LIVESTOCK FARMERS' WILLINGNESS TO PAY FOR CATTLE INSURANCE IN THE NORTHERN REGION OF GHANA

BY

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THIS THESIS IS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN AGRIBUSINESS

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DECLARATION

I, Joycelyn Oteng Asamoah, the author of this thesis, do hereby declare that except for the references which have been duly cited, the work presented in this thesis, "LIVESTOCK FARMERS' WILLINGNESS TO PAY FOR CATTLE INSURANCE IN THE NORTHERN REGION OF GHANA" was done entirely by me in the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon. This work has never been presented either in whole or in part for any other degree of this University or elsewhere.

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DEDICATION

I dedicate this thesis to my parents, Mr. Kwame Omono Asamoah and Mrs. Felicia Oteng Asamoah, and my siblings for inspiring and motivating me.

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A study of this kind could not have been successful without the help of God. I therefore, wish to express my sincere gratitude to the Most High God without whom we would not have been what we are today.

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ABSTRACT

Livestock production is very crucial to improving the livelihoods of smallholder livestock farmers in Ghana. However, these farmers are faced with risks associated with livestock production which affect their income and stability in the livestock business. Most of these risks they face are due to natural factors. It is, therefore, necessary to provide insurance for the farmers. This paper examines livestock farmers' willingness to pay for cattle insurance in the Northern region of Ghana. The research was achieved by identifying the risk mitigating strategies that are used by the cattle farmers, willingness to pay amount and factors influencing their decision to adopt the insurance and the amount they are willing to pay. Using the multistage sampling technique, 227 farmers were sampled from the Northern region of Ghana for the study. The Kendall's coefficient of concordance was used to identify and rank the risk mitigating strategies used by the cattle farmers. The contingent valuation method was adopted in eliciting willingness to pay amount of cattle farmers. The double hurdle model was used to analyze the factors influencing farmers' willingness to pay and willingness to pay amount for the insurance. The study revealed that mixed farming is the most used risk mitigating strategy in the Northern Region of Ghana. The contingent valuation method revealed that the maximum amount cattle farmers are willing to pay is GH¢345.69. The minimum amount is GH¢ 57.61 and average amount cattle farmers are willing to pay per cattle in a year is GH¢115.23. The double hurdle results showed that level of experience, engagement in crop production, awareness of livestock insurance positively influenced farmers' willingness to adopt cattle insurance and age of the farmer, access to credit negatively influenced cattle farmers' decision to insure. Also, level of experience and awareness of livestock positively influenced the WTP amount of cattle farmers. Age of the farmer negatively influenced willingness to pay amount of cattle farmers. Farmers should adopt best production practices to lessen the impact of risk associated with cattle production. Cattle farmers should be effectively educated about livestock insurance. Affordable premiums and demand-oriented insurance products should be provided to the farmers to enhance their willingness to pay.

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ACRONYMS

ADF	African Development Fund
AEA	Agricultural Extension Agent
ASAL	Arid and Semi-Arid Lands
AYII	Area Yield Index Insurance
CVM	Contingent Valuation Method
DFID	Department of International Development
FAO	Food and Agriculture Organization
FASDEP	Food and Agricultural Sector Development Policy
FBO	Farmer Based Organization
GAIP	Ghana Agricultural Insurance Pool
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
IBCL	Index Based Crop Insurance
IBLI	Index-Based Livestock Insurance
IFAD	International Fund for Agricultural Development
ILRT	International Livestock Research Institute
MoFA	Ministry of Food and Agriculture
Mt	Metric Tonnes
NGO	Non-Governmental Organization
NIC	National Insurance Commission
OCED	Organization for Economic Co-operation and Development
SRID	Statistical Research and Information Directorate
TMU	Technical Management Unit
WFP	World Food Program
WII	Weather Index Insurance
WTP	Willingness to Pay

CHAPTER ONE

INTRODUCTION

1.1 Background

In Ghana the production of livestock is centered in the Sudan and the Guinea Savannah vegetation zones of the three northern regions (MoFA, 2010). Agriculture development is enhanced by the livestock sector contributing to 6.7% of GDP in 2015 (GSS, 2016).

About 40.5% of Ghana's rural population manages some livestock which indicates that livestock production is partly depended on by about 6.02 million household as a means of support (Ghana Statistics Service, 2012). Meat produced locally in Ghana amounted to 23,841 Mt of beef, 20,347 Mt of mutton and 24,774 Mt of chevon in 2015 (SRID, 2016).

Poultry and small ruminants serve as an alternative means of food and income during poor crop production (MoFA 2010). Livestock production contributes largely towards meeting food needs, manure to improve soil fertility and structure, providing draught power particularly in the northern part of the country. In the Northern region, small ruminants contribute significantly to food security and poverty reduction in vulnerable household (Mahama 2012; Octchere, 1986). Ruminant livestock are used in the payment of dowry, and act as bank or insurance in pressing times (Adam et al., 2010; ADF, 2001; Karbo et al., 1997). In as much as livestock industry contributes significantly to the economy of Ghana, it is faced with numerous challenges. These include pests and diseases, theft, fluctuating prices of feed, extreme temperatures resulting in death, loss of income and capital (Mahama, 2012). Most of these production risks are beyond the control of the livestock farmers hence making livestock production a high-risk investment.

Although Agricultural insurance started in France by an association of livestock farmers forming mutual insurance companies, Germany however developed the first agricultural insurance product in 1700 (Sandmark et al., 2013). It later emerged in the United States, Argentina and Canada in the 19th century (Stutley, 2010).

Agricultural insurance is now practiced in Africa. The index-Based Livestock Insurance product is piloted and implemented in Kenya, Morocco, Senegal and Tanzania. The Agricultural Insurance Company of India (2008) emphasized that insurance neither prevents the occurrence of unforeseen circumstances nor reduces the likelihood of occurrence, it reduces the impact of the financial loss that may occur. Quagrainie (2006) defined insurance as a tool used to mitigate financial risk such as medical expenses, loss of life, auto accidents, and weather damages. According to Raju and Chand (2008), agricultural insurance serves as a significant tool to effectively deal with income and production risk. The reason why people buy an insurance package is to be compensated by the insurer, when the policy holder suffers loss that is covered by the insurance (Nimo et al., 2011).

Awunyo-Vitor (2011) suggests that if farmers had access to risk mitigating facilities in the form of affordable insurance products, they would be able to access formal financial service, and this can be done by assessing the premium level that would be acceptable to both the insurer and the farmer. Manhul and Stutley (2010) also emphasized that agricultural insurance serves as a risk management framework than can contribute significantly to contemporary agriculture. The National Insurance Commission (NIC) in 2017, through Ghana Agricultural Insurance Pool launched the livestock insurance scheme to cushion farmers in the event of uncertain occurrences. The Ghana Agricultural Insurance Pool has started a pilot study of the livestock insurance to ensure that livestock farmers are protected against production risk. The Ghana

Agriculture insurance pool already provides crop and poultry insurance. It also currently provides the drought index insurance cover for millet, soya, sorghum and groundnut and the weather index insurance (GAIP, 2017). Ghana Agricultural Insurance Pool has commenced a pilot study on livestock insurance hence this study seeks to analyze livestock farmers' WTP for cattle insurance and the factors influencing the amount to pay for the insurance.

1.2 Problem Statement

One of the policies that was captured under the Ghana Shared Growth and Development Policy II is to enhance the effectiveness of livestock production by increasing access to technology and financial instrument by the livestock operators. In implementing this policy, the gap identified was high interest rate on loans due to the risky nature of livestock production. MoFA (2016) also reported that there is an inadequate access to insurance and finance by the livestock producers. Livestock production is affected negatively by high mortality, disease and pests outbreak which contribute to an economic loss of US$50million in the country (Mahama, 2012).

In 2013, a total of 21,131 Mt of cattle, 16,728 Mt of sheep and 16,953 Mt of goats were imported into the country for slaughtering. In the same year a total of 88,257.8 Mt of frozen meat and livestock products were imported into the country. This comprises of 22,155.8 Mt of bovine, 2,064.6 Mt of pork, 60,786.3 Mt of poultry and 3,251.1 Mt of mutton. There was a 33 percent increase in imports from 2004 to 2013 (SRID, 2014).

A report by MoFA (2015) indicated that about 5 percent of the population of Ghana representing 1.2 million people are food insecure. In 2009, the World Food Program reported that about 453,000 people in Ghana faces the challenge of being food insecure (WFP, 2009). The Upper West Region has the highest percentage of people that are food insecure at 34%, followed by

Upper East Region at 15% and the Northern Region at 10% (Biederlack and Rivers, 2009; WFP, 2009). Food insecurity is also as a result of low animal and livestock production in the country (Mahama, 2012; Oppong-Anane, 2011). About 90% of the population of these regions that are food insecure manages livestock to lessen crop failure and food shortages due to drought (Quaye, 2008). As part of the strategic plans outlined by the Ministry of Food and Agriculture to reduce food and nutrition insecurity in 2012, the Ministry emphasized on reducing risk resulting from outbreaks of diseases/ pest and natural disasters to boost availability of food (Darfour and Rosentrater, 2016).

In order to lessen the impact of risk and uncertainties, it is prudent to provide insurance for the cattle farmers but it is unclear whether the farmers are WTP for the cattle insurance services and factors that are likely to affect their willingness to pay. These raised the following questions that need to be addressed:

The main research question seeks to answer whether livestock farmers are WTP for cattle insurance. The specific research questions are as follow:

1. What are the risks mitigating measures employed by the livestock farmers?
2. Are the farmers willing to pay for cattle insurance?
3. What factors affect farmers' willingness to adopt and WTP amount for the cattle insurance?

1.3 Research Objectives of the Study

The main objective of the study is to assess livestock farmers' willingness to pay (WTP) for cattle insurance. Specifically, the study seeks to achieve the following objectives to:

1. Identify the risk mitigating strategies used by the cattle farmers
2. Analyze livestock farmers' willingness to pay for cattle insurance, and
3. Determine the factors that affect farmers' WTP for cattle insurance.

1.4 Justification of the Study

The livestock sector for many years has been one of the main sources of protein for Ghana and has been a major contributor to the GDP. However, with changes in climatic conditions that adversely affects the animals and the prevalence of pest and disease among other negative factors, the livestock sector may suffer a production loss. This study would help foster livestock development by mitigating the effect of risks in the livestock sector. The development of livestock will improve the livelihood and income of small holder farmers which may lead to enhancing food security and poverty reduction. The study will also add to existing knowledge in agricultural insurance literature and will also provide Ministry of Food and Agriculture with information on the risks faced by the livestock sector to assist in the development of livestock production.

The knowledge on the risk faced by the farmers will serve as a guide to the Technical Management Unit (TMU) of Ghana Agricultural Insurance Pool (GAIP) consultants, investors and other stakeholders to providing other demand-oriented insurance products and services tailor-made for the livestock farmers. The study also determines the factors that induce farmers' willingness to adopt and the amount to pay for livestock insurance. This will help in the allocation of resources to ensure market sustainability which will lead to the expansion of the program. The research will help to determine the amount that the livestock farmers are willing to

pay for the cattle insurance so as to inform the insurance companies and investors on the acceptable amount to which the insurance will be welcomed by the farmers.

1.5 Organization of the Thesis

The study is organized into five chapters. Chapter One provides a background to the study. Chapter Two provides a review of literature relevant to the study. Chapter Three presents the methodology of the study which briefly explains the study area, the sampling procedure and the sampling size. The chapter also describes the conceptual and the theoretical framework as well as the method of analysis used and the underlying assumptions. Chapter Four presents results and discussions of the study. Chapter Five which is the final chapter presents the summary of findings, conclusions, and recommendations from the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of relevant literature of the study. The chapter is organized into sections as follows: Section 2.2 presents an overview of livestock production; section 2.3 presents livestock production in Ghana; section 2.4 presents the economic importance of livestock; section 2.5 reviews agricultural risk; section 2.6 reviews agricultural insurance; section 2.7 reviews willingness to pay; section 2.8 reviews the factors affecting willingness to pay; section 2.9 reviews models for estimating willingness to pay; section 2.10 finally reviews constraints to livestock development and section 2.11 presents conclusion for this chapter.

2.2 Overview of Livestock Production

Livestock is an important segment of agriculture in many countries and its development has been recognized as the solution to the disparity between demand and supply of animal food product (Assan 2014) and global food insecurity. According to Steinfeld et al. (2006), approximately one third of the global land total surface area is occupied by livestock. Chicken, cattle, sheep, goats and pigs hugely dominate in the world's livestock population, with distinctive species spread significantly among regions. Livestock development has expanded generously since the 1960s and this as a result of a massive shift towards the consumption of animal products like meat, milk and eggs (World Bank, 2009).

Greater percentage of livestock growth sprouts from developing countries especially in East Asia where traditional mixed farming has been replaced with extensive modern operations with a

substantial number of animals' generation (OCED/FAO, 2006). Livestock globally contributes 17% and 33% of kilocalories and protein consumption (Rosegrant et al., 2009) and give fundamental micro supplements such as vitamin B12, iron, and calcium. It additionally contributes to crop production with inputs of manure and traction which is regular to developing countries (FAO, 2011). Aside these contributions, it also engages not less than 20 percent of the global populace and directly provides livelihood for about 600 million poor smallholder farmers in the developing countries (Thornton et al., 2006).

Livestock rearing assumes a key part in the West African economies, giving on occasion, 44% of agricultural GDP (OCED, 2008). The development of livestock in Sub Saharan Africa has been primarily coordinated towards meeting its quick expanding demand considering rapid population growth, urbanization and expanding livelihoods of the region (Assan, 2014). The Sahel and West Africa is an excellent locale for livestock raising containing 25% of the cattle, 33% of the sheep, and 40% of the goats in the whole sub-Saharan Africa area (OCED, 2008). Poultry and beef are Africa's most consumed meat, followed by lamb and then pork which, for social reasons, is less consumed.

