

UNIVERSITY OF CAPE COAST

LIVESTOCK OWNERSHIP AND POVERTY REDUCTION IN
NORTHERN GHANA

AUGUSTINA AKETEMAH

2018

UNIVERSITY OF CAPE COAST

LIVESTOCK OWNERSHIP AND POVERTY REDUCTION IN
NORTHERN GHANA

BY

AUGUSTINA AKETEMAH

Thesis submitted to the Department of Economics of the Faculty of Social
Sciences, College of Humanities and Legal Studies, University of Cape Coast,
in partial fulfilment of the requirements for the Award of Master of
Philosophy Degree in Economics.

NOVEMBER 2018

DECLARATION

Candidate's Declaration

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

Candidate's Signature: Date:

Name: Augustina Aketemah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: Date.....

Name: Dr. Ferdinand Ahiakpor

Co-Supervisor's Signature: Date.....

Name: Prof. Samuel Kobina Annim

ABSTRACT

This study determined the effect of livestock ownership on household poverty in Northern, Upper East and Upper West Regions of Ghana. Specifically, the study determined the effects of medium-sized and large-sized ownership of livestock on household poverty and examined the effect of type of livestock (cattle, sheep and poultry) ownership on household poverty together with the joint effect between size and type of livestock ownership on household poverty. Employing the Ordinary Least Squares (OLS) estimation technique, the study found that medium-sized and large-sized livestock ownership reduces household poverty through improvement in consumption expenditures. Results on types of livestock owned revealed that livestock such as cattle and poultry significantly reduce household's poverty. As to the joint effect, the study revealed that owning large-sized livestock (being cattle) more significantly reduces household poverty than owning large-sized livestock other than cattle. Moreover, owning medium-sized livestock (being sheep) likewise more significantly reduces household poverty level than owning medium-sized livestock other than sheep. It is therefore recommended that all poor households, especially households in the Upper West Region focus on cattle and poultry rearing in an attempt to reduce their poverty levels. Also, poor households in Upper East and Northern Regions should focus on the production of cattle and sheep respectively.

KEY WORDS

Livestock

Large-sized livestock

Medium-sized

Northern Ghana.

Poverty

ACKNOWLEDGEMENTS

I am very thankful to my supervisors Professor Samuel Kobina Annim and Dr. Ferdinand Ahiakpor for patiently and thoroughly guiding me throughout this work. My heartfelt and humble thanks to my lovely husband Roland Akabzaa for his words of encouragement, and his moral and financial support that has enabled me to come this far academically. My sincere gratitude to my brother-in-law, Professor Thomas M. Akabzaa, for always being there for me in times of need. To my dearest sister in-law Mrs. Professor Mary Akabzaa, I am most grateful to you for your love and care for the family especially the kids while I was away at University of Cape Coast studying. Thanks to you, I did not have a cause to worry a lot about home. To my parents (Mr. and Mrs. Peter S. Aketemah), I am grateful for your prayers and blessings. Thank you for investing in my education. To all the lecturers in the University of Cape Coast Department of Economics, my heartfelt gratitude to you for your mentorship in varied ways without which I would not have been whom I am today. Many thanks to Miss. Sibylla Bronwny Hughes for proofreading this work. Thumps up to my selfless dedicated course mates and friends who stood by me through thin and thick. You will forever be profoundly remembered.

DEDICATION

To my husband and children.

TABLE OF CONTENTS

	Page
DECLARATION	ii
ABSTRACT	iii
KEY WORDS	iv
ACKNOWLEDGEMENTS	v
DEDICATION	vi
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ACRONYMS	xiii
CHAPTER ONE: INTRODUCTION	
Background to the Study	1
Statement of the Problem	7
Objective of the Study	9
Hypotheses	9
Significance of the Study	10
CHAPTER TWO: LITERATURE REVIEW	
Introduction	11
Theoretical Review	11
Classical Theory	11
Neoclassical Theory	13
Liberal/Keynesian Theory	13
Causes of Poverty	14
Poverty Caused by Individual Deficiencies	14
Poverty Caused by Cultural Belief Systems	15

Poverty Caused by Economic, Political and Social Distortions	16
Poverty Caused by Geographical Disparities	17
Poverty Caused by Cumulative and Cyclical Interdependencies	18
The Concept of Poverty	19
Poverty Status in Sub-Saharan Africa	21
Poverty Status in Ghana	21
Sustainable Development Goals (SDGS), Livestock and Poverty Reduction	24
Conceptual Review	27
Concept of Livestock Production System	27
Economic Contribution of Livestock Sector to Wealth Creation	29
Gender and Livestock	32
Ecological Zone of Northern Savannah	34
Livestock Rearing in Northern Ghana	36
Incidence of Poverty in the Rural and Urban Areas	39
Constraints of Livestock Production	39
Inadequate quantities and quality of livestock feed and nutrition	41
Livestock theft	41
Access to water	42
Bush fires	43
Animal diseases	43
Empirical Review	44
Livestock Ownership and Household Poverty	44
Medium Sized-Livestock and Poverty Reduction	49
Large-Sized Livestock and Poverty Reduction	50
Size/Types of Livestock Ownership and Household Poverty	51

Conceptual Framework	54
CHAPTER THREE: RESEARCH METHODS	
Study Design	57
Theoretical Model	58
Econometric Specification and Estimation	59
Empirical Model Specification	59
Testing the First Hypothesis	59
Testing the Second Hypothesis	60
Testing the Third Hypothesis	60
Definition and Justification of Variables	60
Livestock ownership	60
Sex of household head	61
Household size	62
Study area (Ecological Zone of Northern Savannah)	62
Education	65
Employment type and status of household head	65
Data Source and Description	67
CHAPTER FOUR: RESULTS AND DISCUSSION	
Introduction	68
Descriptive Statistics	68
Effects of Medium-sized and Large-sized Livestock on Consumption	
Expenditure	77
Effect of Type of Livestock Owned on Household Poverty	87
Joint Effect of Size and Type of Livestock Owned on Household Poverty	93
Post Diagnostic Test	98

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND

RECOMMENDATIONS

Summary of Findings 99

Conclusions 100

Recommendations 101

Suggestions for Further Research 102

REFERENCES 103

LIST OF TABLES

Table		Page
1	Definition, Measurement and A Priori Signs of Variables	66
2	Results on the Effect of Medium and Large Sized Livestock	77
3	Effect of Type of Livestock Owned by Households on Household Poverty	87
4	Joint Effect of Sized and Type of Livestock Owned by Households on Household Poverty	93
5	Post-Diagnostic Test	98

LIST OF FIGURES

Figure		Page
1	Relationship among medium-sized livestock, types of livestock, large-sized livestock and poverty reduction	55
2	Indicates household poverty status by region.	70
3	Indicates the poverty status of households by the gender of the household head.	71
4	Indicates medium sized livestock ownership based on poverty status	73
5	Large-Sized Livestock Ownership and Household Poverty	74

LIST OF ABBREVIATIONS

DFID	Department for International Development
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GEPA	Ghana Environmental Protection Agency
GLSS	Ghana Living Standard Survey
GSS	Ghana Statistical Service
ILRI	International Livestock Research Institute
LDP	Livestock Development Programme
LEAP	Livelihood Empowerment Against Poverty
MDGs	Millennium Development Goals
MoFA	Ministry of Food and Agriculture
NLSP	National Livestock Service Project
NSEZ	The Northern Savannah Ecological Zone
OLS	Ordinary Least Squares
SAS	Statistical Analysis System
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
SRID	Statistic Research and Information Directorate
UN	United Nations

CHAPTER ONE

INTRODUCTION

Background to the Study

The role of livestock ownership in poverty reduction cannot be overemphasized. Demment et al. (2007) stressed that livestock ownership is critical for many of the poor in the developing world, often contributing to multiple livelihood objectives and offering a pathway out of poverty. Poverty is one of the major challenges facing developing countries. Hoynes (2012) emphatically declared that poverty is a family concept and all persons in the same family has the same poverty status. Perry, Randolph, McDermott, Jones and Thornton (2002) did not miss words when they said that the indispensable requirement for using livestock as a weapon for poverty reduction is a better understanding of where livestock plays a role in the livelihood of the poor people. This is an undeniable fact because livestock are important material and social resources for many of the rural poor.

Further, insufficient access to the financial markets, such as savings, credits, and insurances, hinders the potential of rural people to invest in activities that are important to them and regulates a household's decisions to engage in other income generating activities, say livestock ownership (Feder 1985; Binswanger & Rosenzweig 1986; De Janvry et al., 1985; Dossa et al., 2008). Consequently, most of the time the rural-poor do not have access to standard financial institutions. Livestock thus provides them an alternative means for storing their accumulated wealth that offers them a rationally vigorous border against inflation. Further, they can be sold and transformed into

cash as needed and likewise provide a basis for liquidity and consumption smoothing.

According to World Bank (2007), poverty has been defined in absolute terms as persons who live on less than US\$ 1.25 (extreme poverty) and US\$2.00 (moderate poverty) per day. Roughly about 2.6 billion people in developing countries live on less than US\$2 per day and 1.4 billion of them survive on less than US\$1.5 per day. In Ghana, 2.2 million people representing 8.4 percent of the population are not able to earn GHc 792.05 per annum and are classified as being extremely poor (Ghana Statistical Service (GSS), 2014). This category of people cannot feed themselves even if they spend all their income on food (GSS, 2014). Regarding the upper line, about 6.4 million Ghanaians comprising 24.4 percent of the total country's population do not earn an annual income of GHc1,314.00 and are considered poor (GSS, 2014).

Globally, livestock production contributes to rural livelihoods, employment and poverty relief, integrating with and competing crop production and acting as a savings bank (Sen & Chanders, 2003; Upton, 2004). According to Asley, Holdend and Bazeley (1999), about 987 people million representing about 70 percent of the world's 1.4 billion "extreme poor" draw their livelihood from livestock ownership. Upton (2004) asserted that livestock ownership contributes significantly to the asset of the poor and their human capital thereby helping to alleviate poverty. Ali and Khan (2013) further indicated that households with livestock are more food secured and moreover experience a significant reduction in their consumption poverty compared to households without livestock. The public interest in livestock ownership is on the rise due to its fundamental role in the livelihood of households across the globe

(Colasanti, Litjens, Ham, & Msu, 2010; Ngqangweni, 2000). The increase in demand for livestock products, especially in developing countries, is accounting for the heightened interest in livestock ownership (Thornton, 2007).

Considering the global increase in demand for livestock products, an expansion in the livestock sub-sector could have a positive impact on poverty reduction. It is, however, not certain how much this increase in the demand for livestock products has independently contributed to a reduction in poverty since household livestock production is a common income generating activity in low resource settings and may benefit child nutrition through better access to health care, education, sanitation, and nutritionally rich foods (Pica-Ciamarra & Dhawan, 2010). Krebs, et al, (2011) iterated that direct consumption of eggs, meat, and milk or milk products can improve children's dietary diversity, which is an important contributor to linear growth.

For most rural livelihoods, livestock acts as an insurance against sudden financial crises by virtue of its ability to be sold for cash income (Aboagye et al., 2014). In addition to helping maintain soil fertility and structure through provision of manure, livestock moreover provides draught power enabling bullock owning households to expand the scale of production (Ansah¹, Eib & Amoako, 2015). Similarly, from the World Bank (2004) report, there exists a positive association between livestock ownership and household well-being. It is, however, not clear whether or not the effect of livestock ownership varies with gender of the head of households.

In West Africa, the contribution of the livestock sector to agricultural Gross Domestic Product (GDP) is 49 percent, 15 percent and 44 percent for Nigeria, Burkina Faso and Mali, respectively. While the growth rate of the

regional animal production is estimated at 4 percent per year, the demand for livestock products is expected to increase above 250 percent until 2025 (Amadou, Dossa, & Schlecht, 2012). For many small-scale farmers, livestock represents a form of capital that is easily converted into cash (Rocha et al., 1991).

The livestock sector in Ghana contributes, on average, an estimated 7 percent to agricultural Gross Domestic Product (GDP) thus making a significant contribution to the overall agricultural development. In 2001, the estimated population of livestock in the country for cattle was 1.3 million, sheep, 2.5 million, goats 2.7 million, pigs 0.37 million and poultry including guinea fowls 10 million (African Development Fund, 2001). Statistics show that over the years, the livestock sector has experienced an increase in productivity in the various livestock species. In 2014, the livestock populations were cattle 1,657,000, sheep 4,335,000, goats, 6,044,000, pigs, 682,000 and 68,511,000 poultry (Ministry of Food and Agriculture (MoFA), 2016).

In Ghana, over 100,000 households depend on livestock for their livelihoods, especially in the northern part of the country (GSS, 2008). In addition, livestock ownership represents a major economic activity in the lives and livelihoods of numerous rural smallholder farmers, traders, and processors, particularly in the northern part of the country (Asafu-Adjei & Dantankwa, 2001; Turkson & Naandam, 2006).

There has been an increasing growth trend in the population of livestock in the country for the past years. For example, cattle increased from 1,438,000.00 in 2009 to 1,657,000.00 in 2014; sheep increased from 3,642.00 to 4,335.00; goats from 425.00 to 6044; pigs 521.00 to 682.00; and poultry from

200143,320.00 to 68,511.00 across the same time period respectively (Statistics, Research and Information Directorate (SRID) of MoFA, 2015). Regardless of this increasing trend in livestock productivity in Ghana, the poverty rate is still prevalent especially in rural communities of the country. Although the rate of poverty in Ghana cannot be overstressed, the rate in the Northern, Upper East and Upper West Regions are of great concern to the policy maker. Specifically, Upper West Region experiences the highest (45.5%) followed by the Northern and Upper East Regions with 22.8 percent and 21.3 percent, respectively. Further, although the level of extreme poverty in the country is relatively low, it is concentrated in the rural savannah, with more than a quarter of the people falling into this category. In general, the dynamics of poverty over the years show that poverty is still very much a rural phenomenon (GSS, 2014).

Despite the fact that there are several ways of fighting poverty, for those in the Guinea and the Sudan Savannah, livestock ownership could be a tool to fight their social menace of poverty. Interestingly, the three regions of northern Ghana constitute the centre of livestock production where over 63 percent of cattle, 59 percent of sheep and 42 percent of goats, 23 percent of chicken and about 80 percent of guinea fowls are kept (GSS, 2014). The farmers are largely small-holder farmers whose farm practice is mainly subsistence in nature with a few of them having a larger farm size for commercial purposes. It is, however, dumbfounding as to why this large number of livestock is kept in the regions while they still remain the poorest in the country given the unprecedented socio-economic roles livestock ownership play.

Ghana government through the MoFA instituted the National Livestock Service Project (NLSP) from 1992 to 1999 and later the Livestock Development

Programme (LDP) from 2003 to 2009. Although the projects, especially LDP, focused on livestock development, they had the overarching objective of reducing poverty. The LDP covered seven administrative regions of the country that were considered most important for the production of livestock. They comprised the Northern Region, Upper East Region and Upper West Region (collectively regarded as the centre of livestock production), the Ashanti Region, Volta Region, Greater Accra and Brong Ahafo Regions.

The sub-sector's main contribution to the national economy is food and nutritional security; employment generation opportunities, particularly in the rural areas and it serves as a store of wealth, financial security and improvement in rural livelihoods and income enhancement. Conversely, it serves as a coping mechanism against crop failure (GSS, 2015). According to MoFA (2016), the livestock sub-sector contributed about 8.8 percent of agricultural GDP in 2013 and grew at a rate of 5.2 percent in the same year. Moreover, livestock plays a key role in providing livelihood support to the rural population. It makes significant contributions to rural livelihoods including employment and poverty reduction.

Although there have been certain social programs like the Livelihood Empowerment Against Poverty (LEAP), Capitation Grant, and School Feeding Programs that were implemented by various ruling governments of the country to alleviate poverty, especially in rural communities, more still need to be done. The issue is that agriculture is the main occupation of Ghana's poverty prone zone where livestock is largely kept. The question here is will livestock ownership play a key role in reducing poverty if poor households pay more attention in it? Will this go on further to smoothen their consumption over time

thereby reducing the level of poverty in the stated three regions of Northern Ghana given that the majority of households in these regions' own livestock?

Statement of the Problem

Livestock ownership is key to poverty reduction as they provide livelihood to their keepers. Livestock and livestock-products such as meat, milk, eggs provide cash and nutrients for their owners when sold and consumed respectively. Further, livestock compliment other agricultural activities especially crop farming by means of providing compost manure to fertilize the land, provide energy to plough farm lands and for conveying both farm inputs to the farm and output to places of storage or markets in rural communities where roads are not motorable. The ability of livestock to provide the nutritional needs of households make them fit to do other jobs which compliments livestock ownership thus positively making an impact in their poverty status. Income generated from the sale of livestock and livestock-products are used to provide for the social, economic and physical needs of the household which consequently reduces their poverty statuses.

According to GSS (2013), the Northern, Upper East and Upper West Regions constitute the centre of livestock production. Over 63 percent of cattle, 59 percent of sheep and 42 percent of goats, 23 percent of chicken and about 80 percent of guinea fowls are being kept in these regions (GSS, 2014). Adzitey (2013) adds that these regions account for about 75 percent of all cattle produced in Ghana. Contrary to this, is that the three regions register the highest level of extreme poverty amongst the ten administrative regions. Greater Accra has a very low level (6.5 %) of poverty incidence, which is 18.8 percent lower than the national rate of 24.2 percent. Sadly, the same cannot be said of the three

regions in northern Ghana, which comprises mainly the Savannah areas noted for its largest share of livestock production in the country. More than four in every ten persons are poor in Upper East Region (44.4 %), increasing to one in every two in the Northern Region (50.4 %) and seven out of every ten in Upper West (70.7 %) (GSS, 2014).

Despite all the major contributions and growth in the livestock sector, a survey by GSS indicated that about one quarter of Ghanaians are poor whilst under a tenth of the population are in the extreme poverty range. The report further revealed that poverty is highly concentrated in the rural areas, especially consumption poverty (GSS, 2013). To add, Monili and Paci (2015) alluded to the fact that the poor mostly live in northern Ghana. They further argued that trends in the number of the poor by region confirmed that their concentration has been relatively greater in the north than in the rest of the country. This is caused by the combination of less favourable climate, distance from the sea, and lack of infrastructure. A national survey by Cooke, Hague and McKay (2016) likewise confirmed that, at the regional level, the Northern, Upper East, and Upper West Regions continue to have the highest poverty rates despite the fact that livestock production, particularly sheep, goats, and cattle is predominant in the regions. Poverty could still be prevalent in these regions because households actually do not know how much wealth they can generate from livestock (that which they are best at producing), and what kind of livestock they need to own in order to get out of poverty.

Therefore, this study seeks to determine the effect of livestock ownership on poverty reduction of households in the three regions of northern Ghana given that they keep the largest total stock of livestock in the country.

Specifically, the study builds upon previous works by employing nationally representative data to determine the effect of livestock ownership on poverty reduction of households in Ghana with the main focus being on the Northern, Upper East and Upper West Regions. Emphasis is on both medium-sized and large-sized livestock ownership by households. The study likewise examined the impact of types of livestock (specifically cattle sheep and poultry) owned on household poverty. Further investigation is made on the joint effect of both medium-sized and large-sized ownership of livestock and types of livestock owned by households on household poverty.

Objective of the Study

The main objective of the study is to determine the effect of livestock ownership on poverty reduction of households in Northern, Upper East and Upper West regions, respectively). The study considered the following specific objectives:

1. Determine the effects of medium-sized and large-sized ownership of livestock on household poverty.
2. Examine the effect of types of livestock owned by households on household poverty.
3. Examine the joint effect of size and types of livestock owned by households on household poverty.

Hypotheses

1. Ho: There is no association between medium-sized ownership of livestock and household poverty.
H1: There is an association between medium-sized ownership of livestock and household poverty.

2. Ho: There is no association between large-sized ownership of livestock and household poverty.

H1: There is no association between large-sized ownership of livestock and Household poverty.

3. Ho: Livestock type (cattle, sheep and poultry) has no effect on household poverty.

H1: Livestock type (cattle, sheep and poultry) has an effect on household poverty.

4. Ho: Size and type of livestock owned does not jointly have an effect on household poverty.

H1: Size and type of livestock owned does jointly have an effect on household poverty.

Significance of the Study

The outcome of the study can promote projects and programs by recommending the keeping of livestock to ameliorate some of the adverse psychological impacts of poverty. It can help reach a conclusion on the relationship between overall welfare and livestock ownership in Ghana. The study indicates the extent to which investment in different types of livestock can be a vehicle for poverty reduction. It likewise determines the presence and extent of inequality and the concentration within the livestock sector in Ghana. The findings will help government and policy makers put strategies in place to develop the livestock sector. The findings of the study furthermore provide suggested areas for future research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The purpose of the study is to investigate livestock ownership and poverty in Northern Ghana (Northern, Upper East and Upper West Regions). This chapter reviewed related literature on livestock ownership and poverty reduction. The literature comprised theoretical and empirical reviews, and a conceptual framework.

Theoretical Review

A number of theories have emerged in a bid to explain why people become poor. Among these major theories are:

Classical Theory

Classical economics, developed mostly during the 18th and 19th centuries, included theories on both value and distribution. This theory included the prominent work of Adam Smith and David Ricardo. The fundamental principle of the classical theory is that an economy is self-regulating. Classical economists maintain that an economy is always capable of achieving the natural level of real GDP or output, which is the level of real GDP that is obtained when the economy's resources are fully employed. This theory views individuals as largely responsible for their own destiny, choosing in effect to become poor. Broadly speaking, classical theory typically assumes that the outcomes of the exchanges taking place in the market place are efficient, and hence wages faithfully reflect individual productivity. According to the classical theory, poverty is mainly seen as a consequence of poor individual choices (e.g. the poor lack “self-control”) that affect productivity negatively, although it is

acknowledged that pure differences in underlying genetic abilities are potential causes of poverty. This theory emphasizes that “wrong” choices made by individuals may lead them into a “poverty or welfare trap” (Smith, 1976).

According to the classical theory, beyond a minimum level to prevent destitution, state intervention is generally viewed adversely as a source of economic inefficiency; by generating incentives that are misaligned between poor individuals and society as a whole, welfare programs are perceived as a potential cause for or reinforcement of poverty (through welfare dependence). The government is, at most, justified to intervene whenever poor people need supportive activities or threats to correct for perverse economic incentives. A large majority of the policy prescriptions under this view focus on efforts to raise the productivity of deprived individuals in order for them to join the labour force as soon as possible (although it is acknowledged that some individuals - the young, the sick, the old - cannot participate and will need alternative support). Rank, Yoon, and Hirschl (2003) point out that these individual characteristics that make people poor can range from “the lack of an industrious work ethic or virtuous morality to low levels of education or competitive market skills”: a view, which they contend has gained ground since the mid-1970s. This implies that there is virtually no role for the state to intervene, given that the individual traits that cause poverty are either “given” or determined by market forces. Similarly, Blank (2010) claim that behavioural preferences highlighted in classical theories are passed across generations within dynastic families, due either to a genetic component or upbringing. Hence, “poverty begets poverty” as children growing up in dysfunctional families feed from the deviant behaviour of their progenitors, who act as role models.

