UNIVERSITY FOR DEVELOPMENT STUDIES

WILLINGNESS TO PARTICIPATE IN POULTRY INSURANCE SCHEME BY SMALLHOLDER POULTRY FARMERS IN TAMALE IN THE NORTHERN REGION OF GHANA

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DECLARATION

Student

I do declare that this thesis is my original work, except for similar works by other authors, which have been appropriately acknowledged through citations and referencing. I also declare that this work has not been previously presented for consideration to this university or any other institution for the award of any other degree.

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We hereby certify that this thesis was independently conducted by Mr. Adam Alhassan under our guidance. It was completed as part of the requirements for obtaining a Master of Philosophy (MPhil) Degree in Agricultural Economics, following the University for Development Studies' guidelines on thesis supervision.

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ABSTRACT

There is no concrete evidence regarding the preparedness of poultry farmers of Tamale to adopt poultry insurance as a strategy to manage the diverse risks and uncertainties affecting the poultry industry. This study assessed farmers' perception of poultry farm risks and willingness to pay (WTP) insurance premiums for poultry farm insurance (as a risk management strategy) in Tamale and surrounding communities in the Northern Region of Ghana. Using data from a systematic sample of 214 smallholder poultry farmers, the study employed risk attitude and perception index scales, the double bounded contingent valuation method, and the ordered logit model to measure farmers' risk perceptions and attitudes, evaluate actual premiums they are willing to pay and to analyze the factors influencing the farmers' WTP respectively. The results indicate that risks associated with climate, production shocks, and biological conditions are perceived by farmers to have dire consequences on poultry enterprises. Risk aversion attitudes towards poultry production dominate among farmers in the study area. WTP for poultry insurance is quite significant with a mean of GH₵1.52/bird/production cycle in anticipation of GH₵50.00 indemnity per bird. Furthermore, the level of education attained, risk aversion attitudes and disaster experience have significant positive correlations with the probability of paying higher premiums whereas farming experience, access to credit and farm size show negative correlations. Lack of trust in insurance companies as well as bureaucratic procedures in claim settlements are other potential discouraging factors for readiness to purchase insurance package. The study recommends that private insurance agencies collaborate with state agencies to take advantage of the insurance market potential to design and roll out insurance packages that meet the needs of smallholder farmers.

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DEDICATION

I dedicate this workpiece to my immediate family; my parents for their unceasing love and care, my brother (Mr. A. Sadique Sufyan) for the moral and financial support and my wife (Amadu Mariam) for her emotional and psychological support. I do also dedicate this work to Harriet M. Nutsugah (Mrs.) for her motherly advice and words of encouragement that motivated me to pursue this course of study.

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LIST OF ACRONYMS

ACRONYM	MEANING
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
WDI	World Development Index
GNA	Ghana News Agency
MoFA	Ministry of Food and Agriculture
PFJ	Planting for Food and Jobs
PERD	Planting for Export and Rural Development
NAERLS	National Agricultural Extension and Research Liaison Service
IFC	International Finance Corporation
GIIF	Global Index Insurance Facility
IMI	Index-Based Micro-Insurance
GAIP	Ghana Agricultural Insurance Pool
WII	Weather Index Insurance
AYII	Area Yield Index Insurance
MPCI	Multi-Peril Crop Insurance
PI	Poultry Insurance
KII	Key Informant Interview
WTP	Willingness to Pay
PMT	Protection Motivation Theory
DOSPERT	Domain Specific Risk Taking
CE	Certainty Equivalent
EV	Expected Value
WTA	Willingness To Accept
CVM	Contingent Valuation Method
NOAA	National Oceanic and Atmospheric Administration
SBDC	Single-Bounded Dichotomous Choice
DBDC	Double-Bounded Dichotomous Choice
NAIS	National Agricultural Insurance Scheme
NPFA	Northern Poultry Farmers Association
WPVC	Women in Poultry Value Chain
GNAPF	Ghana National Association of Poultry Farmers
MWTP	Mean Willingness to Pay

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

For countless rural inhabitants and most of the underprivileged in emerging nations, agriculture is thought to be the primary factor facilitating their economic progress and well-being. (Kassie et al., 2020; World Bank WDI, 2014)The Agricultural sector in Ghana contributes about 21.7 percent of the country's GDP and employs about 34 percent (34%) of the workforce (Ghana Statistical Service, 2022).

Regrettably, the industry is challenged with diverse risks and uncertainties that keep it from reaching its full potential (Singla & Sagar, 2012). Farmers are confronted with risks of varying types, including but not limited to drought, floods, disease and pest infestations, price fluctuations, market availability, inadequate credit, unfavourable regulatory frameworks and land administration practices. Consequently, these agricultural risks have led to a substantial reduction in both farm output and farmers' financial returns. As an illustration, in Africa, the fall armyworm infestation has resulted in an 8.3 to 20.6 million tonnes reduction in maize output and a drop in farmers' revenue (Day et al., 2017; Bannor et al., 2022).

The poultry production subsector in Ghana accounts for 14% of the agricultural sector's contribution to the nation's total gross domestic product with the major production areas being the Bono, Ahafo, Ashanti and Greater Accra regions (Sarpong, 2021). The industry produces around 20 million birds annually (Sarpong, 2021) and employs close to 2.5

million people across the country (Adams et al., 2022). In 2017, domestic poultry meat production was estimated at 59,653 metric tonnes whilst the annual egg production was approximately 200 million eggs (Rosalind Boschloo, 2020), contributing approximately 34% of Ghana's national domestic meat output (Adams et al., 2022). As in other West African countries, chicken continues to be the main and most preferred source of protein in Ghana (Biovet, 2022). Thus, the significance of its contribution to the country's economic growth cannot be over emphasized.

However, like any agricultural enterprise, the poultry sector is not spared the devil's hand of risks and uncertainties that stem primarily from production and marketing processes. The industry has been struggling with disease epidemics, with avian influenza proving to be the most catastrophic. This epidemic has led to the loss of thousands of poultry birds worth millions of Ghana cedis, causing significant financial losses to affected farmers and hindering investment in the industry (Dziwornu & Assefuah, 2019).

To curb the spread of such devastating disease outbreaks over the years, the Government of Ghana intervened by eradicating suspected infected birds and then provided compensation to the impacted farmers. In 2007, poultry farmers received GH₵1,595,777,656 in compensation from the government following the loss of 13,371 birds to avian influenza and the extermination of 27,356 others (Adumuah, 2007and GNA, 2007 cited in Dziwornu & Assefuah, 2019).

These are major setbacks to the effective implementation of poultry sector development policies. For instance, Ankrah et al. (2021) observed that disease (Gumboro, Newcastle,

Coccidiosis, Salmonellosis and Fowl pox) outbreaks, coupled with climate-related hazards constitute the most frequently encountered risks in poultry production, and have the potentials to completely thwart the aims of government's flagship programs like Rearing for Food and Jobs (RFJ). Additional risk factors confronting poultry producers in Ghana are predation, declining sales, decreased egg output, challenges in transportation, and financial instability.

In their quest to adapt, poultry farmers adopt such risk management approaches as farm credits, engaging in contract farming, liquidation of farm assets, off-farm job participation and keeping uneconomical number of birds (Bannor et al., 2023). Nevertheless, in many instances, these approaches have failed to offer adequate protection for farmers, making them less effective risk mitigating strategies (Kahan, 2013). Thus, developing innovative techniques for addressing these risks is crucial.

Agricultural insurance is deemed the most potent means of minimizing adverse financial consequences of risks and uncertainties on farmers' welfare and the economies of emerging nations (Kwadz et al., 2013; Ali et al., 2020). Agricultural insurance guarantees enduring stability and expansion of the agricultural sector, promotes credit access, mitigates the negative effects of natural disasters, and stimulates investment in enhanced agricultural technology (March et al., 2015).

Farayola et al. (2013) reported that the National Agricultural Extension and Research Liaison Services (NAERLS) in a 1991 Extension Bulletin. No. 10, Abuja, Nigeria, enumerated the following as rewards farmers stand to enjoy from agricultural insurance:

To begin with, it offers protection to farmers against any form of economic crisis resulting from any of the insured risks for which the farmer is entitled to compensation. This does not only help to enhance the stability of the farmer's income but also helps keep the farmers in business. Secondly, agricultural insurance is a tool for empowering farmers to acquire farm credit. With insurance coverage, the farmer has greater confidence in accessing loans since insurance provides coverage for crop and/or livestock failure. Additionally, because there is a high degree of certainty for the continuity of the agricultural enterprise, it makes possible better planning and project implementation. Furthermore, it acts as an assurance to lending agencies that agricultural credits will be settled. Finally, because farmers are aware that their businesses are covered in the event of a disaster, it increases the level of the farmers' confidence in the use of innovative technologies and in making higher investments in their agricultural enterprises.

The International Finance Corporation (IFC) introduced the "Global Index Insurance Facility" (GIIF) programme to supply insurance products to economically disadvantaged and lower-middle-income countries. Against this backdrop, several initiatives were introduced in Ghana related to Index-Based Micro-Insurance (IMI) schemes. Paramount among these initiatives were introduced under the Ghana Agricultural Insurance Pool (GAIP) in 2011 (Abugri et al., 2017).

The Ghana Agricultural Insurance Pool (GAIP) is the primary agricultural insurance service provider in Ghana, offering four (4) distinct agricultural insurance products. These include Weather (drought) Index Insurance (WII) products for smallholder farmers, Area Yield Index Insurance (AYII), Multi-peril Crop Insurance (MPCI) for commercial farmers,

and Poultry Insurance (PI) for smallholder and commercial farmers (Ankrah et al., 2021; Abugri et al., 2017; KII, 2023).

Poultry insurance (PI) is a form of indemnity coverage available for all species of birds, including layers and broilers, kept within an intensive management regime. The insured farm must fulfill the policy conditions. These conditions include but are not limited to: (1) the insured farm must employ a veterinary surgeon, (2) observe strict biosecurity, (3) install all equipment necessary for the husbandry system of the insured stock and (4) all farms must be equipped with a ventilation system with an alarm and an automated power supply system. Risks covered under the policy include losses due to accidents, fire, lightning, windstorms and diseases. The policy does not cover death due to cannibalism, poisoning from food and medication and such diseases as Avian Influenza, Paramyxovirus 1 and Newcastle disease (may be covered under strict conditions). The premium paid is 3–5% of the investment, depending on the level of risk estimated from the risk assessment conducted by GAIP. A one-time premium is paid for a period of a maximum of eight (8) weeks for broilers and seventy-two (72) weeks for layers. Indemnity(compensation) paid depends on the value of the loss due to the peril insured at the time of loss. The farm to be insured must have a minimum of five hundred (500) birds (GAIP PIP Modified, 2023; KII, 2023).

1.2 Problem Statement

The poultry subsector supports over 2.5 million people in Ghana (Adams et al., 2022) and contributes 14% of the country's agricultural GDP (Sarpong, 2021). However, poultry farmers face significant risks and traditional risk management methods (such as keeping uneconomical flock size, sale of farm assets, etc.) are inefficient. Livestock insurance can help reduce the impacts of these risks (Dong et al., 2020). It is established that insurance does not change the likelihood of occurrence of a risky event, but it mitigates the effects of the financial loss due to the disaster (Danso-Abbeam et al., 2014). Despite this, the adoption of livestock insurance among farmers is low due to insufficient information, complex procedures in claim settlements, and administrative challenges (Okeke-Agulu & Salihu, 2019).

Agricultural insurance as a good requires market demand information, which generally is scanty across the country and mainly crop-centered. The little information available on poultry insurance is about the southern sector where the product exists. Notwithstanding the existence of the product in the South, participation in agricultural insurance is low among poultry farmers, though most farmers have personal insurance (Bannor et al., 2023). The good is unavailable in Tamale. Hence, there is a lack of information on the demand for the good to inform potential poultry insurance policy design in the area.

Contrary to the considerable number of studies carried out on the willingness to pay for crop insurance notably ((Abugri et al., 2017; Nyaaba et al., 2020 and Danso-Abbeam et al., 2014), knowledge on the availability of poultry insurance policies is limited, and the

willingness of poultry farmers to pay as well as the factors driving their decision to purchase such policies remain unclear. Added to this is the fact that the poultry insurance scheme offered by GAIP goes with conditions that are skewed in favour of large-scale commercial poultry farmers. Hence, there is a lack of clarity on the kind and nature of an insurance scheme that would be accessible and acceptable to smallholder poultry farmers in the study area.

Perceptions of consumers affect their purchase decisions, hence, perceptions of farmers, as customers of insurance policies, influence their decisions to subscribe or otherwise (Grunert, 2005). However, to the best of the researcher's knowledge, very few studies (Adjei et al., 2016) examined the effects of farmers' risk perceptions on their willingness to pay for agricultural insurance. There is a clear lack of knowledge about the effect of farmers' risk perceptions and attitudes on their WTP for poultry insurance in the study area. This study seeks to fill this gap by including poultry farmers' perceptions of risks related to poultry production and their risk attitudes as explanatory variables in estimating the determinants of the farmers' insurance purchase decisions and the insurance premium they would be willing to pay to insure their farms.

1.3 Research Questions

From the aforementioned discussions, the following research questions are posed:

Are poultry farmers in the study area willing to participate in the poultry farm insurance market? Specifically, the study addresses the following research questions:

1. To what extent do poultry farmers perceive poultry farm enterprise risky?
2. What are the attitudes of farmers towards risks related to poultry farm enterprise?
3. What premiums would poultry farmers be willing to pay to insure their poultry farms?
4. What factors influence poultry farmers' decision to purchase a poultry insurance policy?

1.4 Research Objectives

The main objective of this study is to investigate the willingness of poultry farmers in the Tamale area to participate in the poultry farm insurance market. The specific objectives are:

1. To assess poultry farmers' perceptions of risks associated with poultry farm enterprise.
2. To assess poultry farmers' risk attitudes towards poultry production.
3. To estimate the premiums that poultry farmers are willing to pay to insure their farms.
4. To examine factors that influence poultry farmers' willingness to pay for poultry insurance policy.

1.5 Justification of The Study

Available literature has revealed that the uptake of agricultural insurance among both crop and livestock farmers in most developing countries and Ghana in particular is low (Bannor et al., 2023; Okeke-Agulu & Salihu, 2019; Abugri et al., 2017; Danso-Abbeam et al., 2014). Livestock insurance is increasingly gaining acceptance in some developing countries. This notwithstanding, agricultural insurance as a tool for risk mitigation has had little interest in research, especially in the context of poultry insurance in northern Ghana.

This study is significant as it produces empirical evidence on the farmers' WTP for poultry insurance in Tamale. It also establishes some factors influencing farmers' WTP for poultry insurance and helps create awareness to increase uptake. The study is also justified as it reveals the kind of poultry insurance acceptable to the farmers and the amount the farmers in the study area would be willing to pay as a premium. Such evidence could be useful to insurance companies, governmental and non-governmental agencies and policy makers in designing attractive and affordable poultry insurance schemes that meet the aspirations of poultry farmers. It would additionally aid in addressing the gaps in the literature on poultry farmers' WTP for poultry insurance in Tamale. Such findings could inform extension services that could promote the uptake of livestock insurance, enhance the farmer's competencies in risk management and improve their livelihoods.

By adopting attractive and affordable poultry insurance schemes, it is expected that poultry farmers would increase their investment in the livestock business which could lead to improved productivity and reduced poverty. Again, it could enhance farmers resilience to natural disasters and contribute to food security.

1.6 Organization of the Study

This study is structured into five chapters. After chapter one, chapter two reviews relevant literature related to this study. It describes the concepts and theories involved in the objectives of the study, the approaches usually adopted in farmer perception and willingness-to-pay studies and the methods employed in estimating the determinants of farmers' willingness to pay. Chapter three outlines the general methodology to be adopted for this study, while chapter four will present and discuss the results and findings of the study. The fifth and last chapter will summarize the results, draw conclusions and give recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter explores literature providing insights into the key concepts involved in this research. It describes how farmers perceive risks associated with farm enterprises, farmers' risk attitudes toward poultry production, and some empirical studies that have evaluated the concept. It also compiles data on farmers' readiness to pay, specifically for poultry farm enterprise insurance and looks at the approaches usually adopted in quantifying farmers' willingness to pay. It further highlights the economic theories underpinning the willingness to pay elicitation approaches. It concludes by outlining the methods for assessing the variables that determine farmers' willingness to pay.

2.2 Farmers and Farm Risks Perceptions

2.2.1 The concept of Risk perception and Risk tolerance (attitudes)

Scholarly research suggests that there is no universally accepted notion of risk or consensus on the level of risk associated with particular activities (Inouye, 2014). As reported by Joy Inouye of the Campbell Institute, the National Safety Council (2003) officially described risk as " a measure of the likelihood and severity of adverse consequences" (Inouye, 2014). Thus, a risk is an estimation of the likelihood of an incident occurring and the gravity of the consequences if it occurs. The capacity to precisely evaluate the risk in a given circumstance or from a series of actions depends on an individual's perception of and tolerance for risks. Risk perception involves a person's ability to appreciate a certain level

of risk, while risk tolerance pertains to the extent to which an individual can accept a certain degree of risk (Inouye, 2014).

Farming is a highly risky endeavour and so farmers constantly encounter risks while making choices daily that influence their farming activities. The possible outcomes associated with the decisions farmers make are mostly unpredictable. When the likelihood of an outcome is known beforehand, it is considered risk otherwise, it is referred to as uncertainty. For the current study, both would be considered as risks. Typical risk sources in agriculture are generally classified into five categories: production, marketing, financial, institutional and human risk sources (Kahan, 2013). The perceptions of different risk sources by farmers vary according to the specific circumstances of the individual farmer and the characteristics of the farm household, including the resource base of the farm and the production processes practiced. For example, farmers practicing irrigation farming may consider drought as not risky, while those producing under rainfed conditions may perceive drought to be very risky. In the same vein, farmers producing products of high value may perceive unstable prices to be the greatest source of risk (Kahan, 2013).

Several factors affect risk perception and tolerance which are classified into three categories; macro-level factors (structural and institutional in nature), meso-level factors (peer-to-peer or community level) and micro-level factors (individual psychological level) (Inouye, 2014)). A macro-level factor might be an organization's safety culture and degree of safety leadership. In the context of farm enterprise, a farm manager's demonstration of commitment to safety impacts positively on employees' risk perception and safety. Pressure from peers in the community is a meso-level factor impacting people's perception

and tolerance for risks. For instance, a new employee in a farm enterprise may perceive an unsafe shortcut approach to job execution used by seasoned workers as highly risky but may adapt to such risky practice with time. Similarly, the level of an individual's knowledge regarding a situation is an example of a micro-level factor affecting risk perception and tolerance. For example, employees who are confident in their expertise regarding job tasks are less likely to consider these tasks risky.