Meat and fish consumption in sub-Sahara African rose from 15 million tonnes in 2004 to 22 million tonnes in 2015 (Gira, 2016) and it is foreseen that the contribution of livestock to the value of agricultural and agribusiness industries in sub-Saharan Africa will reach US$ 1 trillion in 2030 (World Bank, 2013). The expected increments in future demand for livestock in the region provide distinctive opportunities for improving livelihoods for people in the field (McDermott et al., 2014). Livestock production, however, is still under exploited and significant contribution of this sector in Sub Saharan Africa is delivered by poor resourced smallholder ranchers (Gollin, 2014). African livestock markets hold the possibility to generate real business

opportunities for livestock producer, much of the time bigger than those of other regions (Pica-Ciamarra et al., 2013). Growing demand for agricultural produce particular meat and dairy set the stage for continued opportunities for investment in the livestock sector.

2.3 Livestock Production in Ghana

Agriculture assumes a multifarious role in providing livelihood support to many Ghanaians especially the rural populace. It dominates the economy in terms of employment, absorbing around 60 percent of the economically active populace (GSS, 2013). The sector is categorized into crop, forestry, cocoa, fisheries and livestock. The livestock sub-division like any other sub sector is a significant contributor to overall agricultural development of Ghana, contributing in direct product (excluding secondary products) 1.7% to national GDP and 8.8% to agricultural GDP in 2012 and 2013, respectively (MoFA, 2016). Livestock raised in Ghana includes ruminants (dairy cattle, goat and sheep), non-ruminants (pigs and poultry) and non-conventional spices like rabbits and grasscutters (Adzitey, 2013). Major cattle breeds found are the West African Shorthorn, Zebu, Sanga, Jersey, Friesian-Sanga Crossbred and Jersey-Sanga Crossbred Cattle; African Wild Ass Donkey; West African Pony, Arab Barb and Chadian Horses, Djallonké, Sahelian, Djallonké-Sahelian crossbred sheep and goats; Ashanti Black, Large White, Landcrace pigs and crossbreds; domestic fowl, duck, turkey, guinea fowl and ostrich; rabbit, grasscutter and guinea pigs (MoFA, 2016).

Animal production in Ghana is mainly for local consumption and is done under semi intensive, extensive and intensive systems. The intensive system is the safest in terms of animal protection and the most expensive of all the systems. This system is considered a high-input framework and

incorporates all the various forms of intensive livestock management. This system of livestock production is generally practiced by commercial farmers (Adzitey, 2013).

Semi-intensive system involves a medium-input framework and management practices with varying degrees of control and feed supplementation. The extensive system requires low-input for production and is regularly adopted by farmers in rustic communities keeping more than one animal and subsistence-type farming sizes predominating. The livestock sector of Ghana has experienced continued growth despite its unfortunate slow development pace (Table 2.1) to supplement fast increment in demand. From Table 2.1, there has been an insignificant growth in livestock production over the years. Averagely, a growth rate of 2.4%, 3.5%, 5.2%, 4.8% and 8.6% for cattle, sheep, goat, pig and poultry respectively from the period of 2006 to 2014 is not enough to complement their fast raising demand.

There is, however, always a disparity between supply and demand of the livestock. Consequently, millions of dollars has been spent on the importation of huge volumes of live animals from neighbouring nations and frozen meat and dairy products from Europe and America (Adzitey, 2013) to augment local generation in order to take care of demand. In 2013, 21,131 cattle, 16,728 sheep and 16,953 goats were imported for slaughter (MoFA, 2016). Money spent on importation can be invested in the local meat industry, especially in the northern ecological zone which has similar climate conditions like Burkina Faso where majority of live animals are imported from.

Table 2. 1: Livestock Production Trend of Selected Animal Species in Ghana

Livestock Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cattle	1392	1407	1422	1438	1454	1498	1543	1590	1657	1734
Sheep	3314	3420	3529	3642	3759	3887	4019	4156	4335	4522
Goat	3997	4196	4405	4625	4855	5137	5435	5751	6044	6352
Pig	477	491	506	521	536	568	602	638	682	730
Poultry	34030	37038	39816	43320	47752	52575	57885	63732	68511	71594

Source: SIRD and Veterinary Service Directorate, MoFA, Accra, 2015

2.4 Economic Importance of Livestock Production

Livestock provides significant benefits to people and country. The sector plays economic, social and cultural roles to improve the wellbeing of people especially farm families. Livestock contributes to food supply, family nourishment, asset savings, livelihood, transport, soil fertility, employment, agricultural diversification, agricultural traction, sustainable agricultural production, ritual purposes and social status (Moyo et al., 2010). Generally, livestock provides the following economic importance.

Food Security: Food security according to the Ministry of Food and Agriculture of Ghana is characterized to incorporate good quality nutritious food, available in all year at affordable prices (MoFA, 2007). Livestock products provide humans with high nutrient quality, contributing

almost 30% of human protein consumption (Steinfeld et al., 2006). It also serves as buffer to mitigate fluctuation in crop production to stabilize food supply (FAO, 2012).

Monetary Income: Livestock keeping is used in many rural households to generate income more than for subsistence. It provides income to several millions of people through employment. Globally, livestock contributes 70 percent of the rural poor's livelihood which represents 20 percent of animal product traded worldwide (Ali, 2007). A research conducted by Bettencourt, Tilman, Henriques, Narciso and Carvalho (2013) on the economic and sociocultural roles of livestock in the wellbeing of rural communities of Timor-Leste posit that livestock is an important source of income for the rural population. In Ghana poor households particularly in rural communities use livestock income to meet financial needs such as buying food, settling hospital bills, purchasing of farm inputs, paying of school fees, expenses for burial service and marriage (MoFA/DFID, 2002).

Animal Draught Power and Fertilizer: Livestock and crop interactions occur directly in farming system from which bulk of global ruminant are produced. Livestock provides draft power for land tillage especially in the rural area, saving acquisition cost of farm machinery. In Timor-Leste, horses and buffalos are mainly used in the preparation of field for rice production (Bettencourt et al., 2013). In addition to the draught power, livestock also provides manure to improve soil structure and fertility for households who cannot afford industry made organic fertilizers (Devendra, 2001). The use of manure is being promoted against chemical fertilizer with the reason being that, the organic leaves no chemical residue in the produced food. Complementary interaction between crop and livestock results in the expansion in production of both livestock and crop (Upton, 2004).

Means of Transport: Livestock is used as a means of transport in many rural communities with poor road access. Even in places where mechanical transport is available, livestock as a means of transport is still crucial because it is reliable and affordable. In the rural zone, transportation in the form of animal drawn carts is used to convey farm produce, household good and farm supplies (Miranda, 2011).

2.5 Agricultural Risk in Ghana

Agriculture is a risky venture like any other business. Anafo (2011) professed that risk and uncertainties are part and parcel of agriculture including livestock and exist whenever there is no certainty in the future. The complexities of economic and physical frameworks make the outcomes of farmers' decision uncertain. That is, a single plan of action is associated with a likely multiple result. There has not been a clear-cut distinction for risk and uncertainty. According to OCED (2009) uncertainty relating to results including misfortune or loss that contrarily influences wellbeing is typically connected with risk. That is risk and uncertainty are interrelated and where ever there is uncertainty there is risk. Knight (1921), however, distinguishes between risk and uncertainty. Knight infers risk to be knowledge of numerical and objective probabilities of an outcome but with uncertainty, the result of an event is indeterminate, and the probabilities are not known.

This distinction is not extremely operative since the probabilities are seldom known and there is likewise a broad acknowledgement of probabilities as biased convictions (Moschini and Hennessy, 2001). Several authors find a more helpful refinement between uncertainty as imperfect knowledge and risk as exposure to uncertain unfavourable consequences (Hardaker et al., 2004). A forum held in Damascus in 2007 discussed risk from the agricultural perspective as

anything that prompts reduction of consumption below sufficient level or beneath adequate levels (Nehme, 2007). By and large, agricultural risk is related with negative outcome of events such as unpredictable natural or climatic outcomes, and price variability which causes financial loss, though the possibility of monetary benefit is also possible.

2.5.1 Sources of Agricultural Risk

Similar risks pertaining to agriculture are common to farmers in both developed and developing countries (Cervantes-Godoy et al., 2013). In any case, the sort of risk, its magnitude and impact may primarily differ, based on factors such as farming systems adopted, geological area, climate condition, policies implemented and farm type (Aditto et al., 2012).

A study of 149 US ranchers in 12 states by Patrick, Wilson, Barry, Boggess and Young (1985) revealed that change in climate, input and output cost were the three most essential sources of risks in both crop and animal production. In a like manner, nationwide mail survey on risk management strategies of New Zealand farmers by Martin (1996) identified input and output cost as a vital wellspring of risk faced by all ranchers. Other risks such as rainfall, climate, pests and diseases however, varied depending on topographical area, farm type and size.

OECD (2000) classifies agriculture risk into production risk (weather conditions, pest, disease and technological change); ecological risk (environmental change, natural resource management); marketing risk (input and output cost, price fluctuation, new product, safety) and regulatory risk (agricultural policies, food safety and ecological regulations). Musser & Patrick (2001) add to OECD 2000, financial risk and human resource risk. Shadbolt & Martin (2005) however describes financial risk as variations in interest rates on obtained reserves, deficiency in

cash flow for debt obligations and changes in credit terms conditions and other threats faced in securing funds to finance farm activities.

World Bank (2000) and Holzmann & Jorgensen (2001) also characterize risk into natural (rainfall, avalanches, floods, droughts); health (pest and diseases); economic risk that influences income, consumption and wealth; ecological risk, societal risk and political risk. They further classify risk into micro which affect individual; meso relating to the community and macro, influencing an entire nation. Jokhio et al. (2016) also recognizes diseases, input price, drainage, labour, conception, fodder, inadequate equipment and low production as major livestock production risk. Individual ranchers might be confronted with different risks altogether therefore presence of multiple risks ought to be well noted. An apparent management of one notable risk does not prompt the control of general risk profile because when ranchers have dealt with their own direct dangers, backhanded dangers can still cause misfortunes. In these conditions, an ideal choice of a strategy is required to manage them.

2.5.2 Agricultural Risk Management

Farmers are agents best in position to know the dimension, characteristics and correlation of risk affecting their farms and the available strategies to be adopted to manage such risks. The choice of a specific risk management methodology is reliant on ranchers' perception and attitude towards risk. Kahan (2008) identifies three general risk attitudes of producers including livestock owners. These are risk averters who attempt to abstain from going out on a limb; risk takers who are available to more risky business choices; and risk neutrals that lie between risk-averse and risk-taking position.

Stutley (2010) maintained that agrarian producers are risk averters and this greatly influences their decision -making capabilities. Majority of people including agriculturists manage risk by shielding from decisions with indeterminate future results. Risks are unpredictable; measures can be put in place to decrease their occurrences and impacts. Cervantes-Godoy et al. (2013) posited ex-ante risk management and ex-post risk coping as the two general approaches to managing and reducing the chances of loss occurrences. Proactive measures taken to avoid, transfer or reduce exposure to risk are considered ex-ante risk strategies.

However, reactive measures taken after the occurrence to mitigate its impact is the ex-post risk coping techniques. Cervantes-Godoy et al., (2013) further identifies formal and informal strategies as risk management tools used by smallholders in developing countries. Meuwissen and Molnar (2010) described informal strategies as on-farm and off-farm strategies characterized by arrangement between individuals, households or gathering as groups to guard against risk.

Formal strategies, on the other hand, are market based and /or are publicly provided instrument. Risk prevention is rarely possible in agricultural production even in developed countries but in any case, it is regular to mitigate it. According to OECD, (2009) market instruments are risk prevention tools suitable for agricultural risk. Critical among them are future markets and insurance market to curb price and production risk, respectively. In Ghana, the traditional or informal agricultural risk management strategies are used particularly by livestock producers who at present have no insurance scheme and other formal techniques for risk management.

2.6 Agricultural Insurance

Agricultural insurance has roots in numerous nations and been effective in China and other developed countries. Germany in 1700, created the first agricultural insurance product (Sandmark et al., 2013) and it rose later in the Japan, United States, and Canada. Currently, several different types of such products are found in many parts of Europe. Agricultural insurance is now gaining grounds in Africa and three categories of index-based insurance products are piloted or implemented in Africa. These incorporate Area Yield Index Insurance (AYII) and Weather Index Insurance (WII) displayed as Index Based Crop Insurance (IBCI) and then, the Index Based Livestock Insurance (IBLI). The Index Based Livestock Insurance (IBLI) has become an extremely helpful risk management tool for some ranchers in Africa, particularly those in the pastoral territories. Insurance market penetration is very low, never exceeding two percent even in developed countries despite government sponsorship (Mahul & Stutley, 2010).

Agricultural Insurance market development is worst in developing countries. A survey on a sample of 65 countries (including seven countries offering insurance in Africa) by Mahul & Stutley (2010) inferred that agricultural insurance penetration was low in vast parts of the studied nations. In spite of the fact that, the assessed worldwide agricultural insurance premium volume relatively multiplied in the period 2004– 2007, it stayed low particularly in African nations where it generally achieved 63.5 USD million, equal to a normal of 0.13% of the 2007 agrarian GDP. Regardless of the current relative development of the livestock business in Africa, premium volume generated by the agriculture sector remains marginal (Asseldonk, 2013).

2.6.1 Livestock Insurance Schemes Development in Africa

Over the last decade, intensive research work has been geared towards the availability of commercially viable insurance products for the pastoralist communities in the arid and semi-arid lands (ASALs). There has been a high interest in the use of Livestock Insurance and has been tested in several countries as one of the modern risk-management tools. Prior to this, pastoralists used traditional risk-management mechanisms; these include splitting herds, pasture management by creating dry-and wet-season grazing areas, and movement of herds to access water and pasture in other areas. The insurance systems have been designed and piloted in some countries to cushion households against unpredictable losses despite limitations faced. Kenya and Ethiopia are countries in African where livestock insurance schemes implementation is on the rise.

