The factors that were likely to influence the sales rate of cattle producers in the Northern Region of Ghana were estimated by the use of Tobit model. Eleven variables were fitted into the model. The results are presented in Table 4.9 and discussed.

Table 4.9 Tobit model estimates for factors affecting cattle keepers' sales rate

Explanatory variable	Coefficient	Std. Error	t-value	P>t
Household size	0.810542	0.494472	1.64	0.102

Experience of farmer	0.058458***	0.023849	2.45	0.015
Distance to market	-0.000561**	0.000262	-2.14	0.032
Education level	0.052894	0.032291	1.64	0.111
Improved production sys.	-0.016322	0.036149	-0.45	0.657
Access to market information	0.313885***	0.123711	2.54	0.001
Non-farm income	-0.866439***	0.346541	-2.50	0.008
Number of cattle owned	0.002069*	0.001103	1.87	0.064
Access to extension service	0.092296*	0.038546	2.39	0.098
Sales price of cattle	0.009074***	0.003670	2.47	0.018
Constant	0.081324	0.106964	0.76	0.449

***1% Significance, **5% Significance and *10% Significance

Number of observations = 120 Pseudo R2 = 0.171 LR chi2(11) = 39.23 Prob>

chi2 = 0.000 Log likelihood = -70.93435

Source: Survey data, 2013

Distance to the nearest cattle market was significant at 5% and negatively influenced the sales rate. Holding other factors constant, an increase in the distance to the market by 1 kilometer would decrease the expected sales rate by 0.18 km. Isabella and Steve (2007) in Kenya confirms that the distance to a specific market destination was one of the elements that conditioned prices observed at that location. Remote location of most rural cattle producers coupled with poor road network result in high transaction costs especially transport costs thus reducing the prices the dealers are prepared to pay for cattle (Musemwa *et al.* 2008; Makhura, 2001). Nkhori (2004) notes that even if cattle keepers are in areas with good linkages, the distance of the farmer from the markets tends to increase transaction costs. The further away the cattle keepers are from the market, the higher the transport costs. Long distance serves as a disincentive to those sellers who offer less number of animals for sale. Bailey *et al.* (1999) observed that the transportation of cattle through long distances is the most important weakness to cattle marketing system in Kenya. They further highlight that high transport costs increase the transaction costs thus deterring market participation by pastoral households among the cattle producers raising cattle from the natural grasslands of Uganda.

Transportation costs represent a major cost to the producer who is far away from the market. Therefore to reduce the unit cost of transportation, it is advisable for cattle producers to sell their animals in bulk. Nkhori (2004) makes similar observations among cattle keepers in Botswana. He further observes that it was too expensive for cattle producers to drive one or two animals to livestock markets that were situated far away. To minimize the cost of transport, lunch and cattle drivers' fee, they had to increase the number of animals to be driven to the livestock market for sale and at times collaborated with neighbours to drive their cattle jointly to the cattle market.

Market information was significant at 1% and positively influenced the cattle keepers' sales rate. Access to market information raises the predicted cattle keepers' sales rate by 31%. This is consistent with the findings of Montshwe *et al.*, (2006) and Nkhori (2004) whose results suggest that price information significantly increased the participation of small scale cattle keepers in the formal markets of South Africa and Botswana respectively. The quality of the household's decision depends on the market information about prices offered in different marketing channels. Bailey *et al.* (1999) argue that agricultural development has been limited in developing countries due to lack of, poor/non-existent agricultural information.

It is evident from the results that the average sales price of cattle positively and significantly influenced the predicted sales rate of cattle at 1%. Higher average sales prices of cattle will cause a shoot up in the predicted sales rate by 0.9%. When the price of any product is high it serves as an incentive to the seller to supply more of the product to the market. Alene *et al.* (2007) support this view by asserting that output price is an incentive for sellers to supply more to the market. Good prices always induce the farmer to sell more since rational people want good offers and this will lead to an increase in the sale of cattle.