Farmers' attitudes towards risks are influenced by a multiplicity of factors. Kahan (2013) observed that subsistence farmers often exhibit the highest level of risk aversion behaviour. Similarly, farmers who are profit-minded but are unable to endure potential financial losses related to risks also demonstrate greater risk aversion. Hence, the input cost and output value relationship influence the farmers' risk attitude. Added to this, the farmer's family responsibilities and commitments play a critical role in influencing farmers' attitudes towards risks.

2.2.2 Theories of Risk Attitudes and Risk Perception

Available literature (Inouye, 2014) suggests that there is a good number of theories that seek to explain risk attitudes and risk perceptions. Paramount among the few that are commonly cited in studies include the Protection Motivation Theory (PMT), Risk Compensation/Risk Homeostasis Theory, Situated Rationality Theory, Habituated Action Theory, Social Action Theory and Social Control Theory. Following Inouye (2014), highlights of the above theories are discussed below:

R. W. Rogers in 1975 developed the protection motivation theory to provide insights into how fear appeals influence people and the way people respond to them. The theory postulates that people are more inclined to safeguard themselves when they foresee negative outcomes, wish to avoid adverse impacts and feel they are capable of taking effective preventive actions. In line with this, farmers who have experienced the devastating effects of a risky event would have a heightened risk perception of similar events than those who have no such experience.

The risk compensation or risk homeostasis theory suggests that individuals are more inclined to take higher risks when they feel more secure. Wilde (1998) observed that the extent of risk-taking behaviour exhibited by individuals varies with the established safety measures. Experiments on risk compensation theory reveal that given appropriate safety measures, people generally tend to be more careless and indulge in high-risk behaviour (Morrongiello & Lasenby-Lessard, 2007). Following this, it can be deduced that farmers who have put in place the necessary security and safety measures at their farm enterprises may have low-risk perceptions about particular events or conditions. Hence, they may exhibit risk-loving attitudes towards such events.

The social action theory, as applied to risks, postulates that individuals engage in risky behaviours due to social pressure from peers or a widespread community belief that an activity is safer. The saying “after all everyone else is doing it” in the community is motivating enough to lure people to engage in risky behaviour with disregard for the

consequences. Hence, farmers' perceptions of risks could be influenced by the risk behaviours of other farmers towards risky events or actions.

According to the situated rationality theory, it is incorrect to believe that safe behaviours are intrinsically rational and risky actions are naturally illogical or "thrill-seeking". It is rational to take risks if the action has a great reward. For instance, a person might determine that the importance of arriving punctual at an appointment surpasses the dangers of driving unsafely (Keating & Halpern-Felsher, 2008). Choudhry & Fang (2008) discovered that Chinese workers frequently engaged in greater risk actions, anticipating that the improvements in their efficiency would be appreciated and rewarded by their supervisors. Inferences could be made following the above that farmers who anticipate higher returns from a particular farming activity would be more likely to exhibit high-risk-taking behaviour.

The habituated action theory posits that frequently engaging in risky actions without facing adverse repercussions often reduces the perceived danger associated with those behaviours. Weller et al. (2013) reported that individuals who regularly used their cell phones whilst driving had diminished perception of risk regarding that practice. In respect of this, farmers who have never experienced an adverse consequence of some risky behaviours or risky events would associate a low-risk perception to such behaviours or events. Wildavsky & Dake (2018) discovered and evaluated various risk perception theories to determine their effectiveness in predicting and clarifying how different people would perceive various potential hazards as being more or less dangerous. A few of the themes are highlighted below:

To begin with, the knowledge theory is related to the idea that the danger people associate with technologies (and other things) stems from the knowledge that such things are dangerous. Thus, perceptions of danger must be consistent with individuals' knowledge of the risk at hand. According to personality theory, risk-taking tendencies or aversion to risk are innate and stable individual differences between people are linked to their perceptions of risks.

Furthermore, Wildavsky & Dake (2018) explains economic theory to suggest that wealthy individuals are more willing to take risks, such as those associated with technology, because they stand to gain more and are somewhat protected from negative outcomes. Cultural theory explains that people decide what to fear and to what extent to uphold their culture.

2.2.3 Measuring Risk Attitudes and Risk Perception

2.2.3.1 *The Domain Specific Risk Taking (DOSPERT) scale*

Taking into account the various factors influencing decision-making in risky situations (such as individual and domain differences in subjective perceptions of riskiness), Weber et al., (2002) developed a risk-taking scale, thus the DOSPERT scale. The DOSPERT scale allows researchers and practitioners to measure both conventional/traditional risk attitudes (described as the reported degree of risk-taking) and perceived-risk attitudes (reflected in the readiness to engage in a risky activity based on its perceived danger) in five (5) commonly encountered content domains, that is, ethical, financial (gambling and investment), health/safety, social and recreational decisions.

Evidence for the DOSPERT scale's construct validity was provided by Hanoch et al. (2006) who applied the DOSPERT scale to demonstrate that individuals who exhibit significant levels of risk-taking behaviour in one domain (for example, bungee jumpers engaging in recreational risk) may be highly risk averse in other risky contexts (for example, financial decisions). The DOSPERT scale is commended for being able to simultaneously measure multiple risk constructs such as risk-taking, risk perception, and perceived risk attitude. The original DOSPERT scale developed by Weber, Blaiz & Betz was updated by Blais & Weber (2006) through the use of multilevel modeling to explore the link between observed risk-taking behaviour and risk perception (Blais & Weber, 2006). The updated scale is more concise (30 items rather than 40) and relevant to a more diverse population comprising various age groups, cultural backgrounds and educational levels. The revised DOSPERT scale, made up of 30 items, features two (2) distinct scales: the risk-taking scale and the risk-perception scale. Highlights of the two (2) scales as explained by Blais & Weber (2006) are discussed below:

Risk-taking is defined as respondents' self-reported probability of engaging in risky behaviours. The risk-taking scale assesses behavioural intentions by measuring how likely respondents are to engage in risky behaviours across five life domains: ethical, financial, health/safety, social, and recreational risks. This is done using a 7-point Likert scale, ranging from 1 (Extremely unlikely) to 7 (Extremely likely). The rankings for each item are summed within each subscale to obtain subscale scores, with higher scores indicating greater risk-taking in that particular domain.

Risk perception on the other hand assesses respondents' innate or instinctive (as opposed to intellectual or rational) ratings of the riskiness of a risky behaviour. Thus, the risk-perception scale assesses respondents' natural or instinctive sense of the risk associated with each behavior, using a 7-point rating scale from 1 (Not at all risky) to 7 (Extremely risky). Likewise, ratings for items within a specific subscale are summed to calculate subscale scores, with higher scores indicating a greater perception of risk in that subscale's domain.

2.2.3.2 *The summative and multiplicative models*

According to Slovic (2016), expected utility theorists in the fields of economics and psychology define risks as the product of an individual's estimation of the severity and probability of harmful outcomes. However, Le & Arcodia (2018) advocated for defining risk as the sum of the severity and probability of outcomes. In line with the above definitions, two models of measuring risk perceptions are outlined; the summative and the multiplicative models.

Le & Arcodia (2018) criticized the multiplicative model, arguing that risk perception would be zero if either component (outcome severity or outcome probability) is zero. They believe that with the summative model, the risk rating will not equal zero because one of the components is zero.

Wolff et al. (2019) oppose the summative model indicating that it appears to be inconsistent with logical reasoning, disregards common sense and well-established scientific knowledge. The authors explain that the summative model implies events that have adverse

outcomes (outcome severity, for example being poisoned by moon dust) but no chance of occurring (outcome probability) constitute risk. Similarly, the summative model implies that events that have outcome probability (like sleeping) but without negative consequences also constitute risk.

The argument advanced by Wolff et al. (2019) is in consonance with Wilson et al. (2019) who conducted a comprehensive evaluation of risks of varied dimensions to develop a measure that could be extensively applied for evaluating perceived risks. The authors concluded that the most precise formula for measuring risk perception would define probability in terms of exposure and vulnerability, whereas consequence would be defined by severity and effect, thus:

Risk perception = Probability (Exposure + Vulnerability) × Consequence (Severity + Effect) (1)

2.2.3.3 *Certainty Equivalent (CE)*

According to Concina (2014), the certainty equivalent of a risky activity could be defined as the amount considered equivalent to the value of the activity. It is the fixed price at which the activity could be traded. In other words, the CE is the cash amount that would make the person indifferent between keeping or selling the risky activity. Risk attitude is defined through a comparison of the economic agent's certainty equivalent (CE) and the objective Expected Value (EV) of the risky activity. The expected value of a random variable is the weighted average of all possible values the variable can take. Risk aversion implies that the CE for a risky activity is lower than its expected value (CE< EV). The risk-averse person will seek to eliminate the risk, even if it means foregoing a potential gain.

The difference between the EV and the CE is called the risk premium (RP= EV-CE). The risk premium is positive for the risk-averse person.

The CE of a risk lover is always higher than the EV. Thus, the risk premium is negative and denotes the highest sum of money the individual is ready to forfeit to retain the risky activity. They opt to hold onto the risky activity rather than accept its EV. For a risk-neutral person, the CE equals the EV of the risky activity. Hence, the risk premium is null. The neutral person shows no preference for accepting an offer versus enduring the risk of an activity with the same EV.

2.3 Review of Empirical Measures of Farmers' Risk Perceptions and Risk Attitudes

Several studies have examined farmers' risk behaviour, risk perception, as well as, the impact of these on the decisions farmers make in their farm enterprise operations. Adjei et al. (2016), analyzed the effect of perceived perils and perceived-risk attitude of farmers on their choice to invest in poultry farm insurance in the Dormaa Municipality of Ghana using a random sample of 100 commercial chicken producers. The study found that farmers' risk aversion behaviour could partly and positively influence their decisions to insure their farms. The study also discovered that diseases and periodic shortages of maize (feed) were perceived to be frequent and have a moderate impact on farmers' insurance purchase decisions.

Akinbile et al. (2013) used the DOSPERT risk-perception scale to analyze a sample of 118 poultry farmers' perception of the effect of climate change on poultry production and reported that 55.1% of the respondents had a high-risk perception, while 44.9% had a low-

risk perception of climate change effects. The study however, recorded a negative correlation between climate risk perceptions and the risk management strategies adopted by farmers. Cobbinah et al. (2018) measured vegetable consumers' risk perception as scores and analyzed its effect on the consumers' willingness to pay for safer vegetables in Tamale. The study concluded that consumers who believed that safer vegetables are linked to reduced health risks were more inclined to pay higher prices for safer cabbage and ayoyo. Dong et al. (2020) investigated herders' risk perception about herding in three pasture types in Inner Mongolia, China, using ratings. They concluded that the herder's risk perception level was significantly high and positively influenced herders' willingness to purchase Livestock Husbandry Insurance (LHI).

Employing equally likely certainty equivalent and risk factor generated from the scores on a 5-point Likert scale to measure farmers' risk attitudes and risk perception in a research carried out in Bangladesh, Islam et al. (2021) revealed that risk-averse attitudes of farmers positively and significantly influenced the crop insurance adoption decisions of farmers but risk perception related to flood risk was determined to be insignificant. In a related investigation undertaken in the Kintampo North Municipal, Kwadz et al. (2013) analyzed farmers' perceptions of the effects of different hazards on crop cultivation by examining the frequency and severity ratings by farmers on a Likert scale of 1 (very low) to 5 (very high). The study found that bushfires, droughts and floods were the most common and devastating adversities. Nyaaba et al. (2020) assessed farmers' perception of losses due to catastrophic events in the Tolon district of Ghana and reported that the majority (55%) of the farmers rated losses due to catastrophic events as high. Akhtar et al. (2019) measured

the risk perception and risk attitudes of maize farmers and subsequently analyzed the effects of both variables on the adoption of two (2) risk management strategies (use of agricultural credit and off-farm diversification of income). The authors measured farmers' risk perception using severity and incidence scores of four (4) risk sources to generate the risk factor and classified the risk factor as low or high to generate the risk perception variable. The risk attitude variable was generated using the equally likely certainty equivalent.

This study measured farmers' general risk perceptions about poultry farm enterprises, their perceptions about different risk dimensions in the poultry business as well as the attitudes of the farmers towards risks. These were examined using the DOSPERT scale, risk factor and risk matrix on 5-point Likert scales. The farmer's risk perceptions and risk attitudes were generated as variables and used in the ordered logit model to ascertain their significance or otherwise in influencing the farmers' insurance adoption decisions. The DOSPERT scale allows the assessment of perceptions and attitudes of a person from different domains of life.

2.4 Farmers' Willingness to Pay for Farm Insurance

2.4.1 *The concept of Willingness to Pay (WTP)*

Economists' explanation of WTP is oftentimes based on the framework of theories of preference and utility maximization. Willingness to pay is defined as the largest sum of money that must be taken out of a person's income while ensuring their satisfaction remains constant (Hicks, 1941, cited in Abugri et al., 2017). This therefore, suggests that WTP is contingent upon the individual's income, the initial and final quantities of the good

in question, prices confronting the individual and their personal characteristics. WTP for farm insurance is an issue of choice and is underpinned by the microeconomic theory of utility maximization and the Lancaster (1966) demand theory. WTP could relate to indirect utility, which is expressed as a function of the individual's disposable income, the vector of prices faced by the individual, the alternative levels of the good, and the individual's socioeconomic and demographic characteristics. From the foregoing explanations, WTP represents the highest amount of money a consumer is prepared and able to forfeit so as to obtain a product or service.

WTP and willingness to accept (WTA) approaches when used by researchers to assess the value of a resource are noted to have the propensity to give different values for same commodity change. Bishop et al. (2001) observed that WTP for a good is generally lower than the compensation demanded to relinquish the same good.

2.4.2 *WTP Elicitation Procedures*

Several methods are available for estimating economic value for goods/services and environmental resources, thus, the revealed preference and the stated preference methods. The revealed preference approaches assess the individual's preferences by analyzing their real behaviour in markets pertaining to the good under consideration (Andersson et al., 2016). Forms of revealed preference methods include, among others, the travel cost method, hedonic pricing and aversion behaviour. In contrast, stated preference approaches consider the individuals' stated choices in a hypothetical market scenario (Andersson et al., 2016). Researchers have access to a variety of stated preference methods, such as the contingent valuation method, choice experiment and contingent rating techniques, among

others. The contingent valuation is the dominant method employed in eliciting people's willingness to pay (Bateman et al., 2013). This study adopts the contingent valuation method to investigate farmers' WTP for poultry insurance.

2.4.2.1 *The Contingent Valuation Method (CVM)*

Researchers employ several methods to value non-market goods, but the CVM is the most widely used and dependable approach (Davis,1963; Carson &Groves, 2007). With this approach, field surveys are conducted to ascertain the market value of non-market goods grounded in utility maximization theory. The underlying assumption is that responses obtained in the hypothetical market paint a picture of the choices and the values that would be observed in a real market scenario. According to literature, the concept was originally proposed by Siegfried von Ciriacy-Wantrup, a German environmental and resource economist in 1947 and was later elaborated on by Davis (1963).

Consumers' WTP for products that are not yet on the market and those that have no available demand data can be estimated using the CVM (Brago et al., 2022; Keske, 2021; Radam et al., 2010). Although the approach was first primarily used in studies on environmental recreation, it is now widely employed to value a wide range of products and services. An advantage is that it can be used to value nonmarket goods, which other methods cannot (Champonnois, 2018; Keske, 2021). Specifically, the CVM is used in such fields as water quality, biodiversity, fish and wildlife recreational value and rural-urban migration, to mention just a few (Champonnois, 2018; Keske, 2021; Mitchell & T. Carson, 2013). Most CVM applications have been undertaken to assist in policy evaluations (Carson, 2000). The term contingent valuation is used because the values obtained from

the approach are conditional on the specific hypothetical market, the good described to the respondent (Carson et al., 2003) and the options provided in the questionnaire (Randall &Stroll, 1983).

Earl and Dirk (2000) recommended the following to ensure accurate design and execution of contingent valuation: (1) The good being appraised must be clearly defined, thus, a detailed description of the good, the market scenario, the supplier, the conditions attached and the timing of provision must be clearly spelt out, (2) Propose a relevant payment mechanism that is related to the good and measure respondents' certainty, especially for zero(0), very low or very high bids using follow-up questions such as " assessing the respondents' confidence in their answers" and (3) data on socioeconomic characteristics of the respondents including their knowledge about the good and their opinion about the effect of their action. The authors further explained that this data is valuable in clarifying the reasons behind the respondent's answers to the valuation questions. It is recommended that before executing the main survey, the researcher undertakes focus group discussions, pretests and pilot studies. These steps would enable the researcher evaluate how respondents will understand the questions in the actual survey and provide an opportunity for the researcher to make adjustments to the questionnaire.

2.4.3 Survey Instruments for CVM

Survey instruments employed in the administration of contingent valuation questionnaires include but are not limited to mail surveys, in-person surveys and telephone surveys. The panel of renowned economists of the National Oceanic and Atmospheric Administration (NOAA) who evaluated the CVM argued that in-person surveys allow for the use of image-

based (visual) elements, aid in arousing and sustaining respondents' interests and provide the means to monitor their performance (Champonnois, 2018; Earl and Dirk, 2000).

However, in-person surveys are expensive, particularly in surveys that cover a larger geographical area and large sample size. In such cases, mail surveys would offer a better option. On the other hand, mail surveys become unreliable because they are characterized by low response rates, literacy issues and lack of control over the interview process by the researcher. Telephone surveys are unfavourable when dealing with a large sample but may be suitable if the respondents have prior knowledge of the good or resource and when materials are provided in advance (Champonnois, 2018; Earl and Dirk, 2000).

There are two (2) broad elicitation question formats for CVM: the open-ended and the closed-ended formats. With the open-ended questioning approach, the respondent is asked to state the maximum amount he/she would be willing to pay for a good/service or to benefit from an environmental resource. For instance, "What annual premium would you agree to pay per hundred (100) birds if the insurance coverage offers 100% of the value of the 100 birds? In this approach, the respondents specify their maximum values, and the total value of the resource is computed by averaging the individual values and extrapolating to the broader population. An advantage of the open-ended approach is that it is free from starting point bias common in the bidding game technique. A drawback of this approach is its tendency to record a large number of zero responses. Some researchers also argue that respondents may understate or overstate their WTP because they have no reason to think through a maximum WTP and, hence, find it difficult to do so (Earl and Dirk, 2000; Pearce & Sims, 2002). In sharp contrast to the open-ended technique is the closed-ended approach,

which includes the payment card approach and the discrete/dichotomous choice procedures.