The index-based livestock insurance (IBLI) schemes have been rolled out by the International Livestock Research Institute (ILRI) in partnership with private insurance companies and humanitarian agencies in several counties in Northern Kenya and in the Borana area of Ethiopia. The first of such pilot schemes was in Kenya's Marsabit County in 2010. Currently the insurance products are commercially available and applications, premium payments and indemnities are made by mobile phones through the M-pesa system.

In both Kenya and Ethiopia, similar challenges have been faced in the implementation of Index-based Livestock Insurance schemes. Low levels of formal education among pastoralists have hampered understanding of how the product works. Furthermore, the targeted pastoralists' households are difficult to access because of the poor state of the infrastructure, in terms of both road access and telephone network coverage.

In Kenya, IBLI uses livestock mortality data collected in Kenya for slightly over a decade. As opposed to the livestock insurance product in Mongolia, where 100 years of livestock mortality data are available, Kenya lacks such data to calculate basis risk. The situation is worse for Ethiopia where no historical livestock mortality data are available to calculate basis risk. A deviation from the cumulative historical trend of vegetation growth in relation to the NDVI is used to prepare the insurance contract. In the Mongolia case, index-based mortality insurance against *dzud* (extreme winter conditions that result in high livestock losses) was introduced by the Government in 2005. In 2014, this insurance programme was gradually transitioned from a donor-funded initiative to a private company enterprise and the insurance is commercially available. In 2016, the scheme became a fully-fledged public-private insurance venture.

A negligible percentage of the pastoralist populations have taken up the IBLI products that were piloted. This has brought to light the challenging factors that undermine the upscale of Livestock Insurance Scheme and the way forward to achieving a better development of IBLI.

2.6.2 Challenging Factors that Undermine the Upscaling of Livestock Insurance Schemes

Several factors are associated with the low uptake, and a review of the pilot programs in the selected African countries shows some factors such as misunderstanding of how the insurance product works, cultural and social factors such as limited trust in the introduced insurance products and low level of formal education among the pastoralist communities. Other studies on Livestock Insurance in these African countries also discovered the lack of risk market infrastructure necessary to foster livestock insurance and the lack of technical capacity by domestic insurance providers and public decision makers are some of the challenges impeding the upscale of Livestock Insurance Schemes (Jensen, Barrett & Mude, 2015). The

implementation of Livestock Insurance in these countries resulted in ambiguity over the respective role of the public and private sector. This always breeds conflicts of role and eventually negligence of responsibilities.

Studies over the last decade have identified Index-based insurance as a risk-management tool having minimal impact at the household level in terms of poverty reduction and safeguarding assets (Leblois & Quirion, 2013; Miranda & Farrin, 2012). That is, benefits derived from livestock insurance favour better–off households that can pay for the insurance premiums.

Full premium payment of poorer households may lead to asset depletion, since the payouts do not fully compensate for all losses incurred and also not all dry periods will trigger payouts, as this depends on the levels of the index. Therefore, continued payment of premiums by such households may reduce livestock overall value. Poorer households below the poverty threshold only benefit if there is a subsidy programme to assist in premiums payment. In the case of the Kenyan and Ethiopian IBLI pilot program, ILRI introduced it in partnership with local commercial insurance companies and NGOs such as CARE International and Mercy Corps work closely with the local administrations in the pilot areas to enable poorer household to access the insurance product. This is, however, still a major challenge.

Another challenge identified from the pilot African countries is inadequate tools and indicators to monitor and evaluate Livestock insurance programs (particularly index-based insurance). There is a need to monitor the uptake and to study the effectiveness and impact of the livestock insurance in the pilot areas to gain a well-grounded basis for decisions about supporting such insurance in the ASALs and to ensure that it is worthwhile entering into development

cooperation related to IBLI. It would also need to be explored whether IBLI complements indigenous mechanisms for managing risks of livestock losses, or undermines them.

The lack of adequate tools and indicators to monitor and evaluate the effectiveness and impact of Livestock insurance have made it difficult for other agencies and organizations to enter and invest in this new risk-management product. The development of Livestock Insurance Schemes in the pilot African Countries is faced with the challenge of inadequate policies and laws. Livestock insurance falls under the disaster risk management and resilience building in both the national and the intergovernmental regional authority strategies.

In Kenya, Sessional Paper 8 (2012) outlines measures to harness the potential of dry lands and to ensure equitable distribution of resources between high-potential and ASAL areas, which have historically been viewed as marginal. According to this Paper, the Government plans to introduce livestock-insurance schemes for pastoralist communities to strengthen livestock production and marketing. However, despite the acceptance of livestock insurance as a risk-management tool in these African countries with pastoralist populations, there are no laws or policies that are specific to livestock insurance. Development of such policies is a priority to entrench livestock insurance as a risk-management tool for pastoralists' households.

2.7 Willingness to Pay

Mwaura, Muwanika, & Okoboi (2010) define Willingness to Pay (WTP) for a service/product as the maximum value that persons would pay for a product/service given that the individual has enough information on such product. It includes focused on benefactors for services in setting up preferences of the services presented and the amount of money the respondents are prepared to pay for the product or service. The estimation of willingness to pay for a particular product is

useful in policy recommendations in the expression of choices for non-market situations (Telser & Zweifel, 2002). Many agricultural researchers have used the estimation of willingness to pay to assess the preferences of farmers and other stakeholders for a particular agricultural product or service. Chantarat, Mude & Barrett (2009) used willingness to pay to assess farmer preference for index based livestock insurance in northern Kenya.

Likewise, Xiu, Xiu & Bauer (2012) used it to determine farmers' inclination for Cow Insurance in Shaanxi Province of China. A growing number of authors like Kumar, Mirajkar, Y.P Singh and R. Singh (2011), D. Budak, F. Budak & Kaçira (2010) and Zakaria, Abujaja, Adam, and Nabila (2014) has also used willingness to pay in their studies.

Measuring consumers' preferences for products and services has been a crucial task for experts in both academia and business (Owusu-Sekyere, 2014). In assessing willingness to pay for a product, two methods may be used in eliciting consumers' preferences. That is, the revealed and the stated preference data. Revealed preference method is used to estimate consumers' valuation for attributes when data already exists from past behavior of consumers. Stated preference however, is used when data does not exist and involves application of field survey and experiment.

Most researches conducted especially on agricultural insurance in African used the stated preference method since there is no readily available data on past behaviors. Stated preference method of elicitation includes the contingent valuation method and choice experiment; however, the contingent valuation method is widely used in eliciting respondents' willingness to pay for a product. This is done by forming hypothetical questions that will fetch responds on the value respondents attached to a product. The hypothetical characteristics of stated preference methods

give rise to limitations that need to be carefully considered. Many have stated their qualms on the capability and willingness of individuals to give truthful and accurate answers, which prompts faulty legitimacy of the outcomes.

Kemp et al. (2010) adopted both methods on the study of the impact of food miles or product origin on consumers' purchase decisions. It was revealed that the preferences expressed by consumers gave a clearly biased impression of the actual purchase behavior recorded in the revealed preferences part of the research. This effect can, however, be partly avoided by how questions are framed and how much the respondents are informed about the product or service - the choice of elicitation method used. The choice of elicitation format is of considerable importance as it has direct influence on the outcome of data gathered. The most widely used methods include open ended, iteration bidding, payment cards and single and double dichotomous choice.

2.7.1 Open-ended elicitation

Open ended elicitation asks respondents their greatest WTP. This strategy is extremely informative as the most extreme WTP can be recognized for every respondent. However, it has no anchoring bias; does not give respondents signals about what the estimation of the change may be (Pearce & Ozdemiroglu, 2002). Early studies used open ended questions but its complications of eliciting values and its susceptibility to an array of biasness declined its usage (Damschroder et al., 2007). It evokes values without a starting point, without a search procedure to aid respondents determine the value they place on a good, produce large numbers of non-responses and involve lot of brain activity of the respondents' decision which makes the method heavily biased (Dompreh, 2015).

2.7.2 Iteration bidding

Iterative bidding initially administers several rounds of discrete choice questions and finally closes with an open-ended WTP question. This method starts with respondents being asked about their decision on an initial economic value for a service. The sum is then changed until the point that the respondent acknowledges to pay the last sum. This method encourages respondents to consider their preferences carefully but risk of anchoring bias and prompts to huge quantities of "yea-saying" bids and outliers (Pearce & Ozdemiroglu, 2002).

2.7.3 Payment card:

Payment cards present respondents with a visual guide containing countless sums. Respondents select their most extreme WTP amount from a list of possible sums presented on a card. This method reduces the number of outliers and avoids starting point bias (Pearce & Ozdemiroglu, 2002). However, it is prone to range bias which implies that the willingness to pay amount will depend on how the range of monetary value is set (Damschroder et al., 2007).

2.7.4 Dichotomous elicitation choice:

The dichotomous elicitation choice comprises single-bounded dichotomous choice model and double-bounded dichotomous model. Whiles single-bounded dichotomous choice model offered respondents only one bid on a product to accept or reject, double-bounded dichotomous model follows up with a further question after the first question in the single-bounded technique is asked. A “yes” response question is repeated with a higher value for the product and a “no,” is repeated with a lower value for the product. This method reveals more market-realistic WTPs due to its reduction in starting point bias and provides less cognitive burden for the respondents

who only must state "Yes" or "No" to a given price. Both methods seem to have some restrictions for estimating values (Pearce & Ozdemiroglu, 2002); however. they are the most recommended Contingent Valuation elicitation methods.

2.8 Empirical Review of Factors affecting Willingness to Pay

Topics of willingness to pay for an agricultural insurance product have been discussed in recent literature by several authors (Ayedun et al. 2017; Gabre 2014; Owusu & Anifori 2013; Kumar, Singh and Rashmi 2017). Many others have focused on factors influencing willingness to pay for insurance relating to livestock alone. Singh & Hlophe 2017 and Mohammed & Ortmann 2005, in their researches indicated age, education, awareness, farm experience, farm turnover, premium price, off-farm income, farm diversification and farm size as some of the factors influencing willingness to pay for livestock insurance.

Age: Age of farmers has been discussed as a factor that influences farmers' willingness to pay. How young or old a farmer may be, have a link with their decision to pay. Mischra and Goodwin (2006) recommend that more youthful individuals are more audacious and, in this way, less risk averse that older individuals. This increases their willingness to adopt and pay for insurance. Aye and Oji (2007) however provide a contrary view and suggests that older farmers rather are more willing to take on risk and hence increase their willingness to pay. These opposing findings according to Jokhio et al. (2016) may be due to varying cultural recognition about the concept of risk and how to react to it.

Level of Education: Through education farmers are opened to the concept of risk and its impact. As a result several researchers have included an education level variable in studying farmers' willingness to pay for livestock insurance. Farmers' level of education negatively affects their

willingness to take risk (Bullock et al., 1994; Xiu et al., 2012 and Singh and Hlophe, 2017). The likelihood of livestock insurance adoption decreases with an increasing level of formal education of the farmer. However, Mohammed & Ortmann, (2005) and Cao and Zhang, (2012) present a contrary view. To them, education has a positive association with farmers' willingness to pay.

Awareness of Livestock Insurance: The availability of information and in-depth knowledge of insurance is also a highly significant variable in determining willingness to pay. The decision of willingness to adopt is hugely dependent on perception one has on a product. The less previewed farmers are to insurance product information, the less likely the chance of adoption. This is because, many farmers are not willing to pay insurance premiums for elusive products with benefits not yet consumed or claimed (Jokhio, 2016). By and large, livestock farmers patronize livestock insurance often, if they are well informed about the opportunities available to them or the benefits that they stand to gain (Singh and Hlophe, 2017).

Farm Experience: Farmers' willingness to pay may be influenced by their length of farming years. Both Singh and Hlophe (2017) and Mohammed and Ortmann (2005) proposed a negative connection between agriculturists' years of farming engagement and likelihood of livestock insurance adoption. That is, the more seasoned dairy ranchers are the less eager to seek insurance cover. Agriculturists with such attributes may have procured enough information through time to manage income risk without insurance. Vandeveer (2001) affirmed and demonstrated in the aftereffects of his investigation that more youthful or less experienced agriculturists were more inclined to adopt insurance.

Farm Turnover: The decision on willingness to pay for livestock insurance by farmers may be influenced by the measure of cash acknowledge from the farm. The magnitude of revenue will

determine whether or not farmers should adopt insurance. According Singh and Hlophe (2017), there is an adverse correlation between revenue realized from farm and the chance of livestock insurance adoption. That is, the ability to pay for livestock insurance diminishes with an increasing level of farm income. However, Masoumi and Khodadadi (2013) proposed a counter intuitive view to this and posited that, farm turnover has a positive relationship with farmers' likelihood to adopt livestock insurance.

Premium Price: Premium price is the cost of insuring and has a significant impact on willingness to pay. All things being equal generally, price has an inverse association with demand for good or service. This is same in livestock insurance adoption (Singh and Hlophe, 2017). That is, the decision of purchasing livestock insurance or willingness to pay decreases with high premium price. An exception to this is when an acceptable premium is charged. In such a case, premium price will positively impact farmers' reception (Xiu et al., 2012).

Off-farm Income: Off-farm income with respect to livestock farming is any income acknowledged from any activity other than livestock production. This may include but not limited to returns from investment. Off-farm income apparently lessens the odds of agriculturists willing to pay for insurance since it is seen to be a substitute technique for risk management (Mohammed and Ortmann, 2005). Ranchers who get significantly high returns from off-farm investments, have less interest in insurance adoption. This is because their interest and concentration will be in areas where their major income flows from. This, therefore, infers that less income farmer earns from off-farm activities, the more willing he is to pay for insurance.

Farm Diversification: Sometimes farmers engaged in additional money-making activities. Farmers' engagement in business activities in addition to their farming business decreases their

desire for livestock insurance adoption (Mohammed and Ortmann, 2005). On-farm diversification reduces the use of insurance as a strategy for managing risk because it is one of most appropriate risk management tools in the absence of insurance (Blank and McDonald, 1996). Diversified livestock farmers have less chance of experiencing lower income variability because a loss in one enterprise may be reimbursed by higher earnings in a different enterprise (Singh and Hlophe, 2017).