One other significant variable was access to extension service. It was statistically significant at 5% and positively influenced the predicted sales rate of cattle. An increase in access to extension service will lead to an increase in the predicted sales rate by 9 per cent. This suggests that access to extension services will avail information to cattle producers regarding modern animal husbandry practices which improves the health status of cattle and increases cattle productivity. Agricultural extension officers usually equip farmers with new skills, knowledge on production and marketing services. Musemwa *et al.*, (2008) of South Africa opine that extension officers must also play a role in using the recent extension approach of participatory rural appraisal through discussing with farmers and empowering the farmers in the identification of cattle marketing problems and solutions. This enhances the participation of farmers in the market. They further argue that the success of extension officers in livestock farming areas should be measured by the number and value of livestock sold.

The results suggest that the number of cattle owned by a farmer was statistically significant at 10% and positively influenced the market participation of cattle owners in the study areas. A unit increase in the herd size will increase the predicted sales by 0.2 per cent. An increase in the number of cattle owned by an individual farmer is likely to increase the sales volume per year. The participation in the marketing system has to do with the number of cattle owned by an individual farmer, and farmers with more cattle will generate high market surplus (Mendelsohn, 2006). Similar findings were reported in South Africa by (Montshwe, 2006), Kenya (Bellemare and Barrett, 2004) and Botswana (Nkhori, 2004). The results reveal that an increase in cattle productivity will leave farmers with more stock of cattle to supply to the market.

Cattle farmers' experience was statistically significant at 1% and positively influenced the predicted sales rate of cattle. This implies that a one year additional experience in cattle

keeping will enhance the knowledge and understanding of the household head with regard to the prevailing market conditions. The experience of cattle producers enable them to adopt better farm management practices, knowledge of production, market and marketing system which in turn, enhances risk taking characteristics of the household. One possible reason is that households with higher experience in cattle farming have over time developed some understanding of market dynamics and therefore improve their decisions about market participation (Makhura, 2001).

Cattle producers' other sources of income or non-farm income was statistically significant at 1% and negatively influenced the market participation of cattle producers.

The results suggest that other sources of cattle farmers' income will decrease the predicted sales rate by 86%. Cattle producers who earn higher income from non-farm activities are likely not to participate in the market because in times of cash needs they have other sources of income to rely on.

4.11 Cattle production and marketing constraints

The constraints faced by cattle producers are of two types. These are cattle production and marketing constraints. A five-point likert scale was used in ranking these constraints. The most serious cattle production constraints that were identified to be hindering cattle production in the Bole and Sawla-Tuna-Kalba have been reported in Table 4.10.

Table 4.10 Constraints of Cattle Production

Constraints	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean Rank	Std. Dev.
Diseases	17 (14.2)	6 (5.0)	2 (1.7)	24 (20.0)	69 (57.5)	3.97	1.53
Water scarcity	28 (23.3)	34 (28.3)	20 (16.7)	5 (4.2)	23 (19.2)	2.43	1.57
Drought	15 (12.5)	32 (22.5)	27 (22.5)	34 (28.3)	7 (5.8)	2.75	1.27
Pasture scarcity	25 (20.8)	16 (13.3)	39 (32.5)	27 (22.5)	8 (6.7)	2.60	1.32

Inadequate Veterinary service	29 (24.2)	13 (10.8)	25(20.8)	26 (21.7)	20 (16.7)	2.73	1.56
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N = 120 SD (1) = Strongly Disagree, D (2) = Disagree, U (3) = Undecided, A (4) = Agree, SA (5) = Strongly Agree

Figures in parenthesis are percentage responses.

Source: Field survey, 2013.

The results indicated that majority of the respondents, 69 (57.5%) with a mean of 3.97 strongly agreed that cattle disease was the most serious constraint that was affecting the production of cattle in the study area. The incidence of animal disease was cited as a very serious constraint to the production of cattle. The respondents noted that the outbreak of diseases such as lumpy skin and the foot and mouth diseases have resulted in the imposition of quarantines on cattle and in some serious situations leading to cattle mortality, thus reducing cattle herd sizes. The respondents, 34 (28.3%) with a mean of 2.75 also agreed that drought was a critical constraint to the production of cattle. The occurrence of drought has the effect of causing water scarcity and pasture shortage. In times of drought animals usually grow lean and can fall sick. Moreover, twenty (20) respondents who represented 16.7% with a mean of 2.73 strongly agreed that inadequate veterinary services hindered cattle production.