Neoclassical Theory

Building on the classical tradition, neoclassical theory stresses the role of the unequal initial endowments of talents, skills and capital that determine productivity of an individual in generating poverty within a market-based competitive economic system. Neoclassical theorists are wider ranging and recognize reasons for poverty beyond individuals' control. Market failures such as externalities, moral hazard and adverse selection as well as incomplete information are also viewed as aggravators of poverty (Davis, 2007). Uncertainty may play a major role in causing poverty because the poor are more vulnerable to shocks to their well-being (e.g. recessions, sickness, family breakdown). As in the classical tradition, there is also skepticism about the role of government among neoclassical thinkers, although targeted policies to address market failures may be warranted in some cases. De-Freitas, Clark, and Legendre (2009) underscore the importance of the ownership of life insurance or pension schemes for the elderly, and especially vulnerable groups in respect of poverty. Long term accumulation of life insurance and pension pots, encouraged by appropriate legislation with government subsidies for the poor might go a large way in preventing poverty among retirees.

Liberal/Keynesian Theory

Liberal theory revolves around the idea that not only market distortions, but also broad underdevelopment in its multiple facets causes poverty. Meanwhile, Keynesians suggest that growth can promote economic development and thus relieve poverty, hence further justifying government intervention at the macroeconomic level (through fiscal and monetary policy), mainly to tackle involuntary unemployment. In a Keynesian/liberal perspective,

poverty is mainly explained by "the misfortune of certain minorities who fall out of work, cannot work or are not expected to", although they wish to do so. It therefore follows that the state needs to act to "regulate, supplement and exhort, but not impose" (Townsend, 1979). This theory contends that poverty could reflect market failures that under certain circumstances justify redistributive taxation in cash and kind.

Causes of Poverty

Bradshaw (2006) explore five competing theories of poverty which are distilled from the literature of broad theories of poverty and which placed their origin from the causes of poverty such as; individual deficiencies, cultural belief systems that support subcultures in poverty, political economic distortions, geographical disparities and cumulative and circumstantial origins.

These other theories which are in themselves the causes of poverty are discussed below.

Poverty Caused by Individual Deficiencies

This theory Poverty is a large and complex and set of explanations that focus on the individuals as being responsible for their poverty situation. Typically, politically conservative theoreticians blame individuals in poverty for creating their own problems, and argue that with harder work and better choices the poor could have avoided their problems. Other variations of the individual as a cause of him or her being poor is the lack of genetic qualities such as intelligence that are not so easily reversed (Bradshaw, 2005). According to Weber (2001), the belief that poverty stems from individual deficiencies is old. Thus, religious doctrine that equated wealth with the favour of God was central to the Protestant reformation. The blind, crippled, or deformed people

were believed to be punished by God for either their sin or their parents' sins. Rainwater (1970) critically discussed individuals as a cause of poverty as a "moralising perspective" and notes that the poor are "afflicted with the mark of Cain." "They are meant to suffer, indeed must suffer, because of their moral failings; they live in a deserved hell on earth." Rainwater postulated that it was difficult to overestimate the extent to which this perspective (incorrectly) undergirds our visions of poverty, including the perspective of the disinherited themselves.

Ironically, neo-classical economist reinforces individualistic sources of poverty. The core premise of this dominant paradigm for the study of the conditions leading to poverty is that individuals seek to maximise their own well-being by making choices and investments. When some people choose short term and low-payoff returns, economic theory holds the individual largely become responsible for their individual choices - for example to forego livestock rearing among the poor that will lead to the generation of cash from the sales of livestock and livestock-products, provision of food, source of farm inputs in the form of energy for ploughing, and compost manure for fertilizing farm crops which will lead to higher yields, and consequently a reduction in poverty.

Poverty Caused by Cultural Belief Systems

This theory of poverty has its foundation cause in the "culture of poverty", and is sometimes linked with the individualistic causes of poverty or other causes. Poverty caused by cultural beliefs suggests that poverty is created by the transmission over generations of a set of beliefs, values, and skills that are socially generated but individually held. Individuals are not necessarily to

blame because they are victims of their dysfunctional subculture or culture. Culture is socially generated and perpetuated, reflecting the interaction of the individual and community. This makes the “culture of poverty” theory different from the “individual” theories that link poverty explicitly to individual abilities and motivation (Bradshaw, 2005).

This theory of poverty, based on perpetuation of cultural values, has been fraught with controversy. No one disputes that poor people have subcultures or that the subcultures of the poor are distinctive and perhaps detrimental; the concern is over what causes and constitutes the subculture of poverty (Bradshaw, 2005). Moynihan (1965) found the concept particularly applicable to his study of “black poverty” in the early 1960s and linked “black poverty” to the largely “dysfunctional” black family found in central cities.

If poor household’s that own livestock carve a belief that livestock ownership or rearing is a traditional way of keeping them only for social and traditional functions and ceremonies such as funerals, naming ceremonies, festivals and marriages, then the role of livestock production as a means of alleviating poverty could be limited. However, if poor households consider livestock ownership a business then, cash could be generated from the sales of livestock and livestock products to meet other needs of the family thereby reducing their poverty level.

Poverty Caused by Economic, Political and Social Distortions

According to Bradshaw (2005), whereas the first “individualistic” theory of poverty is advocated by conservative thinkers and the second is a culturally liberal approach, the third theory of poverty is a progressive social theory. Theorists in this tradition look not to the individual as a source of

poverty, but to the economic, political, and social system that cause people to have limited opportunities and resources with which to achieve income and well-being (Rank, 2003).

Literature on poverty suggests that the economic system is structured in such a way that poor people fall behind regardless of how competent they may be. Partly, the problem can be attributed to the fact that minimum wages do not allow single mothers or their families to be economically self-sufficient (Jencks, 1996). According to Tobin (1994), the problem of the working poor is increasingly seen as a wage problem linked to structural barriers preventing poor families from getting better jobs, complicated by limited numbers of jobs and lack of growth in sectors supporting lower skilled jobs. Chubb and Moe (1996) asserted that the elimination of structural barriers to better jobs through education and training have been the focus of extensive manpower training and other programmes, generating substantial numbers of successes but also perceived failures.

Poverty Caused by Geographical Disparities

Rural poverty, ghetto poverty, urban disinvestment, southern poverty, third-world poverty, and other framings of the problem represent a spatial characterisation of poverty that exists separate from other theories (Bradshaw, 2005). While these geographically based theories of poverty built on the other theories, poverty caused by geographical disparities theory calls attention to the fact that people, institutions, and cultures in certain areas lack the objective resources needed to generate well-being and income, and that they lack the power to claim redistribution (Shaw, 1996).

In a thorough review of the literature on rural poverty, Weber and Jensen (2004) noted that most literature finds a “rural differential” in poverty, but that the spatial effect is not as clearly isolated from individual effects as needed for confidence. One theoretical perspective on spatial concentrations of poverty comes from economic agglomeration theory. Usually used to explain the emergence of strong industrial clusters, agglomeration shows how proximity of similar firms attracts supportive services and markets, which further attracts more firms (Bradshaw, King, & Wahlstrom, 1999).

Poverty Caused by Cumulative and Cyclical Interdependencies

The previous four theories demonstrated the complexity of the sources of poverty. Poverty caused by cumulative and cyclical interdependencies is by far the most complex and to some degree builds on components of each of the other theories in that it looks at the individual and their community as caught in a spiral of opportunity and problems; once problems dominate they close other opportunities and create a cumulative set of problems that make any effective response nearly impossible (Bradshaw, 2000). This theory has its origin in economics in the work of Myrdal (1957) who developed a theory of “interlocking, circular interdependence within a process of cumulative causation” that helps explain economic underdevelopment and development. Myrdal proposed that personal and community well-being are closely linked in a cascade of negative consequences, and that closure of a factory or other crisis can lead to a cascade of personal and community problems including migration of people from a community. Thus, the interdependence of factors creating poverty actually accelerates once a cycle of decline is started.

The Concept of Poverty

Poverty is one of the major challenges facing the developing world. According to Hoynes (2012), poverty is a family concept and all persons in the same family have the same poverty status. Lower household income is one of the factors worsening poverty situations for many developing countries, especially among Sub-Saharan African countries. Poverty may be defined as an economic condition of lacking both money and basic necessities needed to successfully live, such as food, water, education, healthcare and shelter, or the economic condition of lacking predictable and stable means of meeting basic life needs. It is important to stress that poverty is not only the outcome of inadequate resources but also an inability of society to recognize its extent and put greater determination in identifying potentials that could be applied to overcome it (Cooksey & Likwelile, 2002).

The two basic theories of poverty in social science are “absolute poverty” and “relative poverty”. Todaro and Smith (2012) defined absolute poverty as a situation of being unable to meet the minimum level of income, food, clothing, healthcare, shelter, and other essentials, and summarizes the definition of relative poverty as the lack of collateral. Explicitly, relative poverty is when low-income individuals, whether one is absolutely poor or not, cannot borrow money, and generally cannot sufficiently educate one’s children or start and expand a business. These definitions clearly indicate that an individual can be relatively poor but not absolutely poor but once an individual is absolutely poor, inevitably, that person becomes relatively poor.

Townsend (2002) defined poverty as a situation where resources seriously fall below those commanded by the average individual or household

to the extent that the poor are, in effect, excluded from ordinary living patterns, customs and activities. As resources for any individual or households are diminished, there exist a point where one suddenly withdraws from participation in the customs and activities demanded by culture. The point at which withdrawal escalates unduly to falling resources defines the poverty line or threshold.

The World Bank reports that poverty has many dimensions, and that absolute poverty, which is the proportion of the population below national poverty line, measures poverty by the level of income/consumption available to an individual. It further states that a person is considered poor if his or her consumption or income level falls below some minimum level necessary to meet basic needs. This minimum level is usually called the “poverty line”. It continues that poverty line varies across time and societies. Each country uses a line, which is appropriate to its level of development, societal norms and values (World Bank, 2000). The World Bank reiterates that national poverty lines are set to reflect a country’s specific economic and social circumstances, and therefore, are not intended for comparison across countries. It states further that local poverty lines tend to have higher purchasing power in rich countries, where more generous standards are used, than in poor countries (World Bank, 2007).

In a nut shell, poverty is a call to action for the poor and the wealthy alike, a call to change the world so that many more may have enough to eat, adequate shelter, access to education and health, protection from violence, and a voice in what happens in their communities. As poverty has many dimensions, it has to be looked at through a variety of indicators, levels of income and

consumption, social indicators, and indicators of vulnerability to risks and of socio/political access. The state of poverty differs from one continent to another, one country to another, rural to urban areas and from one household to another.

Poverty Status in Sub-Saharan Africa

The World Bank (2007) reported that poverty was worse in Sub-Saharan Africa than other developing regions and one in every two persons faced extreme poverty and lived on less than US\$1.25 a day. Poverty is higher in most African countries than elsewhere in the developing world. In Sub-Saharan Africa, 50 percent of the total population or 300 million people live on less than 1 USD per day (Otte & Knips, 2005). Poverty in Sub-Saharan Africa is especially prevalent in rural areas where an estimated 70 percent or 210 million of the poor people live. The concentration of poor people in rural areas and their predominant involvement in agriculture (crop and livestock) means that the Sub-Saharan Africa rural well-being is closely linked to agricultural performance. In most areas of Sub-Saharan Africa, increasing productivity of farm activities will have the greatest potential for poverty reduction either through direct income benefits or indirect expenditure linkages through consumer benefits (Wiebe, Soule & Schimmelfennig, 2001).

Poverty Status in Ghana

According to GSS (2014), 2.2 million people representing 8.4 percent do not earn annual income of GH¢792.05 and are classified as being extremely poor. This category of people cannot feed themselves even if they were to spend all their income on food. Regarding the upper poverty line, there are 6.4 million Ghanaians (24.2 %) who do not earn an annual income of GH¢1,314.00 and are also considered poor. This high poverty rate has been attributed to the low level

of incomes individuals earn from their respective economic activities (GSS, 2014).

Since 1983, the government of Ghana has implemented policies and programmes to enable households and individuals to earn substantial income in order to alleviate poverty. These include the Programme of Action to Mitigate the Social Cost of Adjustment (1987), Ghana Poverty Reduction Strategy (2003-2005), Growth and Poverty Reduction Strategy (2006-2009), National Social Protection Strategy (2007) and Livelihood Empowerment against Poverty Programme (2008). These programmes and policies have focused on educational reforms (basic education for all), irrigation system of farms of households, restoring the vocational and technical institutions for the youth between the ages of 15-18 years, direct support for human development and provision of basic services such as health care, portable drinking water among others. As a result, there has been improvement in livelihood among households and a steady decline in poverty from the national average of 51 percent in 1991 to 24.25 percent in 2013 (GSS, 2014).

Unfortunately, this reduction in poverty through enhancement in income among others has not been even throughout the country. Households in the Savannah zone comprising the three regions of northern Ghana (Northern, Upper East and Upper West Regions) have been associated with low income and extreme poverty. Indeed, four in every ten persons are poor in the Upper East Region (44.4 %), seven out of ten in the Upper West Region (70.7 %) and one in every two (50.4 %) in the Northern Region (GSS, 2014). A child in these regions is more likely to drop out of school, get involved in early child marriage and be malnourished than a child in any other part of Ghana. The major

economic activities and sources of income for the majority of households in these regions are crop farming and animal rearing (GSS, 2014). Livestock production has become a key policy option for policy makers and stakeholders for increasing income and, moreover, an attempt to improve the livelihood of rural households (FAO, 2012). Asafu-Adjei and Dantankwa (2001) reported that production of livestock is likely to increase household income and ensure food security among rural households if optimally and sustainably exploited.

According to Cooke et al. (2016), Ghana has steadily experienced increasing growth of over 7 percent per year on average since 2005 following the attainment of middle-income country status in 2010 and discovery of offshore oil reserves, per capita growth in the country has remained relatively high. Despite the growth recorded, inequality has been increasing in the country and poverty remains prevalent in many areas. In looking at poverty trends, the report confirms that, between 1992 and 2013, Ghana's national level of poverty fell by more than half (from 56.5 % to 24.2 %), thereby achieving the Millennium Development Goal one (MDG1) target. However, the Ghana Poverty and Inequality report revealed that the annual rate of reduction, according to the poverty level slowed substantially from an average of 1.8 percent per year in the 1990s to 1.0 percent reduction since 2006. Conversely, the rate of reduction of extreme poverty has not slowed since the 1990s and an impressive progress in cutting extreme poverty has been achieved since 2006 (cut from 16.5 % to 8.4 %).

Households in urban areas continue to have a much lower average rate of poverty than those in rural areas (10.6 % versus 37.9 %). However, urban poverty has dropped in recent years much faster than rural poverty and, as a

result, the gap between urban and rural areas has doubled; rural poverty is now almost 4 times as high as urban poverty compared to twice as high in the 1990s. At the regional level, the Northern, Upper East, and Upper West Regions continue to have the highest poverty rates. However, substantial progress has been achieved since 2006 in the Upper East Region as poverty has dropped from 72.9 percent in 2006 to 44.4 percent in 2013. Of great concern is the Northern Region, which saw its high level of poverty fall only slightly from 55.7 percent to 50.4 percent. Since the 1990s overall, the Northern Region has seen the smallest progress in poverty reduction. According to the Ghana Poverty and Inequality Report (2016), this has been a major issue for the country given that the Northern Region now makes up the largest number of poor people of any of Ghana's ten regions, with a population of about 1.3 million.

Sustainable Development Goals (SDGs), Livestock and Poverty Reduction

On 25 September 2015, the 193 Member States of the United Nations adopted the 2030 UN Agenda for Sustainable Development. The Agenda sets out seventeen (17) aspirational objectives, the Sustainable Development Goals (SDGs), associated with 169 targets, which will serve governments, international organizations, the private sector and civil society to chart the path of human advancement over the next 15 years. The SDGs succeeds the Millennium Development Goals (MDGs), the objectives set for the period 2000-2015. Over this period, the world witnessed significant advances in human development, such as halving extreme poverty and child mortality. However, it is recognized that targets for MDG7- environmental protection - have not been achieved or were negatively impacted (FAO, 2016).

The SDGs cover a much broader range of issues than the MDGs, in the knowledge that development is only sustainable if it respects the limits set by finite resources (land, water, nutrients and energy) and supporting ecosystem services (FAO, 2016). The seventeen SDGs integrate the three dimensions of sustainable development- economic, social and environmental. This means that no one goal is separate from the others, and all call for a comprehensive and participatory approach (FAO, 2016). All goals are universal, in the sense that the 2030 Agenda is relevant to all nations. However, while the UN 2030 agenda for sustainable development is an internationally endorsed framework accepted by, and applicable to, every nation, major gaps still remain in international awareness and consensus on how its various goals and targets are to be accomplished. The SDGs can be grouped into those that describe people's needs and aspirations (no poverty, zero hunger, good health and education, gender equality, reduced overall inequality, and peace and justice); those that describe environmental or "planet" requirements (water, energy, marine systems, land and biodiversity, and climate); and those that described desirable processes by which to achieve a better balance (FAO, 2016).

According to the FAO (2016), there is a link between livestock and the SDGs; livestock is positioned at the interface of the world's human and natural systems, which has been the basis of the Global Agenda's understanding of sustainability. Humans have been shaping their environment, the natural system, since the dawn of agriculture at the very least. Agriculture uses natural resources (land, water, biodiversity, forests, fish, nutrients and energy) and environmental services and transforms them into agricultural products (food, feed, fiber, fuel) that serve not only immediate needs but also provide economic

and social services (food security, economic growth and poverty reduction, health and cultural value).

Livestock is central to achieving many of the Sustainable Development Goals (SDGs) and directly relevant to most of them. The growing demand for livestock products in developing countries, driven by population growth, higher incomes and urbanization, represents a huge opportunity for hundreds of millions of poor smallholder livestock farmers, processors and marketers, many of whom are women, to meet that market demand and rise out of poverty. Livestock products (meat, milk, eggs) provide essential nutrients that contribute to food and nutritional security. Even small amounts of animal-sourced foods in the diets of children improve not only their physical development but also their cognitive and learning abilities (FAO, 2016).

The first goal of the SDG is to end poverty in all its forms everywhere. According to World Bank (2015), there are 900 million poor people worldwide, living on less than US\$1.9 per day. About half of such people depend directly on livestock for their livelihoods. To the poor, farm animals are a major asset-representing both capital and, in many cases, a source of income. Livestock, which can be sold in times of crisis, act as household insurance. On the farm, livestock provide animal traction and fertilization, and reward their owners with a wide diversity of products ranging from milk, meat and eggs to leather, hides and skins. According to the International Livestock Research Institute [ILRI] (2007), livestock contributes to three major pathways out of poverty. These three pathways include: increasing resilience, improving smallholder and pastoral productivity and by increasing market participation. In order to reinforce livestock's role in poverty eradication, however, it is important to

obtain more accurate information on the number and characterization of poor livestock keepers and of workers along livestock supply chains. Another priority is to gather better and systematic evidence on how to improve livestock productivity and generate greater market access for smallholders (ILRI, 2007).

According to FAO (2009), the demand for livestock products will increase by more than 70 percent between 2005 and 2030. According to FAO's estimates, in countries where food consumption is currently increasing, diets generally feature more livestock products, vegetable oils and sugar. Similarly, according to FAO (2013), livestock is a sector where opportunities for profits are substantial and often unrealized. Increasing the currently marginal productivity of labour in the livestock sector through training, technological upgrading and innovation can produce substantial and sustained value creation in developing-countries' supply chains. Employment returns to investment in livestock are higher than average because of the sector's high growth rate and labour intensity, with more diverse recruitment, including women. This is true not only in rural livestock production but also in the area of urban processing and marketing.

Conceptual Review

Concept of Livestock Production System

Livestock systems inhabit about 30 percent of the sphere's ice-free earthly surface area (Steinfeld et al., 2006) and are a significant global asset with a value of at least \$1.4 trillion. The livestock sector is progressively organized in long market chains that employ at least 1.3 billion people globally and directly support the livelihoods of 600 million poor smallholder farmers in the developing world (Thornton et al., 2006). Keeping livestock is an important

risk reduction strategy for vulnerable communities, and livestock are important providers of nutrients and traction for growing crops in smallholder systems. Livestock products contribute 17 percent to kilocalorie consumption and 33 percent to protein consumption globally, but there are large differences between rich and poor countries (Delgado et al., 2009). Livestock systems have both positive and negative effects on the natural resource base, public health, social equity and economic growth (World Bank, 2009).

Currently, livestock is one of the fastest growing agricultural subsectors in developing countries. Its share of agricultural GDP is already 3 percent and is swiftly increasing. This growth is driven by the rapidly increasing demand for livestock products: this demand is being driven by population growth, urbanization and increasing incomes in developing countries (Delgado, 2005). The global livestock sector is characterized by a dichotomy between developing and developed nations. Total meat production in the developing world tripled between 1980 and 2002, from 45 to 134 million tons (World Bank, 2009). Much of this growth was concentrated in countries that experienced rapid economic growth, particularly in East Asia, and revolved around poultry and pigs. In developed countries, on the other hand, production and consumption of livestock products are now growing only slowly or stagnating, although at high levels. Even so, livestock production and merchandizing in industrialized countries account for 53 percent of agricultural GDP (World Bank, 2009). This combination of growing demand in the developing world and stagnant demand in industrialized countries represents a major opportunity for livestock keepers in developing countries, where most demand is met by local production, and this is likely to continue well into the foreseeable future. At the same time, the

expansion of agricultural production needs to take place in a way that allows the less well-off to benefit from increased demand and that moderates its impact on the environment.

Livestock and livestock products are the most important income generating products in many mixed farming systems in Sub-Saharan Africa. Trends in poultry production and demand are highest in Asian countries and lowest in Sub-Saharan Africa, due to the low overall economic development in the region (Delgado et al., 1999). Poultry occupy a unique position in terms of their contribution to the provision of high-quality protein food to rural smallholder farming families in Africa (Sonaiya et al., 1999). Both poultry meat and eggs enrich and contribute to a well-balanced diet to satisfy human needs. Village poultry is particularly important in improving the diet of young children in sub-Saharan Africa, which inhabits about 33 million malnourished children below five years old (Rosegrant et al., 2001). According to Food and Agriculture Organization (FAO) (2003), Africa is estimated to produce 206,643,000 metric tons of milk annually based on the ideal lactation length of 305 days and an average of 1.5 litres per cow per day in Africa compared to 17.4 litres per cow per day in Europe.

Economic Contribution of Livestock Sector to Wealth Creation

Agriculture and livestock are the key components of the livelihood of rural people. The majority (80 %) of the world's poorest people are located in rural areas where they are engaged primarily in subsistence farming (World Bank, 2001). The link between livestock and poverty is brought about by the broad roles that livestock plays in the society. Livestock, especially cattle, poultry, sheep, goats and pigs make a substantial contribution to household food

security by providing income, quality food, energy, fertilizer and assets in over 80 percent of rural households in developing countries (FAO, 2005). Livestock could be seen on the one hand as a means of alleviating poverty and, on the other, as an economic activity to be supported because of the contribution it makes in meeting the rapidly growing demand for animal source foods. According to FAO (2005) and Heifer Project International (2006), small scale livestock production has adequately been cited as one of the strategies for poverty reduction.