Farm Size: Farm size influences the decision by farmers to adopt livestock insurance. An increase in farm size implies an increase in the net value of livestock and hence an increase in farmers' willingness to adopt livestock insurance. Farmers with large farm sizes (livestock) are likely to adopt insurance because larger sums of money have been committed into their farms. A study by Xiu et al, (2012) confirms that farm size has a direct relationship with willingness to adopt livestock insurance.

2.9 Models for Estimating Willingness to Pay

In estimating willingness to pay, some statistical model is used. The are several of such models but those which are commonly used in willing to pay researches are logistics regression model, Tobit model, Heckman model and the double-hurdle model.

Logistic Regression Model: Logistic regression model also called the Logit model is a closed form model which has been used to measure the effects of factors that influence willingness to pay. This model is appropriate when the dependable variable has two possible outcomes or is dichotomous. Singh and Hlophe (2017) used this model to assess farmers' willingness for livestock insurance adoption in Swaziland. Farmers were presented with actual amount to be paid for livestock insurance and then asked whether or not they were willing to pay.

The parameter estimates of the model are asymptotically consistent and efficient. Such estimations however, may not help analysts in bringing out key suggestions on the real sum farmers are willing to pay. Shortfalls of this model according to Train (2009), includes the models inability to signify arbitrary taste variety; inability to be used in connection with multi-dimensional data when imperceptibly factors are related after some time and allows for prohibitive substitution patterns.

A modified form of the Logit model is the mixture regression which is preferred to the former because it accounts for heterogeneity of attributes and advantageous in model fit and predictive test when data are generated from two- step process (Belasco and Ghosh, 2008). Despite these, it had its own short falls which led to the adoption of the Tobit, Heckam selective and double-hurdle model.

Tobit Model: This was the first model proposed by Tobin in 1985 and it involves features of Probit analysis. The Tobit model, also called a censored regression model, was developed specifically for conditions where a dependable variable is truncated at zero. This model measures both the rate of adoption of a product and its willingness to pay amount. According to Dompreh (2015), the Tobit model assumes both willingness to pay and the amount to be paid as one variable and interprets zero observations as people's willingness to accept decision. The Tobit model therefore proved an appropriate model for analyzing scenarios where some of the variables are censored around zero willingness to pay - people are not willing to pay any amount for a product. However, the model is prohibitive and views all zeros in the WTP amounts as respondents' deliberate decision results which might not necessarily be the case.

Heckman's Sample Selection Model: This model deviates from the Tobit model and based on the assumption that the decision of willingness to pay and the amount to be paid may not necessarily be jointly determined by the same factors (Musah, 2013). Xiu et al. (2012) used this model to determine farmer's WTP for cattle insurance in China. They initially determined whether farmers will participate on the cow insurance market using Probit. They then staged an ordinary least squares approach to explain the likely amount to be paid by farmers on participation. In such instance, the decision to pay determinants and the factors that influence decision on the actual amount farmers are willing to pay could be different. Whether or not farmers participate in the cow insurance market is a pre-condition for them to express out their WTP and zero response are cleared before the second stage of the analysis once the first stage is passed. Heckman, therefore, models these decisions as two separate processes.

Double Hurdle Model: This model imitates the Heckman's sample selection model in terms of recognizing zero and positive outcomes. The two models bring out the fact that WTP decision outcomes are expressed by the choice to adopt and willingness to pay amount. As such, they allow for the estimation of both the first and second stage equations with different sets of explanatory factors. The Double-Hurdle however, recognizes in the second stage the possibility of zero observations (Wodjao, 2008) as not all respondents may have full knowledge of questions asked. In double hurdle model, adoption behavior involves the decision of adoption, which is a dual choice, exhibited using a Pobit and truncated regression model for willingness to pay amount (Cragg, 1971).

2.10 Constraints to Livestock Development

Several challenges have been proposed by different authors as constraints faced by livestock farmers (OCDW 2001; Singh et al. 2004; Maburutse, Mbiriri and Kashangura 2012; Belay, Getachew, Azage and Hegde 2013; and Darith, Xu, Yu, Abdul-Gafar, Kennvidy, Ratanak and Mbala 2017). These authors have discussed disease control, feeds and fodder shortage, poor animal productivity, poor breeding facilities, poor veterinary services, livestock extension service, credit and marketing facilities as consolidation on land holding as constraints faced by farmers at different regions.

Prevalence of Diseases: Livestock disease is one constraint that has been earmarked to be commonly seen among livestock producers and discoveries made by different researchers make comparable disclosures (Masimba, et al 2011). According to Devendra et al. (2000), diseases are a major livestock business constraint especially in the tropical zones. Masikati (2010) likewise includes that a noteworthy requirement for dairy cattle generation in the smallholder farming systems is the high mortality through diseases.

Feeds and Fodder Shortage: Feed and fodder are field plants, agricultural and agro-industrial by-products and additives given to animals for body upkeep, milk and meat or egg production (Talib, 2013). Feeds and fodder are vital to the growth and survival of livestock. In a research by Amenu et al. (2011) and Belay et al. (2013) feed shortage was acute limitation of livestock producers in Ethiopia. Shortage of feeds and fodder are experienced generally amid winter and summer seasons. Feed shortage causes under feeding of livestock resulting in late maturity, high animal mortality and infertility (Singh et al., 2004).

Poor Breeding Facilities: Another obstruction to the development of livestock is poor facilities for breeding livestock. For a speedy growth in livestock development, species-wise breeding programs have to be fine-tuned and implemented (Pawars, 2013). That is, using quality disease free high genetic merit bulls for natural service or at best adopting high pedigree animal selection and offspring testing programmes and neglecting natural mating system. A study on constraints and strategies in rural livestock farming in Almora district of hilly Uttaranchal by Singh et al. (2004) revealed that facilities for breeding were not utilized properly by farmers. Cattle and wild ox development programmes implemented suffered because of poor genetic potential of bull. Among seventeen (17) villages, there were only two breeding wild ox bulls available to service 367 breed-able bison.

Poor Veterinary Services: Poor veterinary services are a constraint ranked second in the study conducted by Petrus et al. (2011) in Namibia. Researchers have testified the failure of extension support systems. Peeling and Holden (2004) posited that with a few exceptions, countries have made government provision of clinical Veterinary Services a relic of times gone by. The veterinary workers require to provide crucial livestock services (i.e., emergency treatment, deworming, immunization, mineral mixture and animal feed) to the farmers. They are available but incapacitated due to the absence of equipment, transport and medication, distance between health care center and farms (Singh et al., 2004).

Poor livestock Extension Service: There is a myriad of challenges associated with extension support delivery systems in communal areas (Maburutse et al., 2012). Education of farmers on improved practices and technologically mediate livestock management is on the low. According to Singh et al. (2004), the importance of animal feeding and management has totally been ignored. Farmers are unaware of recent developments around animal nutrition, particularly

improved utilization of existing feed resources, strategic supplementation of roughage-based diet, use of common salt and mineral mixture for improving the animal health, production, reproduction and feeding of colostrum to newly born calves. A study conducted by Masikati (2010) in Zimbabwe also revealed that acaricides for the control of parasites like ticks were not available for sale on the market.

Poor Credit and Marketing Facilities: Access to credit and inadequate infrastructure for marketing are other major constraints to livestock sector development for small holders. Poor economic status of farmers because of inaccessible and high financing credit cost (Singh et al., 2004), poor prices due to lack of established marketing prospect for livestock product (Pawar, 2013) restrict farmers' resource mobilization capabilities for extension.

Poor Animal Productivity: Another constraint to livestock development is poor animal productivity which sprouts from knowledge gap and adoption of inappropriate livestock practices. These include non -availability of adequate feed and fodder, low conception rates, lack of quality breeders, poor livestock management, high mortality and morbidity losses, inadequate marketing infrastructure and unorganized marketing which needs attention and redress (Pawar, 2013; Singh et al., 2004).

2.11 Conclusion

It is evident from literature that, Livestock Insurance Scheme, like any other Agricultural Insurance product, is new and in its developing stages even in the developed countries. As such an effective development of such a scheme would require intense and wider research and understanding into the various factors that significantly affect its successful thrive.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter gives insight into the methodology of the study. The chapter is organized into sections as follows: Section 3.2 and 3.3 presents the theoretical framework and conceptual framework respectively; section 3.4 presents the method of analysis; section 3.5 presents the description of the study area; section 3.6 finally presents the type and sources of data and the sampling procedure of the study.

3.2 Theoretical Framework

Holden and Shiferaw (2002) describe willingness to pay (WTP) for a product or service as a sacrifice of current income to sustain or increase agricultural productivity in future. A rational livestock farmer will be willing to pay a premium for the livestock insurance as a risk management tool, if he attains the highest utility or satisfaction from it as compared to other alternatives. The livestock farmer will choose a product or service based on his highest level of satisfaction subject to his/her budgetary constraints. The satisfaction derived from the livestock insurance varies across different livestock farmers as a random variable.

If the cattle farmer derives utility from the insurance scheme per year, payment for the cattle insurance can be represented as $j = 1$ if the farmer is willing to pay for the insurance and $j = 0$ if the farmer decides not to pay. Assume that the resources available to the cattle farmer is represented by γ, and the vector z represents other attributes of the cattle farmer that will affect his decision to either pay or not.

The cattle farmers' utility will be given by:

$U_1 = U(1, \gamma, z)$, if the farmer is willing to pay for the cattle insurance, and

$U_0 = U(0, \gamma, z)$, if the farmer is not willing to insure.

All other things being equal, the cattle farmer makes decisions subject to his/her budget constraints. As it is generally common in the specification of utility function, this study assumes additively separable utility function in deterministic and stochastic component where the deterministic components is assumed linear in the explanatory variable, i.e.

$$U_1 = U(1, \gamma, z) = V(1, \gamma, z), + \varepsilon_1 \quad (3.1)$$

And

$$U_0 = U(0, \gamma, z) = V(0, \gamma, z), + \varepsilon_0 \quad (3.2)$$

Where $U_j(.)$ is the utility attained from paying for the cattle insurance scheme, $V_j(.)$ is the deterministic part of the utility and ε_j is the stochastic component representing the component of utility known to the farmer but unobservable to the economic investigator. Cattle farmers are assumed to know their resource endowment (income from cattle and other sources), γ, and implicit cost of subscribing to the cattle insurance in terms of engagement of their resources and can decide whether to pay or not for the insurance. Let the farmers' implicit cost be represented by A. Therefore, the farmer will prefer to pay for the cattle insurance if,

$U_1(.) \geq U_0(.)$

$$V(1, \gamma - A; z) + \varepsilon_1 \geq V(0, \gamma - A; z) + \varepsilon_0 \quad (3.3)$$

The presence of a random component permits to make probabilistic statements about decision makers' behavior. If the farmer prefers to pay for the insurance, the probability distribution is given by:

$$P_1 = \text{P (willing)} = \text{P } (V(1, \gamma - A; z) + \varepsilon_1 \geq V(0, \gamma - A; z) + \varepsilon_0) \quad (3.4)$$

And if the farmer is not willing to pay

$$P_1 = \text{P (not willing)} = \text{P } (V(0, \gamma - A; z) + \varepsilon_0 \geq V(1, \gamma - A; z) + \varepsilon_1) \quad (3.5)$$

With the assumptions that the deterministic component of the utility function is linear in the explanatory variables, the utility functions in equation (3.1) and (3.2) can be expressed as:

$U_1 = \beta_1' Zi + \varepsilon_1$, and $U_0 = \beta_0' Zi + \varepsilon_0$ respectively,

The probabilities in equation (3.4) and (3.5) can be given as:

$$\text{P (willing)} = \text{P } (U_1(.) \geq U_0(.))$$

$$= \text{P } (\beta_1' Zi + \varepsilon_1 \geq \beta_0' Zi + \varepsilon_0)$$

$$= \text{P } (\beta_1' Zi - \beta_0' Zi \geq \varepsilon_0 - \varepsilon_1) \quad (3.6)$$

Expanding the equation further to multiple choices alternatives, suppose there is a choice between M different alternatives indexed by $j = 0, \ldots, M$, with the ordering being arbitrary. Assume that the utility individual 1 attaches to each of the alternatives is given by $U_{ij} = 1, 2, 3, \ldots, M$. the cattle farmer will prefer alternative j if it can give him/her the highest utility. That is,

$Uij = \max \{Ui0, \ldots, Uim,\}$

The probability that the farmer i is willing to pay for the cattle insurance j from among M, alternatives is given by:

P (Ci=j) =P $\{U_{ij}$ = max $\{U_{i0,}\ldots, U_{im,}\}\}$

Where C_I denotes the preference of individual.