The **Payment card** is designed to contain a range of values that begin with a low value that is increased in a manner up to a maximum value predetermined by the researcher. Respondents are asked to choose from the range the amount that represents the highest price they are prepared to pay for the good or environmental resource. For example, *Which of the amounts (premium) listed below best describes your maximum willingness to pay per annum through cash payment for your poultry farm insurance, given the conditions I have described to you?*

GH₵ 300 **GH₵ 450** **GH₵ 600** **GH₵ 750** **GH₵ 900**

This approach facilitates the valuation task and avoids starting point bias.

The **Discrete / Dichotomous Choice format** is categorized into the single-bounded dichotomous choice (SBDC) and the double-bounded dichotomous choice (DBDC) formats. The SBDC, also referred to as the "Referendum" or the "Take-it-or-leave-it" approach by scholars, presents a dichotomous choice scenario where the respondents are required to provide a yes or no answer to a value of the good presented by the researcher to indicate their WTP or otherwise. There is only one question without a follow-up question. The coined name "Take-it-or-leave-it" perfectly reflects the realities in an actual market where goods are tagged with fixed prices and consumers have to choose between purchasing at those prices or not purchasing. For example, a referendum question may be stated as:

"Would you pay GH₵ 500 as insurance premium annually for an acre of maize farm if the drought-index insurance offers a GH₵ 10 000 insurance cover"? While the SBDC approach is easier to administer and also minimizes the reasoning task of the respondent, it does not precisely pinpoint the highest amount each respondent is willing to pay.

With the DBDC format, the respondents are asked to answer an additional question that has the same structure as the original question but uses a different value of the good. The researcher poses a question and the respondent is asked to indicate whether or not he/she will pay at the stated value. For example, "Would you be willing to pay GH₵ 500 as an insurance premium for 500 birds annually for an indemnity of GH₵ 10,000? If the respondent answers yes, then a follow-up question is asked in the same manner, but the initial premium is increased by a certain percentage. On the other hand, if the respondent answers no, a follow-up question of the same structure as the initial one is asked, but this time, the premium is decreased by a certain percentage. Studies have proved that the DBDC is superior to the SBDC estimator in terms of efficiency. However, the difference in efficiency tends to reduce as the sample size is increased. On the contrary, no significant differences can be found in point estimates produced by both approaches, even for a small sample size therefore, in terms of biasedness, one cannot say that one approach is less biased than the other (Calia, 1998). The DBDC requires only one follow-up question, unlike the bidding game technique, which requires long adjustment processes.

The **bidding game technique** puts the researcher and the respondent in a context similar to markets where bargaining takes place. The researcher presents a value (first bid) and

asks the respondent if he/she would be willing to pay that price for a good/resource. If the answer is 'Yes', then the value of the good is raised (second higher bid) and the question is asked again. The researcher continues these iterations until the respondent replies 'No' to a bid. The last bid preceding the "NO" answer indicates the respondent's maximum WTP.

Conversely, if the respondent disagrees to pay the initial value (the first bid), the amount is decreased until a 'Yes' answer is made, thus representing the respondent's maximum WTP. This approach is prone to starting point bias, where the first bid may influence the respondent's decisions on the subsequent bids. For instance, the respondent might be tempted to believe that the initial bid represents the appropriate value for the goods. The technique facilitates respondents thought processes and encourages them to consider their preferences carefully.

The CVM is criticized on the basis that it is prone to several biases, including strategic bias, hypothetical bias and information bias, among others. Suggestions to minimize these biases include making respondents understand clearly that their answers would not influence policy decisions, giving proper and in-depth descriptions of the hypothetical market and good, and providing relevant and adequate information on the attributes of the good (Loomis & Santiago, 2013; Mohammed, 2012; and Jakobsson & Dragun, 1996 cited in Cobbinah et al., 2018). Another important issue raised by opponents of the CVM is "Protest Zeros", where respondents refuse to state their true preferences and give zero pay for the good. Removing the protest zeros affects the representativeness of the sample. It is

also claimed that the CVM, when used to evaluate non-use values, is not valid because respondents don't have preferences for the goods or services they are asked to evaluate (Diamond and Hausman, 1994, cited in Champonnois, 2018). Some critics also have it that CVM measures the moral satisfaction people derive from contributing to public goods, not their economic value (Kahneman and Knetch, 2005, cited in Champonnois, 2018).

Notwithstanding the above criticisms, Proponents of the CVM argue that there are no alternatives to the stated preference methods to account for non-use values; therefore, improving stated preference surveys is the best way to achieve an accurate and clear evaluation of projects (Champonnois, 2018). In line with the conclusions drawn by the team of eminent economists of NOAA who assessed the effectiveness of the CVM, the proponents of the CVM clearly indicated that the approach could produce accurate and trustworthy estimates (Arrow et al., 1993) when people properly comprehend and demonstrate familiarity with the commodity or service being assessed (Carson, 2012 cited in Amfo et al., 2019). More recent evidence in support of the above assertion is that stated preference estimates closely resemble revealed preference estimates, frequently agree with projections from economic theory and have often been found to align with the results of binding referendums on environmental policies (Baker & Ruting, 2014).

2.4.4 Discrete Choice Experiments (DCEs)

DCEs are an attribute-based measure of benefit. It is assumed that individuals' decisions to purchase a good or service are determined by the attributes of that good or service. For example, DCEs have been used in transport economics to examine how transport choices

are influenced by attributes such as “mode of travel”, “cost of travel”, “travel time,” and “comfort” (Hensher et al., 2005).

DCE presents respondents with a set of choices between hypothetical scenarios (i.e. combinations of attributes) picked from all possible choices determined according to statistical design properties. Each choice includes two or more alternatives, which vary in the levels of the attributes of interest, and individuals are asked to choose one alternative (Tinelli, 2016). There is a trade-off among the attributes in the different alternatives presented in a choice set when individuals make their choices.

The theoretical foundation of the DCE is rather complex as it combines several different economic theories. The DCE is based on the random utility theory and is consistent with Lancaster’s economic theory of value. The assumption is that for every person, a good, service or behaviour has a certain amount of utility. When faced with a choice between two or more things, a person will choose the thing that has the most utility. The Lancaster approach postulates that a good possesses characteristics that give rise to utility, but the good in itself does not give utility to the consumer (Cherchi & Hensher, 2015; Flynn et al., 2010).

The DCE approach seeks to establish the relative importance people attach to different characteristics of a good or service. It assumes that any good/service can be defined as a combination of levels of a given set of attributes. Hence, the total utility an individual derives from that product is determined by those attributes (de Bekker-Grob et al., 2012). A major usefulness of DCE is that it identifies what characteristics of the good/service respondents value. It can also identify the relative values that respondents attach to these characteristics and the trade-offs they are willing to make (Tinelli, 2016). For instance, in

the case of agricultural insurance, farmers may value the kind of peril covered by the insurance scheme and the expected indemnity more than other attributes. A trade-off farmers could make in this scenario could be the additional cost they will be willing to incur by way of instituting measures to meet the policy conditions (such as the provision of artificial ventilation systems in poultry farms).

The DCE is closely related to the dichotomous choice CVM as both methods involve consumers making mutually exclusive choices from a set of substitutable goods. The methods also share the same economic foundation, thus, the random utility theory (Kjær, 2005).

Choice experiment was introduced to overcome the shortfalls of CVM, however, the choice between the CVM and choice experiment is influenced by the type of good evaluated and the value of interest.

Choice experiments assess a set of attributes and are more suitable where specific attribute values support more flexible policy development and when individuals evaluate the attributes independently of one another. The CVM assesses the total worth of a good and is more appropriate for appraising the overall results of a policy change (Baker & Ruting, 2014).

This study adopted the CVM to estimate how much premium poultry farmers were willing to pay for poultry farm insurance. The researcher's choice of the CVM was informed by the fact that the hypothetical insurance package used for the study was designed to have no alternatives with differing attributes. Detailed description of the package and its design is found in the questionnaire attached to the appendix.

2.5 Review of Empirical measures of farmers' willingness to pay for agricultural insurance

Several studies have investigated the adoption of agricultural insurance as risk management strategy, farmers WTP for insurance, the factors driving the decisions to pay for insurance as well as the constraints militating against farmers' adoption of agricultural insurance.

Adjei et al. (2016) assessed poultry farmers' decision to pay for poultry insurance in the Dormaa Municipality of Ghana using a sample of 100 commercial poultry farmers. Employing the contingent valuation method, the study uncovered that GH₵31.00 was the mean price farmers were prepared to pay as a premium in anticipation of a hypothetical indemnity of GH₵ 10 000 per thousand birds. In a similar investigation carried out in the Dormaa West and East districts of Ghana, (Bannor et al., 2023) applied a discrete choice experiment and concluded that farmers indicated their readiness to pay an average of US$5.96 per month as an insurance premium for their poultry enterprises. Though both studies highlighted above were carried out in the same geographical area, it is difficult to do a meaningful comparative analysis of the WTP values reported because the latter did not report on the insurance cover as well as the number of birds involved. Livestock farmers in Kwara state, Nigeria, were reported to have indicated their WTP ₦23 500 per annum for an insurance cover of ₦500 000 in livestock value. This was unearthed by Aina et al (2018) using contingent valuation to elicit data from 132 respondents.

Dziwornu & Assefuah (2019) established that over 75% of respondents affirmed their WTP GH₵ 1.01/ bird to acquire insurance for their poultry farms. The conclusion was drawn

from the results of a field survey conducted on 180 small-scale and large-scale poultry farmers sampled from targeted communities in the Brong-Ahafo and Greater Accra regions of Ghana noted for poultry production. Ojogbane & Gbigbi (2022), investigated poultry farmers' WTP for poultry farm insurance in Kogi state, Nigeria and reported that 56.7% of the respondents were ready to pay for insurance. However, the researchers did not report on the WTP amount. Similarly, Dong et al. (2020) employed the contingent valuation approach somewhere in China to explore the willingness of livestock farmers to pay premiums to acquire livestock farm insurance but reported a very low positive response (less than 30%) to livestock insurance adoption. The study did not also disclose the WTP amount.

Abugri et al. (2017), estimated the mean WTP amount by maize farmers for drought-index insurance at GH₵ 175.25 per hectare in three districts of Northern Ghana using the contingent valuation method. Danso-Abbeam et al., (2014) also used the contingent valuation approach to analyze farmers' WTP for cocoa price insurance in Ghana using data from 201 cocoa farmers and concluded that 57.71% of the sampled farmers responded positively and accepted to pay GH₵ 28.030 representing 9.21% of the average price insurance of GH₵ 300 per bag of cocoa. Ellis (2017), employed a dichotomous contingent valuation method to elicit farmers' WTP for crop insurance among cereal farmers in the Eastern region of Ghana and reported that the farmers demonstrated they were willing to pay GH₵69.58 for insurance for each cultivation cycle. From the Tolon district of Ghana, Nyaaba et al. (2020) concluded that the premium farmers were willing to pay to insure an acre of maize farm was GH₵59.00 using the open-ended elicitation format of the

contingent valuation. Again, by using the contingent valuation, GH₵128.40, GH₵ 32.10 and GH₵49.32 respectively were the maximum, minimum and the average amounts cocoa farmers were willing to pay for production cost per acre to insure their farms as reported by Okoffo et al. (2016) in the Dormaa district of Ghana. Employing the contingent valuation method Kwadzo et al. (2013) disclosed that on average food crop farmers were willing to pay GH₵24.43 premium for an estimated GH₵ 1000 loss of farm income in a survey undertaken in the Kintampo North Municipality of Ghana.

Again, using the CVM, Ngango et al. (2022), concluded that 19 206 RWF (US$ 18.61) was the mean WTP amount per hectare per annum among maize farmers in Eastern Rwanda. Looking beyond the boundaries of Africa, Mutaqin & Usami (2019) in a survey carried out in rural Indonesia established through the contingent valuation approach that farmers' mean WTP for agricultural production cost insurance was RP30 358/ha/cropping season.

Conclusion: According to these findings, the adoption of agricultural insurance among farmers varies according to several factors including but not limited to the socio-demographic and economic factors, the farmers' perceptions, farm characteristics and product attributes.

2.6 Review of empirical determinants of farmers' WTP for agricultural insurance

2.6.1 Socio-demographic and economic characteristics that determine WTP

Diverse conclusions have been drawn regarding the effects of socio-demographic and economic factors such as education, gender, age, income, off-farm jobs, level of awareness and family size on farmers' participation in farm insurance. Table 1 is a tabular summary of findings from some studies regarding the characteristics that have predominantly featured in the analysis of the determinants of WTP.

Table 1: Review of farmer/farm/institutional characteristics and WTP for farm insurance

Characteristic Variable	Reference study	Direction of effect on WTP	Conclusion from literature
Socio-demographic and economic characteristics			
Education	Bannor et al., (2023), Danso-Abbeam et al., (2014), Dong et al., (2020), Mutaqin and Usami, (2019), Ngango et al., (2022), Ojogbane and Gbigbi, (2022), Okeke-Agulu and Salihu (2019) and Okoffo et al., (2016)	Positive	Inconclusive
	Abugri et al., (2017) and Kwadz et al., (2013)	Negative	
	Adeyonu et al., (2016); Adjei et al., 2016; Islam et al., (2021) and Nimoh et al. (2011)	No significant effect	
Age	Bannor et al., 2023; Dziwornu & Assefuah, 2019; Kwadz et al., 2013, Adeyonu et al., (2016), Ngango et al., (2022) and Mutaqin & Usami,(2019), Dong et al., (2020) and Ojogbane & Gbigbi, (2022)	No significant effect	Inconclusive
	Abugri et al., (2017), Aina et al., (2018) and Islam et al., (2021)	Negative	
	Adjei et al., (2016), Danso-Abbeam et al. (2014), Ellis, (2017) and Okoffo et al., (2016).	Positive	
Household size	Bannor et al., (2023), Nyaaba et al., (2020), Okoffo et al., (2016), Danso-Abbeam et al., (2014) and Aina et al., (2018.)	Negative	Inconclusive
	Kwadz et al., (2013)	Positive	
	Adjei et al., (2016), Ngango et al.,(2022), Okeke-Agulu & Salihu, (2019)	No significant effect	
	Bannor et al., (2023), Nyaaba et al. (2020), Adeyonu et al. (2016), Ojogbane & Gbigbi, (2022) and (Islam et al., 2021)	Positive	

Farming experience	Okeke-Agulu & Salihu, (2019)	Negative	Inconclusive
	Abugri et al., (2017), Kwadz et al., (2013), Dziwornu & Assefuah, (2019) and Ellis, (2017)	No significant effect	
Awareness of Agricultural Insurance	Ellis, (2017), Nyaaba et al. (2020), (Abugri et al., 2017), Adeyonu et al., (2016), Ojogbane & Gbigbi, (2022), Ngango et al., (2022) and Dong et al., (2020)	Positive	Positive
Household/ Farmer's Income	Abugri et al., (2017), Islam et al., (2021), Ojogbane & Gbigbi, (2022), Ngango et al., (2022) and Ellis, (2017)	Positive	Positive
Off-farm job	Bannor et al. (2023), Dziwornu & Assefuah, (2019)	Positive	Inconclusive
	Nimoh et al., (2011) and Aina et al., (2018)	Negative	
	Adjei et al., (2016); Islam et al., (2021), Kwadz et al., (2013); and Ngango et al., (2022).	No significant effect	
Farmers' risk perception	Adjei et al., (2016), Dong et al., (2020)	Positive	Positive
Farmers' risk attitudes	Reardon, (2001), Islam et al., (2021)	Positive (Risk averse)	Inconclusive
	Mutaqin & Usami, (2019)	Positive (Risk loving)	
	Ngango et al., (2022)	No significant effect	
Farm/Institutional Characteristics			
Farm / Flock size	Ojogbane & Gbigbi, (2022) and Dong et al., (2020), Islam et al., (2021), Mutaqin & Usami, (2019), Kwadz et al., (2013), Nimoh et al., (2011) and Danso-Abbeam et al., (2014)	Positive	Inconclusive
	Nyaaba et al., (2020) and Okoffo et al., (2016)	Negative	
	Abugri et al., (2017) and Adjei et al., (2016)	No significant effect	
Farm income	Danso-Abbeam et al., (2014)	Positive	Inconclusive
	Nimoh et al., (2011); Okoffo et al., (2016) and Islam et al., (2021)	No significant effect	
Land holding/ Tenure system	Danso-Abbeam et al. (2014); Ngango et al., (2022)	Positive	Inconclusive
	Nimoh et al., (2011)	Negative	
	Mutaqin & Usami, (2019).	No significant effect	
Disaster experience	Abugri et al., (2017)	Negative	Inconclusive
	Mutaqin & Usami, (2019)	No significant effect	
Access to farm credit	Adeyonu et al., (2016), Dziwornu & Assefuah, (2019), Islam et al., (2021)	Positive	Inconclusive
	Ellis, (2017); Ngango et al., (2022); Ojogbane & Gbigbi, 2022)	No significant effect	

Source: Author's summary (2023)

Education: Bannor et al. (2023), using choice experiments together with conditional and random parameter logits, observed that the educational level of farmers is significantly and positively related to poultry farmers' decision to participate in agricultural insurance. This report aligns with the reports of many other studies (Danso-Abbeam et al., 2014; Dong et al., 2020; Mutaqin & Usami, 2019; Ngango et al., 2022; Ojogbane & Gbigbi, 2022; Okeke-Agulu & Salihu, 2019; Okoffo et al., 2016) that also observed that higher formal education increases the propensity of farmers' willingness to participate in farm insurance plans. In sharp contrast with these findings are the results obtained by Abugri et al. (2017) and Kwadz et al. (2013), who suggested that the educational level of farmers is negatively correlated with their WTP for crop insurance. Interestingly, some other studies (Adeyonu et al., 2016; Adjei et al., 2016; Islam et al., 2021; Nimoh et al., 2011) have reported no significant relationship between farmers' educational level and their WTP.

Age: A good number of studies have found the age variable to play a insignificantly role in determining farmers' willingness to purchase agricultural coverage policies. Mention can be made of some studies in Ghana that have recorded an insignificant negative correlation between farmers' age and their WTP for agricultural insurance (Bannor et al., 2023; Dziwornu & Assefuah, 2019; Kwadz et al., 2013). These results agree with the findings of Adeyonu et al. (2016), Ngango et al. (2022) and Mutaqin & Usami (2019) in Nigeria, Rwanda and Indonesia respectively who also arrived at the same conclusions. However, these findings contradict those of Dong et al. (2020) and Ojogbane & Gbigbi (2022) who observed that in China and Nigeria respectively, farmers' age has a positive but insignificant influence on their decision to participate in agricultural insurance schemes.