About one billion herds of livestock are kept by more than 600 million small farmers in rural areas around the world (FAO, 2001): and about 95 percent of livestock keepers from rural areas live in extreme poverty (Richard & Adams, 1996). Livestock production contributes about 25 to 35 percent of agricultural GDP in Sub-Saharan Africa (Winroch International, 2000; Ehui et al., 2002). Sales of livestock products such as milk, eggs and fibre generate a constant stream of income and the sale of live animals, meat and hides produce substantial sporadic income (Otte & Knips, 2005).

According to Slingerland (2000), livestock contributes to the stability of the incomes of farm households as they act as a cash buffer (small stock), a capital reserve (large animals) and as a hedge against inflation. Slingerland iterated that raising livestock is often found to be more profitable than saving money in a bank as net annual returns from livestock are higher than interest rates. In many Asian and African countries, livestock rearing and dairying contribute largely in the making of income and generation of employment for rural people.

It has been estimated that livestock farming accounts for 15 percent and 20 percent of India and Asia's agricultural GDPs, respectively (Shah, 2006). Livestock currently sustains the livelihoods of an estimated 700 million rural poor in developing countries, and is a source of income generation, improved household food security and nutritional status (Maltsoglou & Taniguchi, 2004).

According to Mchau (1991), smallholder dairy farming is an important part of farming throughout the developing world. Dairying represents one of the fastest returns for livestock keepers in the developing world. More importantly, smallholder dairying provides a regular source of income and spreads income risk, whereas income from agriculture is seasonal. In countries like India, livestock development, in general, and dairy development, in particular, are considered key components of pro-poor development strategies. This is mainly because livestock distribution is much more equitable than land distribution. Livestock accounts for about 53 percent of the agricultural capital stock in Sub-Saharan Africa and contributes significantly (30 %) to agricultural products (Stroebel et al., 2010). In many parts of Africa, the dairy sector has been identified for its potential to increase the income generating productivity of smallholders' assets (Thorpe et al., 2000).

According to Rutamu (2004), it is understood that, by increasing numbers of dairy cattle in rural settings, there are significant direct contributions at the household level of dairy producing households such as; access to high quality nutrients, improved nutritional status of the children, employment of family members, regular incomes for long periods, manure for crops and improved soil fertility and income funds for education and health expenses. De-Haan et al. (2003) conducted a study in India and revealed that about 40 million

landless poor families secured a major part of their income from milk. Similarly, Cyril et al. (2002), in their Morogoro study, revealed that dairy farming is an important revenue for poverty reduction due to its contribution to income generation through sales of milk, milk products, live animals and manure.

In Tanzania, livestock products account for about 30 percent of agriculture and about 90 percent of value of food production and provide about 34 percent of protein and 16 percent of energy combined in human diets (Sibuga et al., 2003). The livestock sector contributes about 18 percent of Tanzania's GDP and 30 percent of the Agricultural GDP. Out of these 40 percent comes from beef production, 30 percent from milk, and 30 percent from poultry and small stock production (Kurwijila, 2002).

Engaging in livestock activities serves as a source of employment for rural and urban people through herding livestock; in processing livestock products and marketing of livestock and livestock products, which is about 50 percent of the total employment; provision of food, which is utilized in the form of eggs, meat and milk; and store of value and investment channel such as sales of livestock and livestock by-products providing farmers with cash to purchase household necessities and farm inputs (International Labour Organization (ILO), 2001; FAO, 2005). It is through the provision of these necessities that livestock contributes to increasing income of rural and urban people, reduction of income poverty, improvement of quality of life and social wellbeing.

Gender and Livestock

Women worldwide play important roles in livestock keeping and provision of livestock services. However, a number of challenges face the livestock sector, including ensuring food and feed resources, and livelihood

security for poor smallholder producers and processors. It is estimated that women compose around two thirds of the 400 million poor livestock keepers who mainly rely on livestock for their income (FAO, 2011).

A report by FAO (2011) argues that, if women were to have access to the same level of resources as men, agricultural productivity would go up by 10-30 percent and agricultural output would increase by up to 4 percent. Women are more likely to be considered the owners of small livestock compared to larger livestock, and to have a say in the disposal and sale of these and their products, and in the use of income accrued from the sales. Despite their role in livestock production, women's control has traditionally declined when productivity has increased and products are marketed through organized groups such as cooperatives, whose membership is predominantly men (Kergna et al., 2010). Studies in the crop sector have shown that the types of products and distance to markets can influence the level of control that women have over these products and the income derived from their sale (Njuki, Poole, Johnson, Baltenweck, Lokman, & Mburu, 2011).

Compared to crops, little research has been conducted on women's role in livestock farming (Kristjanson et al., 2010). The few existing analyses of the role and economic contribution of women to livestock development and the key challenges they face are inconclusive (Niamir-Fuller, 1994; Rangnekar, 1998; Aklilu et al., 2008). This inconclusiveness could be explained, in part, by the fact that the considerable involvement of women in livestock production is underestimated (Sinn et al., 1999). For example, most agricultural work is done by women most of whom work for 12–16 hours a day. Moreover, not all women who manage farm resources have access to the income generated by the farm

(Sinn et al., 1999). In addition, of all rural agricultural extension services, women are able to access only 5 percent of what men access (FAO, 1996-2001). Other likely explanations as to why research regarding the role and economic contribution of women to livestock development and the key challenges they face is inconclusive includes the fact that gender roles, relations and ideologies are not studied prior to and during interventions involving women and livestock; and attitudes and values regarding livestock, between men and women, are highly polarised (Kristjanson et al., 2010).

Ecological Zone of Northern Savannah

The Northern Savannah Ecological Zone (NSEZ) made up of the Northern, Upper East and Upper West Regions of Ghana offers an ideal and conducive environment for ruminant livestock production. Ruminant livestock are animals with a four-chambered stomach, capable of converting roughages, forages, and agro-by products into products such as meat and milk for human consumption. These animals include sheep, goats, and cattle. The NSEZ has the right rainfall, vegetation, land, and less pests and diseases for ruminant livestock production on any scale ranging from small, large and medium to commercial production. The zone homes about 50 percent of the country's ruminant population with smallholder producers using traditional methods of production forming the majority (Abukari, 2017).

The agro-ecological zones in Ghana closely mirror the natural vegetation in the regions and are influenced by climatic conditions and soil type (FAO, 2005; Ghana Environmental Protection Agency [GEPA], 2002). There are six different types of agro-ecological zones in Ghana, however, only the Guinea and Sudan Savannah zones of northern Ghana was covered in this study.

The Guinea savannah agro-ecological zone (147, 900 km²) lies south of the Sudan Savannah (Karbo & Agyare, 1997). The zone covers most of the Northern Region and lower part of the Upper West Region (Canagarajah & Portner, 2003; Tsibey et al., 2003). The Sudan Savannah zone, on the other hand, covers the entire Upper East region and a large part (about 1,900 km²) of the Upper West Region (Codjoe, 2010). Differences in rainfall amount and intensity, as well as temperature and vegetation cover, affect agricultural production in the two zones (Codjoe, 2010). This, in turn, influences production systems, risk coping strategies, production constraints, as well as differences in motivation and production objectives of smallholders. The Sudan Savannah zone consists of short drought- and fire-resistant deciduous trees scattered in open Savannah grassland. The grass cover is very sparse with frequent bare lands and severe surface soil erosion (GEPA, 2002). The Guinea Savannah zone, on the other hand, has ground cover grasses of varying heights with fire-resistant, deciduous broad-leaved trees at the forest margins in the south. Moving northwards, the vegetation is dominated by grassland with interspersed shorter trees (GEPA, 2002).

According to Wilson (1991), annual rainfall and the main vegetation characteristics (grass availability and type) across the zones account for differences in livestock production systems and numbers. The two zones, along with the coastal savannah, constitute the rangelands of Ghana. The dry Savannah (Guinea and Sudan) produces about 70 percent of the nation's cattle, and about 75 percent of the small ruminants (Oppong-Anane, 2011). However, more livestock are raised in the Guinea Savannah than in the Sudan Savannah. Mapiye et al. (2009) observe that there are differences in the agro-ecological

zones and how socio-cultural factors affect the relative importance of livestock among smallholder farmers in the area.

According to Abukari (2017), the ruminant livestock value chain has the potential of creating many jobs for various actors along the value chain in the region and country. In the Upper East Region, ruminant livestock production, when taken as a business, could create jobs, employment, ensure food and income security for many households. The sector could enhance the image and remove the Upper West Region from the league of three poorest regions in the country. For instance, improved cattle production could result in the use of bullocks to plough smallholder producers' fields of nearly 0.5 hectares instead of using tractors. Tractors are difficult to come by during the onset of the rains, very expensive and the continuous use on the same fields predisposes the land to hard pan.

The Upper East Region experiences variations in rainfall patterns and declining soil fertility resulting in reduced crop yields from the cultivated fields. Ruminant livestock production could reduce the impact of rainfall variation due to climate change and declining soil fertility by providing manure. Manure from ruminant livestock production will enhance the soil nutrient content and water holding capacity for improved yields. An integrated ruminant livestock-crop production system will therefore make smallholder producers more climate resilient in a changing climate (Abukari, 2017).

Livestock Rearing in Northern Ghana

According to the Department for International Development [DFID] (2014), livestock is a major resource, providing a source of livelihoods, food security, as well as a source of income and employment to poor rural people and

many others in northern Ghana. Livestock rearing forms an integral part of the mixed farming systems of rural people, providing the main source of manure and draught power for crop production in Northern Ghana. Additionally, cattle, sheep and goats in particular serve as a store of wealth, a source of savings, and security against crop failures for the poor. With the increasing adverse effects of climate change on crop-based agriculture, livestock keeps establishing its place as an important alternative livelihood for the poor and vulnerable in Northern Ghana. According to GLSS (2008), about 600,000 households in Northern Ghana keep livestock, with the Northern ecological zone contributing the highest population of cattle (84 %), sheep (60 %) and goats (60 %) of national production. In fact, Northern Ghana has a huge comparative advantage in livestock production over the rest of the country, because of favourable climatic conditions, large grazing land with vast natural forage resources including residues from crop-dominated agriculture (GSS, 2014).

However, despite this huge production from the zone and favourable agro-climate conditions, the livestock sub-sector contributes only an estimated 8 percent to agricultural GDP (GSS, 2014). The livestock are kept under extensive free-range grazing system where they feed on low nutritive forage, with little or no supplementary feeding, which, coupled with use of low productive breeds and poor disease control, are largely responsible for current low productivity and slow growth rates of cattle, sheep and goats in the north. For instance, the average annual growth rates for cattle, sheep and goats from 2004-2012 were only 1.6 percent, 3.2 percent and 4.8 percent respectively (GSS, 2014).

The livestock sub-sector is an important component of agriculture in Ghana. It is broadly defined to include ruminants (cattle, sheep and goats), non-ruminants (pigs), poultry (chicken, guinea fowl, ducks, turkey, and ostrich) and non-conventional species such as grass cutter, snail, rabbits, and guinea pigs (MoFA, 2004). According to Maalug and Tommie (2006), livestock generally consists of cattle, sheep and goats. In short, all domestic animals kept for food and other valuable purposes can be classified as livestock. According to Awudu (2005), the livestock industry is an important survival enterprise for millions of people in tropical Africa.

Livestock production, particularly sheep, goats, and cattle, are predominant in the three regions of northern Ghana (Upper East, Upper West and Northern). The regions account for about 75 percent of all cattle produced in Ghana (Adzitey, 2013). Karbo and Bruce (2000) indicated that about 70 percent of the land in Northern Ghana is available for livestock production. Livestock production attracts minimum investment in housing, feeding and health care, although it plays a very dynamic role in the lives of both rural and urban dwellers. MoFA (2002) found that the livestock/poultry industry serves as a safety net, providing an important source of ready cash for emergency needs. The major contribution of the livestock sector to the national economy is food security as it provides animal protein to enhance the nutritional status of the human population. It provides employment opportunities to a large part of the population particularly in the rural areas and offers prospects for wealth creation, income enhancement and improvement in rural livelihoods (Williams, 2009). Manure from livestock is now an invaluable resource to crop and vegetable farmers for the maintenance of soil fertility and control of soil erosion.

Most agricultural households operate livestock enterprises alongside crop enterprises. In such mixed farming systems, livestock provides manure to improve soil fertility and structure, and nutrient cycling because it contains nitrogen, phosphorus and potassium (MoFA, 2004).

Incidence of Poverty in the Rural and Urban Areas

Maltsoglou and Taniguchi (2004) conducted a study on poverty, livestock and household typologies in Nepal. The study investigated the features that characterise the poor in Nepal as well as determined the role livestock played in and for household's income and income sources. The findings of the study revealed that the incidence of poverty in the rural areas proves to be approximately three times higher than poverty in the urban areas. Poor people in rural areas represent 56.5 percent of the population, while 21.6 percent of the households were below the poverty line in urban areas. Poverty in the rural areas was furthermore found to be deeper and more severe, since the poverty gap and squared poverty gap measures are higher. Inequality in income distribution varied between rural and urban areas, where distribution of income was more unequal in urban areas. Poverty head count went up to 59.6 percent in the mountains and 62.8 percent in the rural Terai (a lowland region in southern Nepal) and 51.2 percent in the rural hills. In addition, poverty was deepest and most severe in the rural Terai.

Constraints of Livestock Production

Livestock production is very important in many parts of developing countries due to its ability to provide valuable food products and income to smallholder farmers. However, there are constraints to increased livestock production (Mukiibi-Muka, Ebong, Olweny, & Dalsgaard, 2000; Owen, Kitalyi,

Jayasuriya, & Smith 2005; Aboe et al., 2006; Kivaria, 2006). Such constraints include: poor nutrition both in quality and quantity; diseases and parasites (due to poor animal health services); weak extension services; inadequate supply of dairy stocks; inadequate research; non-availability of credit services; disorganized milk and eggs marketing; poor management and poor livestock houses. Several studies have been done to illustrate these constraints in dairy cattle and indigenous chicken.

Msechu (2001) pointed out several factors attributing to low contribution of the livestock sector to the national economy. These includes policy and institutional organizations. In past decades major and minor changes in the ministries hosting the livestock sector, departmental organization and policies relating to management of livestock have been observed to be the constraint in livestock development. These changes affected the performance of the livestock sector since each time a change took place there was a time lag for adjustment. Kurwijila and Kifaro (2001) argued that low genetic potential for milk production characterized by poor milk yields, short lactation length, long calving intervals and old age at first calving contributed to the low contribution of livestock to the country's GDP. Others include animal health, that is, diseases and parasites and nutrition associated with extreme climatic change and low-quality tropical feeds.

Mlay (2001) reported a fall in milk yield by more than 40 percent during the dry season due to nutritional related constraints in which nitrogen, metabolizable energy contents and organic matter digestibility declined as the dry season advanced. According to Aboe et al. (2006), Newcastle disease constitutes the most serious epizootic poultry disease throughout the world,

particularly in developing countries. Newcastle disease occurs every year and kills on an average 70 percent to 80 percent of the unvaccinated village chickens. It is the most important health issue for chickens. Other constraints are poor feeding, poor nutrition, poor housing and marketing (Mukiibi Muka et al., 2000). In furtherance, an extensive research conducted by a number of authors highlighted some major constraints encountered by livestock farmers. Among some of these constraints are:

Inadequate quantities and quality of livestock feed and nutrition

The quantity and quality of feeds may be regarded as the first limiting constraint to livestock productivity in developing countries. In most areas in Ghana, especially in the northern parts, quantity and quality of range grasses decline during the dry season to a point that livestock surviving solely on range grasses are unable to maintain their body or weight (Annor & Adongo, 1992). Under-nutrition of livestock limits the yields of meat and milk to a fraction of the genetic potential and increases the animals' susceptibility to diseases and parasites (Abakar et al., 2002). Cattle, sheep and goats in tropical Africa depend heavily on browse species to meet their dietary requirement (FAO, 2006).

Livestock theft

Khoabane and Black (2009) reported that livestock theft is a contributory factor to poverty. Livestock theft is mainly attributable to the increased poverty of both the unemployed and drought-stricken crop farmers. It reduces the affected households' own consumption of the returns on their wealth and, in addition, restricts the ability of households to sell their animals and use the proceeds to acquire food and non-food products. Livestock theft results in subsistence farmers losing their immediate source of livelihood. Reist,

Hintermann and Sommer (2007), Gong (2005) and Nuhu (2004) reported that livestock theft was one of the biggest problem women faced in the West Gonja and the Saboba-Cheriponi Districts, respectively. They attributed this to the extensive system of rearing their animals where animals are left to roam about throughout the night coupled with the illegal small-scale mining operations in the district. Gong (2005), again noted that livestock theft is one of the factors that discourages women from livestock production.

Access to water

Amede, Descheemaeker, Peden and Van-Rooyen (2009) are of the view that the threat of water scarcity in Sub-Saharan Africa is very real and is as a result of expanding agricultural needs, climate variability and inappropriate land use. Besides the economic benefits, increasing livestock production may also deplete the water resources and aggravate the water scarcity at both local and global levels. Insufficient understanding of livestock-water interactions tends to lead to low productivity, impede sound decisions on resource management as well as undermine the realization of positive returns on agricultural water across Sub-Saharan Africa. Animals use a large amount of water to carry out their daily metabolic activities. The amount of water in an animal's feed affects the amount needed by the body (Payne, 1990). Water requirements of animals are very important because about one-tenth of the water loss from the body could cause serious disability and deaths (Karbo, Bruce, Saila, Hanya & Otchere, 2005) and that pregnant and lactating animals need more water to balance their body fluid and to help produce more milk to feed their offspring. Innovative methods are necessary in order to improve water productivity and reverse the growing trends of water scarcity, which are a cause for concern.

Bush fires

Mengistu (2008) in Ethiopia, reports that fires are started deliberately by local people for reasons like removing dry grass and initiating new flushes of grass, eradicating ticks, tsetse flies and other insects or pests harmful to livestock, clearing agricultural land and harvesting forest honey. However, this practice leads to negative impacts on the local environment, including degradation of the forest vegetation, reduction in the population of wild animals, loss of farm properties such as houses and perennial crops and a critical shortage of cattle feed until the first season of rain. Grassland fires contribute to a significant proportion of land degradation and emission of greenhouse gases to the atmosphere. Furthermore, fire destroys the resources needed for immediate use during the dry season (Nkomo & Sussi, 2009). In Ghana, bush fires are rampant during the dry season especially when the harmattan sets in. These wild fires normally burn grasses and pasture plants exposing livestock to inadequate feed, especially in Northern Ghana.

Animal diseases

Animal diseases constitute one of the principal constraints to smallholder livestock production in the developing world. High incidences of diseases may dramatically reduce appetite and metabolism of body reserves, cause loss of weight, reduce growth rate and reduce productivity. Diseases and pests are the main causes of deaths in livestock (Abebrese, 2003). Several factors affect the health of animals, which could be due to poor management and weather conditions (Adzowu-Tsri, 2005). He added that topical breeds are said to be hardy and resistant but poor management affects their performance. Apiiga (2002) stated that ethno veterinary is a traditional way in which farmers

have developed to keep their animals healthy and productive at low cost. FAO (2002) reported that animal diseases constitute the major constraint to income generation and asset acquisition by the poor, as poor people have limited cash resources with which to pay for animal health. Diseases that limit the productivity of small ruminants in Africa, especially Ghana include pneumonia, coccidiosis, contagious caprine pleura pneumonia, brucellosis among others. Individually, these diseases might not constitute serious problems, but combinations of them or their occurrence under marginal conditions could result in serious losses (Kumah, 2006).

Empirical Review

Livestock Ownership and Household Poverty

Kafle (2014) studied the impact of the livestock donation programme (dairy cow, goat and draft cattle) on poverty and food security measures in Zambia. He applied pooled poisson and probit estimation techniques to gather data from 300 households in the Copper-belt province. Kafle found that all beneficiaries of animals experienced significant increases in livestock revenue and thus contributed to poverty alleviation. The consumption expenditure and frequency of diary/meat consumption at the end of the fourth round likewise increased.

Similarly, Talukder (2014) examined the determinants of income of rural household in Bangladesh. Using secondary data from 1985, 1986 and 2005, ordinary least square estimation technique was applied to the dataset. The result showed that household size and land area for farming were positively and significantly associated with rural household income. An increase in household size increases household income as larger farm size could be cultivated. This

could result in more output hence an increase in income. This study seeks to differ from Talukder study by not only considering household size and other household demographics characteristic and farming in general on poverty, but moreover emphasize livestock ownership by households.

In Nigeria, Inoni (2010) examined the effect of smallholder livestock production on poverty reduction. He used 218 rural dwellers who were engaged in small scale farming in 20 communities in the Central Agricultural Zone of Delta State. His dependent variable was flock size among smallholder livestock producers and the independent variables included household size, annual income and gender of household head. The results of the study indicated that livestock income exerted a positive effect on the lives of farmers through improved nutrition and food security, which tend to reduce poverty. Inoni considered smallholder livestock on poverty reduction. However, this study sought to consider the effects of medium-sized livestock and large-sized livestock as well as types of livestock ownership by households, and the joint effect of size of livestock and specific types (cattle, sheep) of livestock owned by households on poverty reduction in northern Ghana.

Similarly, Yusuf et al. (2008) applied descriptive statistics and the logistic estimation technique to 200 households selected from two local government areas in Ibadan Metropolis of Oyo State, Nigeria. They revealed that poverty was as high as 50 percent among households that engaged in crop farming. For households that engaged in mixed farming it was 37 percent. However, for livestock farmers it was 17 percent. This indicated that households who engaged in smallholder livestock production had lower poverty levels as compared to households who did not engage in livestock production.

Ntanyoma (2010) studied the effect of an increase in numbers of livestock on income in Rwanda. He applied descriptive and propensity score matching techniques to 333 households (210 received cows and 123 formed the control group). The study showed that households who received cows had increased their income and thus reduced poverty.

In another study, Akter (2011) examined the effect of the poverty alleviation programme through the promotion of poultry production on the livelihood of smallholder livestock farmers in Bangladesh for the period 2006-2008. Akter applied self-assessed measurement and multinomial logistic estimation technique to individual data collected from 400 women smallholder farmers. The study revealed that livestock dividends of income was 4.3 percent in 2006 and increased to 7.1 percent in 2008. Again, livestock income dividends increased from 15 percent in 2006 to 18 percent in 2008. This indicates that the alleviation programme introduced really brought relief on the smallholder livestock farmers in Bangladesh.

Little research has been conducted regarding the influence of livestock production on household income in the Ghanaian context. Naminse (2010) studied the impact of ruminant production on household income and food security among the people of Talensi-Nabdam District in the Upper East Region. The sample size was 60 ruminant farmers and descriptive statistics was used to analyze the data. The findings of Naminse's study reported that sales of ruminants contributed roughly 36.10 percent to the annual income of smallholder livestock producers in the Talensi-Nabdam District.