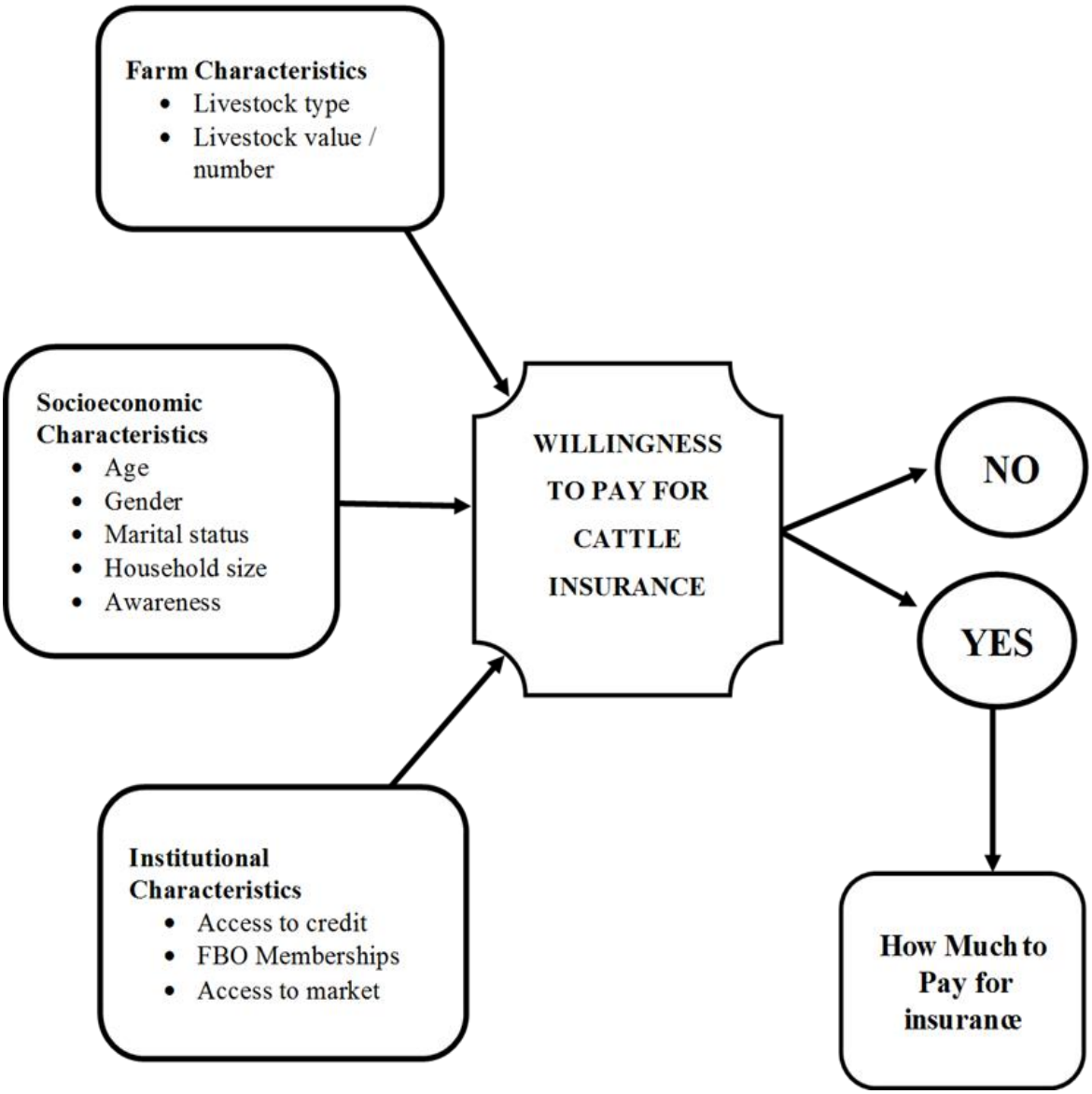
The model is appropriate and makes it possible to study the determination of the factors influencing farmers' preference when the explanatory variables consist of individual specific characteristics (Bekele, 2003).

3.3 Conceptual Framework

Figure 3.1 represents the conceptual framework of the study which describes how farm characteristics, socioeconomic characteristics and institutional characteristics affect the cattle farmers' willingness to pay for the cattle insurance. A farmer will be willing to pay for a product or service if the product meets his/her level of satisfaction and budget. A farmer shifts from using an old product to a new product if the satisfaction level of the new product is higher than that of the old one (Cranfield et al 2003). A farmer shifts from his/her own ways in minimizing risk to adopting livestock insurance based on the fact that, the insurance satisfies his/her utility and corresponds to the amount/premium he/she pays. The benefits and costs of the product also affect farmers' willingness to pay for the product. Aside benefits and costs, the socioeconomic characteristics (age, gender, household size, marital status, awareness), farm characteristics (type of livestock, number of livestock), institutional characteristics (access to credit, FBO membership and access to market) also influences the WTP. Parkin et al (2002) emphasized that these factors are well assessed by the farmers and influence the demand for the product. A

farmer may have its investment protected and cost of production covered if he agrees to accept the insurance and pays premium.

Figure 3. 1 Conceptual Framework



Source: Author's 2018

3.4 Methods of Analysis

3.4.1 Identifying risk mitigating measures

In identifying the risk mitigating measures that are used by the livestock farmers, several ranking techniques can be employed. Some of these ranking techniques from literature include the Spearman rank correlation, Pearson's correlation coefficient, Friedman's two-way analysis of variance and the Kendall's coefficient of concordance. The Kendall's coefficient of concordance was used to rank the risk mitigating strategies because unlike the Friedman's two-way, the Kendall's coefficient provides a test of agreement of the respondents among their rankings. Also, the Kendall's coefficient of concordance is easy to interpret and understood than the Spearman rank correlation (Edward, 1964). The degree of agreement was measured on a scale of zero to one. A higher value indicates a greater agreement of the ranking. The cattle farmers were presented with the identified risk mitigating strategies for ranking. The risk mitigating strategies used by the cattle farmers in the study area were identified from literature and validated during pre-testing of questionnaire. The farmers ranked these strategies with one being the most used strategy and 8 being the least used strategy. The total score for each strategy was computed. The highest score indicated the less used strategy whilst the lowest score represents the most used strategy. The scores from the ranks are then used to compute the coefficient of concordance (W). The coefficient of concordance (W) is given by:

$$\mathbf{W} = \frac{\mathbf{12S}}{\mathbf{m^2 n(n^2 - 1)}} \qquad (3.7)$$

Where

W = Kendall's coefficient of concordance

s = Sum of squares of the risk mitigating strategies

m = Number of cattle farmers

n = Number of risk mitigating strategies

The coefficient of concordance (W) is tested for significance by using the chi-square formula with a significant value of 0.05(5%). The chi-square formula is given by:

$$X^2_{(N-1)} = K\,(N-1)\,W \qquad (3.8)$$

Where

K = the degree of freedom

N= number of risk mitigating strategies

The tests of hypotheses are:

$\mathbf{H_0}$: the rankings of the mitigating strategies do not agree

$\mathbf{H_1}$: the rankings of the mitigating strategies agree

The H_0 will be rejected if the calculated test statistics is greater than the tabulated test statistics i.e., tcal> tcrit, and vice versa.

3.4.2 Measuring livestock farmers' WTP for cattle insurance

The contingent valuation method was used in eliciting farmers' willingness to pay for cattle insurance. Willingness to pay is a mathematical expression of a change in utility in relation with a commodity. In eliciting cattle farmers' willingness to pay for the livestock insurance a contingent valuation dichotomous choice and the open method technique were employed. The open-ended technique enables the farmer to give a free response on how much he/she is willing to pay. A detailed explanation of livestock insurance and how it works was made to the farmers. Benefits and costs associated with the insurance as well as the packages involved were presented in detail to the cattle farmers. This is presented in the livestock (cattle) insurance policy in the appendix. Farmers were then asked if they were willing to adopt the insurance. Farmers that answered yes were further asked on the amount they are willing to pay using the bidding game method. The bidding game comprises of the high, medium and low bids which ranges from a lower premium rate of 5% to a higher premium rate of 35% of the cattle value.

To avoid starting point bias each farmer randomly selects a bid (amount) level. The highest percentage of the bid level is asked. If a farmer says "no" a lower percentage of that same bid level he/she chose is asked. The farmers state his/her maximum percentage they are willing to pay after each step. The amount farmers are willing to pay per cattle was calculated by using the maximum percentage they are willing to pay on their value of livestock taking into consideration the number of cattle they have.

3.4.3 Determining factors affecting willingness to pay

In analyzing the factors affecting the farmers' willingness to pay the double hurdle model developed by Cragg (1971) was used. The double hurdle model is used to analyze adoption

behavior which consist of two decisions. The first decision is the adoption stage estimated by using a Probit model. The second decision is the willingness to pay amount estimated by using a standard regression model. It is assumed that the cattle farmers face a two stage decision process that is, the decision to pay and the decision on the amount to pay for cattle insurance. It is assumed that the two decisions are independent. The first hurdle or the adoption stage is based on the farmers' decision to pay for the product or not to pay. A binary choice Probit model was used to estimate cattle farmers' willingness to insure. The dependent variable is 1 if farmers are willing to insure and 0 if otherwise. This is based on several socioeconomic factors. A binary choice model (Yes/No) using Probit regression model is specified as:

$$WTP = \beta + \beta_1 AGE + \beta_2 GEN + \beta_3 EDUC + \beta_4 HHS + \beta_5 AWARE + \beta_6 ACCESSCRE + \beta_7 EXPERIENCE + \beta_8 FBO + \beta_9 OFFARM + \beta_{10} CROPROD + \varepsilon \quad (3.9)$$

Where

WTP = represent the cattle farmers' decision to insure their cattle

Also, β = represents the constant and

β_1 to β_{10} = represent the various coefficients of the independent variables to be estimated

ε = represent the error term.

The second stage determines the amount or premiums the livestock farmers are willing to pay. Farmers' amount willing to pay was solicited from only farmers that were willing to pay. Therefore, the second hurdle was calculated for only a subset of the Probit model. In order to

avoid sample selection bias the inverse Mills ratio (IMR), λ_i was introduced. The inverse Mills ratio is added to the second stage as an additional explanatory variable. It identifies and eliminates selection bias problem by excluding parts of the error term that are associated with the explanatory variable. It is estimated using a truncated regression at zero. The lower the Mills ratio(λ_i), the higher the probability of sampling all potential observations and verse versa (Jarbi, 2010). The empirical model of the truncated regression is postulated as:

$$WTPamt = \beta + \beta_1 AGE + \beta_2 GEN + \beta_3 EDUC + \beta_4 HHS + \beta_5 AWARE + \beta_6 ACCESSCRE + \beta_7 EXPERIENCE + \beta_8 FBO + \beta_9 OFFARM + \beta_{10} CROPROD + \lambda_i + \varepsilon$$

Where

$WTPamt =$ Amount willing to pay by the farmers

β = the constant

$\beta_1$to β_{10} = the various coefficients of the independent variables to be estimated

ε = the error term

λ_i = Mills ratio

Definition of Variables

(AGE): It is hypothesized that age will either have a positive or negative correlation with willingness to pay. The older the farmer the more he/she is willing to insure and pay for the cattle insurance because of the experience he/she gathers. On the other hand, older farmers may be risk averse and may be conservative in embracing a new product. They may stick to their old

ways of farming because of the experience they gather as they age (Baidu-Forson, 1999). Age is measured in years.

Gender (GEN): The study expects male livestock farmers to be more willing to pay and insure their animals as compared to female farmers. This is because males easily adopt to new technology and are more endowed with resource as compared to females. Gender is measured as a dummy with 1 for males and 0 if otherwise.

Education (EDUC): The higher the level of educational of the famer the more likely that the farmer will pay for the cattle insurance. Educational level is expected to have a significant positive effect on willingness to adopt and the amount to pay premium for livestock insurance. This study expected that as a farmer advances in education and acquires more knowledge, the higher the probability to accept based on knowledge of its benefits. It is measured by the number of years the farmer has spent in formal education.

Household Size (HHS): The number of people living under the same roof and eating from the same pot can positively or negatively affect willingness to insure/adopt and WTP amount for the livestock insurance. A farmer with a large household size may not be willing to pay premium but use the money to take care of the household because of high consumption rate. A farmer on the other hand may be willing to insure if the new product is likely to increase his income.

Awareness of Livestock Insurance (AWARE): Awareness is hypothesized to have a positive effect on WTP. It is hypothesized that as farmer is aware of a new product he/she is willing to adopt the product than a farmer who is not aware of the product (Sharma, 2009). It is measured as a dummy with 1 as “yes I am aware of livestock insurance” and 0 for “no I am not aware of livestock insurance”.

Farm Experience (EXPERIENCE): It is hypothesized that farm experience has a negative influence on farmers' willingness to adopt and the WTP amount for the insurance. The more experienced livestock farmers have gained more skills and knowledge to deal with risk pertaining to the livestock business. Farm experience is measured by the number of years in the cattle business.

Off-farm Work (OFFARM): Off-farm income is assumed to have a positive influence on willingness to insure and the amount to pay for the insurance because as farmers engages in other non-farm work their sources of income increases. The farmer therefore has a higher probability to afford and pay for the insurance product.

Access to Credit (ACCESSCRE): Credit is measured as a dummy with 1 = having access to credit and 2 = having no access to credit. It is hypothesized to have a positive influence on WTP and the amount to pay. Farmers may have a certain level of financial ease to adopt and pay for the insurance when the farmer has access to credit.

Crop Production (CROPROD): Farmers' engagement in crop production is assumed to have a positive relationship with WTP for the insurance. Farmers engage in crop production to serve as cushion to mitigate risk that may occur in the raising of cattle so there not be the need to adopt and pay for the cattle insurance. It is measured as a dummy with 1 as for engaging in crop production and 0 for not engaging in crop production.

FBO membership (FBO): Membership to a farmers-based organization (FBO) is assumed to have a positive influence on farmers' willingness to adopt and the amount to pay for insurance. Farmers acquire skills and knowledge from the FBOs which are likely to increase the adoption of the insurance. It is measured as a dummy (yes = 1, no = 0).