A five-point likert scale was used to rank the marketing constraints of cattle. The major constraints which hindered the marketing of cattle have been reported in Table 4.11 below:

Table 4.11 Cattle producers' marketing constraints

Constraints	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean Rank	Std. Dev.
Low prices	22 (18.3)	4 (3.3)	2 (1.7)	33 (17.5)	59 (49.2)	3.79	1.63
Limited access to market information	25 (20.8)	19 (15.8)	25 (20.8)	37 (30.8)	17 (14.2)	2.23	1.53
Traders' default	28 (23.3)	17 (14.2)	19 (15.8)	18 (15)	10 (8.3)	2.76	1.33
Low traders numbers	30 (25.0)	14 (11.7)	41 (34.2)	23 (19.2)	7 (5.8)	2.57	1.32
Market inaccessibility	25 (20.8)	20 (24.2)	28 (23.3)	5 (4.2)	16 (13.3)	3.31	1.57

N = 120 SD (1) = Strongly Disagree, D (2) = Disagree, U (3) = Undecided, A (4) = Agree, SA (5) = Strongly Agree

Figures in parenthesis are percentage responses.

Source: Field survey, 2013.

A larger proportion of the respondents, 59 (49.2%) strongly agreed that low prices offered for cattle on sale was the most serious marketing constraint faced by cattle producers in the study area. Low prices recorded the highest mean of 3.78. Again, 33 respondents who represented 17.5% agreed that cattle marketing was constrained by low prices. Approximately, 31% of the respondents agreed that limited access to market information was negatively affecting cattle marketing.

4.11.1 Cattle Marketers' Marketing Constraints

In order to identify other constraints to cattle marketing, a group discussion session was held with selected traders in cattle. They mentioned some of the constraints they faced in the course of their transactions. These included the supply of animals to the market with poor body condition, difficult formalities involved in getting clearance letters or Animal Movement Permit (AMP) from the District Veterinary officer, exorbitant taxes and illegal fees collected at animal check points, bad roads and occasional shortage of vehicles for conveying cattle to the markets. Cattle traders noted with concern that there was no formal system of selling on credit particularly to butchers. They also cited poor dissemination of market information that could lead to the over flooding of some abattoirs with beef and a decline in price on some days. The marketing constraints were observed to be inter-related in a way. As a result, they influenced one another. For example, the outbreak of an epidemic such as foot and mouth disease normally results in the quarantine of cattle. The purpose of animal quarantine is to curb the spread of the epidemic from one place to another. The negative effect of an epidemic outbreak on cattle production is a decline in the number of traders. When the traders are not many in a market, they could choose to collude among

themselves and offer lower prices. On the whole, quarantine restrictions can reduce producer prices as it renders limited opportunities for marketing cattle. The situation is further aggravated by inadequate marketing information to cattle sellers, thus contributing to low producer prices.

Moreover, poor road condition and market inaccessibility discourage vehicle owners from operating in many parts of cattle producing areas that are interior because of the high maintenance costs they incur. In Uganda, a study by Kalemera (2010) opines that vehicle owners equally refuse to move to interior cattle producing areas because of poor roads.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the major findings, conclusions and the policy recommendations of the study. One hundred and twenty (120) cattle producers were interviewed to determine the factors that affect the sale of cattle in the Bole and Sawla-Tuna-Kalba Districts. Conclusions are drawn on the findings and recommendations are made with the aim of improving the production and marketing of cattle.

5.2 Summary and Conclusions

The study analysed the determinants of market participation by smallholder cattle producers in the Northern Region of Ghana. The production of cattle is important for enhancing food security, improving incomes and reducing poverty in the Northern Region Ghana. In this regard, cattle production is an integral part of rural farming systems in the Northern Region of Ghana. Smallholder cattle producers' participation in the market has

been considered to bring about agricultural transformation to developing countries. However, there are constraints which limit smallholder cattle producers' access to markets. These include long travelling distances, variability in price, poor market infrastructure, limited marketing support services and limited access to market information by cattle keepers.

The study was conducted in the Bole and Sawla-Tuna-Kalba Districts. Purposive Sampling technique was used. The selection of household heads was based on their ownership of cattle. A total of 120 cattle producers were interviewed. Questionnaire was the main instrument for data collection. The analysis of data was done by using SPSS version 20 and STATA version 10. Descriptive statistics was applied to the socioeconomic characteristics of sampled household heads.