Baidoo, Yusif, and Anwar (2016) conducted a study on the effect of smallholder livestock production on income of farm households in Northern

Ghana. Questionnaires were administered to a sample 300 respondents (smallholder livestock producers). Respondents were randomly sampled in the Yendi Municipality of the Northern Region and an ordinary least squares regression technique was applied to the dataset. The dependent variable was income and measured by total annual income received from farm and non-farm activities by household heads. The independent variable of interest was tropical livestock unit measured by flock size. Farm size, household size, gender, age, educational level, distance to market, dependency ratio and access to formal credit were included as control variables. The findings of the study revealed that smallholder livestock production had a positive and statistically significant effect on household income. The results of the study further indicated that household income was positively associated with farm size and household size. It was evident from the findings of the study that distance to the market centre and the dependency ratio had a negative relationship with household income. Baidoo et al, however, failed to consider the effects of large-sized livestock ownership in order to inform policy makers as to which size of livestock ownership works better when it comes, not only to the issue of increasing household income, but its effect in reducing poverty in general.

Boakye (2008) explores the effect of livestock on the livelihood of small-holder farmers but only considers grasscutters. Abdul-Moomin (2012) considered the challenges and constraints confronting smallholder livestock but overlooked the potential impact of livestock on poverty reduction in Ghana. Sumah (2015) examined the effect of government livestock development projects on livestock development and livelihoods of farmers but only at some specific areas in Ghana. Konga (2014) evaluated the impact of smallholders of

livestock keeping but only considered food security. Adams and Yankyera (2014) looked at the determinants of rearing small ruminant (either goat or sheep or both) but failed to consider poultry and cattle.

According to Oppong-Anane (2011), the limited public programmes in support of livestock production mainly focused on large ruminants as against small ruminant animals. Mahama (2012), reported that the role of small ruminants to food security and poverty reductions to vulnerable households is indescribable, especially in the Northern part of Ghana. The reason could be that the gestation period for small ruminants is far shorter compared to that of the large ruminants (that is, cattle). Furthermore, small ruminants provide quick income in times of basic needs as they can more easily be sold compared to cattle. However, a further attempt has not been made in comparing types of livestock owned, for example, cattle, sheep and poultry by households and their respective impact on household poverty through consumption expenditure.

Further, consideration has not been given to the joint effects of type and the size of livestock on poverty reduction. For example, large-sized cattle compared to other large-sized livestock in general; medium-sized sheep compared to other medium-sized livestock, which of these can more easily get poor households out of poverty? This is envisaged from the fact that poultry compared to sheep and cattle, has a much shorter gestation period and may be a much faster source of food and income to poor households. This study, thus seek to examine the impact of cattle, sheep and poultry ownership by households and their respective impact on household poverty.

Medium Sized-Livestock and Poverty Reduction

Oluwatayo and Oluwatayo (2012) conducted a study on small ruminants as a source of financial security. The study examined the extent to which small ruminants assisted women in rural southwest Nigeria in meeting financial obligations with the overall goal of ensuring its sustainability and enhancing the benefits inherent in the practice of small ruminants' husbandry. A four-stage random sampling method was employed in selecting three out of six states in rural southwest Nigeria. A total of about 500 questionnaires were administered out of which 450 were used in the study. Descriptive statistics, poverty index measure, ordinary least squares regression analysis, and the coping strategies use index were used in analyzing the data.

The average age of respondents in the study area was 48 years old, more than half were married (57.6 %), while only about (22.9 %) were single. The rest were either divorced or widowed (19.5 %). Educational distribution of respondents indicated that only about one-third (33.8 %) were educated up to the tertiary level. While about (48.7 %) did not receive formal education, the rest received either primary or secondary education. Average household size of respondents was seven, and this large household size decreased respondents' per capita income, further worsening their poverty status. Furthermore, respondents' distribution by membership of social group/association (especially cooperative societies) indicated that over three-quarter (77.3 %) of the respondents belonged to one association or another. Such association was very important in creating a platform to showcase what they had to sell to enhance the ease of converting small ruminants into credit facility or ready-made cash. Occupational distribution of respondents showed a relatively high importance

of farming (agriculture-crop/animal husbandry) compared to other occupations available in the study area. Thus, while about 58.7 percent of the respondents indicated agriculture as their main source of livelihood, over two-thirds indicated farming as an alternative source of income.

The types of livestock raised by respondents were goats (71.9 percent), poultry (53.5 percent), sheep (28.1 percent) and swine (11.3 percent). Poverty status of respondents revealed that income per-capita of about two-thirds (65.1 %) of the respondents was below N3, 120 (\$20.5) per month. This indicated high levels of poverty, especially among rural women living on less than one dollar per day.

The findings of Oluwatayo and Oluwatayo (2012) revealed that most of the respondents (67.7 %) reported that income generated from their involvement in small ruminants rearing helped them significantly to attend to other important issues in the welfare of household members since the income generated from other sources was not enough to cope with increasing demands on the home front. For example, small ruminants rearing provided a leeway for important unforeseen financial demands like paying hospital bills and assisting relations in emergency situations. Their findings further revealed that most of the household relied on income from small ruminants' sales especially when there is scarcity of food either due to a lean harvest or when the stock of available food is exhausted.

Large-Sized Livestock and Poverty Reduction

Stroebel and Nesamvuni (2008) conducted a study on the benefits obtained from cattle by smallholder farmers in the Limpopo Province, South Africa. A non-probability sampling method was used to select a sample of 128

households for the survey: a purposive sampling method was used to select respondents for the study. Data was collected by means of a general survey questionnaire and a participatory rural appraisal exercise. A comprehensive participatory rural appraisal technique was used to gather qualitative information from the respondents. In addition, some information was obtained from secondary sources (veterinary services records). Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. The findings of the study indicated that almost 60 percent of farmers owned less than 10 cattle. Female animals constituted the largest component of the herd (55.02%). Although the bull: cow ratio was extremely high (1: 3.7), the calving rate was low at 35.60 percent, with an extremely high herd mortality of 15.70 percent and a low off-take of 8.70 percent. The findings of the study further revealed a significant contribution of livestock to rural development and poverty alleviation. In addition, the findings of the study revealed a pairwise ranking benefits obtained from cattle by smallholder livestock farmers. The benefits included: selling and meat consumption, wealth, status and savings, socio-cultural activities, and draught power.

Size/Types of Livestock Ownership and Household Poverty

Mwanawima (2010) conducted a comparative study on the contribution of livestock projects on poverty reduction in four villages in Tandahimba District in Tanzania. A sample size of 120 respondents (60 from dairy cattle and indigenous chicken projects and another 60 respondents who were out of the projects) were selected and interviewed using a structured questionnaire. Data obtained from the study area were analyzed using Statistical Package for Service Solution (SPSS) and Statistical Analysis System (SAS) computer programmes

to compute descriptive statistics. A comparison of income was done using t-test to compare households with and without livestock projects, as well as comparing periods before the project and after getting involved in the projects. The relative importance of the two projects of dairy cattle and indigenous chicken on total income was determined using forward multiple regressions whereby annual income for each project was computed separately; comparison of these projects was done to see which one had higher annual income. Mwanawima, in terms of type of livestock ownership, only considered cattle (large-sized livestock) and poultry (small-sized livestock) without considering medium sized livestock, for example, sheep.

The findings of the study revealed that farmers in the dairy cattle project had higher income than those out of the project. Likewise, mean household income before joining the project was lower compared to income after joining the project. Similarly, respondents in the indigenous chicken project had higher incomes than those outside the chicken project. The findings of the study further showed that household incomes before the project was lower compared to the household income after joining the project. It was evident from the study that livestock contributed substantially to household income and hence improved the standard of living of households. Livestock projects not only increased cash income but also household consumption of livestock and their products. In a nutshell, livestock projects (dairy cattle and indigenous chicken) have a significant impact on poverty reduction at household level and have enhanced farmers to acquire assets so as to meet their day-to-day needs.

Thanh (2010) explored the role of cattle keeping in the livelihoods of people living in a Khmer community as well as the reasons for farmers

remaining in cattle production as a significant component in their agriculture structure. Both qualitative and quantitative methods were used to collect data to study perceptions and make assessments of 45 Khmer cattle keepers in Vietnam. The findings of the study showed that cattle keeping contributes to the livelihood of Khmer people through many aspects including income generation, tools for agricultural production and social capital. The findings of the study further revealed that the social functions of cattle keeping, which could provide advantages for cattle keepers' access to finance, prestige and trust from local people, were among the most important reasons for the Khmer people remaining in cattle production. Again, a simple linear regression analysis indicated that the number of cattle in the survey significantly correlated to the number of people in households and number of cattle at the beginning of their cattle keeping.

Holmann et al. (2005) conducted a study on the role of livestock in poverty alleviation in Colombia. The study was to understand the perception of agricultural producers in Colombia who currently do not own livestock about the role of cattle in alleviating poverty on their farms. Data came from direct survey interviews with 143 farmers who did not own cattle in the five most important regions of animal production in Colombia to elicit their perception about the role of livestock as a pathway out of poverty. Selected regions were: Piedmont, Caribbean, the Coffee-growing region, the highlands of Antioquia, and the Cundiboyacense Altiplanicie.

Most smallholders interviewed in the Piedmont had cattle in the past (85 %), followed by producers in Antioquia (60 %) and least in the Coffee-growing region (39 %). The most important reason for selling their cattle in all regions was financial crisis. Most smallholders surveyed used the money from the sale

of animals to pay health bills for family members, and to pay off debts. Some also used the cash to survive due to crop failure from extreme weather conditions.

The findings of the study revealed that 76 percent of farmers in Antioquia compared to 97 percent of smallholders in the Cundiboyacense Altiplanicie would like to own cattle if they had the opportunity. The study further revealed that the most important reason for owning cattle in all regions was as a mechanism for savings and building capital. The second most important reason to have cattle in all regions was to obtain milk and beef for family consumption, except in Antioquia where this issue was irrelevant. Other reasons for owning cattle were to reduce and diversify risk due to crop failure and to utilize manure as fertilizer. The preferred animal category to own in all regions was by far the milking cow, ranging from 52 percent of smallholders in Antioquia to 96 percent in the Cundiboyacense Altiplanicie. The results from the study showed that cattle are perceived by small-holder farmers as a contribution to the improvement in the quality of life, saving, capital building as well as poverty reduction.

Conceptual Framework

This study conceptualized the influence of medium sized livestock ownership, diversity of livestock ownership and large sized ownership of livestock on poverty reduction. Figure 1 presents the relationships among the variables.

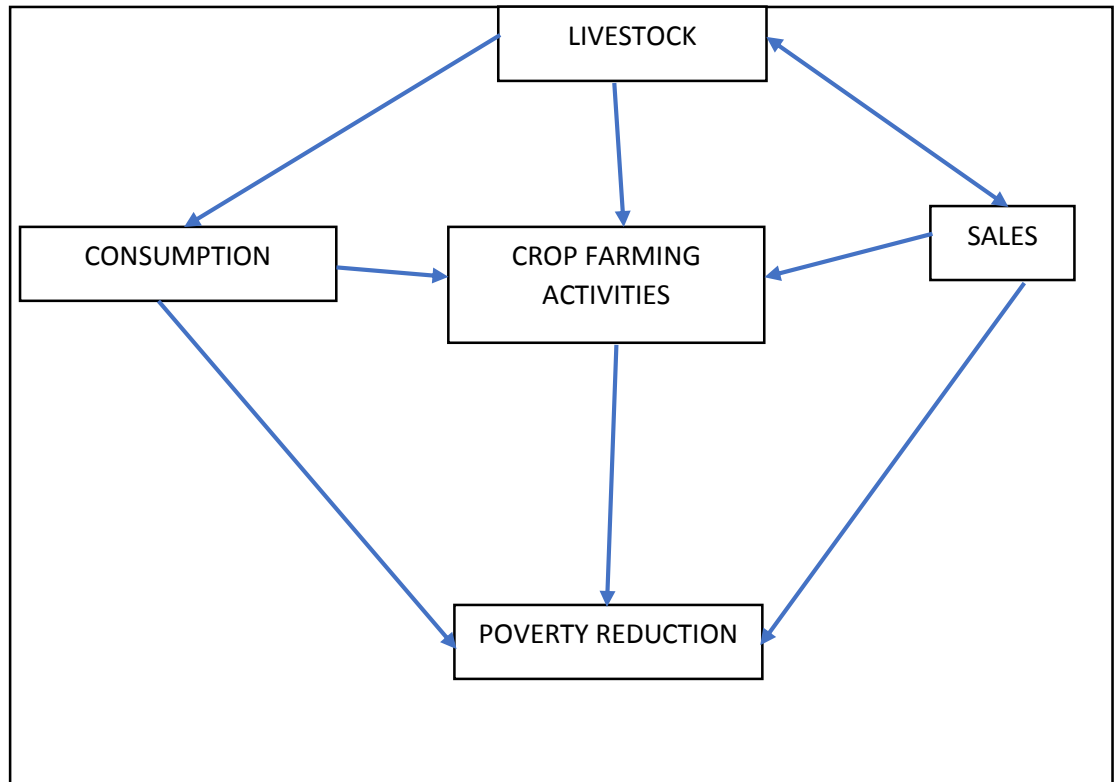


Figure 1- Relationship between livestock and poverty reduction

Source: Filed Survey, Aketemah (2018)

The study proposes that livestock ownership (medium-sized livestock, large-sized livestock and types of livestock) contributes to poverty reduction. This implies that households who owned livestock will generate revenue when livestock and livestock-products are sold to generate revenue. This revenue when spent on other items to meet the needs of the households reduces poverty through consumption poverty. However, if revenue is used to buy more livestock, then there will be growth in the number of livestock raised by the household which will consequently lead to the generation of more future revenue through the sales of more livestock thus leading to a more reduction in household poverty through an improvement in their consumption expenditure.

To add, Livestock and Livestock products can also be consumed directly by house (food consumption). This together with proceeds of crop farming activities which livestock complements enables individual to meet the

nutritional needs of households. Thus, making them fit and healthy to do other economic and social activities, which have a positive impact on their poverty.

Livestock directly compliments crop farming activities through the provision of Compost to fertilize farm lands, supply of energy for farming activities such as ploughing and transportation especially in rural farming settings. Indirectly, the proceeds from the sale of livestock compliments farming activities since revenue can be used to purchase farm inputs such as fertilizer, weedicides and pesticides and farm tools. Holding all other things constant, this will lead to an improvement in the crop yield which can either be consumed directly by households, sold by household or both to reduce household poverty. Thus, the choice of owning livestock by households with the primary aim of reducing poverty is highly justified.

CHAPTER THREE

RESEARCH METHODS

The purpose of the study was to determine the effect of livestock ownership on poverty reduction in Northern, Upper East and Upper West regions of Ghana. This chapter discusses and explains the methods, data and estimation techniques used in conducting the research. The research design used for the study is discussed in the first section. Second in this chapter is the theoretical model that was used in the study. The third section explains the estimation techniques and the fourth section presents the empirical models for livestock ownership and poverty. It also presents the relevant variables together with the expected result from each of the variables. Finally, data source, sampling and sample size are presented along with the data analysis procedure.

Study Design

Harwell (2011) emphasized that, whereas in other studies, research design may refer only to the methodology of a study as data collection and analysis, an entire research process ranging from conceptualizing a problem to the literature review, research questions, methods, and conclusions may be reflected in the research design. This work is a cross-sectional survey and employs the positivist philosophy. Positivist philosophy allows the researcher to study social processes in an objective manner as well as explain relationships between variables. Furthermore, Positivist philosophy is suitable for the development of mathematical models to investigate the relationship between quantitative measurements. Three purposes of social science research have been identified by Babbie (2013), which are known to be exploratory, descriptive and explanatory.

Theoretical Model

The sole purpose of this section is to introduce the theoretical model explaining the formulation of the empirical models and the choice of explanatory variables. Based on literature, poverty can be measured based on monetary approach, non-monetary approach, basic needs approach and capability approach. This study adopts the monetary approach to measuring poverty by using the consumption expenditure approach. Also, based on poverty lines, households must meet a minimum basket of goods and services to be non-poor.

From the literature review, the theories of poverty are collapsed from the broad Classical, Neoclassical and Keynesian theories of poverty into individual, structural, cultural and geographical theories of poverty which are by their nature explains the causes of poverty. In light of this, this study adapts the framework of Blank (2003) in relation to individual and geographical theoretical perspectives of poverty. According to this framework, poverty is attributed to individual behavioural characteristics and choices and also geographical location. Values about livestock ownership, family structure and education that underlie the individual theory of poverty suggest that the problem of poverty is within the control of the poor themselves and policies and programs only need to influence those choices. Also, the ability of individuals to own livestock in order to earn a living in an economy could reduce poverty. Thus, the choice of individuals to engage mostly in rearing livestock leads them into monetary poverty. In short, Blank's (2003) theoretical framework of poverty holds the view that, among other factors, ownership of livestock, age,

sex of household head, the size of a household, geographical location, employment status and education determine the poverty levels.

Econometric Specification and Estimation

The study made use of OLS as the econometric estimation technique. The choice of the OLS technique was informed by the measurement of the dependent variable (household expenditure) that is continuous, with relevant explanatory variables, and key hypotheses for empirical validation.

Empirical Model Specification

The multiple regression model as specified in Equation 1 below, estimates the determinants of household poverty. As indicated earlier (in the data section), the three main variables of interest in Equation 1, livestock ownership, is conditioned on various household characteristics.

Testing the First Hypothesis

To determine the effects of medium-size and large-size ownership of livestock on household poverty, the multiple regression model as specified in Equations 3 was employed:

$$\begin{aligned} \log P_i = & \beta_0 + \beta_1 \text{LLivestock}_1 + \beta_2 \text{MLivestock}_2 + \\ & \beta_4 \text{AgeHH}_4 + \beta_5 \text{SexHH}_5 + \beta_6 \text{HHSize}_6 + \beta_7 \text{Loc}_7 + \beta_8 \text{HHMAST}_8 + \\ & \beta_9 \text{HHEduL}_9 + \beta_{10} \text{HHEMPL}_{10} + \varepsilon_i \dots (3) \end{aligned}$$

Where P_i is poverty measured by consumption expenditure; LLivestock is large-sized livestock owned by households; MLivestock is medium-sized livestock owned by household; AgeHH is the age of the household head, SexHH ; is the sex of the household head, HHsize ; is the size of the house hold, Loc ; is the location of the household (rural or urban), HHMAST ; is the marital

status of the household head, HHEdul; is the level of education attained by the household head and HHEMPL; is the employment status of the household head.

Testing the Second Hypothesis

To examine the effect of type of livestock ownership on household poverty, the multiple regression model as specified in Equations 4 as:

$$\begin{aligned} \text{Log}P_i = & \beta_0 + \beta_1 \text{cattle}_1 + \beta_2 \text{sheep}_2 + \beta_3 \text{Poultry}_3 + \\ & + \beta_4 \text{AgeHH}_4 + \beta_5 \text{SexHH}_5 + \beta_6 \text{HHSize}_6 + \beta_7 \text{Loc}_7 + \beta_8 \text{HHMAST}_8 + \\ & \beta_9 \text{HHEduL}_9 + \beta_{10} \text{HHEMPL}_{10} + \varepsilon_i \dots (4) \end{aligned}$$

Testing the Third Hypothesis

To determine the joint effect of size and type in ownership of livestock on household poverty:

$$\begin{aligned} \text{Log}P_i = & \Omega_0 + \Omega_1 \text{LLivestock}_1 * \text{cattle} + \Omega_2 \text{AgeHH}_2 + \Omega_3 \text{SexHH}_3 + \\ & \Omega_4 \text{HHSize}_4 + \Omega_5 \text{Loc}_5 + \Omega_6 \text{HHMAST}_6 + \Omega_7 \text{HHEduL}_7 + \Omega_8 \text{HHEMPL}_8 + \\ & \varepsilon_i \dots (5) \end{aligned}$$

$$\begin{aligned} \text{Log}P_i = & \Upsilon_0 + \Upsilon_1 \text{MLivestock}_1 * \text{sheep} + \Upsilon_2 \text{AgeHH}_2 + \Upsilon_3 \text{SexHH}_3 + \\ & \Upsilon_4 \text{HHSize}_4 + \Upsilon_5 \text{Loc}_5 + \Upsilon_6 \text{HHMAST}_6 + \Upsilon_7 \text{HHEduL}_7 + \Upsilon_8 \text{HHEMPL}_8 + \\ & \varepsilon_i \dots (6) \end{aligned}$$

Definition and Justification of Variables

Livestock ownership

Livestock is used in this study to include cattle, sheep, goats, pigs, poultry, micro-livestock, horses, donkeys and pets. Livestock ownership refers to households that own it. According to MoFA (2004), the livestock species in the country can be classified into three in terms of their use as follows: a). for human consumption; b). for draught power; and c). recreation pet and security.

Also, the three most important criteria used in ranking the livestock types are their contribution to nutrition, livestock population (the rate at which the population of each specie increases) and the contribution to livelihood.

For the purpose of this study, livestock is broadly grouped into two:

a. **Medium-sized livestock.** This refers to the average weight in terms of monetary value placed on a given livestock type by the farmers at the household level.

b. **Large-sized livestock.** Large-sized livestock is defined as having a higher weighted monetary value placed on a livestock type by the farmer at the household level relative to a medium-sized livestock. However, this is the author's guided classification of the variable as their definitions (medium-sized and large-sized livestock owned by households) in the data set and GLSS round six report did not explain succinctly their respective classification.

Age of Household Head

Extant literature holds that, an individual's productivity and working agility decreases with increase in age. Thus, age is one of the determinants of poverty. The age of a household head measured in complete years. Similarly, Malik (1996) and Khalid et al. (2005) observed that the likelihood of households remaining poor reduces for households with heads in the higher age group. In this study age is treated as a continuous variable as well as a categorical variable.

Sex of household head

A lot of studies have found that the sex of household heads has an influence on poverty. Geda et al. (2005) found that there is a high probability of female headed households to be poor as compared with male headed households. However, there are mixed results in relation to the relationship

between male headed and female headed households and poverty as indicated in a study by Rajaram (2009).

Household size

Household size refers to the number of people that reside in a particular house. This factor as an indicator of poverty depicts the correlation between household's level of poverty and household composition. Household composition, in terms of size of the household is mostly different for poor and non-poor households. Increased household size has been found by many studies to increase poverty. Biyase and Zwane (2017) found that an additional person in a household increases poverty by reducing consumption expenditure. Poverty is, however expected to reduce with smaller households, all other things being equal.

Study area (Ecological Zone of Northern Savannah)

The Northern Savannah Ecological Zone (NSEZ) made up of the Northern, Upper East and Upper West Regions of Ghana offers an ideal and conducive environment for ruminant livestock production. Ruminant livestock are animals with a four-chambered stomach, capable of converting roughages, forages, and agro-by products into products such as meat and milk for human consumption. These animals include sheep, goats, and cattle. The NSEZ has the right rainfall, vegetation, land, and less pests and diseases for ruminant livestock production on any scale ranging from small, large and medium to commercial production. The zone homes about 50 percent of the country's ruminant population with smallholder producers using traditional methods of production forming the majority (Abukari, 2017).