This notwithstanding, some studies have reported a significant negative correlation between the age variable and farmers' WTP, notably; Abugri et al. (2017) in Ghana, Aina et al. (2018) in Nigeria and Islam et al. (2021) in Bangladesh whilst a few more others concluded that advancement in farmers' age significantly increase the probability of their WTP for agricultural insurance (In Ghana; Adjei et al., 2016; Danso-Abbeam et al., 2014; Ellis, 2017; Okoffo et al., 2016).

Farming experience: Some studies conducted in Ghana have confirmed that advancing in years of experience in farming significantly increases the probability of farmers' decision to take up farm indemnity plans (Bannor et al., 2023; Danso-Abbeam et al., 2014; Nyaaba et al., 2020). These results corroborate the findings of other studies in Nigeria (Adeyonu et al., 2016; Ojogbane & Gbigbi, 2022) and elsewhere in Bangladesh (Islam et al., 2021). Conversely, Okeke-Agulu & Salihu (2019) observed in a study in Nigeria that increasing years of farming reduces the probability of farmers' participation in farm insurance systems. It is also worth mentioning that studies by Abugri et al. (2017), Kwadz et al. (2013), Dziwornu & Assefuah (2019) and Ellis (2017) revealed that farming experience plays an insignificant role in determining farmers' insurance purchase decisions.

Household size: It is suggested that larger households have a lesser probability of WTP for agricultural insurance. This is attributed to the findings of Bannor et al. (2023), Nyaaba et al. (2020), Okoffo et al. (2016) and Danso-Abbeam et al. (2014) from studies conducted across different districts in Ghana and Aina et al. (2018) in Nigeria who observed a significant negative relationship between household size and farmers' WTP. Contrary to these findings, Kwadz et al. (2013) reported that large family size positively and

significantly influenced farmers' WTP for market-based crop insurance in the Kintampo North Municipal of Ghana. Yet, other studies recorded an insignificant relationship between household size and WTP (Adjei et al., 2016; Ngango et al., 2022; Okeke-Agulu & Salihu, 2019).

Farmers' awareness of Agricultural insurance: Knowledge about a commodity plays a key role in consumers' decision to purchase the good. Available literature at the disposal of the researcher conducting this current study suggests that in Ghana, farmers' knowledge and awareness of the availability of agricultural insurance positively and significantly influenced farmers' decision to purchase agricultural insurance. This revelation could be attributed to the similar observations made by Ellis (2017), Nyaaba et al. (2020) and Abugri et al. (2017) who concluded that a significant and positive relationship exists between farmers' awareness of the availability of agricultural insurance and their WTP. Elsewhere in Nigeria, Rwanda and China respectively, results of similar studies by Adeyonu et al. (2016), Ojogbane & Gbigbi, (2022), Ngango et al. (2022) and Dong et al. (2020) corroborates those reported in Ghana.

Farmer's / household income: It is said that effective demand for a good is backed by the ability to pay. Farmers' income level was discovered to be a significant positive determinant of their WTP (Abugri et al., 2017) which is consistent with a study by Islam et al. (2021) in Bangladesh who concluded that an increase in household annual income increases the probability of farmers adoption of crop insurance to manage risks. In related studies, Ojogbane & Gbigbi, (2022), Ngango et al. (2022) and Ellis (2017) also established

a positive association between household income level and the WTP for agricultural insurance.

Off-farm job / other source of income: Bannor et al. (2023) observed that poultry farmers who engaged in other forms of income-generating ventures (off-farm jobs) were more inclined to pay higher prices for poultry insurance. This finding is in line with that of Dziwornu & Assefuah (2019) but contradicts those of Nimoh et al. (2011) and Aina et al. (2018) who recorded a significant negative correlation between other sources of income and the WTP decisions of farmers. They observed that farmers who use off-farm jobs as risk mitigating strategy invest less in insurance. A considerable number of studies rather found an insignificant correlation between the off-farm job variable and WTP (Adjei et al., 2016; Islam et al. 2021; Kwadz et al., 2013; and Ngango et al., 2022).

Farmers' risk perception and risk attitude: The high perception of poultry farmers about the impact of diseases on poultry production significantly and positively influenced their decisions to participate in poultry farm insurance policies in the Dormaa municipality of Ghana (Adjei et al., 2016). This finding is in tandem with Dong et al. (2020) who reported that herders with a high-risk perception of natural disasters demonstrated a stronger desire to pay for livestock husbandry insurance in China. Reardon (2001) observed that farmers who are risk-averse in their attitudes were more inclined to adopt agricultural insurance as a risk management strategy, to lessen the negative effects of risks.

The finding of Islam et al. (2021) agrees with that of Reardon (2001) as they concluded that farmers' risk-averse attitudes significantly and positively influenced farmers' decision

to purchase crop insurance policy. However, their study discovered a positive but no significant relationship between farmers' risk perception (flood risk) and their willingness to subscribe to crop insurance. Contrary to Reardon (2001) and Islam et al. (2021) reports, Mutaqin & Usami (2019) found a positive relationship between farmers' risk-loving behaviour and their desire to purchase agricultural production-cost insurance. They concluded that risk-loving farmers were more likely to buy agricultural insurance in Indonesia. A study by Ngango et al. (2022) however, recorded a negative but insignificant correlation between the risk-averse attitude of crop farmers and WTP for agricultural insurance in Rwanda.

It is worth noting that farmers' marital status, gender and experience in insurance purchase featured less in the models used for analyzing farmers' socioeconomic characteristics that influence their participation in agricultural insurance.

2.6.2 Farm characteristics/Institutional networks that determine farmers' WTP

***Farm / Flock size*:** The number of poultry birds kept by a farmer at a time and the size of the cropped area have been found to have varied influences on farmers' WTP for agricultural insurance. In Nigeria and China, studies by Ojogbane & Gbigbi (2022) and Dong et al. (2020), respectively found a positive and significant influence of flock size on poultry and livestock farmers' decision to participate in agricultural insurance schemes.

With respect to crop producers, Islam et al. (2021) in Bangladesh, Mutaqin & Usami (2019) in Indonesia, Kwadz et al. (2013), Nimoh et al. (2011) and Danso-Abbeam et al. (2014) in Ghana, all reported a significant and positive relationship between crop farm size and farmers' WTP and concluded that increasing farm size increases the probability of a

farmer's choice to subscribe to insurance. These findings, however, are at variance with those of Nyaaba et al. (2020) and Okoffo et al. (2016) who established that an increase in farm size reduces the probability of farmers' WTP for insurance in Ghana. Interestingly, Abugri et al. (2017) and Adjei et al. (2016) reported an insignificant relationship between WTP and farm size in Ghana.

Farm Income: The income generated from a farm enterprise is expected to influence farmers' decision to insure the farm enterprise. Danso-Abbeam et al. (2014) observed a positive significant influence of farm income on cocoa farmers' insurance purchase decisions in the Western region of Ghana. Thus, cocoa farmers who obtain higher returns from their farms are more likely to pay for farm insurance than those who get less farm income. Studies in other regions of Ghana (Nimoh et al., 2011; Okoffo et al., 2016) and elsewhere in Bangladesh (Islam et al., 2021) have reported an insignificant correlation between income from farms and farmers' insurance subscription decisions.

***Landholding/Tenure*:** Land tenure practiced by crop and livestock farmers is expected to have a significant influence on farmers' decision to participate in agricultural insurance schemes. Similar results were obtained by Danso-Abbeam et al. (2014) and Ngango et al. (2022) as they established from studies in Ghana and Rwanda respectively that farmers who used their land for production have a higher probability of subscribing to crop insurance policies than their counterparts who used rented lands for production. Conversely, Nimoh et al. (2011) reported a significant inverse association between land ownership and the propensity of farmers in Ghana to purchase farm insurance. A similar study in Indonesia recorded a negative but

insignificant correlation between land ownership and smallholder farmers' WTP for agricultural production cost insurance (Mutaqin & Usami, 2019).

***Disaster experience/Farm exposure to risk*:** High farm risk level was observed to be positively and significantly related to farmers' willingness to pay for drought-index crop insurance in Ghana but the experience of damage caused by extreme climate events (disaster experience) was negative (Abugri et al., 2017). However, Mutaqin & Usami (2019) observed no significant effect of disasters experienced by farmers on their interest in subscribing to agricultural insurance. Other farm characteristics which did not feature predominantly in the reviewed studies include, cost of investment/production cost, Farm diversification and farm location.

***Access to Credit*:** Access to credit by poultry farmers from financial institutions was observed to have a direct correlation with farmers' interest in obtaining agricultural insurance in Oyo state Nigeria (Adeyonu et al., 2016). This finding is in line with the results of Dziwornu & Assefuah (2019) and Islam et al. (2021) who reported that farmers who can access agricultural credit had a higher probability of taking up insurance for their farms than farmers who did not have access to farm credit. These findings contradict the results produced from a study in Nigeria that reported that access to credit significantly and negatively influenced farmers' decision to participate in an index-based livestock insurance scheme (Aina et al., 2018). Other studies found an insignificant relationship between access to credit and farmers' WTP for agricultural insurance (Ellis, 2017; Ngango et al., 2022; Ojogbane & Gbigbi, 2022).

***Member of farmers' Association*:** Farmers who belong to the farmers' group were observed to demonstrate a higher willingness to pay for insurance for their maize farms

than those who did not belong to a farmer's association. This conclusion was brought to bear in a study by (Ngango et al., 2022). This finding corroborates that of Aina et al. (2018) but contradicts the results obtained by Adeyonu et al. (2016) who established that poultry farmers who belonged to the farmers group were less willing to join the National Agricultural Insurance Scheme (NAIS) in Nigeria. Ojogbane & Gbigbi (2022) found no significant association between farmers' WTP and being a member of a farmers' association.

***Access to Extension service*:** Interestingly, a few analyses that included access to extension as a deterministic variable produced results that showed that the availability of extension services to farmers did not significantly affect their inclination to purchase agricultural insurance (Adeyonu et al., 2016; Ngango et al., 2022; Ojogbane & Gbigbi, 2022). However, a significant and positive relationship was recorded by Ellis (2017) in Ghana and Mutaqin & Usami (2019) in Indonesia.

2.6.3 Attributes of Agricultural insurance package that determine farmers' WTP

Key attributes of hypothetical agricultural insurance packages whose significance were tested in various studies include; premium (price), frequency of payment (period of premium), kind of participation, kind of peril covered and expected indemnity (compensation). From a discrete choice experiment analysis, it was concluded that the price and participation type played a significant negative role in poultry farmers' decision-making regarding poultry enterprise insurance, whilst the premium period and kind of disaster covered directly influenced farmers' participation in poultry insurance in Ghana.

The study further suggested that poultry farmers demonstrated a stronger desire to participate in individual insurance contracts than in group contracts and that insurance packages for production risk were preferred to insurance schemes for marketing risks (Bannor et al., 2023). In line with the results of Bannor et al. (2023), Mutaqin & Usami (2019) discovered a significant negative relationship between premium and farmers' WTP. Similarly, Dziwornu & Assefuah (2019) reported that government subsidies on premiums positively impacted farmers' decision to obtain poultry insurance in Ghana.

Conclusion on Literature Review:

A broad strand of literature indicate that the agricultural sector globally is challenged with many performance-stifling risks and uncertainties, but more in the developing economies in particular. To counter this, farmers adopt a wide range of risk mitigating strategies including agricultural insurance. The review of literature has provided insight into varied risk management strategies employed by farmers. For agricultural insurance, diverse willingness to pay elicitation techniques and analytical models employed by researchers in various studies have been unearthed. It has been brought to light that the contingent valuation method is the predominant elicitation procedure employed in WTP studies. The review highlighted several analytical models relied upon by researchers to analyze the factors impacting farmers' WTP for agricultural insurance including multinomial logit, Tobit model, and double hurdle model, with binary logit and probit models dominating all other models. The review has also informed the choice of analytical methods to be used, key concepts and the variables to include in the models as well as the expected outcomes of the variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Various sections of this chapter discuss the study area, data source and sampling techniques applied in this survey, the conceptual framework guiding the study, the theoretical and analytical framework which shows the various models and data analysis techniques employed to meet the research objectives. The final part of this chapter presents definitions of the model variables, the criteria for measuring them and their a priori expectations.

3.2 Study Area

The study was conducted in the Tamale Metropolis and surrounding communities in the Northern Region of Ghana. The Tamale Metropolis is one of the 26 districts in the Northern Region. It is in the central part of the Region and shares boundaries with the Sagnarigu District to the west and north, Mion District to the east, East Gonja to the south and Central Gonja to the south-west. The Metropolis has a total estimated land size of 646.90180sqkm (Ghana Statistical Service, 2014). Geographically, the Metropolis lies between latitudes 9º16 and 9º 34 North and longitudes 0º 36 and 0º 57 West and about 180 meters above sea level. The metropolis has 115 communities. The Metropolis experiences only one rainfall season per annum. Daily temperatures in the Metropolis vary by season and range between a maximum of 38^0C and a minimum of 27^0C. The average annual rainfall distribution is about 750mm to 1050mm. There are two seasons; the dry season (which is experienced between November and April) and the wet season (experienced between May and October) (Ghana Statistical Service, 2014).

Crop farming, livestock rearing, tree growing as well as fishing are the main types of farming activities undertaken in the metropolis. Crop farming dominates farming activities accounting for 52.9% of the population of urban residents and 47.1% of the rural population. In contrast, 50.2% of the rural populates are engaged in livestock rearing as compared to 49.8% of the urban areas. Generally, farming activities are done at the subsistence level in the metropolis. Chicken, goats and sheep are kept by the largest proportion of the population but on relatively small holdings. About 57% of the urban population is engaged in agriculture compared to 43% in rural localities.

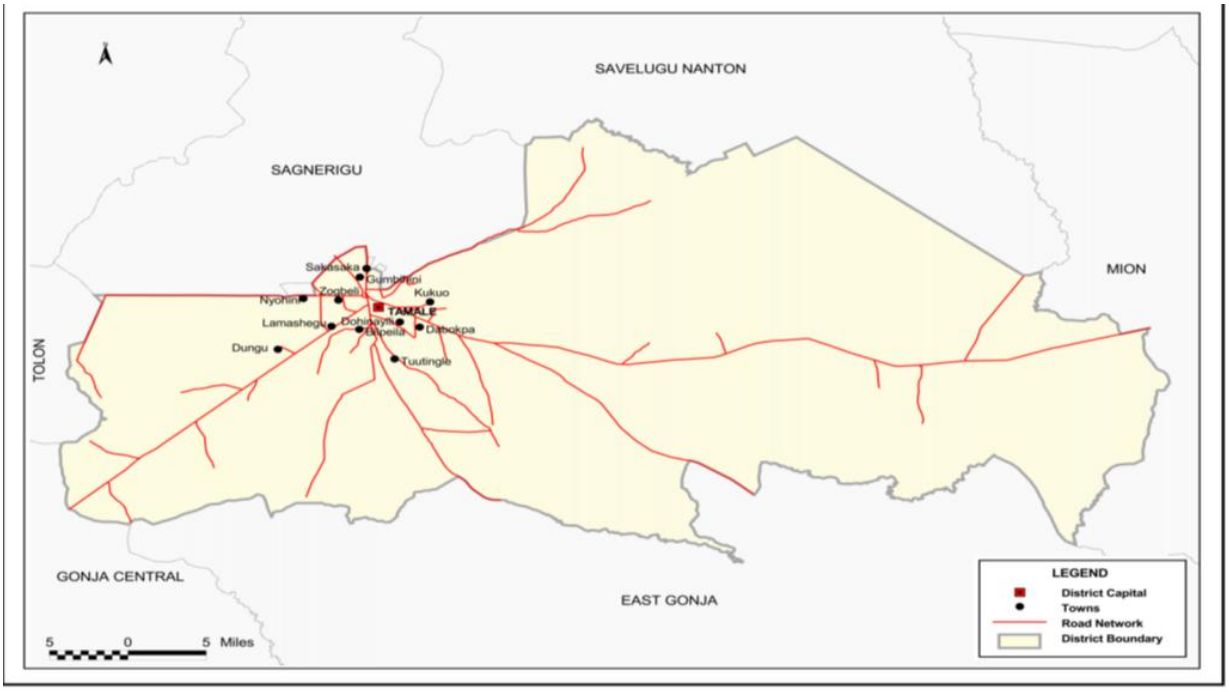

Figure 1: Map of the Study Area : Source: (*Ghana Statistical Service*, 2014)

3.3 Type and Source of Data

This study used cross-sectional data obtained from poultry farmers in Tamale and surrounding communities using a semi-structured questionnaire. Both qualitative and quantitative data were collected for the study. The questionnaire elicited data on farmers'

socio-economic and demographic characteristics (such as sex, age, educational level, and farm income among others). It also elicited farmers' insurance purchase decisions with regards to attributes of poultry insurance products, awareness and knowledge of agricultural insurance, risk perceptions about the poultry business and about insurance subscription, farmers' risk attitudes, farm characteristics, prices farmers desired to pay as premium for their farm insurance and kind of insurance preferred. This made it possible for the researchers to estimate the actual premium farmers were willing to pay and the factors that influenced their decisions to pay. The questionnaires were administered through face-to-face interviews.

3.4 Sampling procedure and sample size

The population of poultry farmers (1027 registered members) in Tamale and surrounding communities constituted the sampling frame for the study. Systematic sampling was employed to randomly select poultry farmers who belong to the Northern Poultry Farmers Association (NPFA) and Women in Poultry Value Chain for the interview. Mobile phone numbers of the farmers were obtained from leaders of the farmers' groups which were listed serially in order of experience in the business. Every other third number starting from the first number (which was randomly chosen) was sampled and interviewed.

Systematic sampling was employed since the arrangement of the names on the list was based on farming experience, thus, the names at the top of the list were more experienced (old members) than those at the bottom (new entrants in the business). Respondents were taken from the two farmer-based organizations as over 95% of poultry farmers in Tamale and surrounding communities (according to the group leaders) were registered with the

groups. A few farmers (about 5%) who were not members of any of the groups were also contacted for the survey.