Table 3. 1: Description of Variables

Variables	Description	Measurement	Expected signs
AGE	Age of farmer	Years	+/-
GEN	Gender of farmer	1 if male, 0 otherwise	+
HHS	Household size	Number of dependents of farmer	+/-
EDUC	Educational level	Years	+
EXPERIENCE	Farm experience	years	-
CROPROD	Crop production	Yes=1, No=0	+
OFFARM	Off-farm income	Gh₵	+
ACCESSCRE	Access to credit	Yes=1, No=0	+
FBO	Farmer-based organization	Yes=1, No=0	+
AWARE	Awareness of livestock insurance	Yes= aware, No= not aware	+

Source: Author's Design, 2018

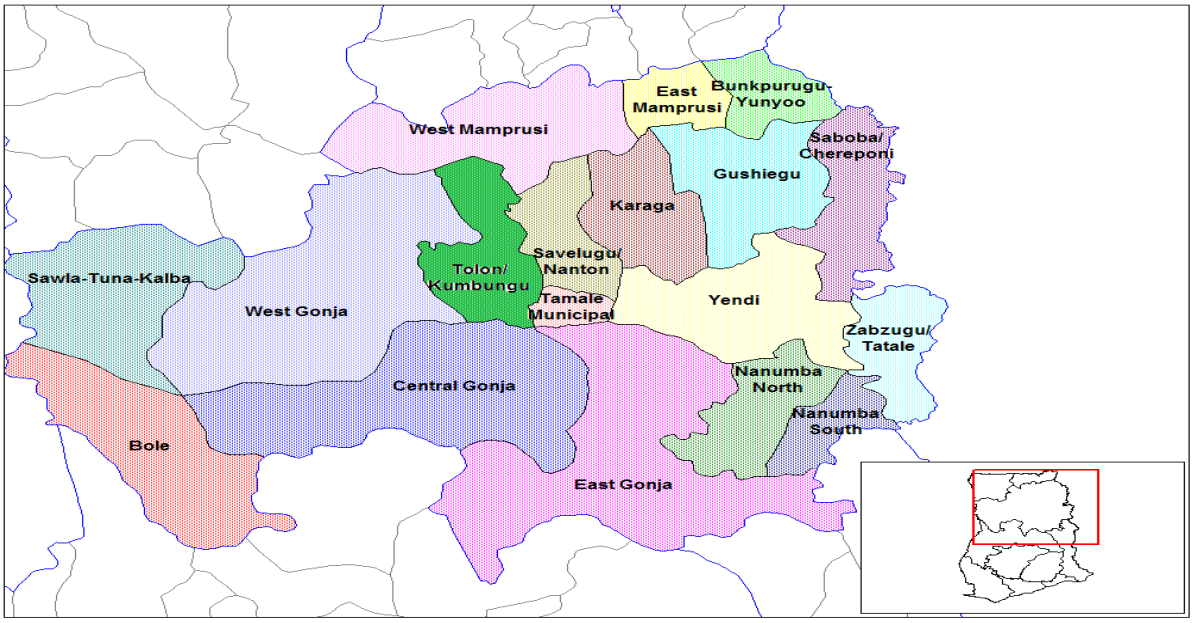
3.5 Study Area

The study area was the Northern Region which is the largest region in Ghana. It covers an area of about 70,384 square kilometers. It shares boundaries with the Brong Ahafo and the Volta regions to the south, the Upper East Region and the Upper West regions to the north, Togo to the east, and Côte d"Ivoire to the west (GSS, 2011). It lies between longitudes 0.15W and 2.25W, and latitudes 5.50N and 7.46N to the equator. The vegetation is characterized as vast areas of grassland interspersed with guinea savannah woodland.

Drought resistant tress including sheanut, dawadawa, acacia and baobab are cultivated in the northern region. Temperatures range between 14 degrees at night and 40 degrees in the day. There are two major seasons in the Northern region. The dry season is between January and March and the wet season is between July and December with an annual rainfall of 750mm to 1050mm.

Majority of the economic active people are engaged in agriculture, fishery and forestry. Few others are engaged in sales and services. Livestock holding comprises chicken, sheep, goats, cattle, guinea fowl and pigs. Northern region contributes about 77% of large ruminant and 55% of smaller ruminants to the national livestock production (Karbo and Bruce, 2000). Figure 3.2 presents the map of the Northern region.

Figure 3. 2: Map of Study Area



Source: https://commons.wikimedia.org/wiki/File:Northern_Ghana_districts.png (2016)

3.6 Data Collection Approach

3.6.1 Types and Sources of Data

Primary and secondary sources of data were used for the research. Secondary data were obtained from reading articles, journals, information from Ghana Agricultural Insurance pool, Ministry of Food and Agriculture, unpublished data bases, internet sources and relevant books. Information from the Ministry of Food and Agriculture helped gained more insight into the study area. Secondary data on insurance policy that are being piloted was sourced from Ghana Agricultural Insurance Pool (GAIP). Primary data on demographics, willingness to pay and factors that influences the farmers' willingness to insure and pay were collected from respondents through the use of structured questionnaire consisting of open and close ended questions. The questionnaires are attached in the Appendix.

The questionnaire was in four sections. The section focused on farmers' demographic characteristics that includes, the age, gender, educational level, household size, religious affiliation and marital status. The second section is based on the agricultural activities of the farmer. Questions include type of livestock produced, number of livestock produced, value of livestock, crops grown, and the total farm size were asked. The third part of the questionnaire captured the risk mitigating strategies used by the farmers. Risked mitigating strategies were posed to the farmers to rank. Risk mitigating strategies included contract farming, saving, mixed farming, decreased herd size and expanded herd size. The final part of the questionnaire asked questions on the farmer's willingness to pay. This includes the maximum, medium and minimum bids.

The respondents were informed of the advantages and cost associated with the insurance as well as the packages associated with the cattle insurance. Farmers were asked whether they were willing to pay or not. Farmers that responded yes, were asked if they were willing to pay an amount for the product. If he/she responded yes, then a maximum amount is posed to the farmer. If the farmer answers no, he/she is asked again if he is willing to pay a lower price. The respondent gives a maximum percentage on their livestock value they are willing to pay at each step.

3.6.2 Sampling Procedure

A multi-stage sampling technique was used. The Northern region of Ghana was purposively selected for the study. This is because of the dominance of livestock production in the region. At the district level two Gonja districts of the Northern region were purposively selected namely West Gonja and Central Gonja. This is because the major economic activity of the two districts includes livestock production. Four communities were randomly selected from each of the two districts. The randomly selected communities were Damongo, Busunu, Laribanga and Nabori from the West Gonja and Yapei, Mpaha, Yipala and Fulfulso from the Central Gonja.

Probability theory was used in determining the sample size and it is given by

$$S = (1-n/N)^{0.5} * [(p * q)/n]^{0.5}$$

Where

N and n are population and sample size and S is the standard error.

p and q sum to 1, with p denoting the probability of the presence of the key attribute of the population and q is the probability of the absence of this key attribute.

A total of 227 respondents was sampled for the study

The list of all the cattle farmers within the districts selected was sought from the Ministry of Food and Agriculture in the study area and the lottery method was used to select the number of respondents from the population of the cattle farmers. Shown in the Table 3.2 below shows the selected districts, communities and the sample size.

Table 3. 2: Selected Districts, Communities and Sample Size Distribution

Districts	**Communities**	**Sample Size**
West Gonja	Damongo	33
	Busunu	28
	Laribanga	26
Central Gonja	Nabori	28
	Yapei	32
	Mpaha	25
	Yipala	28
	Fulfulso	27
Total		227

Source: Author's Design, 2018

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the study results and discussions. It presents the description of the farmer demographics and farm characteristics in section 4.2. This is followed by the presentation of farm production activities of the cattle farmers in section 4.3. Distribution of risks faced by the cattle farmers is outlined in section 4.4. Section 4.5 presents results on the cattle production systems. Results on the general knowledge of insurance is outlined in section 4.6. Following section 4.6 is section 4.7 which presents results and discussions on the risk mitigating strategies used by the cattle farmers. Under section 4.8, results on cattle farmers' willingness to insure and WTP amount for cattle insurance is presented. Finally, the factors influencing cattle farmers' WTP and the WTP amount is discussed in section 4.9.

4.2 Socio-Economic Characteristics of the Farmers

Gender: Out of the total number of 227 farmers that were interviewed for the study, 218 representing 96 percent were males whiles 9 farmers representing 4 percent were females. The results revealed that cattle farming is dominated by men in the study area. This may be due to economic reasons, cultural issues or societal norms. Males manage household productive assets and are mostly decision makers in African societies (Turkson and Naandam, 2006). It is reported by DFID, (2000) that 70% of the world women living in rural areas are poor. Thus, women should be encouraged to take up livestock farming to improve their standard of living.

Educational Level: Table 4.1 reveals that 28.2 percent of the respondents had primary education, 7.9 percent had JSS/JHS education, 3.1 percent were educated up to the secondary/SHS level, 5.3 percent had tertiary education and 126 respondents representing 55.5 percent had no formal education. This implies a high illiteracy rate among the cattle farmers in the study area. This is in harmony with a report by GSS, (2012) that indicated that there is high illiteracy rate among majority of the population in the Northern region of Ghana. A higher educational level is relevant for assessing risk resulting in a higher demand for the insurance (Mohammed and Ortmann, 2005). The high illiteracy rate of the cattle farmers may hinder their ability to access information to obtaining insurance.

Table 4. 1: Distribution of the Cattle Farmers' Educational Levels

Educational Levels	**Frequency**	**Percentage**
No formal Education	126	55.5
Primary	64	28.2
JSS/JHS/Middle School leaver	18	7.9
Secondary/SHS	7	3.1
Tertiary	12	5.3
Total	**227**	**100**

Source: Field Survey, 2018.

Age Distribution: The mean, minimum and maximum age of cattle farmers in the study area are 51, 21 and 77 years respectively. The mean age of 51 years is related to Duku et al. (2010) who reported a mean age of 47.5 years in the transitional zones of Ghana. The mean age denotes that a typical cattle farmer in the study area is 51 years old. 64.6 percent of the cattle farmers in the study area are between the ages of 39 and 60. This means that the youth do not engage themselves in cattle farming. The standard deviation of the mean age is 10.89.

Table 4. 2: Socio-Economic Characteristics

Variable	Characteristics	Frequency	Percentage
Age	20 to 39	28	12.4
	40 to 59	146	64.6
	60 to 79	52	23.0
Experience (years)	Less than 5	5	2.2
	6 to 15	75	33.0
	16 to 25	102	44.9
	26 to 35	39	17.2
	36 and above	6	2.6
Household Size	≤ 5	25	11.0
	6 to 10	109	48.0
	≥ 10	93	41.0
Marital Status	Married	209	92.1
	Single	5	2.2
	Divorced	9	4.0
	Separated	4	1.8

Source: Field Survey, 2018.

Household Size: Majority of the cattle farmers (48%) have a household size ranging from 6 to 10 per house. Only 11% has a household size of 5 or below. Higher household sizes represent

labour availability in conducting livestock production activities. The mean and standard deviation of the household size are 0.93 and 0.26 respectively.

Marital Status: From Table 4.2, it is seen that almost all the cattle farmers in the study area are married. About 92.1% of the farmers were married with only about 2.2% being single and never married. About 4% were divorced and the remaining 1.8% were separated.

Farmer Experience: The results of the study depict that cattle farmers are more experienced in the cattle farming with a mean of 19 years of experience and a standard deviation of 8.37. The minimum and maximum years of experience in cattle farming are 2 and 50 respectively.

4.3 Farm Production Activities of Farmers

4.3.1 Farm Size and Number of Crops

Aside livestock production a total of 199 cattle farmers representing 87.7percent grow crops in addition to raising livestock. This is in agreement with Blench (2006) who reported that mixed farming dominates the farming systems in the Northern Region of Ghana. The minimum size (acreage) of their farms is 0 and the maximum acreage was 60. The average acreage of the farmers in the study area was 12.7. The results is presented in Table 4.3.

4.3.2 Livestock Kept by the Farmer

Table 4.4 represents livestock raised by the farmers in the study area. All the respondents keep cattle. The results also indicate that 78.4% of the farmers keep goat, 77.1% keep sheep, 75.8% keep chicken, 52% keep guinea fowl, 7.5% keep turkey, 4% keep ducks and 0.4% each keeps donkey and pigs. The maximum and minimum averages are 75 for cattle and 0.4 for pigs. The

results is similar to Oppong-Anane, (2010) who emphasized that, 70% and 75% of Ghana's cattle and small ruminants are produced in the Guinea and Sudan Savannah. This indicates that, any development that targets livestock in the study area will be accepted by the farmers which might lead to improve livelihoods of farmers.

Table 4. 3: Farm Size and Number of Crops

	Percentage	Minimum	Maximum	Mean	Std. Deviation
Farm area size(acreage)	87.7	0	60	12.7	11.16
Number of crop enterprises	87.7	0	8	2.76	1.69

Source: Field Survey, 2018.

Table 4. 4: Livestock Kept by the Cattle Famers

Type of Livestock	Percent	Minimum	Maximum	Mean	Std. Deviation
Cattle	100	14	400	75.26	55.42
Goat	78.4	0	61	15.38	14.11
Sheep	77.1	0	110	20.15	18.64
Chicken	75.8	0	150	33.93	35.09
Guinea fowl	52.0	0	101	15.28	21.55
Turkey	7.5	0	24	0.37	1.92
Duck	3.96	0	15	13.5	9.192
Donkey	0.4	0	2	0.63	0.5
Pig	0.4	0	10	.04	.65

Source: Field Survey, 2018.

4.4 Distribution of Risk Faced by the Cattle Farmers

The distribution of risk faced by the cattle farmers is shown in Table 4.5. The major risk faced by the cattle farmers is theft representing 46.3% of the total respondents. This is like Singh and Hlophe, (2017) who reported a major risk faced by livestock farmers being theft with a percentage of 40. Pests and diseases, drought/feed shortage follows at 42.7% and 10.1% respectively. Increased population pressure on lands used to cultivate crops and uncontrolled bush fires are the main causes of feed shortage of smallholder livestock farmers and their skills, knowledge and perception are key in managing feed constraint in livestock production (Duku et al, 2010).

Smith (2008) reported that the type of management systems used, and the climate conditions are relevant factors that influence the outbreak of pests and diseases. Oladeji and Oyesola (2008) emphasized that scavenging of animals exposes them to pest and diseases and theft. In addition, Dei et al, (2007) attributed the prevalence of pest and diseases to poor livestock housing whiles Turkson (2003) attributed the prevalence of pests and diseases to ineffective veterinary livestock delivery services. The results clearly show that all the farmers face or encounter risk in their livestock business. It is, therefore, essential to provide insurance to the farmers to enable them mitigate risks

Table 4. 5: Distribution of Risk Faced by Farmers

Risk Faced	Frequency	Percentage
Theft	105	46.3
Pests and diseases	97	42.7
Accidental death	1	0.4
Drought/Feed shortage	23	10.1
Predators (snake, etc.)	1	0.4
Total	227	100

Source: Field Survey, 2018.

4.5 Cattle Production Systems

Table 4.6 presents the production systems used by the cattle farmers in the study area. Out of the 227 cattle farmers, 129 (56.8%) indicated that their cattle are produced using the semi-intensive system, 34.4 % of the farmers indicated their cattle are raised by the extensive system, and the least production system used is the extensive system. Majority of the cattle farmers practice the semi intensive.