The agro-ecological zones in Ghana closely mirror the natural vegetation in the regions and are influenced by climatic conditions and soil type (FAO, 2005; Ghana Environmental Protection Agency [GEPA], 2002). There are six different types of agro-ecological zones in Ghana, however, only the Guinea and Sudan Savannah zones of northern Ghana was covered in this study. The Guinea savannah agro-ecological zone (147, 900 km²) lies south of the Sudan Savannah (Karbo & Agyare, 1997). The zone covers most of the Northern Region and lower part of the Upper West Region (Canagarajah & Portner, 2003; Tsibey et al., 2003). The Sudan Savannah zone, on the other hand, covers the entire Upper East region and a large part (about 1,900 km²) of the Upper West Region (Codjoe, 2010). Differences in rainfall amount and intensity, as well as temperature and vegetation cover, affect agricultural production in the two zones (Codjoe, 2010). This, in turn, influences production systems, risk coping strategies, production constraints, as well as differences in motivation and production objectives of smallholders. The Sudan Savannah zone consists of short drought- and fire-resistant deciduous trees scattered in open Savannah grassland. The grass cover is very sparse with frequent bare lands and severe surface soil erosion (GEPA, 2002). The Guinea Savannah zone, on the other hand, has ground cover grasses of varying heights with fire-resistant, deciduous broad-leaved trees at the forest margins in the south. Moving northwards, the vegetation is dominated by grassland with interspersed shorter trees (GEPA, 2002).

According to Wilson (1991), annual rainfall and the main vegetation characteristics (grass availability and type) across the zones account for differences in livestock production systems and numbers. The two zones, along

with the coastal savannah, constitute the rangelands of Ghana. The dry Savannah (Guinea and Sudan) produces about 70 percent of the nation's cattle, and about 75 percent of the small ruminants (Oppong-Anane, 2011). However, more livestock are raised in the Guinea Savannah than in the Sudan Savannah. Mapiye et al. (2009) observe that there are differences in the agro-ecological zones and how socio-cultural factors affect the relative importance of livestock among smallholder farmers in the area.

According to Abukari (2017), the ruminant livestock value chain has the potential of creating many jobs for various actors along the value chain in the region and country. In the Upper East Region, ruminant livestock production, when taken as a business, could create jobs, employment, ensure food and income security for many households. The sector could enhance the image and remove the Upper West Region from the league of three poorest regions in the country. For instance, improved cattle production could result in the use of bullocks to plough smallholder producers' fields of nearly 0.5 hectares instead of using tractors. Tractors are difficult to come by during the onset of the rains, very expensive and the continuous use on the same fields predisposes the land to hard pan.

The Upper East Region experiences variations in rainfall patterns and declining soil fertility resulting in reduced crop yields from the cultivated fields. Ruminant livestock production could reduce the impact of rainfall variation due to climate change and declining soil fertility by providing manure. Manure from ruminant livestock production will enhance the soil nutrient content and water holding capacity for improved yields. An integrated ruminant livestock-crop

production system will therefore make smallholder producers more climate-resilient in a changing climate (Abukari, 2017).

Education

In this study, the highest education attained by household heads was used as a proxy for the level of education of the household head. Education has been found to impact positively on the welfare of households as in the study conducted by Mukherjee and Benson (2003). Among the studies that found education as key to poverty reduction are by Akerele (2012), Datt and Jolliffe (1999) and Okurut et al. (2002). Household heads with higher education have been found to lessen the odds of being poor. Improving the level of education of heads therefore is seen as a factor that can impact living standards and poverty levels.

Employment type and status of household head

Twerefou et al. (2014) found that employment is a factor that influences poverty level of households and individuals. Empirical results by Mukherjee and Benson (2003) in Malawi and Sackey (2004) gives an indication that industry specific employment is a key determinant to poverty reduction through increased per capita consumption or per capita food consumption. While a study conducted by Litchfield (2003) proved employment in a “white collar” job and in the agricultural sector reduces the probability of being poor. In this study, employment status of household heads relates to whether heads are employed or unemployed whereas the type of employment involves the specific type of employment a household-head is engaged in, for instance, public-sector employee or private-sector employee.

Table 1: Definition, Measurement and a Priori Signs of Variables

Variables	Definition of the Variables	A Priori Sign
Poverty	Household total consumption expenditure	
Large-sized livestock	Large-sized livestock ownership by households	Negative
Medium-sized livestock	Medium-sized livestock ownership by households	Negative
Sex	A dummy variable to capture the sex of the household head (0=male, 1=female).	Indeterminate
Age	A continuous variable that captures the age of the household head	Positive
age_cat	A categorical variable that captures the age of the household head in various groups	Positive
hhsizes_cat	A categorical variable that captures the number of people in a household	Positive
Emp	A dummy variable that captures the employment status of the household head (0=employed, 1=unemployed)	Indeterminate
employment type	A categorical variable that captures the type of employment of a household head	Indeterminate
marital status	A categorical variable that captures the marital status of a household head	Indeterminate
level of education	A categorical variable that captures the educational level of a household head	Positive
Region	A categorical variable that captures the region of household	

Source: Author's construct (2018)

Data Source and Description

The study employed the use of secondary data. The data was entirely the sixth round of the Ghana Living Standards Survey (GLSS 6). The GLSS captures households' information on thematic issues such as demographic characteristics, education, health, economic activity, migration and tourism. The main variable of interest (livestock ownership) and other variables such as age and sex of the household head, household size, land ownership, location, educational level, marital status, employment status and region were all obtained from the household demographic and economic indicators sections of the GLSS round 6. The credibility and representative nature of the data makes it credible for this study. The unit of analysis is household.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the results on the effect of livestock ownership on poverty reduction in Ghana with emphasis on the Northern, Upper East and Upper West regions respectively. The analysis is divided into two main parts with the first looking at the descriptive statistics and the second with OLS results to achieve the main objectives of the study.

Descriptive Statistics

Table 2 gives a brief description of the variables that were used in the study. As shown in the table, the dependent variable (poverty) was measured as a continuous with a mean value of 8.488 ranging from 5.703 to 11.740. The main variables of interests (medium livestock, large livestock, cattle, poultry and sheep) have also been presented with their respective means and ranges. These policy variables were measured as dummies with values one as “Yes” and zero otherwise (i.e., “No”). Other explanatory variables such as age, household size, and income from sale of livestock are all measured as continuous variables as shown in Table 2. Those measured as categorical includes household heads levels of education, employment status and region.

Table 2: Descriptive statistics of the variables used in the study

Variable	Obs	Mean	Std. Dev.	Min	Max
Poverty	4,542	8.487842	.7767523	5.70287	11.74086
Medium livestock	4,542	.5821224	.4932641	0	1
Large livestock	4,542	.2540731	.4353868	0	1
Cattle	4,542	.0295024	.1692286	0	1
Income from sale of livestock	4,542	243.7479	2504.677	0	150000
Sheep	4,542	.0297226	.1698397	0	1
Poultry	4,542	.1043593	.3057598	0	1
Age	4,542	46.61096	16.37031	15	99
Sex	4,542	1.179436	.3837595	0	1
House size	4,542	5.298987	3.193391	1	29
Location	4,542	.2274328	.4192205	0	1
Marital status	4,542	1.874064	.4858638	0	2
Education	4,542	1.623734	1.351955	1	6
Employment	4,542	3.532365	1.305448	0	5
Region	4,542	8.933509	.8230226	1	10

Source: Filed Survey, Aketemah (2018)

Figure 2 indicates household poverty status by region. From Figure 2, it can be observed that Greater Accra has the least number of very poor households (1.3 %), with Upper West Region registering the highest number of very poor households (39.9 %), followed by Northern Region (20.7 %) and Upper East Region (18.6 %). A possible explanation could be that Greater Accra has vastly more economic activities, infrastructure and amenities than the three northern regions (Northern, Upper East and Upper West), which would result in greater numbers of households in Greater Accra consuming more than the extreme poverty line unlike the other regions.

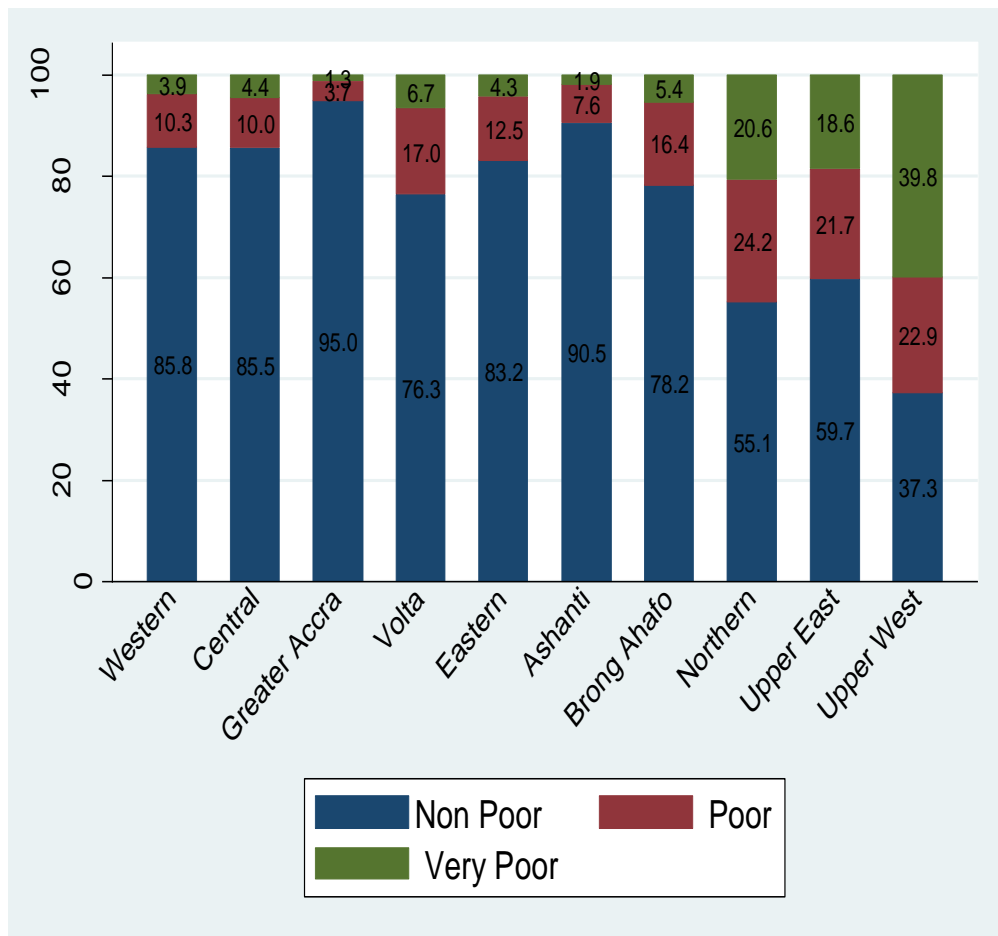


Figure 2: Indicates household poverty status by region.
 Source: Filed Survey, Aketemah (2018)

In Northern, Upper East and Upper West Regions specifically, household poverty is high because of their geographical location. The regions fall under the Sudan and Guinea Savannah and receive a mean annual rainfall between 1000mm and 1100mm annually. They experience a unimodal rainfall pattern followed by a prolonged dry season. During the long dry season, inhabitants either travel in search of greener pastures in the cities or concentrate on livestock keeping and other off-farm activities such as basketry, pot making or limited irrigation farming. However, these economic activities do not grant households with regular flow of income. This thus renders most households in northern Ghana poor relative to the other regions of the country.

There are many more households that cannot afford good drinking water, electricity, good roads, health services and decent housing compared to those in the Greater Accra Region.

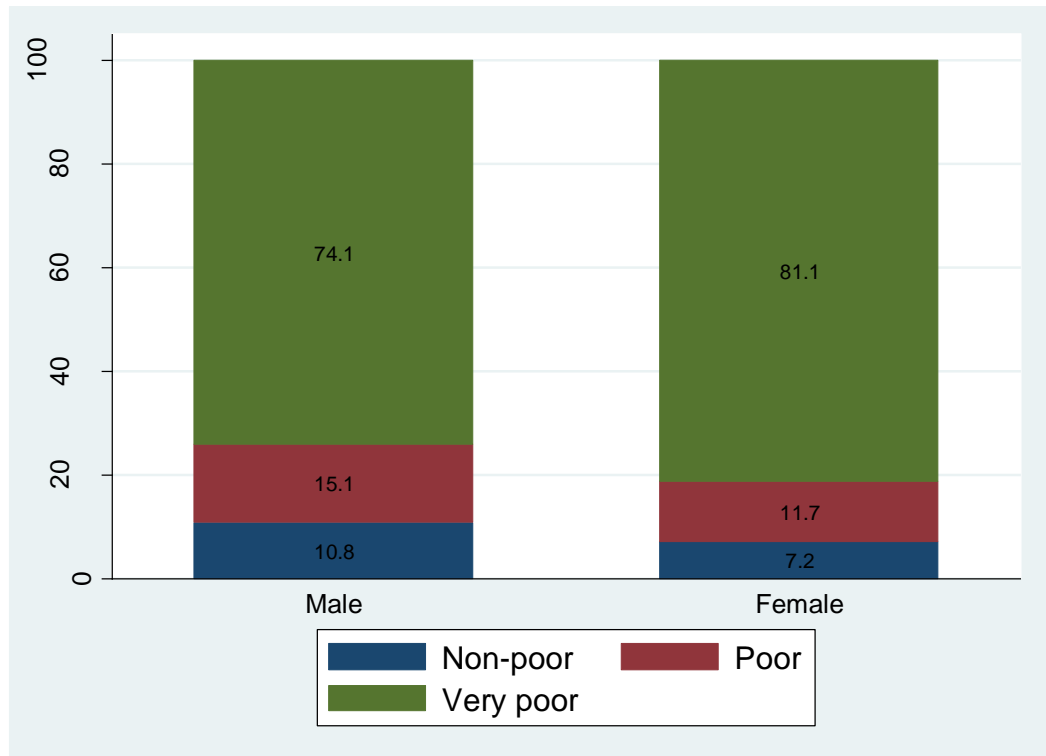


Figure 3: Poverty status by gender of the household head.

Source: Filed Survey, Aketemah (2018)

In terms of gender, about 74.1 percent of the male headed households were very poor compared to only 10.8 of them who were non-poor. Even more female headed households were very poor (81. 1 percent) while the non-poor female-headed households sadly was only 7.2 percent. Thus, female-headed households experience extreme poverty more than male-headed households. This is typically true for Ghana and many parts of the developing world where most economic resources and decisions are in the hands of the males. Males have generally been the bread-winners of the family, so where the females become the head of their households either through widowhood, divorce or separation, they have usually not been empowered economically to sustain or

improve upon their household's consumption expenditure so as to reduce or not to fall into extreme poverty.

However, 11.7 percent of female-headed households were poor whereas about 15.1 percent of the male headed households were poor. The case of poor male-headed households relative to poor female-headed households could be different from that of the very poor male-headed households relative to very poor female headed households as a result of some subjective factors. To start, a female household head is more likely to be more efficient in managing her resources/finances relative to a household head who is male and is poor all other things being equal. Furthermore, according to Twerefou, Sanadza and Owusu-Afriyie (2014), male-headed households on the average have a larger household size relative to female-headed household. An increase in household size means the provision of more resources or the redistribution of existing household resources to cater for the needs of the additional household members relative to the male headed household.

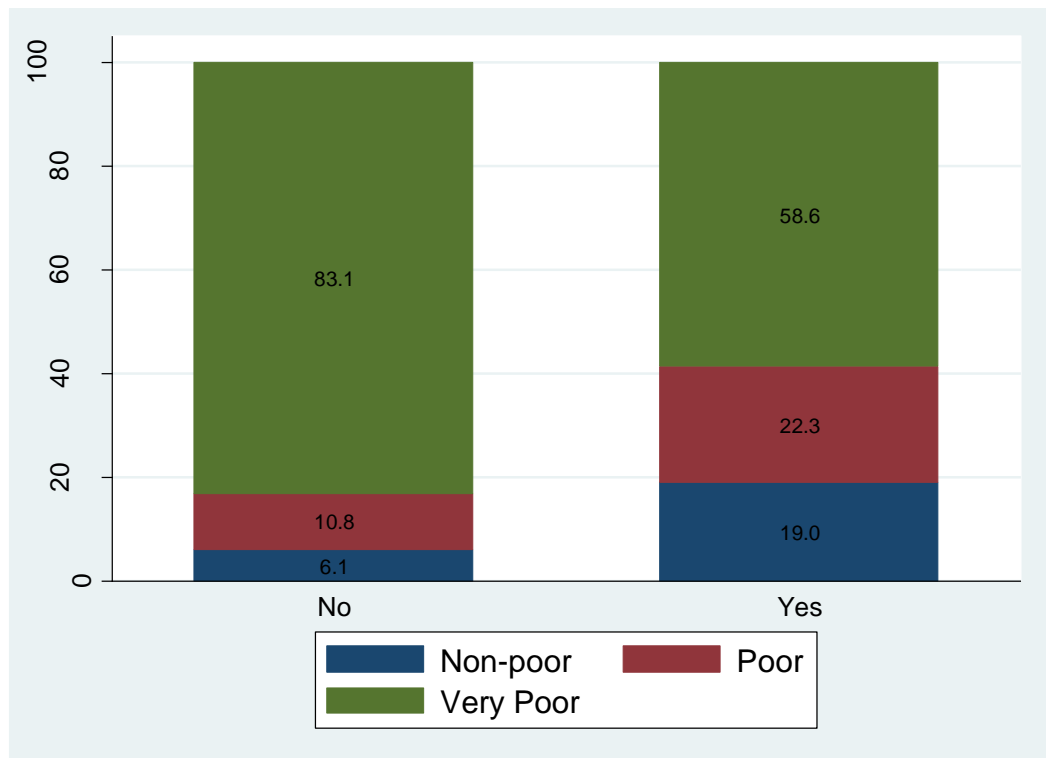


Figure 4: Medium sized livestock ownership based on poverty status.
Source: Filed Survey, Aketemah (2018)

For those households who owned medium-sized livestock, about 58.6 percent of them were very-poor compared to about 83.1 percent for the households without medium-sized livestock. This shows that owning medium-sized livestock by households plays a key role in reducing household poverty amongst very poor households. Dossa et al. (2008) found that the majority (78 percent) of their surveyed households were keeping small ruminants, which supports the importance of goats and sheep in the livelihood strategies of rural households. According to them, a household was more likely to keep small ruminants when its head has relatively fewer economic options, this could improve upon the financial role of small-ruminant household-holders as well as household livelihood.

Further, 22.3 percent of households who own medium-sized livestock are poor as against 10 percent of household without medium-sized livestock.

Perhaps, households without medium-sized livestock possibly engaged in other economic activities other than livestock keeping more than those who owned medium-sized livestock. Remarkably, about 19 percent of household that owned medium-sized livestock were non-poor compared to a very small proportion of 6.1 percent in the case of household without medium-sized livestock. This indicates that, for those who did not own medium-sized livestock, the majority of them were very poor compared to those who own medium-sized livestock. In conclusion, owning medium sized livestock is good for a household' welfare as it plays a significant role in poverty reduction. Both poor and non-poor households in every respect would be much better off if they engaged themselves in owning medium-sized livestock.

Figure 5 shows large sized livestock ownership across the various poverty groupings.

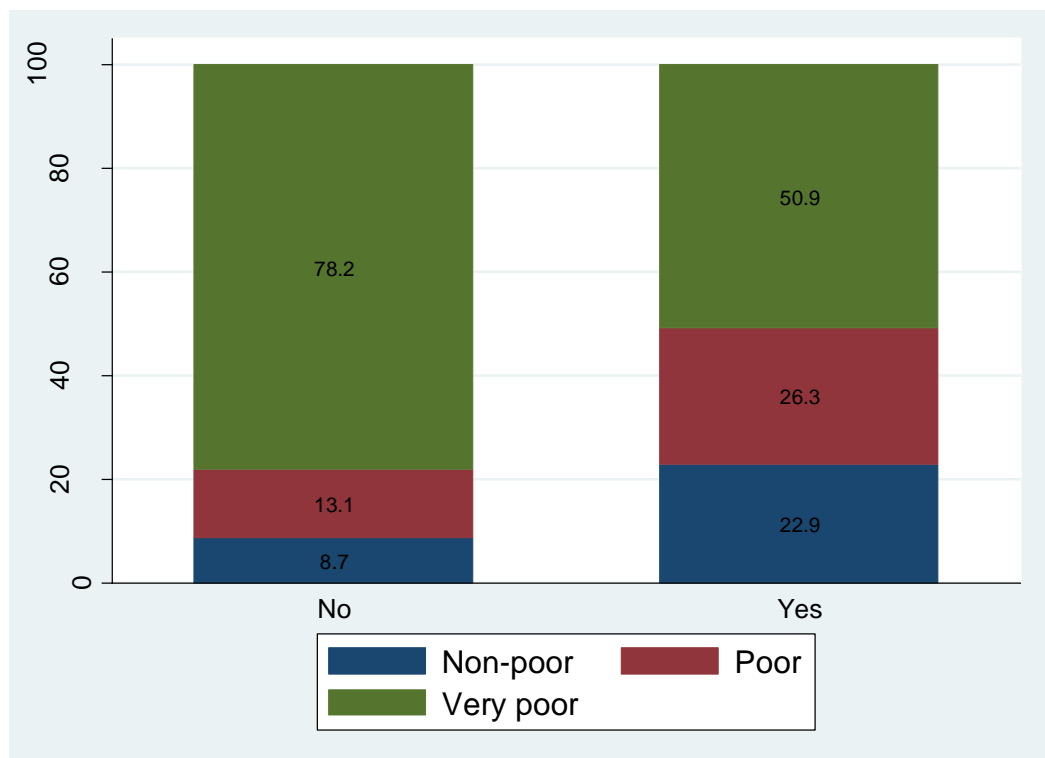


Figure 5: Large-Sized Livestock Ownership and Household Poverty

Source: Filed Survey, Aketemah (2018)

From Figure 5, 78.2 percent of households without large-sized livestock are very poor compared to 50.9 percent of households who owned large-sized-livestock. Moreover, only 13.1 percent and 8.7 percent of those who do not own large-sized livestock are poor and non-poor respectively compared to 26.3 percent and 22.9 percent of those households who owned large-sized livestock. Large-sized livestock have greater potential to reduce poverty than medium-sized livestock amongst the very poor and non-poor households. A possible reason is that large-sized livestock is more expensive compared to medium-sized livestock. It will therefore take someone who is relatively more resourceful to acquire large-sized livestock. On the contrary, given that medium-sized livestock is cheaper to acquire, poor households are able to own more medium-sized livestock, which subsequently enables them to create more wealth and consequently reducing their poverty status.

In sum, Figures 4 and 5 indicate that poverty is very prevalent among households without medium-sized and large-sized livestock. The various types of livestock owned by the 16,765 household in Ghana during the round six of the GLSS survey were put in twenty categories including other types of animals. They are draught animals, cattle including calves, sheep, goats, pig, rabbits, chicken guinea fowl, etc.

The average mean of income from the sale of livestock is 356.78 with a total observation of 5,771 households. The total mean expenditure is 971.12. The highest mean expenditure is on chickens followed by ducks with a total observation of 5771 households. Medium-sized livestock ownership has a minimum of zero ownership and a maximum of 3126 whereas large-sized livestock ownership has a minimum of zero and a maximum of 200 with a

respective observation of 16,765 households. Total number of persons who owned livestock is 7,281 (43.44 %) as against 9,480 (56.56 %) of the 16,765.