A total of 240 respondents were targeted for the study. However, only 214 farmers made themselves available for the interview. Farmers who were either out of reach or declined to participate in the survey were subsequently replaced with farmers who did not form part of the initial sample. It is worth mentioning that, interaction with the farmers in a focus group discussion revealed that, only 605 farmers were actively involved in production whilst the rest were temporarily out of business for varied reasons (primarily, due to escalating prices of poultry feed) as explained by their leaders. Against this background, only farmers who were in production were sampled. This explains why the population size (N) of 605 was used in the sample size determination.

The sample size was determined using the Yamane's (1967) formula:

$$n = \frac{N}{1 + N(e)^2} \tag{2}$$

Where: N = population size (605), e = margin of error (0.05)

3.5 Method of data collection and Survey instrument

A comprehensive semi-structured questionnaire was developed and administered through in-person interviews to obtain the primary data. The personal interviews provided an opportunity for the enumerators to explain the questions to the respondents for clarity. This helped obtain more accurate information for the study. It also provided a good platform for the researchers and the respondents to discuss matters beyond those captured in the questionnaire.

The survey instrument (questionnaire) employed to collect data is composed of five (5) parts. *Part I* solicited information on the farmers' risk perceptions about the poultry business, and *Part II* and *III* respectively sought data on farmers' risk attitudes and their risk perceptions about insurance subscriptions. This first part delved into the level of risk farmers associate with poultry production. It also captured the risk levels farmers associate with different risk dimensions that pose a threat to the business and concludes with farmers' levels of agreement or disagreement with statements that assessed the farmers' risk behaviours in some life domains. *Part IV* gathered information on the amount poultry farmers were willing to pay as a premium for their farm insurance while *Part V* captured socio-economic and demographic characteristics of poultry farmers and other factors (such as farm characteristics and attributes of the poultry insurance package) that influenced their decision to pay premium to purchase poultry insurance.

3.6 Preliminary survey

The questionnaire was subjected to a preliminary test in a pilot survey with twelve (12) poultry farmers/respondents which was followed subsequently by a focused group discussion involving a cross-section of the leaders of the farmers' association and some farmers who were attending a training workshop on handling and processing poultry products. The preliminary testing of the questionnaire was conducted to measure the level of understanding of the questions by respondents and ascertain how feasible it would be. It helped to identify some lapses in the questionnaire and provided relevant information to address these lapses. For instance, the initial total cost of stocking 300 birds used in

estimating the hypothetical bids was revised upwards, and so as the WTP bids which were calculated per 300 birds initially were revised to per bird to facilitate understanding. The focus group discussion provided a good platform to validate the questionnaire and offered the opportunity for the leaders of the farmers' groups to officially introduce the researcher to a cross-section of the farmers. This also helped create awareness among the farmers about the mission of the researchers before the actual survey was carried out.

3.7 Conceptual Framework

In line with the utility and Landcaster demand theories mentioned earlier, the researcher has the conception that farmers' adoption of insurance to alleviate the effects of risks on their livelihoods is subject to the expected benefits of subscribing to the scheme and the attributes of the insurance package. Besides these qualities, the socioeconomic characteristics of the farmers could be significant determinants of poultry farmers' insurance purchase decisions.

Based on the literature consulted, it is expected that the amount to be paid as a premium, the kind of peril covered by the scheme, the premium period and the expected indemnity are major attributes of an insurance scheme that could influence farmers' decision to purchase poultry insurance (Bannor et al., 2023). Farm characteristics such as flock size, farm location and risk exposure are variables that are also expected to play a vital role in determining farmers WTP for insurance. A few socioeconomic characteristics that the study anticipates to influence farmers' WTP include age, educational level, family size,

other sources of income, farmers' risk perceptions of poultry business and farming experience.

The conceptual framework is summarized below in Figure 2.

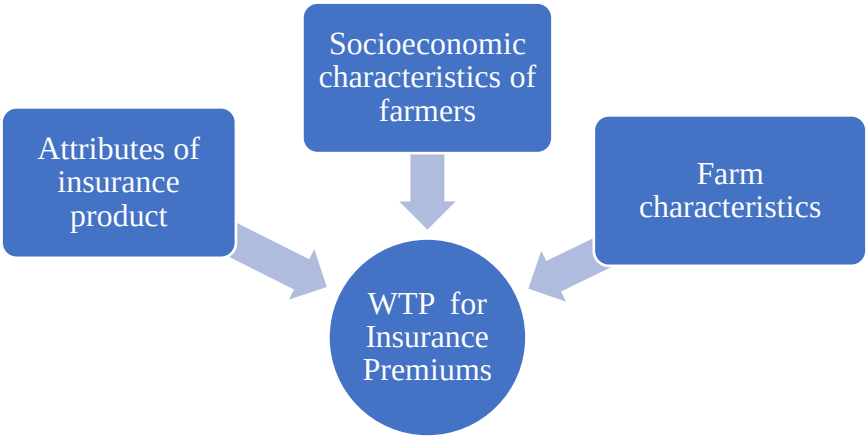

Figure 2. Conceptual Framework

3.8 Theoretical Framework and Models

The appropriate framework for explaining consumers' preferences for alternatives with similar or unrelated attributes usually relies on the traditional random utility and the Lancaster demand theory. The utility maximization theory suggests that given a set of alternatives; a consumer would choose a commodity that offers the highest satisfaction. The Lancaster theory on the other hand postulates that a commodity per-se does not give utility to the consumer, rather utility comes from the commodity's attributes. WTP for poultry insurance is a consumer (farmer) preference concept and therefore rests on the utility maximization and Lancaster demand theories. Therefore, the farmer's decision to take up or reject the insurance policy rests on the expected utility the farmer derives from choosing to pay and that of declining to pay for an insurance package. Analyzing the WTP

and the factors influencing observed decisions can be done using economic choice probability models (McFadden, 1982). The utility function could be expressed as;

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (3)$$

Where: U_{ij} is the utility function, V_{ij} is observed deterministic component

ε_{ij} is the unobserved random component

The behavioural model of the decision maker is thus; choose alternative j over q if and only if alternative j provides the greatest utility ((i.e., $U_{ij} > U_{iq}$ where j ≠ q). (4)

The probability of the consumer maximizing utility for commodity j over commodity q is given by:

Prob ($U_{ij} \geq U_{iq}$) = F (x_{ij}, b_{ik}) + e_{ij} ≥ F (x_{iq}, b_{ik}) + e_{iq} for j ≠ q (5)

Following from the above and the work of (Guo, 2015) the analysis below could be made: Given that U_0 is the utility level if a farmer declines a subscription, and U_1 is the utility level if a farmer chooses to subscribe to poultry insurance. Theoretically, U_0 is influenced by the income (Y_0) level of the farmer, prices (p_0) of a vector of goods (q_0) [such as production inputs] and a vector of the farmer's demographic characteristics (Z). Similarly, U_1 is affected by the new income level (Y_1) after paying a premium for the insurance, prices (p_0) of a vector of goods (q_1), the premium amount (WTP) and a vector of demographic characteristics (Z).

Intuitively, the farmer's new income (Y_1) is equal to the original income (Y_0) less the premium amount, thus, $Y_1 = Y_0 - WTP$. Consequently, the new vector of goods (q_1) owned by the farmer after paying the premium to subscribe to the policy would be q_0 plus an additional good, which is the poultry insurance policy in this case. The farmer will

choose to subscribe to the policy granting that the new utility (U_1) is at least **not** lower than the original utility (U_0). Thus:

$$U_1\ (Y_0\ - WTP, p_0,\ q_1\ Z) \geq U_0\ (Y_0,\ p_0, q_0\ Z) \quad (6)$$

The probability that a farmer pays an insurance premium to subscribe is equal to the probability that equation (6) holds;

$$P_r\ (yes) = P_r\ (U_1\ (Y_0\ - WTP, p_0,\ q_1,\ Z) \geq U_0\ (Y_0,\ p_0, q_0,\ Z)) \quad (7)$$

Since q_1 is equal to q_0 plus an additional good ($q_1 = q_0 + 1$) we could rewrite equation (6) as:

$$U_1\ (Y_0\ - WTP, p_0,\ q_0\ + 1,\ Z) \geq U_0\ (Y_0,\ p_0, q_0\ Z) \quad (8)$$

It is expected that a farmer who has subscribed to the insurance policy would be paid indemnity in the event of peril and when the coverage conditions are met. This would imply that the farmer who has suffered a loss (L) gets a pay (G) that corresponds to the loss. Hence, equation (8) could be rewritten as:

$$U_1\ (Y_0\ - WTP + G - L, p_0,\ q_0\ + 1,\ Z) \geq U_0\ (Y_0,\ p_0, q_0\ Z) \quad (9)$$

From equation (9), the probability that a farmer purchases the insurance product could be revised as:

$$P_r\ (yes) = P_r\ (U_1\ (Y_0\ - WTP + G - L, p_0,\ q_0\ + 1,\ Z) \geq$$

$$U_0\ (Y_0,\ p_0, q_0\ Z) \quad (10)$$

3.9.0 Data and empirical models of analysis

3.9.1 Poultry farmers' risk perception

Poultry farmers' risk perceptions of poultry production were assessed using DOSPERT on a 5-point Likert scale adapted from Blais & Weber, (2006). A Likert scale that assessed farmers' risk perceptions of poultry enterprises in terms of 1 (Not at all Risky), 2

(Somewhat Risky), 3 (Moderately Risky), 4 (Risky), and 5 (Very Risky) was used. The variable risk perception of poultry business was generated as a dummy variable (1 if a farmer rated it risky/very risky and 0 if otherwise) and included in the ordered logit model to ascertain its significance or otherwise in influencing farmers' insurance subscription decision.

Generally, risks confronting farmers take different dimensions which are grouped into climatic/production risks, market risks, biological risks and financial/institutional risk sources (Akhtar et al., 2019, Bannor et al., 2023). Farmers' risk perceptions about the different kinds of risks under these dimensions were analyzed using the summative model for assessing risk perception which explains risk perception as the sum of outcome probability (incidence) and outcome severity.

Adapting the risk factor score (incidence score + severity score) of Ullah & Shivakota (2014) and following the risk matrix generated by Rosenberg et al. (1999) and Cooper (2005) as cited by Akhtar et al., (2019), a 5-point Likert Scale was used and farmers were tasked to score the incidence and severity of each kind of risk under the dimensions. A Likert scale that assessed the perceived incidence (frequency of occurrence) of each risk kind from 1 (Never occurred), 2 (Rarely Occurs), 3 (Occurs sometimes), 4 (Occurs often) to 5 (Occurs Very often) was used. Similarly, a Likert scale that assessed the perceived severity (degree of negative impact) of each risk kind from 1 (Very low), 2 (Low), 3 (Moderate), 4 (High) to 5 (Very high) was used. Following the risk matrix mentioned above, risk factor scores less than or equal to five (5) were classified as a low-risk event, whilst a score of between six (6) to ten (10) was classified as a high-risk event.

3.9.2 Farmers risk attitudes

Farmers' risk attitudes were measured using the DOSPERT scale. Farmers were categorized as Risk-loving, Risk-neutral and Risk-averse based on the scores of a set of statements adapted from Adjei et al. (2016) and Blais & Weber (2006) that assessed farmers' risk behaviours in three(3) domains. Farmers were asked to indicate their level of agreement or otherwise to the set of risk-taking statements. The responses were evaluated using a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) to measure the likelihood of respondents engaging in such risky behaviours. Adapting the risk matrix of Rosenberg et al. (1999) and Cooper (2005), farmers whose total score was less than or equal to twenty (20), exactly equal to twenty-one (21) and between twenty-two (22) and thirty-five (35) were respectively classified as risk averse, risk neutral and risk loving. Refer to Appendix A part II for details on risk-taking statements and scores.

3.9.3. Poultry Farmer's Willingness to Pay for Farm Insurance

Following Aina et al. (2018), willingness to pay for poultry insurance could be defined as the amount of money a farmer would be willing to pay as a premium to subscribe to the insurance scheme subject to his income, risk preferences, and other background characteristics.

Common methods used by researchers to elicit the actual amounts of money farmers are willing to pay for farm insurance are the contingent valuation method and discrete choice experiment. This study employed the contingent valuation method (CVM) to elicit the premiums poultry farmers were willing to pay to insure their farms. A hypothetical poultry

insurance product (adapted from GAIP, 2023) was designed and used for the elicitation of farmers' WTP. The WTP bids used for this survey were estimated based on a formula adapted from GAIP 2023 poultry insurance scheme. The first, second and third bids correspond to 3%, 4% and 5% of the total initial investment cost of stocking 300 birds excluding the cost of the farm structure at the time the farmers were contacted. A detailed description of the hypothetical insurance product is found in part IV of Appendix A.

The CVM offers several approaches for data elicitation including the bidding game technique, the open-ended format and the closed-ended format. The closed-ended format takes different forms which include the payment card approach and the discrete/dichotomous choice formats. The discrete choice format is further categorized into the single-bound dichotomous choice and the double-bounded dichotomous choice elicitation formats, (Champonnois, 2018; Watson and Ryan, 2007). In this study, the data set on farmer's willingness to pay was elicited from respondents using the closed-ended CVM. Specifically, the double-bounded dichotomous choice format together with the bidding game elicitation method was used. In the open-ended CVM, respondents are asked to state the maximum amount they are willing to pay for a good. This method provides inadequate information about the new product to the respondent. As a result, the respondent may not give realistic estimations since they are unable to take into account the value associated with the product in a real-world market scenario (Carson et al., 2001; Arrow et al., 1993, cited in Amfo et al., 2019). It is also argued that the single-bounded approach is statistically inefficient and requires a substantial sample size (Hanemann et al.,1991; cited in Amfo et al., 2019).

The closed-ended CVM was chosen for this study because it helps provide realistic estimates (Carson et al., 2001 cited in Amfo et al., 2019)). Thus, it offers respondents adequate information about the new product (poultry insurance in this case) and allows respondents to evaluate the value of the product if a market were to exist. It minimizes the reasoning task of the respondent and makes it easier for respondents to answer than the open-ended format as it mimics that which transpires between buyers and sellers in the commodity market. Calia (1998) argued that the DBDC is more efficient than the SBDC estimator. The discrete choice experiment is an alternative to the CVM. However, the procedure adopted to design the hypothetical insurance package used for this study did not give room to provide alternative packages with differing attributes that farmers could value. Hence, the CVM was more appropriate since it captures the overall value of the good (insurance package) but not values attached to particular attributes.

In the elicitation process, a detailed description of the hypothetical insurance product was provided to respondents. After providing detailed information, farmers were asked if they would be willing to pay a premium to subscribe to such a contract. If the respondent expressed the desire to pay, then he/she was subsequently asked to state whether they would be willing to pay a certain premium (first bid). The first bid was randomly chosen from a hat containing three price premiums corresponding to 3%, 4% and 5% of the total initial investment cost of stocking 300 birds.

The monetary equivalents of the percentage bids respectively were GH₵300, GH₵450 and GH₵600 per 300 birds per production cycle (also equivalent to GH₵1.00, GH₵1.50 and GH₵2.00 per bird per production cycle). For reasons of simplicity and clarity, the latter bids would be used in subsequent discussions. If the response was yes for the first bid, a

second higher bid was presented to the respondent to decide whether to pay. However, if the response to the first bid was no then a second lower bid was presented to the respondent to decide whether S/he will be willing to pay or not. Farmers who declined to pay any premium were denoted by zero WTP. The last bid each farmer agreed to pay was recorded as the farmer's maximum willingness to pay. The structure of the willingness to pay elicitation process is shown in Figure 3 below:

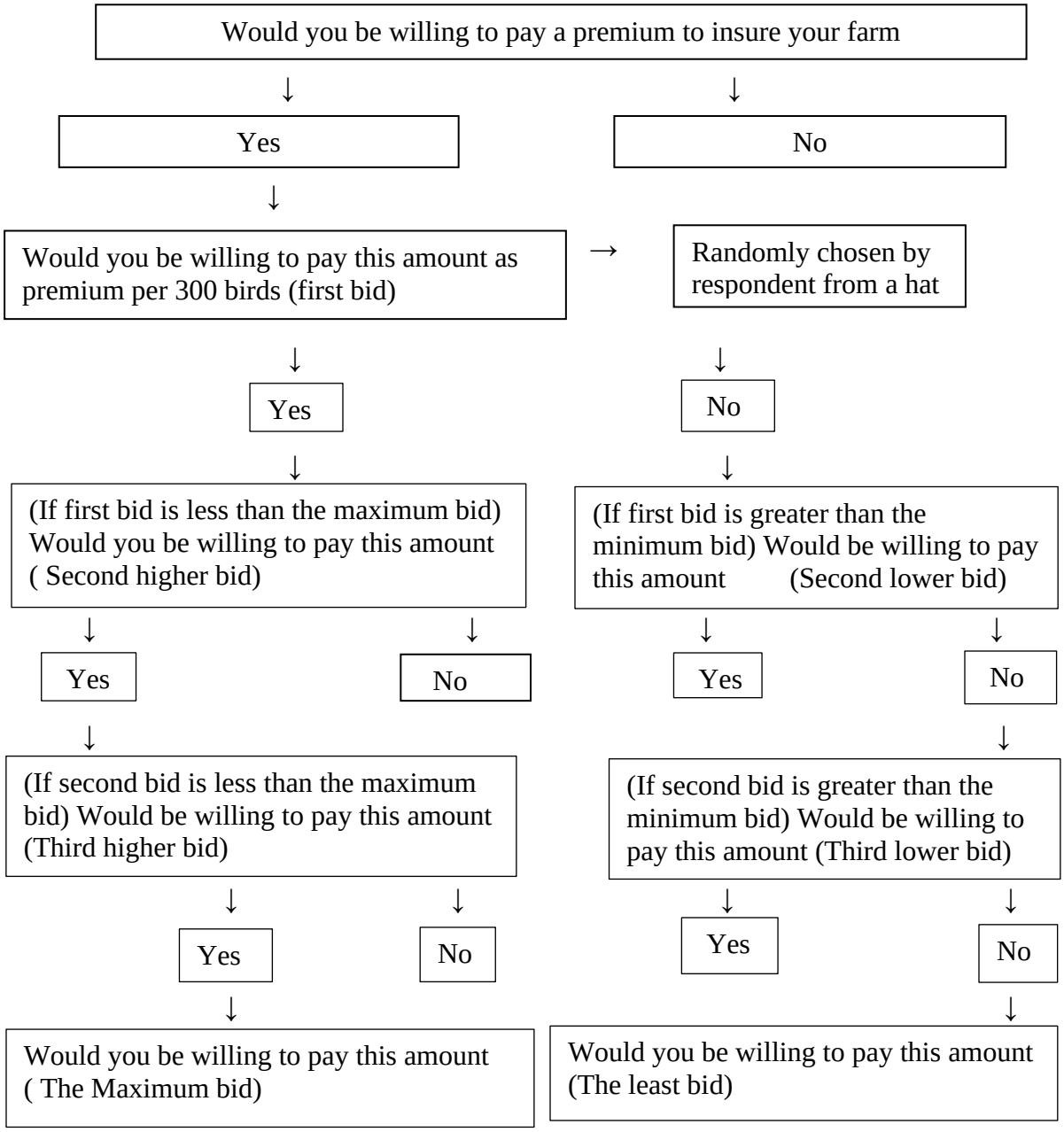

Figure 3. Structure of the WTP elicitation process

3.9.4 Economic theory and Modelling of the DBDC elicitation format

Whereas in the single-bounded CVM, the respondent is required to provide a straightforward YES or NO answer to just one bid, in the double bounded, the respondent has the task to take a YES or NO decision on many bids as illustrated in Figure 2 above. Consequently, each respondent would give two (2) responses to two (2) successive bids. This produced four (4) likely response outcomes; 'NO-NO', 'NO-YES', 'YES-NO' and 'YES-YES'. A respondent who answers 'NO-NO' would be considered as not ready to offer any amount for farm insurance (not willing to subscribe to insurance policy), a 'NO-YES' response depicts willingness to pay the 3% bid price (GH₵1.00/bird), a 'YES-NO' signifies willingness to pay the 4% bid price (GH₵1.50/bird) whilst a 'YES-YES' implies willingness to pay the 5% bid (GH₵2.00/bird) as maximum willingness to pay. Following the elicitation procedure, the response of a farmer (y_i) assumes ordinal values which proxy the utility derived from his/her choice as follows:

$$\begin{aligned} y_i &= 0 \quad \text{if} \quad C_1 > U \\ y_i &= 1 \quad \text{if} \quad C_1 < U < C_2 \\ y_i &= 2 \quad \text{if} \quad C_2 < U < C_3 \\ y_i &= 3 \quad \text{if} \quad C_3 < U \end{aligned} \tag{11}$$