Cattle are grazed within the boundaries of the village during the rainy season in the late mornings or evenings. Cattle go beyond to other neighboring villages to search for pasture in the dry season. Grazing is restricted under the semi intensive system and animals are stall-fed based on the time, feed availability and family labour (Ockling, 1987; Devendra, 1985).

Locally available materials such as bamboo, timber, branches of trees, metal sheets and mud are used to construct simple kraals for the animals (Oppong-Anane, 2011). Limited pasture during

the dry season poses a challenge to the cattle farmers because cattle a large extent, depends on natural pasture for survival.

Table 4. 6: Cattle Production Systems

Production Systems	Frequency	Percent
Semi intensive system	129	56.8
Extensive system (with shepherd)	78	34.4
Zero grazing or cut and carry system	17	7.5
Free range (No shepherd)	2	0.9
Intensive system (commercial production)	1	0.4
Total	227	100

Source: Field Survey, 2018.

4.6 Knowledge and Source of Information on Livestock Insurance

Table 4.7 shows the summary of cattle farmers' knowledge and source of information on livestock insurance. Among the respondents about 12.8% have knowledge or are aware of livestock insurance. This indicates the cattle farmers in the study area have less knowledge on livestock insurance. The cattle farmers that were aware obtained the information from the media (46.7%), Agricultural Extension Agents (AEA) (23.3%), other farmers and Farmer Based Organizations (FBO).

Knowledge on livestock insurance	Frequency	Percentage
Yes	29	12.8
No	197	87.2
Sources of information on livestock insurance		
Media (TV / Radio)	14	46.7
Extension Agents	7	23.3
FBOs	2	6.7
Other farmers	6	20.0

Table 4. 7: Knowledge and Source of Information on Livestock Insurance

Source: Field Survey, 2018.

4.7 Risk Mitigating Strategies Used by Cattle Farmers

Table 4.8 presents the risk mitigating strategies used by the cattle farmers. Majority of the respondent ranked mixed farming as the most important strategy used in mitigating risk, followed by accumulating/saving of more money. Decrease in herd size was ranked eighth and the least important risk management strategy adopted by the farmers.

Determining the level of differentiation between these various risk management strategies the Kendall's coefficient of concordance was applied, and the test statistics presented in the table 4.8. The estimated Kendall's Co-efficient of Concordance (W) for the ranking of risk strategies as shown is 0.682. This implies that, the degree of agreement on a scale of zero score for random ranking and one being a perfectly unanimous ranking is 0.68. The degree of concordance

measured by the chi-square statistics to a large extent shows that there is agreement among respondents in the ranking provided, at an asymptotic significant level value of 0.00. Cattle farmers in the study area therefore generally agree that risk mitigating strategies adopted are more related to first and foremost mixed farming, followed by accumulation of money, then purchase of more veterinary inputs, with decreasing of herd size being the least used risk mitigation strategy.

Table 4. 8: Risk Mitigating Strategies of Cattle Farmers

Strategies	**Mean Rank**	**Rank**
Mixed farming	1.43	1st
Saving more money	3.05	2nd
Purchasing more veterinary inputs	3.06	3rd
Increasing feed or grain storage	4.13	4th
Expanding herd size	4.42	5th
Increasing non-farm income	5.78	6th
Engaging in Market contract	6.85	7th
Decreasing herd size	7.27	8th
N	227	
Kendalls W[a]	.682	
Chi square	1078.765	
df	7	
Asymp. Sig.	000	

Source: Field Survey, 2018.

4.8 Cattle Farmers' Willingness to Insure WTP Amount for Cattle Insurance

From Table 4.9, 78.4% of the respondents were willing to adopt and pay for the cattle insurance scheme if it was established. Respondents decision to insure was informed by their willingness to expand the business and curb against losses mostly theft, pest and disease and drought. The remaining respondents were unwilling to insure and pay due to their lack of trust in insurance schemes especially during the period of indemnity, referring to the abysmal performance of the health insurance scheme over the years. Cattle farmers are willing to pay as high as GH¢345.69, a minimum amount of GH¢ 57.61 and a mean WTP amount of GH¢115.23 for each cattle per year to insure their cattle. Majority of the cattle farmers (53.9%) were willing to pay 10% of the total livestock value as premium and only 6.2% were willing to pay 30% of their total livestock value as insurance premium per year.

4.9 Factors influencing Farmers' WTP and WTP Amount for Cattle Insurance

The estimated results from the multinomial Probit model is represented in Table 4.10 Based on pseudo R2 statistics, it can be clearly seen that estimated Probit model is a suitable regression and, therefore, independent variables of the model explain 43.11% of the variation of dependent variable. Moreover, the model is statistically significant at 1% level. It also is statistically significant based on the Chi-Square test for both models. Likewise, for the truncated regression, the model is statistically significant at 5%.

From the Probit regression in Table 4.10, Awareness, crop production, credit and experience were statistically significant at 1%. Age was also significant at 5% level, while gender, household size, marital status, education, off-farm work and FBO were not significant. The truncated regression for the amount willing to pay in Table 4.10 also revealed that, age and

experience were significant at 1% level, whiles awareness was significant at 10% level. Crop production, credit, FBO, off-farm work, education, marital status, gender and Inverse Mills Ratio (IMR) were all not significant. The statistically significant variables are discussed as follows:

Table 4. 9: Cattle Farmers' Willingness to Insure and Pay for Cattle Insurance

Variable	**No. of Farmers**	**Percentage**
Willingness to pay		
Yes	178	78.4
No	49	21.6
Total	**227**	**100**
Maximum amount WTP % of livestock value of total livestock value		
5	25	11.2
10	122	53.9
15	18	7.9
20	45	19.7
25	3	1.1
30	14	6.2
Total	**227**	**100**
Minimum premium willing to pay per cattle		**GH¢ 57.61**
Maximum premium willing to pay per cattle		**GH¢ 345.69**
Average amount farmers are willing to pay per cattle per year		**GH¢ 115.23**

Source: Field Survey, 2018.

4.9.1 Age

Age of farmers has a negative influence on farmers' willingness to insure and the amount willing to pay at a significant level of 5% and 1%, respectively. This suggests that, as farmers' age increases, their WTP and the WTP amount for cattle insurance decreases and vice versa. The result is similar to the findings of Singh & Hlophe (2017) who also attain a negative relationship with the age of farmers and farmers' willingness to pay. This is because, young people are adventurous and risk loving so will also want to take up risks as compared to older people who are risk averse (Bellante & Green, 2004).

4.9.2 Experience

Experience has positive and significant relationship with cattle farmers' WTP and WTP amount. This implies that the more experienced farmers are in the cattle business, the more they are willing to adopt insurance and the more amounts they are willing to pay. As farmers' level of experience increases, *ceteris paribus*, their knowledge in cattle production also increases. This increases their exposure to the likelihood and impact of various livestock risk, hence increases their willingness to pay and amount to pay for insurance. This result is similar to that of Temesgen & Tola (2015) who also ascertain a positive relationship between farmers' experience and farmers' WTP and WTP amount. Mohammed & Ortmann (2005) and, Singh & Hlophe (2017) however, provide a contrary view that there is a negative relationship between farmers experience and adoption of livestock insurance.

4.9.3 Credit

Credit or access to credit also shows an inverse relationship with willingness to pay and the amount to pay. However, this relationship is only significant to willingness to insure but not the amount to be pay. The negative relationship between access to credit and willingness to pay is because access to credit increases cattle farmers' capacity to manage risks themselves. This hence decreases their WTP for insurance. When farmers realized they have more or enough credit to manage risk facing them, their WTP for cattle insurance and the amount to be paid decreases.

4.9.4 Crop Production

Farmers engaging in crop production in addition to cattle rearing positively and significantly influence their willingness to pay. Activities which has the tendency to provide farmers, an additional stream of income, which in the case of the respondents are crop production have greater influence of willingness to pay. This is because most farmers practice mixed farming and use crop production to supplement livestock. As income from crop production increases, farmers' purchasing power also increases and hence increases their willingness to pay.

4.9.5 Awareness

Awareness of livestock insurance has positive influence and significant relationship on willingness to pay and the amount to pay. This suggests that the more informed the farmers, the more their willingness to pay and the more amounts they are willing to offer as premium. Singh and Hlophe (2017) affirms that farmers knowledge of an insurance product influences their willingness to pay because the more abreast farmers are on an insurance package, the

opportunities and benefits they stand to gain from, all things being equal, the more willing they are to pay.

Table 4. 10: Factors Influencing Farmers' WTP and WTP Amount for Cattle Insurance

Willingness to Insure				Amount willing to Pay		
Probit Regression				Truncated Regression		
Variable	Coeff.	Std. Err.	P> chi2	Coeff.	Std. Err.	P> chi2
Gender	-0.170	0.5201	0.743	165.023	189.6759	0.384
Age	-0.029**	0.0134	0.031	-15.629***	5.0251	0.002
Household size	0.003	0.0255	0.909	-10.313	9.8566	0.295
Experience	0.037***	0.0140	0.008	27.113***	6.4458	0.000
Marital Status	-0.176	0.2691	0.513	-50.532	141.9938	0.722
Education	-0.206	0.2452	0.401	101.983	106.3175	0.337
off-Farm Work	0.115	0.3323	0.728	55.507	129.8802	0.669
FBO	-0.368	5.3461	0.945	-1091.661	1723.6730	0.527
Credit	-1.986***	0.2914	0.000	-120.540	193.1521	0.533
Crop Production	1.014***	0.3791	0.007	169.789	181.7924	0.350
Awareness	2.262***	0.7555	0.003	229.979*	127.2608	0.071
IMR				133.166	185.2272	0.472
_cons	1.328	0.8230	0.107	-521.631	388.6452	0.180
/sigma				308.351***	49.4840	0.000
Regression diagnostics	Value			Regression diagnostics	Value	
Number of obs	227			Number of obs	178	
LR chi2(11)	107.39			Wald chi2(12)	24.83	
Prob > chi2	0.0000			Prob > chi2	0.0157	
Pseudo R2	0.4311			Log likelihood	-1068.85	
Log likelihood	-70.8461					

NB: *, ** and *** denotes 10%, 5% and 1% significant levels respectively

Source: Field Survey, 2018.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the results of the study and draws conclusions from it. Conclusions are followed with recommendations for policy consideration.

5.2 Summary

The livestock subsector is a lucrative sector in agriculture. It improves livelihoods by generating employment, it guards against food security providing high quality food with nutrient, agricultural traction, improves soil fertility, transport etc. However, the livestock industry is susceptible to numerous risks such as pests and diseases, drought/food shortage, theft, etc. These are sometimes beyond the control of the farmer making it difficult to bear without insurance. Ghana agricultural insurance pool has introduced livestock insurance in Ghana, but it is unclear whether the farmers are willing to pay for the insurance services and the factors which are likely to influence their WTP. It is also unclear how farmers mitigate the impact of these risks. This study assessed cattle farmers' WTP for insurance in the Northern region of Ghana.

Using a multi-stage sampling technique, a pretested structured questionnaire was used to sample two hundred and twenty-seven (227) cattle farmers from eight randomly selected communities within two districts in the Northern Region of Ghana. Kendall's coefficient of concordance, Simple descriptive statistics, the contingent valuation method as well as the double hurdle model was employed in this study.

The Kendall's coefficient of concordance was used to identify and rank the risk mitigating strategies used by the cattle farmers to mitigate the impact of risk of the cattle business. Descriptive statistics and the contingent valuation method were used to assess the awareness of livestock insurance and the amount the cattle farmers are willing to pay.

The double hurdle method analyzed the factors that influence the willingness to pay for cattle insurance by cattle farmers. The results showed that majority of the farmers adopt mixed farming as a risk mitigating strategy to reduce the impact of risk faced. The results also revealed that 87.2% of the respondents were not aware of livestock insurance. However, 78.4% of the respondents are willing to pay for the insurance. The minimum, average and maximum amounts the cattle farmers were willing to pay are GH¢57.61, GH¢115.23 and GH¢345.69, respectively per cattle per year.

Engagement in crop production, level of experience and awareness of livestock insurance were positively and statistically significant in influencing cattle farmers' decision to adopt cattle insurance whiles age of the respondent and access to credit were negatively and statistically significant in influencing farmers' decision to adopt the insurance. Awareness of livestock insurance and level of experience were positively and statistically significant in influencing the amount farmers are willing to pay whiles age of respondent were negatively and statistically significant in influencing cattle farmers' amount to pay.

5.3 Conclusions

Based on the findings it can be concluded that theft, pests and diseases and drought/feed shortage are the major risks faced by the cattle farmers in the study area. Majority of the cattle farmers adopts mixed farming as a means of mitigating the impact of risk in raising cattle. In general,

most of the farmers (78.4%) were willing to accept the cattle insurance in the study area. Meanwhile majority of the farmers do not have knowledge on livestock insurance. On the average the cattle farmers are willing to pay GH¢115.23 per cattle in a year. The minimum and maximum amounts they are willing to pay are GH¢57.61 and GH¢345.69, respectively. Majority of the farmers were willing to pay 10% of their livestock value per year as premium. To encourage the adoption of the insurance the price for the insurance package should be set at GH¢57.61 or lower.

The major factors that will influence farmers' decision to pay for the insurance are age of the respondent, level of experience, awareness of livestock insurance and production of crops. The major factors influencing the amount farmers are willing to pay include age of respondent, awareness of livestock insurance and level of experience.

5.4 Policy Recommendations

Based on the conclusions presented above, the following are recommendations drawn from the study for policy considerations:

For GAIP to be able to design insurance products suitable to cover the risks farmers faced being theft, pests and diseases and drought/feed shortage which will be attractive to the farmers, they should adopt improved ways of raising their livestock. There should be appropriate veterinary services for the farmers. It is imperative for the livestock farmers to consider good risk assessment and risk reduction strategies regardless of their value of livestock.