Table 3: Livestock Ownership Based on Poverty Status

Livestock	Very poor	Poor	Non poor	Total
no	4.98	8.98	86.04	100.00
yes	16.13	20.80	63.08	100.00
Total	9.82	14.11	76.07	100.00

Source: Filed Survey, Aketemah (2018)

As indicated in Table 3, for those who do not own livestock, 472 (4.98 %) of them were very poor; 851 (8.98 %) were poor and 8,157 (86.04 %) are non-poor: this brings a total observation of 9,480 (56.56 %) not owning livestock. For those who owned livestock, 1,174 (16.12 %) were very poor; 1,514 (20.79 %) were poor whereas 4,593 (63.08 %) were non-poor. This brings a total of 7,281 (43.44 %) of the observations owning livestock. This means that, nationally, a greater percentage of the people do not own livestock. The poverty rate could be low among the category who do not own livestock supposedly because the majority of them might be engaged in the service and manufacturing industries, which could either be in the private or public sector.

According to MoFA Facts and Figures (2015), the regional distribution of agriculture by rural households is 90 percent, 93.70 percent and 88.6 percent for Northern, Upper East and Upper West Regions respectively compared to a very low figure of 31.30 percent of rural households in Greater Accra Region. However, the distribution of urban agriculture by urban households is 46.70 percent, 51.40 percent and 32.40 percent for the Northern, Upper East and Upper West Regions accordingly whilst Greater Accra Region has a negligible percentage of 4.40. This indicates that household agricultural activities, which

include livestock rearing, is highest among households in northern Ghana, despite the Northern, Upper East and Upper West Regions remaining the poorest in the country. This supports the claim that the poorest regions in Sub-Saharan Africa largely rely on agriculture and livestock for survival. Hence, given that livestock production is a sub-sector of agriculture, the possibility is that farmers might have their focus on crop production or mixed farming as against purely livestock rearing.

Effects of Medium-sized and Large-sized Livestock on Consumption Expenditure

To test the hypothesis that medium-sized and large-sized livestock have no effect on poverty, the study estimated equation 3.

Table 3: Results on the Effect of Medium and Large Sized Livestock

Variable	Northern	UE	UW
Medium sized (base=without medium sized)			
Medium livestock	0.207*** (6.15)	0.092** (2.38)	0.038 (0.84)
Large sized (base=without large sized)			
Large livestock	0.133*** (3.42)	0.243*** (6.20)	0.136*** (2.90)
Age	0.001 (0.48)	-0.002 (-1.54)	-0.003** (-2.45)
Sex (base=male)			
Female	-0.149*** (-3.00)	0.034 (-0.88)	-0.247*** (-4.96)
Household size	0.076*** (15.36)	0.106*** (15.73)	0.103*** (17.21)
Location(base=rural)			
Urban	0.438*** (11.69)	0.356*** (8.51)	0.724*** (12.16)
Marital status (base=not married)			
Married	0.379*** (5.58)	0.215*** (2.79)	0.150** (2.10)
Education (base=no education)			
BECE	0.072 (1.11)	0.109 (1.51)	0.128 (1.36)
MSLC	.076 (.99)	.195** (2.33)	.120 (1.47)

SSS/Secondary	0.272*** (4.15)	0.377*** (5.00)	0.293*** (3.24)
Voc/Tech/Teacher	0.431*** (4.024)	0.496** (5.06)	0.670*** (6.06)
Tertiary	0.609*** (6.52)	0.681*** (7.29)	0.743*** (7.96)
Employment (base=public sector worker)			
Self-employed non-agric	0.051 (-0.77)	-0.133** (1.97)	-0.017 (-0.22)
Self-employed agric	0.115* (-1.78)	0.143*** (-6.68)	-0.265*** (-2.58)
Unemployment	-0.241***	-0.248*** (3.39)	-0.290*** (-3.50)
Number of obs	1,699	1,446	1,397
F(21, 1375)	50.86	51.63	67.73
Prob > F	0.0000	0.0000	0.0000
R-squared	0.3119	0.3513	0.4239
Adj R-squared	0.3058	0.3445	0.4176
Root MSE	.59196	.60482	.6558

Source: Aketemah, (2018)

From Table 3, a household in the Northern Region with medium-sized livestock was able to increase their consumption expenditure in excess of 20 percent compared to a household without medium-sized livestock. This was significant at 1 percent. In the Upper East Region, a household with medium-sized livestock compared to a household without medium-sized livestock increased consumption expenditure by 9 percent, which was statistically significant at 5 percent. Finally, in the Upper West Region, a household with medium-sized livestock experienced an increase in consumption expenditure in excess of 4 percent compared to a household without medium-sized livestock but this was not statistically significant.

On the whole, Table 3 indicates that having medium-sized livestock help to improve household consumption pattern as such households are able to create more wealth, hence increasing consumption expenditure. Undeniably, medium-sized livestock compared to large-sized livestock can easily be borrowed by poor households from non-poor households that keep medium-sized livestock,

which could, in the long run, get them out of the worse of their poverty status. Poor households are able to satisfy certain pressing needs of the household in terms of hardship given that medium-sized livestock like sheep and goats though smaller in value relative to large-sized livestock like cattle, can be sold easily to raise revenue. Indeed, this finding is consistent with Naminse (2010) who observed that medium livestock positively impacted on household income and food security among the people of Talensi-Nabdam District in the Upper East Region. Besides, Naminse found that livestock have a significant poverty reduction effect as it contributed roughly 36.10 percent to the annual income of livestock producers in the Talensi- Nabdam District of the Upper East Region.

Kafle (2014), in a study on medium livestock ownership, found that all beneficiaries of such livestock experienced a significant increase in livestock revenue, thus contributing to poverty alleviation. Besides, their consumption expenditure and frequency of diary/meat consumption also increased significantly. Similarly, Oluwatayo and Oluwatayo (2012) found that most of the respondents (67.7 %) who had medium livestock reported that income generated from their involvement in livestock rearing helped them significantly to attend to other important issues in the welfare of household members since the income generated from other sources was not enough to cope with increasing demands on the home front. For example, respondents alluded that livestock rearing provided a leeway for important unforeseen financial demands like paying hospital bills and assisting relations in emergency situations. The findings of the study further revealed that most of the household relied on income from livestock sales especially when there is scarcity of food either due to a lean harvest or when the stock of available food is exhausted.

On the side of large-sized livestock, relative to a household without large-sized livestock, in the Northern Region, a household with large-sized livestock encountered increase in consumption expenditure in excess of 13 percent compared to a household without large-sized livestock. This is statistically significant at 1 percent indicating the relevance of livestock ownership. Compared to a household without large-sized livestock in the Upper East Region, a household with large-sized livestock increased consumption expenditure by 24 percent, which is statistically significant at 1 percent.

Finally, for the Upper West Region, a household with large-sized livestock experienced an increase in consumption expenditure in excess of 14 percent compared to a household without large-sized livestock. This is also statistically significant at 1 percent. This means that, for a household in the Upper West Region to increase consumption expenditure, the household needs to own large-sized livestock. The implication of this finding is that, having large-sized livestock not only improves poverty but does so by a higher and more significant magnitude compared to those with medium-sized livestock. Similarly, Ntanyoma (2010) found that households with large sized livestock like cows experienced an increase in their income thereby reducing their poverty levels substantially. Consistently, Stroebel and Nesamvuni's (2008) work showed a significant contribution of large-sized livestock to rural development and poverty alleviation. Also, the findings of the study revealed pairwise ranking benefits obtained from cattle by smallholder livestock farmers. The benefits included: selling and meat consumption, wealth, status and savings, socio-cultural activities, and draught power.

From the results, the coefficient of age implied that a year increase in the age of a household head reduced consumption expenditure by 0.2 percent and 0.3 percent for Upper East and Upper West Regions respectively. This is significant at 5 percent in the Upper West but insignificant in the Upper East Region. Although, the finding is statistically significant, age as an independent variable, is debatable. For instance, at a youthful age an increase in age of the household head could result in an increase in experience, knowledge and energy to embark efficiently on farm activities. However, at an older age, an increase in the age of the household head might not have an impact in experience and knowledge in farming activities but could lead to a loss in energy as an additional year of increase in age among the elderly reduces their energy level to do more physical work. Twerefou et al. (2014) found a non-linear effect of age of female household heads on poverty: that if the age of female heads increases by one more year, the probability of household poverty reduces but as they grow old, a further increase in age increases the household poverty.

For sex, the results indicated that a male-headed household compared to female-headed household increased consumption expenditure more by 15 percent, 3 percent and 25 percent in the Northern, Upper East and Upper West Regions respectively. These are significant at 1 percent except in the Upper East Region. This is in line with the findings of Adams and Ohene-Yankyera (2014). Their finding implied that men are the owners of small ruminants in the households. They found another possible reason to be attributed to societal customs and norms in Sub-Saharan African countries where men are in charge of household productive assets. In most northern households, men are the owners of large-sized animals such as cattle. The majority of them also owned

sheep and goats. However, only a few of their female counterpart's owned sheep, goat and poultry. Mupa waenda, Chawatatama and Muvavarirwa (2009), noted that, for mainly traditional and historical reasons, men continue to dominate livestock production, especially the more valuable species. Their dominance over women shows up in terms of stock ownership, decision-making and control of livestock production systems. The implication is that male-headed households compared to female-headed households with medium-sized or large-sized livestock experienced an increase in consumption expenditure hence a reduction in household poverty.

From the findings, a unit increase in household size increased consumption expenditure in excess of 8 percent, 11 percent and 10 percent at the Northern, Upper East and Upper West Regions respectively. These findings are all statistically significant at 1 percent. In northern agrarian communities, labour is essential to farming activities. A unit increase in labour input thus implies more hands for farm work which, all other things being equal, will lead to an improvement in farm output. This is consistent with the findings of Talukder (2014) whose result showed that household size and land area for farming were positively and significantly associated with rural household income. An increase in household size increases household income as larger farm size could be cultivated. This could result in more output hence an increase in income.

Households in urban areas compared to rural households have a consumption expenditure of 41 percent, 36 percent and 72 percent in the Northern, Upper East and Upper West Regions correspondingly. These are all statistically significant at 1 percent. This finding is in line with that of

Shedenova and Beimishava (2012) who found that there is a significant difference in the economic status of the residents living in the city and the countryside. One of the questions of their survey was about income, specifically the household having enough income to cover its needs (expenses for food, housing and education). The answers revealed that urban residents are in a better position than rural residents: 67 percent of urban households and 46 % of rural households indicated that they are able to cover all necessary expenses. About 29 percent of the urban households and 34 percent of the rural households indicated that they fell a bit short. The significant financial difficulties experienced were 4 percent of urban household and 20 percent of rural households.

A household head who is married compared to a household head who is not married gained an increase in consumption expenditure higher by 40.0 percent, 21 percent and 15.0 percent in the Northern, Upper East and Upper West regions separately. These are all statistically significant at 1 percent except Upper West Regions, which is statistically significant at 5.0 percent. Intuitively, household heads who are married experienced higher consumption expenditure possibly because they would be compelled to engage themselves in income generating activities so they could provide for the needs of their children, spouses and sometimes external family members. However, household heads who are single, widowed or divorced incur low consumption expenditure possibly because most of them are compelled to be household heads after separation, the death of a spouse or a divorce especially instances where their partners were their initial household heads. This inherently leads to a

dwindling in household resources thereby leaving them relatively poorer as their consumption expenditure falls.

From the results, a household head with tertiary education encountered an increase in consumption expenditure in excess of 61.0 percent, 68.0 percent and 74.0 percent in the Northern, Upper East and Upper West Regions respectively. These are all statistically significant at 1.0 percent. Education is the key to success. An educated household head is more likely to earn a higher wage from a paid job, adapt to technological changes in the field of agriculture to boost productivity and be more informed about the existence of economic generating opportunities. The consequence will be a reduction in their households' poverty as they possess the ability to generate more wealth to increase their consumption expenditure. Education has been found to impact positively on the welfare of households as in the study conducted by Mukherjee and Benson (2003). Among other studies that found education as key to poverty reduction are by Akerele (2012), Datt and Jolliffe (1999) and Okurut et al. (2002). Household heads with higher education have been found to lessen the odds of being poor. Improving the level of education of heads therefore is seen as a factor that can impact living standards and poverty levels.

From the results, a household head who is employed in a non-Agric sector compared to public-sector worker had a reduced consumption expenditure more by 13.0 percent in the Upper East region at a 5 percent significant level. On the contrary, probability values for Northern and Upper West Regions were not statistically significant. According to Bucherieder (2011), farming income makes up about half of household income. However, non-farm labour contributes significantly to income. Its share of household

income, not surprisingly, is higher in the peri-urban region than in the typical rural one. This could be a reason why, in the Northern and Upper East Regions, household heads who are not self-employed in the non-agricultural sector relative to household heads who are employed in the public-sector are worse off in terms of their consumption expenditure. In these regions, most household heads who are self-employed in non-agricultural sector are into retail businesses or into craft and art work such as basketry, pottery, cloth weaving, leather works, sewing and hair-dressing. Most of these economic activities do not provide regular income for households unlike public sector work.

A household head who is self-employed in the agricultural sector compared to a public-sector worker had a lower consumption expenditure of 12.0 percent, 43.0 percent and 24.0 percent at Northern, Upper East and Upper West Regions, respectively. These are all statistically significant at 1.0 percent with the exception of Northern Region, which is statistically significant at 10.0 percent. According to GSS (2014), farming is predominantly rural with about 82.3 percent of rural households involved. These agricultural operators are common in the rural Savannah, which covers the Northern, Upper East and Upper West regions with about 93 percent of the households involved. Household heads employed in the sector are faced with the challenges of risk and uncertainties. They are mostly hit by drought, floods, low market prices for farm outputs, post-harvest losses etc. The over reliance on rainfall for farming activities for fewer months compared to a follow up prolonged dry season render most farmers unemployed during the dry season. This irregularity in their economic activities that, leads to the generation of income from agriculture not only lead to a fluctuation in their consumption expenditure but lowers it as well.

The case is different for households whose heads are employed in the public sector where they are certain of a regular flow of income, thus making their consumption expenditure relatively higher.

A household head who is unemployed compared to a public-sector worker had a reduction in consumption expenditure lower by 24 percent, 25 percent and 29 percent in the Northern, Upper East and Upper West Regions respectively. These are all statistically significant at 1 percent. If a household head is unemployed all other things being equal, then that household suffers from the full severity of poverty. The basic needs of that household would barely be met. They will live in destitution and might lose their dignity, rights to decision making and, if the situation is not salvaged, can lead to inter-generational poverty status of the household.

From the results, compared to Greater Accra region, households in the Western, Central, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East and Upper West Regions have their consumption expenditure reduced by 15 percent, 20 percent, 29 percent, 28 percent, 10 percent, 26 percent, 52 percent, 47 percent and 73 percent, respectively. These findings indicated that the Northern, Upper East and Upper West Regions are the poorest. This has been confirmed by Cooke et al. (2016). According to them, at the regional level, these regions continue to have the highest rates of poverty. Similarly, Action Aid Ghana's country strategy paper (2015) declared that about 70 percent of people with income that falls below the poverty line are located in the northern Savannah areas.

The majority of households in Northern, Upper East and Upper West Regions respectively, draw their livelihood from agriculture. The effect of

farmers' over-reliance on rainfall has made them susceptible to the effects of climatic change over the years. These effects are mostly manifested by drought, and then flooding as a consequence of a continuous heavy down-pour which not only affects plants and animal lives, but also human lives including valuable property of the poor. These events aggravate the situation of prevailing household poverty among poor households. These unpleasant conditions often times constitute the push factors that results in members of households, specifically heads, migrating from the rural-north to the urban-south in search of better living conditions. This has a bearing on other household members in the rural areas.

Effect of Type of Livestock Owned on Household Poverty

To examine the effect of type of livestock owned on household poverty, the multiple regression model, as specified in Equations 4, was estimated. The result of this estimation is presented in Table 4.

Table 4: Effect of Type of Livestock Owned by Households on Household Poverty

Variable	Consumption poverty		
	Northern	UE	UW
Cattle	0.156** (2.66)	0.033** (2.33)	0.078*** (3.83)
Sheep	0.071 (1.43)	0.006 (0.07)	0.041 (0.39)
Poultry	0.110 (1.21)	0.044 (0.87)	0.115* (1.86)
Age	-0.037 (-0.60)	-0.06 (-1.09)	-0.002 (-0.29)
Sex	-0.204*** (-4.06)	0.094*** (-2.38)	-0.274*** (-5.56)
Household size	0.086*** (17.11)	0.120*** (17.58)	0.107*** (18.06)
Location	0.392*** (10.35)	0.302*** (7.25)	0.710*** (12.29)
Marital status	0.406*** (5.71)	0.234*** (2.90)	0.156** (2.00)

BECE	0.040 (0.61)	0.098 (1.32)	0.126 (1.33)
MSLC	0.090 (1.14)	0.201** (2.34)	0.106 (0.13)
SS/Secondary	0.255*** (3.83)	0.356*** (4.62)	0.303*** (3.33)
Voc/Tech/Teacher	0.446*** (4.08)	0.513*** (5.13)	0.671*** (6.05)
Tertiary	0.610*** (6.41)	0.669*** (7.02)	0.747*** (7.98)
Self-employed non-agric	-0.023 (-0.34)	-0.107 (-1.55)	-0.004 (-0.05)
Self-employed agric	-.057 (-0.88)	.376*** (-5.75)	-.237*** (-3.21)
Unemployed	-0.202** (-2.43)	0.224*** (-2.98)	-0.278*** (-3.33)
Number of obs	1,699	1,446	1,397
F(21, 1375)	37.74	38.26	55.78
Prob > F	0.0000	0.0000	0.0000
R-squared	0.2879	0.3255	0.4215
Adj R-squared	0.2803	0.3170	0.4140
Root MSE	.60271	.61738	.65786

Source: Filed Survey, Aketemah (2018)

As shown in Table 4, the study focused on cattle, sheep and poultry within the type of livestock owned by households and their respective effect on consumption expenditure. A household in the Northern region that have cattle increased consumption expenditure by 16.0 percent compared to a household in the same region without cattle. For Upper East Region, a household with cattle experienced higher consumption expenditure in excess of 3.0 percent compared to a household without cattle in the same region (Upper East). Within Upper West Region, a household with cattle was able to increase its consumption expenditure more by 8.0 percent compared to a household without cattle. These are also statistically significant at 5.0 percent for the Northern and Upper East Regions. However, a cattle keeping in the Upper West Region on poverty reduction is statistically significant at 1.0 percent.

Still on types of livestock, a household in the Northern region with sheep increased consumption expenditure more by 8.0 percent compared to a household in the same region without sheep. For a region like Upper East, a household with sheep consumption expenditure increases by 3.0 percent compared to a household without sheep. Within Upper West Region, a household with sheep is able to increase its consumption expenditure higher by 4.0 percent compared to a household without sheep. However, the probabilities values of sheep are not statistically significant across the regions.

Moreover, a household in the Northern Region that owned poultry experienced an increase in consumption expenditure in excess of 10 percent compared to a household in the same region without poultry. For a region like Upper East, a household with poultry in that region gained an increase in consumption expenditure more by a 4 percent extra compared to a household without poultry in the same region. Within Upper West Region, a household with poultry is able to increase their consumption expenditure by 11.5 percent more compared to a household without poultry and it is statistically significant at 5 percent. This means that, although poultry has the potential of reducing poverty, its ownership by poor households in the Upper West Region plays a key role in reducing the poverty status of poor households relative to the Northern and Upper East Regions. It also implied that they being the poorest among the regions, means owning poultry could be of essential help as far as poverty reduction is concern. Among the lives of the very poor in some northern communities where poultry is raised, the poor measure their progress in wealth accumulation as they progress in owning a fowl, a goat a sheep and then cattle. It therefore means that if one is able to own poultry, goats or sheep for example,

worth a cattle or number of cattle, then they possess about the same value of wealth holding all things constant. Proceeds of these livestock species if converted into cash will boost their consumption expenditure thereby reducing their poverty status.

In sum, from Table 4, one key finding emerged: ownership of livestock such as cattle and poultry significantly reduced household poverty compared to not rearing or owning livestock. This is consistent with the findings of Mwanawima (2010). His finding revealed that farmers in a dairy cattle project had higher income than those out of the project: mean household income before joining the project was lower compared to income after joining the project. Similarly, respondents in an indigenous chicken project had higher income than those outside the chicken project. The findings of the study further showed that household incomes before the project were lower compared to the household income after joining the project. It was evident in the study that livestock contributed substantially to household income and hence improved the standard of living of households. Livestock projects not only increased cash income but also household consumption of livestock and their products. In a nutshell, livestock projects (dairy cattle and Indigenous chicken) have a significant impact on poverty reduction at household level and have enhanced farmers to acquire assets to enable them to attain their day-to-day needs.

From the results the coefficient of age implies that a year increase in age reduced consumption expenditure more by 3.7 percent in the northern region, 6.0 percent in the Upper East and less than 2.0 percent in the Upper West Region. Though, an increase in age at a certain stage in life could lead to an increase in experience, knowledge and energy to do more productive work, at

another stage in life, a unit increase in age might not have any impact on knowledge and experience but leads to a fall in energy meant for physical work. This thereby leads to a reduction in the number of livestock owned and a fall in income.

For sex, the results indicated that a male-headed household compared to a female-headed household is 20.4 percent, 9.4 percent and 27.4 percent in the Northern, Upper East and Upper West Regions respectively, in terms of consumption expenditure. This is significant at 1 percent. Once again, this finding is consistent with that of Adams and Ohene-Yankyera (2014).

As shown in Table 4, an additional member added to the household size increased consumption expenditure by 8.6 percent, 12.0 percent and 10.7 percent in the Northern, Upper East and Upper West Regions, respectively. These findings are all statistically significant at 1 percent. This is consistent with the findings of Talukder (2014) whose results indicated that household size and land area for farming were positively and significantly associated with rural household income. An increase in household size increases household income as larger farm size could be cultivated.

Households in urban areas compared to rural households had higher consumption expenditure of 39.2 percent, 30.2 percent and 71.0 percent in the Northern, Upper East and Upper West Region correspondingly. These are all statistically significant at 1 percent indicating the importance of these variables. This concurred with the findings of Maltsoğlu, (2004) who found the incidence of poverty in the rural areas to be approximately three times higher than poverty in the urban areas. According to Maltsoğlu, poor people in rural areas represent 56.5 percent of the population, while 21.6 percent of the households were below

the poverty line in urban areas. Poverty in the rural areas was found to be deeper and more severe, since the poverty gap and squared poverty gap measures were higher.

A household head who is married relative to a household head who is not married experienced an increase in consumption expenditure higher by 40.6 percent, 23.4 percent and 15.6 percent at the Northern, Upper East and Upper West Regions respectively. These are all significant at 1 percent except Upper West region which is statistically significant at 5 percent. From the results, a household head with tertiary education had consumption expenditure of 61.0 percent, 66.9 percent and 74.7 percent more in the Northern, Upper East and Upper West regions respectively. These are all statistically significant at 1.0 percent. This supported the findings of Maltsoğlu (2004) who reported that increased education was strongly correlated with decreased poverty levels. Maltsoğlu iterated that the proportion of households with a household head that can read and write and were poor were 36.9 percent compared to 63 percent for households with illiterate household heads. Literate households also faced less acute and severe poverty whereby literacy assisted in reducing the poverty gap. Inequality in income distribution rises slightly for households that have literate household heads.