It was observed that majority of the cattle keepers sold their cattle through informal markets, mainly amongst themselves. At times the cattle keepers made emergency sales. In most cases, they got relatively low prices for their animals sold through informal marketing channels. The results indicated that majority of the respondents were keeping cattle for obtaining income to meet their immediate consumption needs such as payment of school fees, medical bills, funeral expenses among others. The marketing channels of cattle involved the transport of live animals from the farm gate to primary markets, then to secondary markets, to terminal markets and down to the final consumer. It was observed that both the producers and traders were engaged in the sale and purchase of cattle. Culled cows were mostly sold by cattle owners. The study further highlighted that majority of the farmers did not have access to market information and poor road infrastructure was an impediment to the sale of cattle. The study estimated the cattle sales rate to be 0.34, indicating that the net commercial off-take rate was approximately 34% of stocks per annum.

The Tobit model analysis showed that access to market information, the selling price, the number of cattle owned and the experience of the farmer have significant and positive influence on cattle keepers' sales rate or participation in the market. *Ceteris paribus*, these variables would induce a cattle keeper to participate in the market and hence, increasing sales rate. However, distance to the market and other sources of income (nonfarm income) were statistically significant but had negative effects on cattle keepers' participation in the market. The findings of the study highlighted the constraints that were affecting both cattle marketing and production. In terms of cattle production, the major constraints faced by smallholder cattle farmers were diseases, water scarcity during the dry season, drought, pasture (feed) scarcity and inadequate veterinary services. Cattle farmers ranked diseases as the most serious constraint affecting the production of cattle. The greater risk associated with the loss of an animal was a further constraint as revealed by the study. Low prices were ranked first in the constraints affecting cattle marketing. The findings of the study suggest that cattle producers in the Northern Region required some measures to improve their market access and participation.

5.3 Recommendations

Based on the findings of the study, the following recommendations are made for the improvement of cattle keepers' market participation:

□ Accessibility to market-related information

Access to market information was observed to enhance the market participation of smallholder cattle keepers in the Northern Region of Ghana. The Ministry of Food and Agriculture should make market information readily available to cattle farmers and traders. Information dissemination through cattle producers' information days, printed media and

radio programmes should be used to equip producers with knowledge, skills and the appropriate techniques on cattle production and marketing behaviour. The methods of disseminating information should be designed to have a wider coverage to the benefit of smallholder cattle farmers in remote communities. Radio programmes and farmers' workshops for example can be conducted in different languages. Market information should be consistently supplied to smallholder cattle farmers with assistance from both private and governmental organizations. In making information available to cattle farmers, it is important to know the type of market information that is necessary for different markets. The provision of market information should relate to the preferences of buyers, type of animals and meat prices. Information on the supply and demand levels for cattle in the study areas is equally important for both cattle producers and traders.

□ Provision of extension services to farmers

Extension officers should intensify their contacts with rural cattle farmers. Subsequently, extension officers will have ample opportunity to provide technical agricultural information to farmers and advise cattle producers on the adoption of appropriate farming technologies. The influence of these agricultural officers will further aid cattle farmers to improve their knowledge and skills on livestock farm management. Extension officers can also guide smallholder cattle farmers to adopt efficient and appropriate marketing services information.

□ Overcoming the costs of travelling long distance

Cattle sellers who do not live in close proximity to cattle markets should form cattle marketing groups. In this way, cattle buyers would rather come to purchase cattle from these marketing groups, thereby saving cattle producers from incurring transport costs. Secondly, cattle sellers from one production area could also come together and make use

of one truck when transporting their animals to the market. By conveying cattle in bulk to the market, they stand a better chance of benefiting from economies of scale as compared to transporting animals individually and in small quantities.

□ Prevention of animal disease

The incidence of animal disease was cited as a key constraint to the production of cattle. Cattle producers should pay particular attention to maintaining the health of their animals. Cattle farmers should tap the services of private veterinary doctors to provide periodic medication or vaccination for their animals against the outbreak of cattle diseases. This will promote the health of cattle and subsequently leads to an increase in animal productivity.

□ Increasing cattle productivity

Cattle producers should avoid traditional animal husbandry practices. Such farm management practices are geared towards subsistence production and contribute to low productivity of cattle. The adoption of improved cattle production systems has the potential of enabling farmers to raise saleable cattle in commercial quantities.