Where U is the utility, y is the consumer's WTP bid amount, C values are the threshold parameters linking the farmers' utility to their WTP and 0, 1, 2 and 3 respectively represent the four outcome categories, thus, 0 WTP, WTP lower bid (GH₵1.00/bird), WTP moderate bid (GH₵1.50/bird) and the WTP higher bid (GH₵2.00/bird). In the ordered choice models, an underlying score is estimated as a linear function of the explanatory variables and a set of cut points. The probability of observing outcome j corresponds to the

probability that the estimated linear function, plus the random error, is within the range of the cut points estimated for the outcome.

$$P_r\,(WTP_i = \mathrm{j}\,|\,\mathrm{X}) = P_r\,(\,C_{j-1}\; < X_i'\beta + \varepsilon_i \leq\; C_j\,) \qquad (12)$$

Under such ordered response conditions, the probability of the j-category follows a logistic distribution, hence, equation (12) is re-specified by Maddala (1983) as:

$$P_r\,(WTP_i = \mathrm{j}\,|\,\mathrm{X}) = \wedge\,(\,C_j\; -\; X_i'\beta\,) - \wedge\,(\,C_{j-1}\; -\; X_i'\beta\,) \qquad (13)$$

(standard formula for the predicted probability in the ordered response model)

Where; $\wedge$ is the logistic cumulative distribution function of ε_i

So, for the four outcome categories (0WTP, WTP GH₵1.00, WTP GH₵1.50 and WTP GH₵2.00/bird) the probability of each outcome could be modeled as follows:

$$\left\{\begin{array}{c} P_r\,(WTP_i\; =\; 0\,|X_i\,) = \wedge\,(-\,X_i'\beta\,) \\ P_r\,(WTP_i\; =\; \mathrm{GH₵1.00}\,|X_i\,) = \wedge\,(\,C_1\; -\; X_i'\beta\,) - \wedge\,(-\,X_i'\beta\,) \\ P_r\,(WTP_i\; =\; \mathrm{GH₵1.50}\,|X_i\,) = \wedge\,(\,C_2\; -\; X_i'\beta\,) - \wedge\,(\,C_1\; -\; X_i'\beta\,) \\ P_r\,(WTP_i\; =\; \mathrm{GH₵2.00}\,|X_i\,)\; =\; 1\; -\; \wedge\,(\,C_2\; -\; X_i'\beta\,) \end{array}\right\} \qquad (14)$$

Where:

P_r = probabilities, WTP_i= decision of the i^{th} farmer to pay a certain bid, c = cut-points representing WTP bids, $X_i'\beta$ = characteristics of the respondent that determine his/her choice

3.9.5 Estimating Mean Willingness to Pay (*MWTP*)

Following Lusk and Hudson (2004), the maximum bids reported by the respondents were used to estimate the *MWTP* as follows:

$$MWTP = \frac{1}{n}\sum_{i=1}^{n} MaxWTP \quad (15)$$

Where: n is the sample size, $MaxWTP$ is the reported maximum willingness to pay

3.9.6 Determinants of farmers' willingness to pay for Poultry Insurance

Analysis of consumers' WTP for a given commodity could be achieved by several analytical tools. The models commonly employed include but are not limited to; binary logit or probit models, Tobit models, ordered and multinomial logit forms of random utility model. To analyze the factors that influenced poultry farmers WTP different levels of premiums this study used the ordered logistic regression model. The ordered response model was assumed because the responses are logically ordered alternatives (price premiums). Greene (2002) asserted that though in such instances the outcomes are discrete, the ordinal nature of the response variable cannot be explained by the multinomial probit or logit models.

The level of bid chosen by the respondent could be modeled as follows; given that WTP_i is the dependent variable and assumes values zero (0) through j categories. The probability of a farmer choosing to pay a particular level of bid WTP_i is conditional on P_i = 1, thus, P_r ($WTP_i \mid P_i$ = 1). Each respondent reveals the strength of his preference with respect to the level of the bid chosen. The observed response (WTP_i) categories are tied to a latent regression of the form:

$$WTP_i^* = X_i\beta + \varepsilon_i \quad (16)$$

Where:

WTP_i^* is the propensity to choose the different levels of bids, X_i is a vector of independent variables determining the level of bid chosen and ε_i is the random error term

that follows a logistic distribution. The observed outcome is discrete and would be coded as follows:

$$WTP_i = \begin{Bmatrix} 0 \; if \; WTP_i^* \leq C_1 \\ \text{GH₵1.00} \; if \; C_1 < WTP_i^* \leq C_2 \\ \text{GH₵1.50} \; if \; C_2 < WTP_i^* \leq C_3 \\ \text{GH₵2.00} \; if \; C_3 < WTP_i^* \end{Bmatrix} \quad (17)$$

Where:

C_1 , C_2, and C_3 are unknown thresholds or cut points to be estimated.

3.9.6.1 The Empirical model

The empirical model for analyzing the factors influencing poultry farmers' willingness to pay (WTP) price premiums for poultry insurance could be specified as:

$$Y_{ij} = \beta_0 + \beta_1 Age + \beta_2 Edu + \beta_3 Gend + \beta_4 Crd\_Acc + \beta_5 Ext + \beta_6 Fgrp + \beta_7 OFI + \beta_8 RP + \beta_9 Ins\_S + \beta_{10} HHS + \beta_{11} Ins\_Aware + \beta_{12} F\_Exp + \beta_{13} LT + \beta_{14} D_{Exp} + \beta_{15} FI + \beta_{16} FS + \beta_{17} Att\_1 + \beta_{18} Att\_2 + \mu_i \quad (18)$$

Where: Y_{ij} is the response variable and represents the willingness of the i^{th} farmer to pay for the j^{th} alternative (Last bid accepted), β_0 is the constant term, the remaining beta values (β_1 – β_{18}) are the coefficients of the corresponding stimulus variables to be estimated and μ_i is the error term that accounts for the unexplained variations in the dependent variable.

Respectively, β_1 *to* β_{18} of the explanatory variables are defined in Table 2 as follows: Age of respondent (*Age*), Number of years respondents have spent in formal education (*Edu*), Gender of respondent (*Gend*), Whether farmer has access to credit (*Crd_Acc*), Whether farmer has access to extension service (*Ext)*, Membership of a farmer group (*Fgrp*), Income accruing from off farm activities (*OFI)*, Farmers risk perception about

poultry enterprise (*RP*), Whether respondent has subscribed to other forms of insurance (*Ins_ S*), Farmers household size/number of dependents (*HHS*), Whether respondent is aware of the availability of poultry insurance in the study area (*Ins_Aware)*, Farming experience / number of years respondent has been in poultry production (*F_Exp*), Whether farmer produces on own farmland, family land or rented land (*LT*), Whether farmer has experienced disaster before (*D_Exp*), Farm income accrued from previous production season (*FI*), Number of birds reared by farmer / Flock size (*FS*), Risk averse attitude of respondent (*Att_1*), Risk neutral attitude of respondent (*Att_2*), and Risk loving attitude of respondent (*Att_3)* set as bench mark.

Given the outcomes illustrated in equation (17) above, the parameters of the model could be consistently and efficiently estimated using the maximum likelihood (ML) estimation criteria. Farmers' sociodemographic characteristics were analyzed using descriptive statistics and the results were presented using tables. Stata 17 was used for the data analysis.

Table 2**: Independent variables used in the analysis of the determinants of farmers WTP**

Variable	Description	Measurement	Expected sign
Age	Age of respondent	In years	+
Edu	Educational level	Number of years	+
Gend	Gender	Dummy, 1 if male, 0 if female	+
Crd_Acc	Access to credit	Dummy, 1 if a farmer has access, 0, otherwise	+
Ext	Access to extension	Dummy, 1 if a farmer has access, 0, otherwise	+/-
Fgrp	Farmer group member	Dummy, 1 if a farmer belongs to the farmers' group, 0, otherwise	+/-
OFI	**Off-farm** income	Amount in Ghana cedis	+
RP	Risk perception of Poultry production	Ratings, 1 if the farmer risk rating is high, 0 if low	+
Ins_S	Insurance subscription experience	Dummy, 1 if farmer has subscribed, 0, otherwise	+/-
HHS	Household size	Number of dependents	-
Ins_Aware	Farmers awareness of insurance	Dummy, 1 if a farmer is aware of insurance, 0, otherwise	+
F_Exp	Farming experience	Number of years in production	+/-
LT	Land holding type	Dummy, 1 if the farmer owns farmland, 0, otherwise	+
D_Exp	Disaster experience	Dummy, 1 if a farm has been hit by a disaster before, 0 otherwise	+
FI	Farm income	Amount of farm income in GH₵	+
FS	Flock size	Number of birds kept	+
*Attit_*	Farmer's risk attitude	Categorical: 1 if risk averse	+
		2 if risk-neutral	+/-
		3 if risk-loving	+/-

CHAPTER FOUR (4)

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents findings of the analysis of the data collected from two hundred and fourteen (214) poultry farmers in Tamale and surrounding communities in the Northern Region of Ghana. The outcome of the CVM techniques used together with the output results of the ordered logit model are presented in frequency tables, percentages, means and deviations. Subsections discussed under this chapter include among others; Respondents' socio-economic and demographic characteristics, Farmers' risk perceptions of the poultry business, Farmer's risk attitudes, their experiences in insurance subscription, Summary statistics of variables influencing farmers' WTP for poultry insurance, the premiums farmers are willing to pay for poultry insurance, the Mean WTP and Factors determining farmers' WTP for poultry insurance.

4.2. Farmers' Demographic and Socio-economic Characteristics

Farmer's gender, age, highest level of education, number of years in school and marital status constituted respondents' demographic characteristics considered for this survey. Similarly, number of dependents (household size), farming experience, flock size, farmers' average monthly income, average farm income, off-farm activity, off-farm income, access to credit, subscription to insurance, member of farmers' association and kind of land holding constitute socio-economic characteristics of respondents included in this study.

4.2.1 Summary Statistics of Farmers' Demographic and Socio-economic Characteristics

Gender of respondents: The majority (80%) of the interviewed farmers were males with only a few (20%) being female indicating that men primarily dominate the poultry industry as an income-generating venture in Tamale (Table 3). According to GSS, 2010 PHC, the metropolis is female-dominated by sex, thus 50.2% of females compared with 49.8% of males. This male dominance in the poultry business could be attributed to various factors. These may include the high-risk nature of the business, men in agriculture generally are more predisposed to high-risk ventures than women, low interest levels among women, low technical know-how and the time-consuming nature of the business. Most of the few women in the business have male employees who perform the daily management activities of the farms.

Age of respondents: The mean age of the respondents was 39 years with the youngest farmer being 25 and the oldest being 58 years. There was a slight dispersion with a standard deviation of 6.698 (See Table 4). The age distribution indicates that all the respondents were within the youthful and middle-aged group (economic and active age group) but none was within the teenage or aged group.

Marital status of respondents: Most (91%) of the farmers were married whilst 9% were single (not married /divorced/widowed) (Table 3). This high percentage observed is expected considering the mean age (39 years) of the respondents and the fact that marriage is a very critical cultural and religious practice in Ghana. Marriage comes with a lot of daily household chores on the part of the woman which keep the woman engaged almost

all the time. This could explain why most women farmers resort to the services of young men for their farm daily routine activities.

Table 3: Summary statistics of farmer characteristics (Categorical variables)

Variable	Description	Measurement	% of sample
Gender	Dummy	0 = female,	20.09
		1 = male	79.91
Educational level	Dummy	0 = Below tertiary	12.62
		1 = Tertiary	87.38
Credit access	Dummy	1= yes	33.18
		0 = no access	66.82
Land tenure	Dummy	0 = Rented/family land	30.37
		1 = Owned land	69.63
Insurance subscription	Dummy	1 = if the farmer has ever subscribed	79.91
		0 = otherwise	20.09
Farmer group membership	Dummy	1 = member,	94.86
		0 = no member	5.14
Disaster experience	Dummy	1 = experienced farm disaster	80.84
		0 = otherwise	19.16
Off-farm activity	Dummy	1 = yes,	77.10
		0 = otherwise	22.90
Poultry production Risk perception	Ratings	1 = perceived as high	86.45
		0 = perceived as low	13.55
Risk attitude	Categorical	Behaviour Scores: ≤ 20 = risk averse	60.75
		Behaviour scores: = 21 = risk-neutral	8.88
		Behaviour scores: >21, but ≤35 = risk loving	30.37
Risk perception (Insurance sub.)	Ratings	1 = perceived as high	35.06
		0 = perceived as low	64.94
Trust (Insurance agencies)	Ratings	1 = high trust	25.23
		0 = low trust	74.77

Source: Author's computation from field survey data (August/Sept., 2023)

Educational level of respondents: All the respondents contacted in this survey had some form of formal education. The lowest level of education attained by respondents was basic education (JHS) whilst the highest educational level achieved by the respondent was

tertiary (PhD). Majority (87.38%) of the respondents had tertiary education whilst 12.62% had certificate, secondary or basic education (Table 3). This is an indication that the respondents were in a better position to understand the willingness to pay scenario and to make informed decisions. Bellwood-Howard et al. (2015) as cited by Amfo et al., (2019) observed that the educational level among farming households in Tamale was low. Their report suggested that 62% of the adults surveyed lacked any formal education. Mustapha et al., (2012) also observed that 73% of irrigation farmers in Bontanga did not have any formal education. The insights of this current survey however suggest that the poultry enterprise apparently is the reserve of the elite farmers in Tamale. This could stem from the fact that the management system of the commercial poultry business deviates from the traditional management systems practiced by indigenous farmers. Since farmers' educational levels significantly influence their understanding and adoption of contemporary farm investments such as insurance, it is envisaged that a high proportion of the farmers would participate in the poultry insurance scheme.

The farmers surveyed pursued formal education for a period ranging between 12 to 23 years, averaging 15 years as specified in Table 4. This means that most poultry farmers in the study area had at least a secondary education. The analysis further revealed that 1%, 13%, 44% and 29% of the surveyed farmers had PhD, Masters, Undergraduate and Diploma certificates respectively.

Household size of respondents: The mean number of dependents was 6 persons with a standard deviation of 3. The minimum number of dependents was zero (0) while the

maximum number of dependents was 20 persons (Table 4). This suggests that at least a poultry farmer in Tamale and its surrounding communities had six (6) dependents. This is far higher than the dependency ratio of 100:70 (active age: dependent age) reported by the GSS, 2010 PHC for the Tamale metropolis. The survey also showed a significant discrepancy between the minimum (0) and maximum (20) number of dependents. A large number of dependents may have a negative influence on farmers' insurance purchase decisions as it tends to significantly reduce the farmer's budget.

Table 4: Summary statistics (Continuous variables)

Variable	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Age	39.04	6.70	25	58
Number of years in sch.	15.74	1.46	12	23
Number of dependents	5.88	3.26	0	20
Farming Exp	5.94	4.03	1	36
Off-farm income	2953.61	840.68	500	5500
Flock size	528.74	259.53	200	2000
Farm income	26485.98	6952.37	10000	50000

Source: Author's computation from field survey data (August/Sept., 2023).

Farming experience: The mean number of years a farmer had been in poultry production was 6 years indicating that on average a farmer in the study area had 6 years of poultry farming experience. Production experience varied from a minimum of 1 year to a maximum of 36 years with a slight deviation of 4 years (Table 4). The data suggests that most of the farmers (73%) had little experience in the business (≤ 6 years) while a few

(27%) had greater than 6 years of experience. This revelation may have a mixed influence on the farmers' insurance purchase decisions. For instance, there is empirical evidence (Danso-Abbeam et al, 2014; Ojogbane &Gbigbi, 2022) establishing a positive relationship between farming experience and insurance adoption as a risk-mitigating strategy. In this respect, it is anticipated that the more experienced farmers would express interest in the poultry insurance scheme while the less experienced farmers might decline. Newer farmers may lack the financial resources or understanding of insurance benefits, making them less likely to adopt such schemes. Additionally, they may prioritize immediate operational costs over long-term risk management, perceiving insurance as an unnecessary expense.

Conversely, it might not be out of place to state that farmers who are just a few years into the poultry business may lack adequate experience to appreciate trends in the business and to cope with the associated risks. Against this background, such farmers would be expected to adopt insurance schemes and demonstrate a stronger desire to pay for insurance to insure their farms to protect their investments.