Awareness creation is a key component in the efforts to stimulate the adoption of insurance schemes. There is the need for GAIP to design sensitization programs such as insurance workshop that involves all stakeholders to create the needed awareness and educate farmers on

the benefits derived from engaging in livestock insurance. Currently, cattle farmers in the study area practice mixed farming as an alternative strategy of managing risk.

Premiums should be more reasonable and should at a range that majority of the cattle farmers can afford. Lower and affordable premiums can be a source of motivation for farmers to adopt the insurance. The premium rate could be subsidized by the Government to enable more of the farmers to adopt the insurance. A higher subsidy rate will induce participation which will lead to a lower burden of farmers and increase their income.

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APPENDICES

Appendix 1: Questionnaire

University Of Ghana

Department of Agricultural Economics and Agribusiness, Legon

This study is being carried out by Joycelyn Oteng Asamoah, a graduate student of the University of Ghana, Legon, on the topic **Livestock Farmers' Willingness to Pay for Cattle Insurance in the Northern Region of Ghana,** in partial fulfilment of the award of master of philosophy in Agribusiness. All information gathered will be treated with much confidentiality and would solely be for academic purposes. Your support and contribution would be very much appreciated. For further enquiries, please contact me at joyseonline@yahoo.com or call 0547433721.

Identification:

Date_____ Enumerator Name_____

District_____ Village /community_____

Name of Respondent _____ Contact number _____

To be completed by field supervisor:

Respondent code_____

Section A: Farmer Demographics

A1.Gender of respondent 1. Male [ ] 2. Female [ ]	**A2**. Age of respondents (in years)
A3. Head of household 1.Yes [ ] 2.No [ ]	**A4**. Marital status 1. Married [ ] 2. Single [ ] 3. Divorced [ ] 4. Separated [ ] 5. Otherwise [ ]
A5.Religious affiliation 1.Christian [ ] 2.Muslim [ ] 3.Traditional [ ] 4.Other [ ]	**A6**. Level of education(highest) 1. None [ ] 2. Primary [ ] 3. JHS/middle school [ ] 4.Secondary/SHS [ ] 4.Tertiary [ ]
A7. Household size ……	**A8**. How many years have you been raising livestock ……
A9. Do you have other work aside livestock and crop production 1. Yes [ ] 2. No [ ]	**A10**. Are you a member of a farmer association 1. Yes [ ] 2. No [ ]

A11. Do you have access to credit? Yes [ ] No [ ]	**A12**.If yes, from which source? Formal [ ] Informal [ ] Both [ ]
A13.If formal, which main source? Commercial Bank [ ] Rural Bank [ ] Microfinance [ ]	**A14**. How many cattle do you sell on an average per year ……..
A15.What is the unit price of each cattle sold (GHS)…….	**A16.** How much do you get from selling the byproduct of the cattle per year (GHS)……

B. Agricultural Activities of Farmers

B1.Are you into crop cultivation? Yes [ ] 2. No [ ]

B2. ***If yes***, indicate your total farm size (cropping area) in acreage? ……

B3. Number of crop enterprises …….

B4. Mention the crops grown……

B5. Please specify the number of cattle you manage on your farm

Animal type	**Number**	**Unit price sold (GHS)**	**Value of livestock (GHS)**
Calves ≤ 1year			
Between 1 and 3 years			
3≥ years			
Grand total			

B6. Please specify which production system reasonably describes your cattle production/management systems

Production systems	**Tick appropriately**
Free range (no shepherd)	[ ]
Extensive system (with shepherd)	[ ]
Semi-intensive system (tethering of animals)	[ ]
Zero grazing or cut and carry system	[ ]
Intensive system (commercial production)	[ ]
I don‘t know	[ ]

Animal enterprises	Response: 1= Yes, 0=No	Number of animals
Goat		
Sheep		
Chicken		
Guinea Fowl		
Turkey		
Pigs		
Horse		
Other (specify)		
Grand total		

B7. Please provide information on the following table on other livestock you are rearing

C. General Information on Insurance

C1. What types of insurance do you already have access to?

1. Livestock insurance [ ] 2. Crop insurance [ ] 3. NHIS [ ] 4. Life policy insurance [ ] 5. Auto insurance [ ] 6. None [ ] 7. Others (specify) ……

C2. Have you heard about livestock insurance before? 1. YES [ ] 2. NO [ ]

C3. ***If yes***, to C2, where did you hear it from?

1. FBO's/farmers [ ] 2. Extension Agent [3. Workshop/Seminar [ ] 4. Other farmers [ ] 5. GAIP [ ] 6. Media (TV, radio) [ ] 7. Others (specify)……..

C4. Which of the following perils is most likely to cause herd loss on your farm? 1. Theft [ ] 2. Pests and diseases [ ] 3. Accidental death [ ] 4. Drought/Feed shortage [ ]

5. Predators (snake, etc.) [ ] 6. Others (specify) ……..

D. Risk Mitigating Strategies

Rank the following strategies used to mitigate risks on your farm. Rank them in order of importance of adoption. 1 being the most important and 8 being the least important.

Risk mitigating Strategies	Rank

Mixed farming	
Increase non-farm income	
Save more money	
Decrease herd size (through loaning and sales)	
Expand herd size	
Purchase more veterinary inputs	
Increase feed/grain storage	
Market contract	
Others (specify)	

E. Willingness to Pay for herd loss Cattle Insurance

E1. Given the benefits of receiving compensation for death or loss of any insured livestock and cost (premium) associated with livestock insurance; are you willing to insure your livestock? 1. YES [ ] 2. NO [ ]

E2. ***If Yes*** to **E1**, what will be your motivation to insure your livestock?

1. Desire to expand [ ] 2. High exposure to risks [ ] 3. Favorable insurance policies [ ] 4. Accessibility of livestock insurance policies [ ] 5. Others (specify)…….

E3. ***If No*** to **E1**, what will discourage you from insuring your livestock? 1. Limited money [ ] 2. Livestock farming is a minor activity [ ] 3. Intention to quit livestock farming [ ] 4. Others (Specify)……

E4. If yes to **E1,** are you willing to pay for insuring your livestock? 1. YES [ ] 2. NO [ ]

E5. How do you want to pay the premium? Annually [ ] Semi-annually [ ] Quarterly [ ]

Low Opening Bid (Cattle)

E6. ***If Yes*** to E1, are you **willing** to pay 10% of market value of the livestock as the insurance premium annually? (***If yes*** go to **E7& if no** go to **E8**) 1. YES [ ] 2. NO [ ]

E7. What about if the premium charged is 15% of the market value of your livestock? (No matter the answer go to **E9**) 1. YES [ ] 2. NO [ ]

E8. What about if the premium charged annually is 5% of the market value of your livestock? (No matter the answer go to **E9**) 1. YES [ ] 2. NO [ ]

E9. What is the maximum percentage of your livestock market value you are willing to pay for insuring your farm? ……..

E10. Are you willing to insure your farm if you are assisted financially? 1. YES [ ] 2. NO [ ]

Medium Opening Bid (Cattle)

E11. ***If Yes*** to **E1**, are you willing to pay 20% of the market value of the livestock as the insurance premium annually? (***If yes*** go to **E12 & *if no*** go to **E13**) 1. YES [ ] 2. NO [ ]

E12.What about if the premium charged is 25% of the market value of your livestock? (No matter the answer go to **E14**) 1. YES [ ] 2. NO [ ]

E13.What about if the premium charged annually is 15% of the market value of your livestock? (No matter the answer go to **E14**) 1. YES [ ] 2. NO [ ]

E14. What is the maximum percentage of your livestock market value you are willing to pay for insuring your farm? …….

E15. Are you willing to insure your farm if you are assisted financially? ……

High Opening Bid (Cattle)

E16. ***If Yes*** to **E1**, are you willing to pay 30% of market value of the livestock as the insurance premium annually? (***If yes*** go to **E17 & *if no*** go to **E18**) 1. YES [ ] 2. NO [ ]

E17.What about if the premium charged is 35% of the market value of your livestock? (No matter the answer go to **E19**) 1. YES [ ] 2. NO [ ]

E18.What about if the premium charged annually is 25% of the market value of your livestock? (No matter the answer go to E19) 1. YES [ ] 2. NO [ ]

E19. What is the maximum percentage of your livestock market value you are willing to pay for insuring your **farm? ……**

E20. Are you willing to insure your farm if you are assisted financially? ……..

Appendix 3.1 Livestock (Cattle) Insurance Policy

Insurance Coverage

The policy shall provide indemnity against death of cattle due to accident (including Fire, Lightning, Flood, Strike, Riot and Civil Commotion), drought, theft or diseases contracted or occurring during the period of insurance and within 80 km of the registered community or occurring outside the said geographical area in situations of drought, epidemics upon prior approval by the insurer

Premium rates

The premium rates ranges from 5% to 35% of the market value of the cattle at the time of been insured. The market value of each of the animals the time of being insured will be determined by a certified veterinary officer.

Indemnity:

Payment will be made to the Insured after receipt of proof of death and information about the cause thereof to the satisfaction of the Company, an amount not exceeding its market value declared and approved at the time of being insured.

Exclusions

(i) Malicious or wilful act, negligence, overloading, unskilled treatment, use of the cattle other than stated in the policy.

(ii) Accident/diseases contracted prior to commencement of risk.

(iii) Intentional slaughter of the animal except in cases where destruction is necessary to terminate incurable sufferings on human consideration on the basis of certificate issued by qualified veterinarian or in cases where destruction is resorted to by order of lawfully constituted authority.

(iv) Transport by air or sea, Transit beyond 80 KMS, by road or rail, War and Allied

(v) Death of the animal due to diseases within 15 days from the inception of the policy

(vi) No tag - No claim' is applicable here.

POLICY CONDITIONS

Identification and charges

Insured animal has to be identified by means of brass button ear tagging or by tattooing method. Natural descriptive features such as age, sex, color, height and special markings if any shall be noted in the proposal and veterinary health certificate.

Claim Procedure

In the event of death of the animal, immediate intimation should be made within 7 days and submission of the following within 30 days

(i) Duly completed and signed claim form

(ii) Death certificate from a qualified Veterinary Surgeon

(iii) Postmortem Report (if required by the company)

(iv) Submission of dead cattle's' eartag's' and veterinary certificate.

Ttransfer of interest

Policy may be transferred to new owner or to cover a new animal which is subject to adjustment of premium on prorata basis

Appendix 4.1 Regression Results

```
. probit WTP A1_gen A2_age HHsize Experience Maristatus A6_edu offfarmwrk A10_fbo A11_credit crop_prodn Awareness

Iteration 0:   log likelihood = -124.53907
Iteration 1:   log likelihood =   -74.7426
Iteration 2:   log likelihood = -71.017859
Iteration 3:   log likelihood = -70.846768
Iteration 4:   log likelihood = -70.846118
Iteration 5:   log likelihood = -70.846118

Probit regression                               Number of obs     =        227
                                                LR chi2(11)       =     107.39
                                                Prob > chi2       =     0.0000
Log likelihood = -70.846118                     Pseudo R2         =     0.4311
```

WTP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
A1_gen	-.1704966	.5200747	-0.33	0.743	-1.189824	.8488311
A2_age	-.0289852	.013443	-2.16	0.031	-.055333	-.0026375
HHsize	.0029032	.0254645	0.11	0.909	-.0470063	.0528127
Experience	.0374374	.0140336	2.67	0.008	.009932	.0649428
Maristatus	-.17598	.2691258	-0.65	0.513	-.7034569	.3514969
A6_edu	-.2058224	.2452488	-0.84	0.401	-.6865013	.2748564
offfarmwrk	.1154299	.3322549	0.35	0.728	-.5357778	.7666376
A10_fbo	-.3676394	5.346069	-0.07	0.945	-10.84574	10.11046
A11_credit	-1.986096	.2913623	-6.82	0.000	-2.557156	-1.415037
crop_prodn	1.014341	.3791222	2.68	0.007	.2712747	1.757406
Awareness	2.262367	.7555043	2.99	0.003	.7816061	3.743129
_cons	1.328323	.8229507	1.61	0.107	-.2846308	2.941277

```
. predict IMR, score

. truncreg WTPamthead A1_gen A2_age HHsize Experience Maristatus A6_edu offfarmwrk A10_fbo A11_credit crop_prodn Awareness IMR, ll(0)
(note: 49 obs. truncated)

Fitting full model:

Iteration 0:   log likelihood = -1113.5914
Iteration 1:   log likelihood = -1083.4894
Iteration 2:   log likelihood = -1070.8826
Iteration 3:   log likelihood =  -1069.148
Iteration 4:   log likelihood = -1068.8656
Iteration 5:   log likelihood =  -1068.857
Iteration 6:   log likelihood = -1068.8569
```

Truncated regression
Limit: lower = 0 Number of obs = 178
upper = +inf Wald chi2(12) = 24.83
Log likelihood = -1068.8569 Prob > chi2 = 0.0157

WTPamthead	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
A1_gen	165.0225	189.6759	0.87	0.384	-206.7354	536.7803
A2_age	-15.62884	5.025106	-3.11	0.002	-25.47787	-5.779813
HHsize	-10.31308	9.85662	-1.05	0.295	-29.6317	9.005541
Experience	27.11299	6.445819	4.21	0.000	14.47942	39.74657
Maristatus	-50.53159	141.9938	-0.36	0.722	-328.8343	227.7712
A6_edu	101.9833	106.3175	0.96	0.337	-106.3952	310.3618
offfarmwrk	55.5067	129.8802	0.43	0.669	-199.0537	310.0671
A10_fbo	-1091.661	1723.673	-0.63	0.527	-4469.998	2286.676
A11_credit	-120.54	193.1521	-0.62	0.533	-499.1111	258.0311
crop_prodn	169.7893	181.7924	0.93	0.350	-186.5173	526.0959
Awareness	229.9794	127.2608	1.81	0.071	-19.44728	479.406
IMR	133.1664	185.2272	0.72	0.472	-229.8723	496.205
_cons	-521.631	388.6452	-1.34	0.180	-1283.362	240.0996
/sigma	308.3511	49.48399	6.23	0.000	211.3643	405.338