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APPENDIX

QUESTIONNAIRES FOR CATTLE FRAMERS

A: BACKGROUND INFORMATION

1. Household head,,s gender 1) male ☐ 2) female ☐
2. Age.....years;
3. Marital status ☐ 1) single ☐ 2) married ☐ 3) Divorced ☐ 4) widowed ☐
4. Household size at the time of interview: Male.....Female.....
5. Educational level of household head.....
6. Tribe.....
7. Religion.....
8. How many years have you been keeping cattle? years.
9. How many family members in your household are involved in cattle production?

Number of Adults ≥ 18 years		Number of Children ≤ 18 years	
Male	Female	Male	Female

10. Who performs the following activities? State their numbers

Activity	Father	Mother	Sons	Daughters	Hired labour	Other
Grazing						
Cleaning housing/feeding unit						
Milking						
Milk Sales						
Animal Sales						
Health Management/ care						

11. Do you practice improved cattle management / production system on your farm?

Yes ☐ No ☐

12. Indicate the breeds of cattle and number in each category you have on your farm

Category	Number
Exotic	
Crossbreeds	
Local /indigenous	

13. What is the herd structure by number on your farm?

Category	Number		
	Local/indigenous	Exotic	Cross breeds
Bulls			
Bullocks			
Calves			
Cows			
Heifers			
Total			

14a. Do you keep other livestock? Yes ☐ No ☐

Q14b. If yes, complete the table

Type	Number	Number ready for sale	Number sold
Goats			
Sheep			
Pigs			
Other (Specify)			

15. How did you acquire your cattle?

1) Inherited ☐ 2) Buy from local market ☐ 3) Gifts ☐ 4) Other (specify)

16. How do you acquire your replacement stock? Tick where applicable

- 1) Own cattle (births) ☐ 2) Buy from market ☐ 3) Exchange/barter ☐ 4) Other
(specify)

17. How many cattle did you inherit, purchase or receive as gifts?

Category	Inherited		Purchased		Gifts	
	Local	Exotic	Local	Exotic	Local	Exotic
Bulls						
Calves						
Cows						
Heifers						

18. How many cattle did you have as at January 2012?

19. How many cattle did have as at December 2012?

B: Economic Data

20. For what purpose do you keep cattle? Tick as deemed appropriate.

Purpose of Keeping the Cattle	Strongly disagree	Disagree	Uncertain	Agree	Strongly Agree
Prestige					
Draught power/Plough					
Store of wealth					
Security/insurance					
Source of income					
Other (specify)					

21. What is your major occupation?

22. What is your major source of income?

23. What are your other sources of income?

1) Sale of Cattle ☐ 2) Milk Sales ☐ 3) Hides and skins sale ☐

4) Sale of crops ☐ 6) other (specify)

24. Do you sell Milk? Yes ☐ No ☐ ; If yes, answer question number 20.

24. Do you sell Milk? Yes ☐ No ☐ ; if yes, answer question number 20.

Do you milk your cows?	Yes	
	No	
If yes, what do you use the milk for?		
	Home consumption	
	Sales	
	Other (Specify)	
If sold, how many litres per day?		
How much is the price per litre?		
If no, give a reason.....		

C: Reasons for cattle Sales (Marketing)

25. Have you sold any cattle since the past one (12 months ago) year? Yes ☐ No ☐ if yes, complete the table below.

Category	Number ready for sale		Number actually sold		Average Price (GH¢)	Reasons of Sale
	Local	Exotic	Local	Exotic		
Bulls						
Steers/Bullocks						
Calves						
Cows						
Heifer						

Reasons of Sale: 1) Pay school fees 2) Pay medical bills 3) Purchase food

4) Animal Sick 5) Purchase household items 6) Animal was old (Culling)

7) Other (specify)

26. How many cattle did you sell each month of the past one year?

Month	Number of cattle sold	Average Price (GHC)	Buyer: 1= on farm sale; 2= local butchery; 3= Local Market 4= Abattoirs 5= Friends/private sales
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

27. What motivates you to sell your cattle?

- 1) High price for cattle ☐ 2) Selling cattle during festivals ☐
- 3) Selling cattle because of disease ☐ 4) Selling to buy ☐ food
- 5) Other (Specify).....