From the results, a household head who is employed in a non-Agric sector compared to public-sector worker reduced consumption expenditure by 5 percent, 13 percent and 2 percent in Northern, Upper East and Upper West Regions respectively. These are statistically significant at 1.0 percent and 5.0 percent at the national and Upper East Region respectively. On the contrary,

probability values for Northern and Upper West Regions are not statistically significant.

A household head who is self-employed compared to a public-sector worker has a lower consumption expenditure of 2.3 percent, 10.7 percent and 4 percent in the Northern, Upper East and Upper West Region respectively. These are all statistically significant at 1 percent with the exception of Northern Region, which is statistically significant at 10 percent. Self-employed workers do not have a regular flow of income as is the case for public-sector workers.

A household head who is unemployed compared to a public-sector worker has a reduction in consumption expenditure by 24.0 percent, 25.0 percent and 29.0 percent in the Northern, Upper East and Upper West Regions, respectively. And these are all statistically significant at 1 percent.

Joint Effect of Size and Type of Livestock Owned on Household Poverty

The study also estimated the joint effect of size and type of livestock owned on household poverty status. Results of this estimation are reported in table 5.

Table 5: Joint Effect of Sized and Type of Livestock Owned by Households on Household Poverty

Variable	Consumption poverty		
	Northern	UE	UW
Large sized cattle	0.034** (2.05)	0.534*** (3.12)	0.045** (2.27)
Medium sized sheep	0.253*** (2.66)	0.113** (3.06)	0.060 (0.52)
Age	-.001 (-0.19)	-.006 (-1.08)	-.002 (-0.32)
Sex	.149*** (-3.00)	-.029 (-0.72)	-.248*** (-4.93)
Household size	0.076*** (14.83)	0.107*** (15.61)	0.103*** (16.88)
Location	0.437*** (11.61)	0.358*** (8.53)	0.724*** (12.14)
Marital status	0.386***	0.231***	0.149*

	(5.52)	(2.92)	(1.92)
BECE	0.069	0.100	0.128
	(1.06)	(1.38)	(.136)
MSLC	0.080	0.120**	0.117
	(1.03)	(2.37)	(1.44)
SSS/secondary	0.268***	0.376***	0.293***
	(4.10)	(4.97)	(3.23)
Voc/tech/Teacher	0.429***	0.501***	0.666***
	(3.99)	(5.10)	(6.01)
Tertiary	0.610***	0.681***	0.739***
	(6.53)	(7.30)	(7.90)
Self-employed non agric	-0.051	-0.136**	-0.105
	(-0.77)	(-2.00)	(-0.19)
Self-employed agric	-0.115*(-1.77)	-0.435***(-	-0.264***
		6.73)	(-3.56)
Unemployed	-0.243***	-0.256***	-0.288***
	(2.98)	(-3.48)	(-3.46)
Total	1,699	1,446	1,397
Number of obs	1,699	1,446	1,397
F(21, 1375)	38.51	39.01	48.51
Prob > F	0.0000	0.0000	0.0000
R-squared	0.3146	0.3538	0.4256
Adj R-squared	0.3064	0.3447	0.4168
Root MSE	.59168	.60472	.65626

Source: Filed Survey, Aketemah (2018)

As shown in Table 5, a household in the Northern Region that have cattle will be able to increase its consumption expenditure by 16 percent compared to a household with large-sized livestock other than cattle. For a region like the Upper East, a household that owned large sized livestock (and it is cattle) has consumption expenditure increased by an extra 3.4 percent compared to a household with large sized livestock other than cattle. Within Upper West Region, a household with large sized livestock (and it is cattle) is able to increase their consumption expenditure by 4.5 percent compared to a household with large sized livestock other than cattle and it is statistically significant at 5 percent. This means that a household in Northern Region with large sized cattle will experience an increase in consumption expenditure higher than a household in the Upper East and Upper West Regions. Northern Region has more vast land for cattle rearing compared to the other regions.

Likewise, a household in Northern Region with medium sized livestock (and it is sheep) will be able to increase its consumption expenditure by 25.3 percent compared to a household with medium-sized livestock other than sheep. For a region like Upper East, a household owning medium-sized livestock (and it is sheep) consumption expenditure increased by an extra 3 percent compared to a household with medium-sized livestock other than sheep. Within Upper West Region, a household owning medium-sized livestock (and it is sheep) is able to increased their consumption expenditure by 6 percent compared to a household with medium-sized livestock other than sheep and it is statistically significant at 5 percent. Medium-sized sheep has the greatest potential of reducing poverty in the Northern Region, followed by Upper West and Upper East Regions. A household in the Upper West Region positively gained from medium-sized livestock (given that it is a sheep) rather than large sized livestock (given that it is cattle). The intuitive could be that, given the poverty nature of households in the region, the ability of a poor household to own a medium-sized sheep will positively make an impact on their consumption expenditure.

From the results, the coefficient of age implied that a year increase in age increases consumption expenditure more by 0.8 percent in the Northern Region, but reduces consumption by 0.1 percent in the Upper East and by less than 1 percent in the Upper West Region.

For sex, the results indicated that a male-headed household compared to female-headed household reduced consumption expenditure by 15.0 percent, 30.0 percent and 25.0 percent in the Northern, Upper East and Upper West Regions respectively in terms of consumption expenditure. This is significant at 1 percent except for the Upper East Region whose coefficient is not

statistically significant. Once again, this finding is consistent with that of Adams and Ohene-Yankyera (2014).

As shown in Table 4, an additional member added to the household size increased consumption expenditure more by 7.6 percent, 11.0 percent and 10.3 percent in the Northern, Upper East and Upper West Regions respectively. These findings are all statistically significant at 1 percent. This is consistent with the findings of Talukder (2014), whose result showed that household size and land area for farming were positively and significantly associated with rural household income. An increase in household size increases household income as larger farm size could be cultivated.

Households in urban areas compared to rural households gained an increase in consumption expenditure in excess of 44.0 percent, 30.2 percent and 72.0 percent in the Northern, Upper East and Upper West Regions correspondingly. There is an outstanding difference in urban household expenditure relative to rural household consumption expenditure in Upper West Region. The reason could be that the region has a relatively small urban area compared to prevailing rural communities.

A household head who is married compared to a household head who is not married encountered an increase in consumption expenditure higher by 39.0 percent, 23.0 percent and 15.0 percent in the Northern, Upper East and Upper West Regions, respectively. These are all significant at 1 percent except Upper West Region, which is significant at 5 percent.

From the results, a household head with tertiary education had an increase in consumption expenditure in excess of 61.0 percent, 68.0 percent and

73.0, in the Northern, Upper East and Upper West Regions respectively. These are all statistically significant at 1 percent.

The study also found that a household head who is employed in a non-Agric sector compared to public-sector worker reduces consumption expenditure by 5 percent, 14 percent and 11 percent in Northern, Upper East and Upper West Regions respectively. This was statistically significant at 1 percent in the Upper East region. On the contrary, probability values for Northern and Upper West Regions were not statistically significant.

Household heads who are self-employed in the agricultural sector compared to a public-sector worker had a lower consumption expenditure of 12.0 percent, 44.0 percent and 26.0 percent, in the Northern, Upper East and Upper West Region, respectively. These were all statistically significant at 1 percent with the exception of Northern Region, which was statistically significant at 10 percent. The reason could be that agricultural activities are saddled with uncertainties, which most often leads to a fall in farm output and, consequently, a fall in income from farm proceeds.

A household head who is unemployed compared to a public-sector worker has a reduction in consumption expenditure by 24 percent, 26 percent and 29 percent at the Northern, Upper East and Upper West Regions, respectively. These are all statistically significant at 1 percent. Being unemployed means the household-head is not able to provide for the basic needs of his/her household. Such households may probably be able to rely on remittances, which may or may not be regular or enough to maintain an average level of consumption expenditure at a time.

Post Diagnostic Test

The multiple regression model for the OLS estimation passed the model specification test at 5 percent indicating that the model has no omitted variable bias. The mean VIF for the model was 5.65, which is far less than the conventional level of 10 hence no presence of multicollinearity; and finally, the p-value for the homoscedasticity test was insignificant at 5 percent also indicating that at 5 percent significant level the model has no heteroscedasticity.

Table 5: Post diagnostic Test

Test	P-value
Homoscedasticity	0.0764
Omitted variable bias	0.0597
Multicollinearity (Mean VIF)	5.65

Source: Filed Survey, Aketemah (2018)

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study determined the effect of livestock ownership on poverty of households in the Northern, Upper East regions and Upper West regions of Ghana. Specifically, the study determined the effects of medium-sized and large-sized ownership of livestock on household poverty, examined the effect of type of livestock owned by households on household poverty and, finally, examined the joint effect of size and type of livestock (cattle, sheep and poultry) on household poverty. These objectives were achieved by testing three hypotheses. This chapter presents the summary of findings that were made from the study. It includes conclusions made from the study and thereafter gives recommendations based on the findings. The chapter ends by giving suggestions for further areas of research.

Summary of Findings

The study generally determined the effect of livestock ownership on poverty of households in Ghana. The study employed the OLS estimation technique as the dependent variable (household consumption) was continuous. It was found that medium-sized and large-sized ownership of livestock by households positively and significantly reduced poverty of households in Northern, Upper West and Upper East regions of Ghana through improvement in their consumption expenditures. For instance, households that own medium-sized livestock experienced higher expenditure in terms of consumption compared to those without medium-sized livestock. Again, households with large-sized livestock did not only record higher consumption expenditure than those without large-sized livestock, but also more than households with

medium-sized livestock. On types of livestock owned by households, the study found that livestock such as cattle and poultry significantly reduced household's poverty. Within the three regions, cattle significantly reduced poverty, most notably in the Northern region compared to Upper East and Upper West Regions. Poultry reduces poverty the most in the Upper West Regions compared to other regions while the probabilities values for sheep across the regions under study are not statistically significant. Finally, for the joint effect of size and type of livestock owned by households on household poverty, the study found that owning large-sized livestock (given that it is cattle) significantly reduces household poverty across the regions as opposed to owning large-sized livestock other than cattle. Owning medium-sized livestock (given that it is sheep) also reduces household poverty levels more significantly than owning medium-sized livestock other than sheep. This is peculiar to households in Northern and Upper East regions as their Probabilities values are statistically significant.

Conclusions

The study mainly determined the effect of livestock ownership on poverty reduction of households in in the Northern, Upper East and Upper west region, respectively. It was found that having medium-sized and large-sized livestock ownership significantly and positively affects the poverty levels of households as they are able to smoothen their consumption pattern. Besides, owning livestock like cattle, sheep and poultry positively affect the consumption expenditure of household and hence a reduction in their poverty levels. Households with cattle recorded higher consumption expenditures than those without cattle and households with sheep likewise had higher

consumption expenditures than those without sheep; while poultry owners experienced higher consumption expenditures compared to those without poultry. The study concludes that owning large-sized livestock (specifically cattle) reduces household poverty more than owning large-sized livestock other than cattle. Again, owning medium-sized livestock (sheep) more significantly reduced household poverty than owning medium-sized livestock other than sheep. While cattle and sheep have the highest poverty reduction effect in the Northern Region, poultry has the highest poverty reduction effect in the Upper West Region, followed by Upper East Region.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are made:

- The government should strengthen the country's agricultural policies specifically livestock production and development strategies through the Animal Production Directorate (APD) to ensure efficiency in cattle and sheep production in the Northern region. This will enable poor households in the regions to experience a significant reduction in their poverty statuses.
- Poultry and cattle farming should be promoted by government and Non-governmental agencies in the Upper West region.
- Sheep and cattle farming should be encouraged in the Upper East regions as they reduce poverty.
- Households in the Northern, Upper East and Upper West regions should improve upon or increase their productive capacity of production both

large and medium sized livestock production so as to substantially reduce their poverty levels.

Suggestions for Further Research

The study suggests that future studies can consider the impact of diversity in livestock ownership on household poverty in the Northern, Upper East and West regions.

REFERENCES

- Asongwed-Awa, A., Abakar, O., & Vall, E. (2003). The use of legume cover crops for livestock feeding in semi-arid environments: Effects of *Calopogonium mucunoides* used as forage on weight maintenance of draught donkeys during the dry season. *The Journal of World's Poultry Research*, 3(1), 1-4.
- Abdul-Moomin, A. (2012). The impact of microcredit on smallholder livestock production in Wa Municipality: A case of the livestock development project. *Asian Journal of Agricultural Extension, Economics & Sociology*, 5(3), 166-182.
- Abebrese, A. (2003). *Management and Productivity of Small Ruminant in the Tolon –Kumbungu District of Northern Region, Ghana*. Bsc. Dissertation, University for Development Studies Tamale.
- Aboagye, G. S., Boa-Amponsem, K., Okanta, S. A., Ahunu, B. K., Osei-Amponsah, R., & Ayizanga, R. A. (2014). *The State of Animal Genetic Resources: physical and life sciences*. Department of Animal Science, University of Ghana.
- Aboe, P., Boa-Amponsem, K., Okantah, S., Butler, E., Doward, P., & Bryant, M. (2006). Free range village chicken on the Accra plains, Ghana: Their husbandry and productivity. *Tropical Animal Health and Production Journal*, 38(3), 235-248.
- Abubakari, Y. (2017). *Ruminant livestock production as a business enterprise in the Upper East Region*. Retrieved from <https://agricinghana.com/>

- Adams, F. (2016). Socio-economic analysis of small ruminant livestock production in Northern Ghana. *Journal of Science and Technology*, 36(3), 20-39
- Adams, F., & Ohene-Yankyera, K. (2014). Socio-economic characteristics of subsistent small ruminant farmers in three regions of northern Ghana. *Asian Journal of Applied Science and Engineering*, 3(3), 351-364.
- Adzitey, F. (2013). Animal and meat production in Ghana - An overview. *The Journal of World's Poultry Research*, 3(1), 1-4.
- Adzowu-Tsri, V. (2005). *Management and Productivity of Small Ruminant in the Savelugu/Nanton District of the Northern Region of Ghana*. BSc Dissertation, University for Development Studies, Tamale.
- African Development Fund. (2001). *Livestock Development Project*, (August), 1-6. Retrieve from <http://extwprlegs1.fao.org/docs/pdf/gha148233.pdf>
- Akerele, D., Momoh, S., Adewuyi, S. A., Phillip, B. B., & Ashaolu, O. F. (2012). Socio-economic of poverty among urban households in South-West Nigeria. *International Journal of Social Economics*, 39(3), 168-181
- Aklilu, H. A., Almekinders, C. J. M., Udo, H. M. J., & Vander-Zijpp, A. J. (2008). Village poultry consumption and marketing in relation to gender, religious festivals and market access. *Tropical Animal Health and Production*, 39(7), 165-177.
- Akter, S. (2011). *Livestock based livelihoods and pathways out of poverty: The case of smallholder farmers in Bangladesh*. Agricultural Economics Society, Warwick University.
- Ali, A., & Khan, M. (2013). Livestock ownership in ensuring rural household food security in Pakistan. *Journal of Animal Plant Science*, 23(1), 313-318.

- Amadou, H., Dossa, L. H., Lompo, D. J. P., Abdulkadir, A., & Schlecht, E. (2012). A comparison between urban livestock production strategies in Burkina Faso, Mali and Nigeria in West Africa. *Tropical Animal Health and Production*, *44*(7), 1631-1642.
- Amede, T., Descheemaeker K., Peden D., & Van-Rooyen, A. (2009). Harnessing benefits from improved livestock water productivity in crop-livestock systems of sub-Saharan Africa. *The Rangeland Journal*, *31*(2), 169-178.
- Annor, S. Y., & Adongo, S. A. (1992). *The effect of treatment of crop residues with urea on feed intake and live weight performance of West African dwarf sheep in the dry season. The role of women. In: Proceedings of the West African Commonwealth Association/Ghana. Veterinary Medical Association Conference, Accra International Conference Centre Ghana.*
- Ansah, I. G. K., Eib, D., & Amoako, R. (2015). Socioeconomic determinants of livestock production technology adoption in northern Ghana. *Asian Journal of Agricultural Extension, Economics & Sociology*, *5*(3), 166-182.
- Apiiga, S. Y. (2002). *A survey on the role of livestock in rural livelihood in Ghana*. BSc. Dissertation, University for Development Studies, Tamale.
- Asafu-Adjei, K., & Dantankwa, A. (2001). *Policies for improving the competitiveness of smallholder livestock producers in Ghana*. International Livestock Research Institute. Abidjan, Cote d'ivoire Retrieved from <https://www.researchgate.net/publication/321171630>.
- Ashley, S. D., Holden, S. J., & Bazeley, P. B. S. (1995). *Livestock in Development: The changing role of veterinary services*. Retrieved from <http://www.eldis.org/fulltext/OIereport>.

- Awudu, R. E. (2005). *Challenges and opportunities of small ruminants rearing on domestic bases in Gushegu District of Northern Region of Ghana*. BSc. Dissertation, University for Development Studies, Tamale.
- Babbie, E. R. (2013). *The basics of social research*. Retrieved from <https://www.cengage.com/>
- Baidoo, S. T., Yusif, H., & Anwar, U. (2016). The effect of smallholder livestock production on income of farm households in northern Ghana. *Journal of Science and Technology*, 36(3), 8-19.
- Binswanger, H. P., & Rosenzweig, M. R. (1986). Behavioural and material determinants of production relations in agriculture. *The Journal of Development Studies*, 22(3), 503-539.
- Biyase, M., & Zwane, T. (2018). An Empirical Analysis of the Determinants of poverty and household welfare in South Africa. *The Journal of Developing Areas*, 52(1), 115-130.
- Blank, R. M. (2003). Selecting Among Anti-Poverty Policies: Can an economics be both critical and caring? *Review of Social Economy*, 61(4), 447-471.
- Boakye, G. L. (2008). *Assessing the effect of grass cutter farming on the livelihood of small-holder Farmers: A case study of Action aid from the Asutifi District*. Retrieved from <https://www.researchgate.net>.
- Bradshaw, T. K. (2000). Complex Community Development Projects: Collaboration, comprehensive programmes and community coalitions in complex society. *Community Development Journal*, 35(2), 133-145.

- Bradshaw, T. K. (2005). *Theories of poverty and anti-poverty programmes in community development*. Rural poverty research centre, Oregon University, Ballard Hall.
- Bradshaw, T. K., King, J. R., & Wahlstrom, S. (1999). Catching on to Clusters. *Planning*, 65(6), 18-21.
- Canagarajah, S., & Portner, C. (2003). *Evolution of poverty and welfare in Ghana in the 1990s, achievements and challenges*. Retrieved from <http://www.portner>
- Chen, S., & Ravallion, M. (2008). The developing world is poorer than we thought, but no less successful in the fight against poverty. *Review of Income and Wealth*, 47(21), 283-300.
- Chubb, J. E., & Moe, T. M. (1996). Politics, markets, and equality in schools. *Reducing Poverty in America*, 11(7), 121-153.
- Codjoe, S. N. A. (2010). *Population growth and agricultural land use in two agro-ecological zones of Ghana*. Regional Institute for Population Studies, University of Ghana, Accra, Ghana.
- Colasanti, K., Litjens, C., & Hamm, M. (2010). *Growing food in the city: The production potential of Detroit's vacant land*. The CS Mott Group for Sustainable Food Systems at Michigan State University, East Lansing, MI, 1-13.
- Cooke, E., Hague, S., & McKay, A. (2016). *The Ghana poverty and inequality report: Using the 6th Ghana living standards survey*. University of Sussex.
- Cooksey, B., & Likwelile, S. (2002). The rise and fall of agricultural liberalisation in Tanzania. *Development Policy Review*, 21(1), 67-91.

- Cyril, E. U., & Guan, G.-G. G., Yih-Goh, C., & Ling-Tan, T. (2002). Perspectives of SMEs on knowledge sharing. *Vine Journal of Information and Knowledge Management Systems*, 43(2), 210-236.
- Datt, G., & Jolliffe, D. (1999). Determinants of poverty in Egypt: 1997. *Food Consumption and Nutrition Division Discussion Paper*, 75(1), 23-28.
- Davis, E. P. (2007). *A confrontation of economic and theological approaches to ending poverty in Africa*. Brunel University and London School of Theology. Retrieved from <http://bura.brunel.ac.uk/handle/2438/1036>
- De-Haan, L., & Zoomers, A. (2003). Development geography at the cross roads of livelihood and globalization. *Tijdschrift Voor Economische en sociale Geografie*, 94(3), 350 – 362.
- De-Freitas, N., Clark, G., & Legendre, B. (2009). *Individual private pension insurances: The effects of socio-demographic characteristics on poverty*. Dauphine University, Paris.
- De-Haan, C., Van-Veen, T. S., Brandenburg, B., Gauthier, J., Le-Gall, F., Mearns, R., & Siméon, M. (2001). *Livestock Development*. Implications for Rural Poverty, the Environment, and Global Food Security. Washington, D.C: The World Bank.
- Delgado, C. (2005). Rising demand for meat and milk in developing countries: implications for grasslands-based livestock production. In D. A. McGilloway (Ed). *Grassland: A global resource*. pp. 29–39. The Netherlands: Wageningen Academic Publishers.
- Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., & Courbois, C. (1999). *Livestock to 2020: The next food revolution*. International Food Policy Research Institute (IFPRI), Washington D.C: The World Bank.

- Demment, M. W., Randolph, T. F., Schelling, E., Grace, D., Nicholson, C. F., Leroy, J. L., Cole, D. C., Omore, A., Zinsstag, J., & Ruel, M. (2007). Role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of Animal Science*, 85, 2788–2800.
- Dossa, L. H., Rischkowsky, B., Birner, R., & Wollny, C. (2008). Socio-economic determinants of keeping goats and sheep by rural people in southern Benin. *Agriculture and Human Values*, 25(4), 581.
- Feder, G. (1985). The relation between farm size and farm productivity: The role of family labor, supervision and credit constraints. *Journal of Development Economics*, 18(3), 297-313.
- Food and Agricultural Organisation (2006). *FAOSTAT*, Statistics database
FAO, Rome, Italy. Retrieved from www.fao.org/statistics/en/#/data/.
- Food and Agricultural Organisation (2011). *Global food losses and food waste: Extent, causes and prevention*. FAO, Rome.
- Food and Agricultural Organisation (2013). *Children's work in the livestock sector: Herding and beyond*. FAO, Rome.
- Food and Agricultural Organisation (2016). *Food and Agriculture: Key to achieving the 2030 Agenda for Sustainable Development*. FAO, Rome.
- Food and Agriculture Organisation (2001). *Contribution of Livestock to Poverty Alleviation*. Retrieved from <http://www.fao.org/ag/agargo/programs/home.html>.
- Food and Agriculture Organisation (2003). *FAO bulletin of statistics*. Retrieved from <http://www.fao.org/ag/agargo/programs/home.html>.