Flock/Farm size: All farmers in the survey operated on small scale bases. The mean number of birds kept by the farmers was 529. The smallest farm had a minimum of 200 birds whilst the largest farm had a maximum of 2000 with a standard deviation of 259.530 (Table 4). Generally, small scale farmers are observed to be risk averse in comparison with large scale farmers. Again, farmers with large flock sizes are thought to be more inclined to participate in insurance schemes to safeguard their businesses compared with farmers with small flock sizes. With poultry insurance at hand, farmers' confidence levels are raised

high and they are more likely to increase the size of their farms knowing that they are covered. This is confirmed by Ojogbane & Gbigbi (2022) who observed that farmers who had no poultry insurance saw a 79% increase in their flock size after subscribing to the poultry insurance scheme.

Average Farm Income: The amount of income a farm generated in the last production cycle could play a significant role in a farmer's current and future production decisions as well as their insurance purchase decisions. From Table 4, the mean amount of income accruing from the sale of poultry and poultry products of a farm in the last production cycle was GH₵ 26,485. The range of farm earnings averaged between GH₵ 10, 000.00 and GH₵ 50, 000.00. As indicated earlier, a farm that generates a substantially large amount of income to cover farm expenses and yield some amount of profit would be enough motivation for the farmer to invest more and possibly take up an insurance policy to protect the investment. Danso-Abbeam et al. (2014) observed a significant positive relationship between farm income and insurance take-up decisions by cocoa farmers in Ghana.

Off-farm activity and income: A large proportion (165 out of 214, representing 77%) of the farmers interviewed were involved in various income-generating activities besides poultry production while the remaining 23% did not engage in any form of off-farm job (Table 3). Poultry production is undertaken as a secondary occupation by a significant percentage of the respondents with only a few engaged in it as their major occupation. About 57 % of the respondents who had off-farm jobs were public servants, 13% were artizans while smaller proportions were civil servants, entrepreneurs and traders.

The mean monthly income earned by farmers from the off-farm job categories was GH₵2,954.00. On average, a farmer engaged in an off-farm income-generating activity earned at least GH₵500.00 and at most GH₵5,500 with a standard deviation of GH₵840.00 (Table 4). The influence of off-farm income on farmers' insurance purchase decisions could be double-sided. On one hand, off-farm income adds up to the farmer's income and therefore increases the farmer's purchasing power. This may motivate the farmer to subscribe to poultry insurance due to the ability to pay. On the other hand, it could be a demotivating factor to insurance take-up to farmers who consider the off-farm job as a means of diversifying their income source. Such farmers may be reluctant to take up insurance after all, they can still earn their livelihoods outside the farm.

Access to credit: Approximately a third (33%) of those surveyed reportedly had access to credit as an additional source of funds for investment while a larger proportion (67%) indicated they did not have access to any form of credit. Most farmers were of the view that the use of credit funds for investment in the poultry business is not the best practice due to the risky nature of the business. Such farmers would prefer the use of personal savings for investment to going for credit from financial institutions. They were more comfortable investing with their little savings. This may explain why the mean number of birds kept by the farmer in the study area was small (529) compared with that (1,683 birds) of smallholder farmers in the Bono, Ahafo and Greater Accra regions as reported by Dziwornu & Assefuah (2019). The availability of credit to farmers and their willingness to subscribe to insurance schemes have a symbiotic relationship. While credit access

increases farmers' income level and for that matter their ability to pay for insurance, insurance subscription in turn increases farmers' chances of obtaining credit from lending institutions.

Awareness and experience of insurance subscription: All respondents agreed they were unaware of the availability of poultry insurance in Tamale but a few indicated they were aware poultry insurance was operational in some parts of the country. One hundred and seventy-one (representing 80% of respondents) indicated they have subscribed to some form of insurance other than poultry insurance with only 20% having no subscription of any kind (Table 3). National Health Insurance Scheme, Vehicle and Child education were the most subscribed insurance policies. This suggests that the majority of the farmers had experience with insurance policies which could influence their decision to adopt poultry insurance as a risk management tool. It is worth mentioning that farmers expressed mixed feelings about their experiences dealing with the insurance service providers. While some experiences served as incentives for poultry insurance adoption others were serious disincentives. Such experiences directly or indirectly influenced the farmer's trust in insurance companies and their risk perceptions about insurance policies.

Farmer's group membership: The results show that only eleven (11) out of 214 respondents did not belong to any poultry farmers' association. The majority (95%) belonged to at least one farmer group (Table 3). Farmer groups are key determinants of technology adoption such as poultry insurance for risk mitigation. This is so because they

serve as useful channels of information dissemination and are very good platforms for educating members about improved technologies and government policies.

This study discovered three (3) farmer groups with which respondents associate. Ghana National Association of Poultry Farmers and Women in Poultry Value Chain were the most formal groups that had scheduled meetings and planned activities, though their combined membership (32 members) in the study area was far less than the membership of the less formal association, thus, Northern Poultry Farmers Association (171 members). This was a digital text messaging platform on which members shared information and ideas relating to their business. Nevertheless, these groups could be relied on to educate farmers and build positive attitudes toward insurance adoption.

Ownership of farmland/building: Data from the survey revealed that about 70% of poultry farmers (149 out of 214 farmers) owned the land and farm building used for production while the remaining 30% either produced on rented or family lands. Operating on one's own land is enough motivation for the farmers to invest more and to adopt insurance to protect the investment since land litigation issues and unfavourable tenancy conditions are eliminated from the business. Besides, some studies have reported a positive correlation between farmland ownership and the propensity to invest in farm insurance (Danso-Abbeam et al, 2014).

Disaster experience: The results in Table 3 point out that most (81%) of the respondents had experienced some form of a disaster leading to the death of a significant number of day-old chicks, growers or layers with only 19% reported to have not experienced any

serious casualty of birds as a result of a disaster. Given the severity of the impact of the disasters experienced by most of the respondents, it is expected that shock from the experience would motivate farmers to adopt poultry insurance to mitigate the negative effects of such undesirable events on the business and the livelihoods of the farmers at large.

Pest and disease infection was the leading cause of bird mortality, followed by rainstorm and flooding. It is surprising that heat stress did not make it to the first three most experienced disasters by the respondents though it was perceived by 99% of the surveyed farmers as a highly risky condition to the business. Only 8% of respondents recorded deaths due to heat stress. A possible explanation to this observation could be that farmers over the years have invented varied mitigating practices for heat stress that yielded positive results. A few of such strategies enumerated by some respondents include, planting trees around farm buildings, use of ice cubes in watering troughs, increasing ventilation with burglar proof wire netting, raising the roof of farm structures high and sometimes dipping older birds in large quantity of cold water under extreme conditions. Vaccine failure, stampede and transportation stress were also reported to have accounted for a significant number of deaths of poultry.

Trust and perceived risk in insurance subscription: Interestingly, 160 farmers (75% of respondents) indicated they had low trust or no trust at all for insurance companies regarding their attitudes towards claim settlements and provision of other insurance benefits to subscribers. The remaining 25% expressed high trust in insurance companies'

commitments to settling claims and other benefits due clients (Table 3). Notwithstanding this low trust in insurance companies, a substantial number of the surveyed farmers expressed their readiness to take up poultry insurance should it be rolled out in the study area partially because of the perceived risky nature of the business and possibly for the expected benefits the policy comes with. This is supported by a respondent's assertion that "Since the expected benefits outweigh the perceived risk; it would only be appropriate to try one's luck".

A large proportion of the respondents (72%) had the perception that it is risky to pay premium to insurance companies to subscribe to a policy with the reasons that the companies could just close their offices and bolt away with your money or use technical jargons in the policy document to deny you the claims due you. The remaining respondents associated no risk to insurance subscription. Amongst the category of farmers who associated risk to insurance contracts, 35% perceived the risk level as high whist 65% think the risk level is low (Table 3). This may imply, farmers could still take up poultry insurance since the general risk perception of insurance subscription is low among the respondents.

4.3 Farmers' Risk Perception of the Poultry Business

The first objective of this study was to investigate poultry farmers' risk perceptions about the poultry business. Simple descriptive statistics were used to understand how farmers perceive risk in poultry production. Therefore, this section sheds light on how poultry farmers generally perceive the riskiness of poultry production as an economic venture. It deliberates on various risk dimensions in poultry production and factors that constitute

risks and for that matter pose serious threats to the business from the point of view of the farmer.

4.3.1 Perceived Riskiness of Poultry Business

Based on the farmers' assessments and experiences, 185 out of 214 farmers (about 86%) perceived the poultry enterprise as a high-risk venture surrounded by a lot of uncertainties while only 14% had the perception that the business is a low-risk economic venture (Fig. 4). Perceptions play a significant role in determining consumers' preferences and purchase decisions for commodities (Grunert, 2005). Since the perception of the risk level of the poultry business is high, most of the farmers would rationally put pragmatic measures in place to minimize if not eliminate the adverse effects of such risks. It is therefore not surprising that the majority (64%) of the respondents indicated their willingness to pay premiums and sign insurance contracts for their farms.

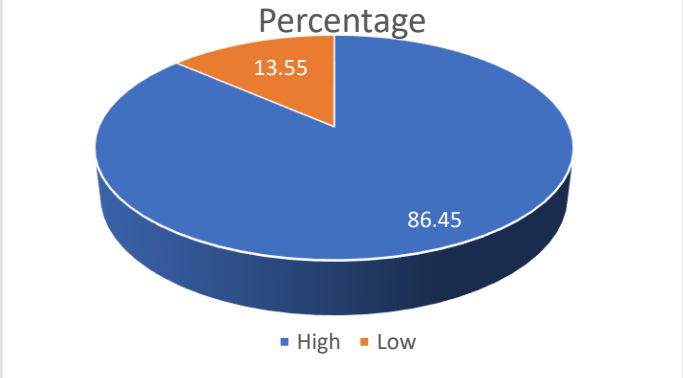

Figure 4. Farmers risk perception about poultry business

Source: Author's computation from field survey data (August/Sept., 2023).

4.3.2 Dimensions of risk in poultry production

Farmers' perceptions about some risks under various dimensions were investigated to ascertain farmers' level assessment of such risks. The information in Table 5 reveals that each kind of production/climatic risk was perceived by the respondents as high-risk conditions. Extreme temperatures (cold/heat stress), rainstorms, flooding and input shortage were respectfully perceived as highly risky events by almost all respondents (about 99%) based on their knowledge and experiences. Under market risks, input quantities and input price fluctuations as well as losses due to transportation of poultry and poultry products were perceived to be high-risk factors by 98% and 85% of respondents respectively. Conversely, output quantity and price fluctuations were perceived to pose little threat to the business by more than half (55%) of the farmers. This implies that most farmers did not encounter a significant decline in output prices and expected output levels from their farms.

For biological risks, predator activity was perceived to be of little concern to the majority (77%) of farmers (Table 5). According to the farmers, the birds were capable of self-defense against mice, lizards and black moles through pecking. Appropriate measures were put in place to screen off snakes from the farms. However, disease and pest infestation as well as contamination of feed, water and equipment were rated highly risky situations (96% and 82% respectively) that could lead to severe losses. From the farmers' experiences, the main sources of contamination were chemical treatment of feedstuffs, prolonged storage of feed before milling and contamination from visitors.

Table 5: Farmers' perceptions about the dimensions of risks

Category of Risk	*Example of Risk source*	*Farmers Risk Perception (n=214)*			
		Low risk		High risk	
		Freq.	%	Freq.	%
Production / Climatic Risks	Extreme temperatures	3	1.40	211	98.60
	Rainstorms and Flooding	3	1.40	211	98.60
	Input Shortage (Feed, drugs, vaccines)	19	8.88	195	91.12
Market Risks	Input quantity and price uncertainty	5	2.34	209	97.66
	Output quantity and price uncertainty	118	55.14	96	44.86
	Transportation risks	32	14.95	182	85.05
Biological Risks	Diseases and pest infestations	8	3.74	206	96.26
	Contamination (feed, water and equipment)	39	18.22	175	81.78
	Predator attack	165	77.10	49	22.90
Financial Risks	Limited / No access to credit	133	62.15	49	22.90
	Fluctuations in interest rates	205	95.79	9	4.21
	Inadequate finance to pay loans	205	95.79	9	4.21

Source: Author's computation from field survey data (August/Sept., 2023).

Despite the high-risk perception of diseases, the few farmers (4%) who rated diseases and pest conditions as low risks explained that religiously following the recommended routine vaccination and good farm sanitation was the surest way to avoiding disease and pest attacks on the poultry birds.

The data in Table 5 further shows that the financial/institutional risk dimension was perceived to be the least of the categories of risks in terms of ratings. About 62% of respondents rated limited/no access to credit as a low-risk factor to the business. This revelation is not surprising because farmers did not depend on farm credit for their farm investment. Against this background issues about credit access, defaulting in loan repayment and high interest on credit did not directly affect their business. The high-risk

perception of the poultry business and that of the various risk categories are envisaged to positively impact the farmers' insurance uptake decisions in the study area.

4.4 Farmer's Risks Attitudes

Objective two (2) of this study assessed poultry farmers' potential attitudes toward risks. The results were then used to generate the risk attitude variable for further analysis. This subsection discusses farmers' risk attitudes using descriptive statistics. Using the DOPERT scale, farmers were tasked to assess the likelihood with which they might engage in risky behaviours from a set of statements relating to various content domains. By scoring the response to each risk-taking statement on a 5-point Likert scale, respondents whose total score was less than or equal to twenty (20) were classified as risk-averse farmers. Those who scored exactly twenty-one (21) and those who scored between twenty-two (22) and thirty-five (35) were respectively classified as risk-neutral and risk-loving farmers (adapted from Blais & Weber, 2006) and following the risk matrix generated by Rosenberg et al. (1999) and Cooper (2005).

Table 6: Poultry Farmer's Risk Attitudes

Risk Attitude	Frequency	Percentage (n=214)
Risk averse	130	60.75
Risk neutral	19	8.88
Risk loving	65	30.37

Source: Author's computation from field survey data (August/Sept., 2023).

It is obvious from Table 6 that the majority of the farmers exhibited risk-averse attitude towards poultry production and other content domains. A significant number of respondents also demonstrated risk-loving attitudes in these domains while a few portrayed

risk-neutral attitudes. The risk-averse attitude of the majority of farmers could trigger their acceptance of poultry insurance as a risk-mitigating strategy. Reardon (2001) noted that risk-averse farmers are more inclined to adopt risk mitigating strategies, such as agricultural insurance, to reduce the negative effects of risks. Islam et al. (2021) also concluded that farmers' risk-averse attitude significantly and positively influenced their decision to purchase crop insurance policies. In contrast, risk-loving farmers may consider insurance subscriptions as an additional cost. Ankrah et al. (2021) in a study reported farmers in a focus group discussion in the Volta Region have asserted that:

"Insurance is a tool used by the elite group in the society to extort money from unsuspecting people. The educated people enrich themselves through insurance policies. How often do unexpected calamities occur annually? We have been in the farming business for a long time without insurance and still surviving, why the need for insurance".

It would not be out of point to state that risk-loving farmers would most likely think in line with the above assertion. Following the above analysis, the risk-neutral farmer may exhibit an indifferent attitude to insurance adoption as a risk-coping strategy.

4.4.1 Determinants of Farmer's Risk Attitudes

Risk attitudes of farmers play a significant role in determining their preferences and risk management decisions on their farms. The behaviour of farmers towards risks could be influenced by their risk perceptions and other factors. This study sought to ascertain some of these factors that could influence the risk attitudes observed among the farmers using ordered logistic regression analysis as reported in Table 7.

The regression output (Table 7) indicates that the Log Likelihood Ratio (LR) Chi^2 was significant at 1% (Prob > Chi^2 = 0.000). This implies that the regressors collectively help in clarifying the observed variations in the farmers risk attitudes. The Pseudo R^2 measures the goodness of fit of the model. The value (0.1226) indicates that the model's independent variables account for 12.26% of the variations in farmers' risk attitudes whilst the rest of the variations are explained by other factors.

Five (5) out of sixteen (16) explanatory variables hypothesized to influence farmers' risk attitudes were found to be statistically significant. It is important to state that the directions and magnitudes of the regression coefficients in Table 7 are not the most accurate measures of how the predictors influence the risk attitudes of farmers since these attitudes are in categorical levels. Therefore, the marginal effects which offer a more meaningful measure of the effects of the regressors on the outcome variable were generated. The marginal effects measure how the probability of observing either of the risk attitude categories varies with a unit change in the predictor variables, holding other factors constant.

Table 7: Determinants of farmers' risk attitude

		Risk-averse	Risk neutral	Risk-loving
Characteristic variable	**Coefficient**	**Marginal Effects (Std Error)**	**Marginal Effects (Std Error)**	**Marginal Effects (Std Error)**
Age	0.010	-0.002	0.000	0.002
	(0.033)	(0.006)	(0.001)	(0.006)
Number years sch	0.039	-0.008	0.001	0.007
	(0.119)	(0.023)	(0.003)	(0.020)
Flock size	0.000	-0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Access credit	0.670*	-0.129 *	0.015*	0.114*
	(0.388)	(0.073)	(0.009)	(0.065)
Extension	0.006	-0.001	0.000	0.001
	(0.529)	(0.102)	(0.012)	(0.090)
Farmer group	-0.009	0.002	-0.000	-0.001
	(0.737)	(0.102)	(0.012)	(0.090)
Disaster Experience	-0.789**	0.152**	-0.018*	-0.134**
	(0.389)	(0.073)	(0.010)	(0.064)
Land tenure	-0.701***	0.135***	-0.016***	-0.119***
	(0.19)	(0.032)	(0.005)	(0.030)
Awareness insurance	1.065	-0.205	0.024	0.181
	(1.544)	(0.296)	(0.035)	(0.262)
Farming Experience	0.027	-0.005	0.001	0.005
	(0.046)	(0.009)	(0.001)	(0.008)
HH size	0.082*	-0.016*	0.002*	0.014*
	(0.053)	(0.010)	(0.001)	(0.009)
Gender	0.051	-0.010	0.001	0.009
	(0.416)	(0.080)	(0.009)	(0.071)
perception	-1.376***	0.265***	-0.031**	-0.234***
	(0.464)	(0.084)	(0.013)	(0.074)
Off-farm	-0.395	0.076	-0.009	-0.067
	(0.476)	(0.091)	(0.011)	(0.081)
Subscribe insurance	-0.125	0.024	-0.003	-0.021
	(0.438)	(0.084)	(0.010)	(0.075)
cut1	-2.281			
	(2.133)			
cut2	-1.799			
	(2.13)			
Number of observations	*214*	*Pseudo R2*	*0.1226*	
LR Chi2 (16)	*46.16*	*Log likelihood*	*-165.17943*	
Prob > Chi2	*0.0001*			

Source: Author's computation from field survey data (August/Sept., 2023).