28. Which channels do you use for the sale of your cattle?

CHANNEL	Rank
Speculators	
Private sales	
Butchers	

Abattoirs	
On farm sales	
Local markets	
Other (specify)	

29. To what extent are you satisfied with the channel through which cattle are marketed?

CHANNEL	Strongly dissatisfied	Dissatisfied	Indifferent	Satisfied	Strongly Satisfied
Speculators					
Private sales					
Butchers					
Abattoirs					
On farm sales					
Local markets					
Other (specify)					

30. Which of the channels do you regard as the most rewarding?

CHANNEL	Rank
Speculators	<input type="text"/>
Private sales	<input type="text"/>
Butchers	<input type="text"/>
Abattoirs	<input type="text"/>
On farm sales	<input type="text"/>

	Local markets	<input type="checkbox"/>
	Other (specify)	

31. What are the main benefits of the channel you use regularly? Tick where appropriate

	Receive high price	<input type="checkbox"/>
	Understand the contract	<input type="checkbox"/>
	Nearer to channel	<input type="checkbox"/>
	Other (Specify)	

32. If you were provided with other alternative sources of money given below, would you offer your cattle for sale?

a. Income from formal employment Yes ☐ No ☐

b. Income from self-employment Yes ☐ No ☐

c. Income from sale of crops Yes ☐ No ☐

33. Are you satisfied with the cattle marketing system in your area? Yes ☐ No ☐. If no, which one are you not satisfied with and why?

.....

34. When are you paid by each of these cattle marketing systems? Tick as appropriate.

	On the spot	Within 1 working day	Within 7 working days	More than 7 days
On farm sales				
Speculators				
Private sales				

Butcheries				
Local Markets				
Abattoir				
Other (specify)				

35. Is there any cattle market available in your area? Yes ☐ No ☐

D: Marketing information

1. Do you receive market information prior to sales?		
	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
2. If yes, what is/are your source(s) of information?		
	Radio	<input type="checkbox"/>
	Television	<input type="checkbox"/>
	Extension publications	<input type="checkbox"/>
	Extension officers	<input type="checkbox"/>
	Co-farmers	<input type="checkbox"/>
	Other (specify)	

3. What type of information is provided?		
	Market information	<input type="checkbox"/>
	Production information	<input type="checkbox"/>
	Financial management	<input type="checkbox"/>
	Animal husbandry	<input type="checkbox"/>
	Other (Specify)	
4. If you don't receive market information, would you like to have a regular source in future?		
	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
5. What type of information would you like to receive?		
	Sales price	<input type="checkbox"/>
	Buyers	<input type="checkbox"/>
	Production information	<input type="checkbox"/>
	Other (Specify)	

36. Are you aware of cattle prices in other markets? Yes ☐ No ☐ if yes, where do you get the information? 1) Fellow Cattle Keepers ☐ 2) Family members ☐ 3).NGOs ☐ 4) Farmer Association/cooperatives ☐ 5) Radio ☐ 6) Newspapers ☐

37. How many times are you visited by extension agents in a month?

Number:.....

38. What is the distance of the cattle markets from your home? (Kms)

39. How do you transport your cattle to the cattle markets?

	Trekking (by foot)	By truck
Speculator		
Butcheries		
Local markets		
Abattoirs		
Other (specify)		

40. What is the state of the road to the cattle market?

1) Properly maintained ☐ 2) Fairly Maintained ☐ 3) Poorly maintained ☐

E: CONSTRAINTS OF CATTLE FARMERS

41. For the past one year what challenges have you experienced in cattle keeping as a farmer? **Rank** them in order of importance.

1) Water scarcity 2) Drought..... 3) Pasture scarcity

4) Political interference 5) Diseases

6) Lack of marketing infrastructure.....7) Poor roads

8) Other (specify)

42. What constraints do you face in marketing cattle?

1) Low prices ☐ 2) Lack of/ low numbers of traders ☐ 3) Traders default in payment ☐

4) Inaccessibility to cattle markets ☐ 5) Inaccessibility to market news and information ☐

6) Poor road Condition ☐ 7) Other (Specify).....

Do you have any suggestions on how the problems raised above can be overcome? Yes

No ☐

If yes, state them.

.....

THANK YOU FOR YOUR VALUABLE INFORMATION