- Food and Agriculture Organisation (2005). *Contribution of livestock to poverty alleviation: Animal production and health*. Retrieved from <http://www.fao.org/ag/againfo/projects/en/pplpi/home.html>
- Food and Agriculture Organisation (FAO) (2005). *Fertilizer used by crops in Ghana*. Food and Agriculture Organisation of United Nations, Rome, Italy.
- Geda, A., de Jong, N., Kimenyi, M. S., & Mwabu, G. (2005). *Determinants of poverty in Kenya: a household level analysis*. Nairobi: University of Nairobi and Ministry of Finance and Planning.
- Ghana Environmental Protection Agency (GEPA) (2002). *National action programme to combat drought and desertification*. Environmental Protection Agency, Accra, Ghana.
- Ghana Statistical Service (2008). *Ghana Living Standards Survey Report of the Fifth Round*. GSS, Accra, Ghana.
- Ghana Statistical Service (2014). *Ghana living standard survey (GLSS Round 6): Poverty profile in Ghana (2005-2013)*. GSS, Accra, Ghana: Author.
- Ghana Statistical Service (2015). *Revised Gross Domestic Product 2014*. Ghana Statistical Service, Accra. Retrieved from [Ghana.http://statsghana.gov.gh/](http://statsghana.gov.gh/)
- Ghana Statistical Service. (2013). *Poverty profile in Ghana (2005-2013)*.
- Gill, M. (1999). Meat production in developing countries. *Proceedings of the Nutrition Society*, 58(2), 371-376.
- Gong, S. A (2005). *Sustainable Livestock Production in the Northern Region of Ghana: The role of women in the West Gonja District*. BSc. Dissertation, University for Development Studies, Tamale.

- Harwell, M. R. (2011). Research design: Qualitative, quantitative, and mixed methods: Pursuing ideas as the keystone of exemplary inquire. In C. Conrad & R. C. Serlin (Eds.), *The Sage handbook for research in education: Pursuing ideas as the keystone of exemplary inquiry* (Second Edition ed.). Thousand Oaks, CA: Sage
- Heifer Project International (2006). *Ending Hunger, caring for the earth: Charity wire*. Retrieved from <http://www.heifer.org>
- Holloway, G. J., & Ehui, S. (2002). *Expanding market participation among smallholder livestock producers: A collection of studies employing Gibbs sampling and data from the Ethiopian highlands, 1998-2001* (Vol. 48).
- Holmann, F., Rivas, L., Urbina, N., Giraldo, L., Guzman, S., Martinez, M., & Ramirez, G. (2005). The role of livestock in poverty alleviation: An analysis of Colombia. *Forest*, 3, 0-9.
- Hoynes, H. (2012). *Poverty: Facts, causes and consequences*. Joe Tiao Lecture, Kansas State University, University of California, Davis.
- Inoni, O. E. (2010). Effects of small-holder livestock production in reducing rural poverty in the central agricultural zone of Delta State, Nigeria. *Libyan Agriculture Research Center Journal International*, 1(3), 171-176.
- International Labour Organisation (2001). *Promoting of the linkage between women employment and reduction of child labours*. Dares Salaam, Tanzania.
- International Livestock Research Institute (2007). *Markets that work: Making a living from livestock*. Nairobi, Kenya.

- Janvry, A. D., & Dethier, J. J. (1985). *Technological Innovation in Agriculture: The political economy of its rate and bias*. Department of Agricultural and Resource Economics, University of California, Berkeley, U.S.A.
- Jencks, C. (1996). Can we replace welfare with work? *Reducing Poverty in America*, 11(7), 69-81.
- Kafle, K. R. (2014). *Is there more than milk? The impact of Heifer International's livestock donation programme on rural livelihoods: Preliminary findings from a field experiment in Zambia*. Minneapolis, Minnesota. Agricultural and Applied Economics Association.
- Kapinga, D. S. (2007). *Political Economy of agrarian change and Rural Development Issues*. Sokoine University of Agriculture, Morogoro, Tanzania.
- Karbo, N., & Agyare, W. A. (1997). *Crop-livestock systems in Northern Ghana: Improving crop livestock systems in West and Central Africa*. Retrieved from <http://www.old.iita.org/cms/details>.
- Karbo, N., & Bruce, J. (2000). The contribution of livestock production to food security in Northern Ghana. CIDA (Canadian International Development Agency) food security programme. A report submitted to CIDA by the Animal Research Institute of the Council for Scientific and Industrial Research, Tamale, Ghana. *Journal of Agriculture and Social Research*, 8(1), 3-11.
- Karbo, N., Bruce, J., Saila, P., Hanya, G., & Otchere, E. O. (2005). *Small ruminants' production in Upper East Region Ghana. Land conservation and small holder rehabilitation project*. Ministry of Food and Agriculture, Bolgatanga, Upper East Region.

- Kergna, A., Diarra, L., Kouriba, A., Kodoi, B., Teme, B., & McPeak, J. (2010). Role of farmer organizations in the strategy for improving the quality of life for livestock producers in Mali. *Research Brief*, 10-02.
- Khalid, U., Shahnaz, L., & Bibi, H. (2005). Determinants of Poverty in Pakistan: A Multinomial Logit Approach. *The Lahore Journal of Economics*, 10(1), 65-81.
- Khoabane, S., & Black, A. (2009). *The effect of livestock theft on household poverty in developing countries: The case of Lesotho*. Department of Economics and the Bureau for Economics Research, Stellenbosch University. Retrieved from <https://www.ekon.sun.ac.za/wpapers/>
- Kivaria, F. M. (2006). *Epidemiological studies on bovine mastitis in smaller dairy herds in the Dares salaam Region*. PhD Thesis. Utrecht University, Netherlands.
- Konga, D. (2014). *Transformation of Smallholder Livestock Keeping into Commercial Livestock Keeping in Rukwa Region South Western Tanzania*. PhD Thesis. University of Tanzania.
- Krebs, N. F., Mazariegos, M., Tshetu, A., Bose, C., Sami, N., Chomba, E., & Hambidge, K. M. (2011). Meat consumption is associated with less stunting among toddlers in four diverse low-income settings. *Food and Nutrition Bulletin*, 32(3), 185-191.
- Kristjanson, P., Krishna, A., Radeny, M., Kuan, J., Quilca, G., Sanchez-Urrelo, A., & Leon-Velarde, C. (2007). Poverty dynamics and the role of livestock in the Peruvian Andes. *Agricultural Systems*, 94(8), 294-308.

- Kumah, K. D. (2006). *Constraints and Prospects for Small Ruminants Production in East Gonja*. BSc. Dissertation, University for Development Studies, Tamale.
- Kurwijila, L. R. (2002). Evolution of dairy policies for smallholder production and marketing in Tanzania. *Smallholder dairy production and marketing— Opportunities and constraints*, 298.
- Kurwijila, R. L., & Kifaro, G. C. (2001). An overview of biodiversity of livestock in Tanzania. In G. C. Kifaro, R. L. Kurwijila, S. W. Chenyambuga, & P. R. Chilewa (Eds.), *Proceedings of Project Workshop* (pp. 2-26). Morogoro, Tanzania.
- Litchfield, J., McCulloch, N., & Winters, L. A. (2003). Agricultural trade liberalization and poverty dynamics in three developing countries. *American Journal of Agricultural Economics*, 85(5), 1285-1291.
- Maalug, Y. W., & Tommie, T. J. (2006). *Livestock Production and the socioeconomic development of households: A case study of Pong-Tamale in the Savelugu/Nanton District*. B.Sc. Dissertation, University for Development Studies, Tamale.
- Mahama, C. (2012). *Farm animals are vital to Ghana's food secure future*, *Modern Ghana Multimedia Group*. Modern Ghana, Retrieved from <http://www.modernghana.com/>
- Malik, S. (1996). Determinants of Rural Poverty in Pakistan: A micro Study. *The Pakistan Development Review*, 35(2), 171-187
- Maltsoglou, I., & Taniguchi, K. (2004). *Poverty, livestock and household typologies in Nepal*. Retrieved from <http://www.fao.org/ag/pplpi.htm>

- Mapiye, C., Chimonyo, M., Dzama, K., Raats, J. G., & Mapekula, M. (2009). Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa. *Livestock Science*, 124(11), 196-204.
- Martin, O. J. (2009). *Support given to the Livestock Industry by District, Municipal and Metropolitan Assemblies in the Northern Region of Ghana*. B.Sc. Dissertation, University for Development Studies, Tamale.
- Mchau, K.W. (1991). *The impact of upgrading the Tanzania short horn zebu on smallholder dairy production*. PhD Thesis, Sokoine University of Agriculture, Morogoro, Tanzania.
- Mengistu, A. (2008). *Country pasture/forage resource profiles, Ethiopia*. Retrieved from <http://www.fao.org/AG/agp/agpc/doc/Counprof/Ethiopia/Ethiopia.htm>
- Ministry of Food and Agriculture (2004). *Livestock Development in Ghana: Policies and Strategies*. Animal Production Directorate, MOFA, Accra.
- Ministry of Food and Agriculture. (2018). *Agriculture in Ghana*. Facts and Figures. Accra: Ministry of Food and Agriculture
- Mlay, P. N. S. (2001). *Enhancement of smallholder dairy production under tropical conditions through supplementation to optimize roughage intake, digestibility and microbial protein synthesis*. PhD Thesis. Royal Veterinary and Agricultural University Copenhagen, Denmark.
- MoFA (2002). *Food and Agriculture Sector Development Policy*. Retrieved from www.sirtwaterandenergy.org/docs/reports/
- MoFA (2004). *Livestock Development in Ghana: Policies and Strategies*. Animal Production Directorate, MOFA, Accra.

- MoFA (2016). *Ghana's Livestock Growth Trend*. Ministry of Food and Agriculture, Accra. Ghana.
- MoFA/DFID (2002). *The Role of Livestock in Rural Livelihoods in Ghana: Final Report; presented to Ministry of Food and Agriculture (MOFA) and Department for International Development (DFID)*. Accra, Ghana
- Möllers, J., & Buchenrieder, G. (2011). Effects of rural non-farm employment on household welfare and income distribution of small farms in Croatia. *Quarterly Journal of International Agriculture*, 50(3), 217.
- Moynahan, D. (1965). *The Negro family*. Washington DC: United State Department of Labour, Office of Policy Planning and Research.
- Msechu, J. K. K. (2001). *Institutional framework for animal genetic resources management in Tanzania: Project workshop on farm animal genetic resources*. Morogoro, Tanzania.
- Mukherjee, S., & Benson, T. (2003). The determinants of poverty in Malawi, 1998. *World Development*, 31(2), 339-358.
- Mukiibi-Muka, G., Ebong, C., Olweny, J., & Dalsgaard, J. P. T. (2000). Poverty alleviation through free-range poultry improvement: Livestock system research program in Uganda. In G. Pedersen, A. Permin, & U. Minga, (Eds.), *Proceedings of the Workshop on the Possibilities of Smallholder Poultry Projects in Eastern and Southern Africa* (pp. 53-70). Morogoro, Tanzania.
- Mwanawima, R. E. (2010). *A comparative study on the contribution of livestock projects on poverty reduction in Tandahimba District, Mtwara Region*. University of Agriculture. Morogoro, Tanzania.

- Myrdal, G. (1957). *Economic theory and underdeveloped regions*. Thousand Oaks: Sage
- Naminse, E. Y. (2010). *The impact of ruminant production on household income and food Security in Ghana*. Symposium Paper, University for Development Studies, Faculty of Agriculture Department of Agribusiness Management and Finance. Boston, USA.
- Ngqangweni, S. S. (2000). *Promoting income and employment growth in the rural economy of the Eastern Cape through smallholder agriculture*. Doctoral dissertation, University of Pretoria.
- Niamir-Fuller, M. (1994). *Women livestock managers in the third world: Focus on technical issues related to gender roles in livestock production*. International Fund for Agricultural Development, Rome.
- Nii Ardey C. S. (2010). Population and food crop production in male-and female-headed households in Ghana. *International Journal of Development Issues*, 9(1), 68-85.
- Njuki, J., Poole, E. J., Johnson, N., Baltenweck, I., Pali, P., Lokman, Z., & Mburu, S. (2011). *Gender, livestock and livelihood indicators*. Kenya, Nairobi: International Livestock Research.
- Nkomo, G. V., & Sussi, M. (2009). *Impact of veld fires on land on smallholder farmers in Cashvalley in Zimbabwe*. Natural Resources, Natural Resources, Agricultural Development and Food Security. International Research Network.
- Ntanyoma, R. D. (2010). The effect of livestock production on poor and smallholder farmers' income in Rwanda: Case of 'one cow one family programme'. *Journal of Science and Technology*, 36(3), 8-19.

- Nuhu, A. (2004). *Sustainable development of livestock in the Northern Region of Ghana: The role of women in the Saboba-Cheriponi District*. BSc. Dissertation, University for Development Studies, Tamale.
- Okurut, F. N., Odwee, J. J., & Adebua, A. (2002). *Determinants of regional poverty in Uganda*. Nairobi, AERC Research Paper 122.
- Oluwatayo, I. B., & Oluwatayo, T. B. (2012). *Small ruminants as a source of financial security: A case study of women in rural Southwest Nigeria*. Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria.
- Omezzine, A. M. (2009). *Looking into the future for agriculture and AKST*. Washington DC: Island Press.
- Opong-Anane, K. (2011). *Ghana livestock sector review report*. A report submitted to the Food and Agriculture Organization of the United Nations.
- Otte, J., & Knips, V. (2005). *Research Report. Livestock Development for sub-Saharan Africa*. Animal Production and Health. FAO, Rome, Italy.
- Owen, E., Kitalyi, A., Jayasuriya, N., & Smith, T. (2005). *Livestock and wealth creation. Improving the husbandry of animals kept by resource poor people in developing countries*. Hampshire: Hobbs.
- Payne, W. J. A. (1990). *An introduction to animal husbandry in the tropics: Principles of animal agriculture* (4th ed.). Englewood Cliffs, Prentice Hall Inc.
- Perry, B. D., Randolph, T. F., McDermott, J. J., Sones, K. R., & Thornton, P. K. (2002). *Investing in animal health research to alleviate poverty*. Nairobi, Kenya: ILRI.

- Pica-Ciamarra, U., & Dhawan, M. (2010). Small scale poultry farming and poverty reduction in South Asia: From good practices to good policies in Bangladesh. *World's Poultry Science Journal*, 66(2), 309–320.
- Rainwater, L. (1970). Neutralizing the disinherited: Some psychological aspects of understanding the poor. *Psychological Factors in Poverty*, 7(3), 9-28.
- Rajaram, R. (2009). *Female-headed households and poverty: Evidence from the National Family Health Survey*. University of Georgia, USA.
- Randolph, T. F., Schelling, E., Grace, D., Nicholson, C. F., Leroy, J. L., Cole, D. C., & Ruel, M. (2007). Invited review: Role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of animal science*, 85(11), 2788-2800.
- Rangnekar, S. (1998). *Women in livestock production in developing countries. International Conference on Sustainable Animal Production*. Hisar, India.
- Rank, M. R. (2004). *One nation, underprivileged*. New York: Oxford University Press.
- Rank, M. R., Yoon, H., & Hirschl, T. A. (2003). American poverty as a structural failing: Evidence and arguments. *Journal of Sociology and Social Welfare*, 30(4), 3-29.
- Reist, S., Hintermann, F., & Sommer, R. (2007). *The livestock revolution: An opportunity for poor farmers*. Retrieved from <https://scholar.sun.ac.za/>
- Republic of Ghana (2001). *Appraisal Report: Livestock Development Project*. Accra: MoFA.
- Ricardo, D. (1973). *The Works and Correspondence of David Ricardo: Volume 10, Biographical Miscellany* (Vol. 10). Cambridge university press.

- Richard, H., & Adams, J. R. (1996). *Livestock income, male, female and inequality in Rural Pakistan: Food consumption and nutritional division*. Retrieved from <https://ageconsearch.umn.edu/bitstream/42681/2/dp21.pdf>
- Rocha, A., Starkey, P., & Dionisio, A. C. (1991). Cattle production and utilisation in smallholder farming systems in southern Mozambique. *Agricultural Systems*, 37(1), 55-75.
- Rosegrant, M. W., Fernandez, M., Sinha, A., Alder, J., Ahammad, H., Fraiture, C. D., & Rosegrant, M. W., Paisner, M. S., Meijer, S., & Witcover, J. (2001). *2020 global food outlook: Trends, alternatives, and choices* (Vol. 11). Washington D.C: International Food Policy Research Institute.
- Rutamu, I. (2004). *Investment Opportunities in the dairy sub- sector of Rwanda*. Retrieved from www.rwandinvest.com
- Sackey, H. A. (2004). Modelling poverty in sub-Saharan Africa and policy implications for poverty reduction: Evidence from Ghana. *Canadian Journal of Development Studies*, 25(4), 608-624.
- Sen, A., & Chander, M. (2003). Privatization of veterinary services in developing countries: A review. *Tropical Animal Health and Production*, 35(3), 223-236.
- Shah, M. B. (2006). The Indian Supreme Court acknowledge the right to food as a human right. *Entwicklung and Land licherraum*. 40(1), 24 – 36.
- Shaw, W. (1996). *The geography of United States poverty*. New York: Garland Publishing.
- Shedenova, N., & Beimisheva, A. (2013). Social and economic status of urban and rural households in Kazakhstan. *Procedia-Social and Behavioral Sciences*, 82, 585-591.

- Sibuga, K. P., Lekule, F. P., & Kinala, T. Z. (2003). *Principles and practices of livestock production*. Dares Salaam: Tanzania Educational Books Publishers Ltd.
- Sinn, R., Ketzis, J., & Chen, T. (1999). The role of woman in the sheep and goat sector. *Small Ruminant Research*, 34(3), 259-269.
- Slingerland, M. (2000). Animal production and rural financing: the case of Zoundweogo province, Burkina Faso. *Quarterly Journal of International Agriculture*, 37(3), 180-200.
- Smith, A. (1976). *An inquiry into the nature and causes of the wealth of nations*. Indianapolis: Liberty Classics. Retrieved from <https://www.ibiblio.org/ml/>
- Sonaiya, E. B., Branckaert, R. D. S., & Gueye, E. F. (1999). *Research and development options for family poultry*. Retrieved from <http://www.fao.org/>
- Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., & de-Haan, C. (2006). *Livestock's long shadow: environmental issues and options*. Rome, Italy: FAO.
- Stroebel, A., & Nesamvuni, E. (2008). Benefits obtained from cattle by smallholder farmers: A case study of Limpopo Province, South Africa. *Australian Journal of Experimental Agriculture*, 48(7), 825-828.
- Sumah, M. M. A. (2015). *Impact of government livestock intervention programme in Ghana*. Retrieved from ugspace.ug.edu.gh/handle/123456789/8523
- Talukder, D. (2014). Assessing determinants of income of rural households in Bangladesh: A regression analysis. *Journal of Applied Economics and Business Research*, 4(2), 80-106.

- Thanh, T. (2010). *Cattle keeping among Khmer people in Vietnam*. Can Tho University, Can Tho City, Vietnam. Uppsala, Sweden.
- Thornton P. K., Herrero, M., Freeman, H. A., Okeyo Mwai, A., Rege, E., Jones, P. G., & McDermott, J. J. (2006) Mapping climate vulnerability and poverty in Africa. Nairobi, Kenya: ILRI. Retrieved from <http://www.dfid.gov.uk/research/mapping-climate.pdf>
- Thornton, P. K., Herrero, M., Freeman, H. A., Okeyo Mwai, A., Rege, E., Jones, P. G., & McDermott, J. J. (2007). *Vulnerability, climate change and livestock-opportunities and challenges for the poor*. Retrieved from <http://www.dfid.gov.uk/research/mapping-climate.pdf>
- Thorpe, W., Muriuki, H. G., Omore, A., Owango, M. O., & Staal, S. (2000). Dairy Development in Kenya: The Past, the Present and the Future. *Journal of Development and Agricultural Economics*, 2(4), 122-137.
- Tobin, J. (1994). *Poverty in relation to macroeconomic trends, cycles, policies*. Cambridge: Harvard University Press.
- Todaro, M. P., & Smith, S. C. (2012). *Economic development*.
- Townsend, P. (1979). *Poverty in the United Kingdom*. London, WK: Allen Lane and Penguin Books.
- Townsend, P. (2002). Peasant household behaviour with missing markets: some paradoxes explained. *The Economic Journal*, 101(409), 1400-1417.
- Tsibey, F. K., Quincy, F. L. & Clotey, V. A. (2003). *Peanut production methods in Northern Ghana and some disease perspectives: Proceedings of sod-based cropping systems Conference*. North Florida and Education Center-Quincy. PhD Thesis. University of Florida.

- Turkson, P. K., & Naandam, J. (2006). Constraints to ruminant production in East Mamprusi Districts of Ghana. *Ghana Journal of Agriculture Science*, 39, 155-164.
- Twerefou, D. K., Senadza, B., & Afriyie, J. O. (2014). Determinants of Poverty among Male-Headed and Female-Headed Households in Ghana. *Ghanaian Journal of Economics*, 12(7), 40-45.
- Upton, M. (2004). *The role of livestock in economic development and poverty reduction*. Rome, Italy: Food and Agriculture Organization, Rome, Italy.
- Weber, B., & Jensen, L. (2004). *Poverty and place: A critical review of rural poverty literature*. Oregon State University: Rural Poverty Research Center, Working Paper 04-03.
- Weber, M. (2001). *Protestant ethic and the spirit of capitalism*. New York: Routledge.
- Wiebe, K. D., Soule, M. J., & Schimmelpfennig, D. (2001). Agricultural Productivity for Sustainable Food Security. In: Zepada, L. (Ed.), *Agricultural Investment and Productivity in Developing Countries*. FAO Economics and Social Development Papers, Italy, Rome: Overseas Development Administration.
- Williams, G. S. (2009). Livestock Production Prospects in South Africa. *Journal of Animal Science*, 87(12), 1628–1637.
- Wilson, R. T. (1991). *Small ruminant production and the small ruminant genetic resource in tropical Africa: Animal production and health*. Rome, Italy: Food and Agriculture Organization, Rome, Italy.
- Winrock International (2000). *Low head drip irrigation*. Retrieved from <https://www.winrock.org/>

World Bank (2000). *World development report: Attacking poverty*.
Washington, D.C: The World Bank.

World Bank (2001). *Attacking Poverty. Overview: World development report*.
Washington, D.C.: The World Bank.

World Bank (2004). *Drivers of Sustainable Rural Growth and Poverty
Reduction in Central America. Nicaragua Case Study*. Washington, DC:
World Bank.

World Bank (2005). *Introduction to poverty analysis: World Bank institute*.
Washington, D.C: The World Bank.

World Bank (2007). *Global Economic Prospects*. Washington, DC: The World
Bank.

World Bank (2007). *World development indicators*. Washington, D.C: The
World Bank.

World Bank (2009). *Minding the stock: bringing public policy to bear on
livestock sector development*. Washington, D.C: The World Bank.

Yusuf, S. A., Adesanoye, A. O. & Awotide, D. O. (2008). Assessment of
poverty among urban farmers in Ibadan Metropolis, Nigeria. *Journal of
Human Ecology*, 24(3), 201-207.