Access to credit

Access to credit was significant for each three categories of farmers at a 10% significant level. The marginal effects of access to credit are positive for both risk-neutral and risk-loving attitudes but negative for the risk-averse attitude. This implies that having access to credit raises the likelihood of the farmer exhibiting risk-neutral and risk-loving attitudes while decreasing risk aversion attitudes in farmers, holding other factors constant. The signs of the marginal effects imply that as farmers can acquire a higher amount of credit, they become more risk-loving but less risk-averse in attitude. This is not far from reality because increased access to credit increases the farmer's available income and makes the farmer take higher risks in expanding his/her investment. With limited funds, even the risk-loving farmer would not be capable of demonstrating their attitude by taking higher risks to invest.

Disaster experience

Disaster experience was statistically significant at a 5% level for both risk risk-averse and risk-loving categories of farmers but significant at 10% for risk neutral category. The marginal effects of disaster experience are positive for risk-averse attitudes but negative for both risk-neutral and risk-loving attitudes. This means that experiencing farm disasters increases the probability of farmers demonstrating risk aversion attitudes but decreases that of both risk-neutral and risk-loving attitudes if other factors are held constant. Intuitively, a farmer who experiences more disasters in his production process would tend to be more risk-averse and less risk-loving in his attitude. Logically speaking, the shocks and losses suffered by a farmer due to disasters would most likely make such a farmer develop a risk-

averse attitude in production. After all, the lesser the risk, the lesser the shock and losses. An increase in disaster experiences could increase the risk perception level of farmers about the poultry enterprise and consequently make them risk averse.

Land tenure system

The kind of land/farm holding practiced by the farmer was statistically significant at 1% for all three categories of risk attitudes. The marginal effects of the kind of farmland holding imply that operating on own farmland/structure increases the probability of exhibiting a risk-averse attitude but decreases the probability of demonstrating a risk-neutral or risk-loving attitude holding other factors constant. The coefficient is negative for land tenure implying that producing on one's own farm structure decreases the probability of being a risk-loving farmer but increases the farmer's chances of being a risk-averse farmer. This revelation deviates from that which was expected as ownership of the farm structure was expected to build farmers' confidence in taking high risks by investing more in the business.

Household Size (Number of dependents)

Household size of respondents was significant at a 1% level for all three categories of risk attitudes. The signs of the marginal effects of farmers' household size as shown in Table 7 imply that an increase in a farmer's household size increases the probability that the farmer exhibits risk neutral or risk-loving attitude in the poultry business whilst decreasing the probability that the farmer demonstrates risk-averse attitude all things being equal. This positive relationship between household size and risk-loving attitude could be attributed to

the idea that increasing household size increases the farmer's responsibilities. To meet this obligation of providing the needs of the dependents, the farmer could take higher risks by increasing the farm investment to increase output and revenue.

Risk perception about the poultry business

Farmers' risk perception about the poultry enterprise was statistically significant at a 1% level for both risk-averse and risk-loving attitudes but at a 5% significant level for the risk-neutral category. The signs of the marginal effects of farmers' risk perception from Table 7 point out that if a farmer's risk perception level increases, the probability of demonstrating a risk-averse attitude increases but the probability of exhibiting a risk-neutral and risk-loving attitude decreases *ceteris paribus.* Thus, high-risk perception increases risk aversion behaviour but decreases risk-loving behaviour of farmers.

4.5 Farmer's Willingness to Pay for Poultry Insurance

The third objective of this research elicited from farmers the amount of money they were willing to pay as a premium to subscribe to poultry farm insurance. The technique employed allowed each respondent to declare the highest amount they were prepared to pay through an iteration procedure from a set of bids. The last bid accepted by each respondent after the iteration was recorded as their maximum WTP.

This section brings to bear the count of respondents who agreed to pay and of those who declined, the reasons for accepting to pay and reasons for rejecting the policy. It sheds light on the various levels of bids together with the number of respondents who agreed or

disagreed to accept each level of bid, as well as the maximum and mean WTP values. The section concludes with a summary statistic of the WTP bids.

The figures in Table 8 reveal that 64% of respondents indicated their willingness to pay insurance premiums to insure their farms whilst about 36% declined to subscribe to the insurance policy. The 64% is a little less than the figure (72%) reported by Adjei et al. (2016) in a similar study conducted in the Dormaa Municipality of the Bono Region and also far less than 83% of respondents reported by Dziwornu & Assefuah (2019) from a survey conducted on poultry farmers in six selected communities of the Bono-Ahafo and Greater Accra regions of Ghana. The difference in WTP percentages is expected because there are more large-scale commercial farmers in those regions who would choose insurance to protect their huge investments from complete loss in the event of a disaster.

Table 8: Famer's willingness to pay for poultry insurance

Willing to Pay Premium	Percent
Yes	64.02
No	35.98
Total	100.00

Source: Author's computation from field survey data (August/Sept., 2023).

4.5.1 Mean Willingness to Pay (MWTP)

Using the maximum willingness to pay values recorded for each respondent, the mean willingness to pay for the sample was computed as follows (Table 9):

Table 9: Mean Willingness to Pay

Group	Observation	Mean (GHc)	Std. err	Std. dev.
Female	30	510.00	22.28	122.05
Male	107	435.98	11.87	122.82
Combined	137	452.19	10.77	126.01
Difference		74.02	25.339	
No Off-farm	21	392.86	24.22	111.00
Off-farm	116	462.93	11.70	126.00

t= 2.9211 $P_r(|T| > |T|) = 0.0041$ (Gender)
t= -2.3851 $P_r(|T| > |T|) = 0.0185$ (Off-farm activity)
Source: Author's computation from field survey data (August/Sept., 2023).

Generally, poultry farmers in the study area would be prepared to pay an average of GH₵ 1.52 per bird per production cycle (equivalent to GH₵ 452.19 per 300 birds/production cycle) as insurance premium for their farm insurance (Table 9). The observed mean willingness to pay in this study is comparatively higher than that reported by Dziwornu & Assefuah (2019) who observed that poultry farmers surveyed in six communities in the Bono/Ahafo and Greater Accra regions were willing to pay a mean amount of GH₵ 1.00 per bird annually for their farm insurance.

Similarly, the GH₵ 1.52 *MWTP* reported in this study is even much higher than that (GH₵ 31.00 per 1000 birds per annum) which Adjei et al. (2016) reported from a similar study carried out on poultry farmers in the Dormaa municipality. However, it would be out of place to jump to the conclusion that poultry farmers in Tamale are willing to pay higher premiums than their counterpart farmers in the South though the records say so. The reason was that the farmers did not make the decisions under the same conditions. For instance, among other factors, the scale of operation and the hypothetical insurance cover could not

have been the same.

The results in Table 9 also reveal that the difference between the MWTP value for female farmers and that of male farmers was statistically significant at 1% significance level (P_r ($|T| > |T|$) = 0.0041). On average, a female poultry farmer in Tamale would agree to pay GHc 510.00 insurance premium per 300 birds, equivalent to GHc1.70 per bird/production cycle compared with their counterpart male farmers who demonstrated their willingness to pay an average premium of GHc 436.00, equivalent to GHc1.45/bird. Women generally are thought to be risk averse in attitude and are therefore expected to adopt risk-coping strategies. Hence, the revelation that women were willing to pay more for poultry insurance lends support to the above assertion.

Similarly, farmers who had off-farm jobs on the average exhibited the willingness to pay higher amounts as premiums than their counterpart farmers who were not engaged in other forms of income-generating activities based on the MWTP values (GHc 1.54 and GHc1.31/bird respectively) reported in Table 9. This outcome appears to be in line with the findings of other studies (Bannor et al., 2023; Dziwornu & Assefuah, 2019) that reported that farmers' engagement in off-farm jobs is positively related to their willingness to pay for farm insurance.

4.5.2 Reasons for farmers' acceptance and rejection of poultry insurance

Table 10 presents some reasons enumerated by respondents who declined to subscribe and the reasons outlined by farmers who agreed to pay a premium for their farm insurance to explain their respective decisions. Lack of trust in insurance companies was a very serious concern reported by about 92% of the farmers who declined to pay for farm insurance. This

trust issue could be linked to unpleasant experiences the farmers had with insurance companies who provided other services to these farmers.

Other key reasons that accounted for the farmer's unwillingness to pay were difficulty in accessing claims and difficulties in meeting policy conditions which were respectively reported by 90% and 87% of the farmers who were not willing to pay. Most of the reasons mentioned by farmers were not in complete variance with the reasons reported by studies carried out in Ghana and beyond the nation's borders (See Farayola et al.,2013; Dong et al,.2020; Aina et al., 2018). Some minor reasons on which the respondents' unwillingness to pay decisions could be blamed include among others; lack of awareness of poultry insurance, exclusion of bird flu, New Castle disease and stampede in the policy coverage and unclear contract terms and conditions.

Table 10: Major reasons for Farmer's Unwillingness and WTP decisions

Unwillingness to Pay (n=77)	%	Willingness to Pay (n=137	%
Lack of trust **in** insurance agencies	92.21	Obtaining financial backing to restart the business	98.54
Difficulties in claim settlements	90.91	Boost confidence in technology adoption and investment	73
Unfavourable policy conditions	87.01	Transfer of financial loss to insurance agency	72.26

Source: Author's computation from field survey data (August/Sept., 2023).

Among the reasons assigned by farmers for accepting to pay premiums for their farm insurance, three reasons stood tall. About 99% of the farmers who agreed to subscribe indicated that the policy would provide financial backing which will enable subscribers to restart their business without much difficulty in the event of a disaster. They explained that

the indemnity that they would receive could be used to procure the logistics required to get them back on their feet after a disaster. Similarly, about 73% of those willing to pay were of the view that paying for farm insurance would boost their confidence levels in adopting new and improved production technologies and increasing their investment which may come at a higher cost (Table 10). The feeling that they will not have all their investment going down the drain because of the expected indemnity is enough motivation for them to adopt improved technology.

Likewise, almost the same proportion (72%) agreed that insurance is a means of transferring completely or sharing the financial loss caused by a disaster with the insurance company. In the absence of farm insurance, the farmer single-handedly bears the financial losses due to a disaster. Among other reasons enumerated in support of their WTP decisions were; the sustainability of business and safeguarding farmers against shocks due to natural disasters.

4.5.3 Farmers WTP at various levels of bids

Based on the procedure adopted for estimating the bids used for the study, the highest bid was GH₵ 2.00 whilst the lowest bid was GH₵ 1.00 per bird per production cycle. The proportions of farmers who accepted each level of bid as their maximum WTP is illustrated in the chart below:

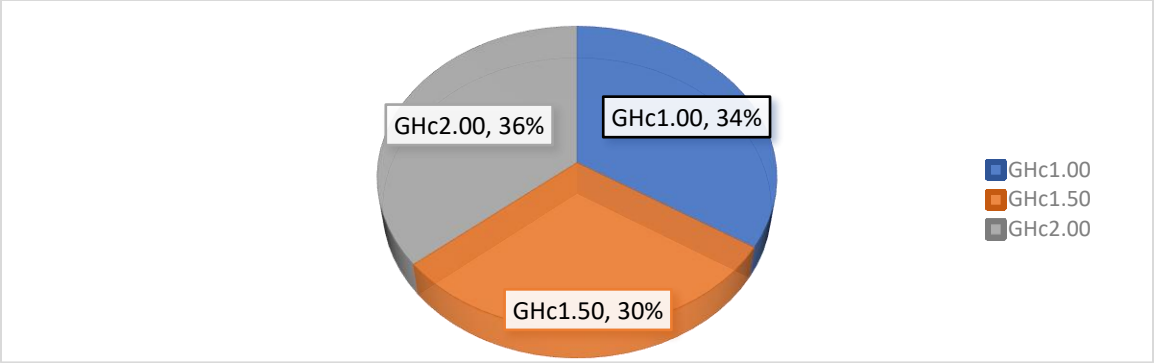

Figure. 5 Respondents Maximum WTP

Though the proportions for the three categories of bids were very close, the number of farmers who accepted the GH₵ 2.00 as their last bid was higher indicating that the farmers were not only willing to subscribe but were willing to pay a higher premium for their farm insurance.

4.6 Summary statistics of selected variables on the WTP Bids

The iteration procedure used to elicit respondents' maximum WTP produced four mutually exclusive response outcomes; No-No (denoting zero WTP), No-Yes (denoting WTP GH₵1.00), Yes-No (denoting WTP GH₵1.50) and Yes-Yes (denoting WTP GH₵2.00) (Table 11).

Table 11: Summary Statics WTP Bids by Farmer Characteristics

Variable	*WTP0*		*WTPGhc1.00*		*WTPGhc1.50*		*WTPGhc2.00*	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	38.156	7.738	38.246	5.689	40.442	6.092	41.560	6.124
Number years sch	14.974	1.287	16.043	1.419	16.442	1.485	16.040	1.020
Flock size	548.312	257.035	541.449	195.111	514.884	378.760	457.200	149.291
Disaster Experience	0.649	0.480	0.884	0.323	0.860	0.351	1.000	0.000
Farm income	25633.770	7424.455	27594.200	6364.698	25953.490	7758.109	26320.000	7092.954
Farming Experience	5.896	5.459	5.797	2.857	6.512	3.660	5.520	1.531

Source: Author's computation from field survey data (August/Sept., 2023).

Age of Respondents

The results in Table 11 above point out that the mean age of surveyed farmers who completely rejected poultry insurance was 38 years which is the same as the mean age of farmers who chose the GH₵1.00 bid as their maximum willingness to pay. The respective mean ages of respondents whose maximum willingness to pay was GH₵1.50 and GH₵2.00 were 40 and 41 years. This revelation seems to suggest that a significant number of younger farmers surveyed did not agree to take up farm insurance and the few that accepted only demonstrated their willingness to pay low premiums. The reason could be that, as young farmers and possibly new entrants, they did not appreciate the risk involved in the business due to little experience. For the older farmers, the results suggest that the majority of them agreed to adopt poultry insurance as well as pay a relatively higher premium for their farm insurance.

Number of years in school

The mean number of years in school of farmers who accepted none of the bids (WTP0) was 14 years whilst that of farmers who agreed to pay either of the three (3) bids was 16 years each. Again, the discovery suggests that typically, farmers who declined poultry insurance subscriptions had seen fewer years of formal education than their counterpart farmers who agreed to pay the premium for their farm insurance. This means that farmers who agreed to adopt poultry insurance had attained higher education than those who disagreed to pay premium for farm insurance. This argument emanating from this data aligns with numerous empirical studies showing that technology/insurance adoption is positively related to the educational level of farmers (Bannor et al., 2023; Danso-Abbeam et al., 2014). However, the results from Table 11 do not indicate that education is positively related to higher WTP amounts since the mean year of education is the same for all levels of bids.

Flock size

For farmers who responded No-No to the bid, the mean number of birds reared was 548 which was greater than the mean number of birds kept by farmers who agreed to pay either of the three bids. Interestingly, the mean flock size decreased along the levels of bids (Table 11). As can be seen from the table, the mean number of birds produced by farmers whose maximum WTP was GH₵1.00/bird/production cycle was 541birds, that of WTPGH₵1.50 was 514 birds and WTP GH₵2.00 was 457 birds. This observation suggests that farmers who had larger flock sizes opted for the lower bids. Thus, as flock size increases the tendency to pay lower premiums increases.

Farming experience

On average, farmers who turned down poultry insurance had about 6 years of farming experience, the same as those who agreed to pay a maximum of GH₵1.00 and GH₵2.00 premium. However, those who accepted the GH₵1.50 as their maximum price had an average of 7 years of experience (Table 11). There was no significant difference in farming experience between the zero WTP group and the WTP GH₵1.00 and WTP GH₵2.00 category of respondents. This suggests that ordinarily, farming experience does not matter in the level of bid chosen by the farmers.

4.7 Determinants of farmers' willingness to pay for poultry insurance

Objective four of this study analyzed the factors that influenced farmers' willingness to choose different levels of premium for poultry farm insurance in the study area. This section elaborates on the variables, their regression coefficients and marginal effects on farmers' decisions to choose each category of bids. Table 12 is a summary of the ordered logistic regression and marginal effects outputs.

Table 12: Determinants of farmers' WTP for poultry insurance

	Ordered Logit	Marginal Effects (Standard Errors)			
Variable	**Coefficients (std Error)**	**WTP (GHc0.00)**	**WTP (GHc1.00)**	**WTP (GHc1.50)**	**WTP (GHc2.00)**
Age	0.014 (0.032)	-0.002 (0.004)	-0.000 (0.001)	0.001 (0.002)	0.001 (0.003)
Number years sch	0.406 *** (0.114)	-0.052*** (0.014)	-0.010** (0.005)	0.027*** (0.008)	0.036*** (0.011)
Flock size	-0.002 ** (0.001)	0.000** (0.000)	0.000* (0.000)	-0.000** (0.000)	-0.000** (0.000)
Access to credit	-0.729 ** (0.350)	0.094** (0.045)	0.018* (0.011)	-0.048** (0.024)	-0.064** (0.031)
Extension	0.784 (0.589)	-0.101 (0.076)	-0.020 (0.016)	0.052 (0.039)	0.069 (0.052)
Farmer group	-0.391 (0.757)	0.050 (0.098)	0.010 (0.019)	-0.026 (0.050)	-0.034 (0.067)
Disaster Experience	1.22 *** (0.429)	-0.157*** (0.054)	-0.030* (0.017)	0.080*** (0.029)	0.107*** (0.040)
Land tenure	1.363 *** (0.221)	-0.176*** (0.021)	-0.034** (0.017)	0.090*** (0.019)	0.120*** (0.025)
Awareness insurance	-0.098 (1.252)	0.013 (0.161)	0.002 (0.031)	-0.006 (0.082)	-0.009 (0.110)
Poultry Farming Experience	-.099 * (0.055)	0.013* (0.007)	0.002 (0.002)	-0.007* (-0.007)	-0.009* (-0.009)
HH size	.025 (0.053)	-0.003 (-0.003)	-0.001 (-0.001)	0.002 (0.002)	0.002 (0.002)
Gender	-0.648 * (0.380)	0.084* (0.049)	0.016 (0.011)	-0.043* (0.025)	-0.057* (0.034)
perception	0.270 (0.517)	-0.035 (0.067)	-0.007 (0.013)	0.018 (0.034)	0.024 (0.046)
Off-farm	-0.674 (0.473)	0.087 (0.061)	0.017 (0.013)	-0.044 (0.032)	-0.059 (0.042)
Subscribe insurance	0.800 * (0.445)	-0.103* (0.057)	-0.020 (0.013)	0.053* (0.030)	0.070* (0.040)
Attitude_1	1.226 *** (0.367)	-0.158*** (0.046)	-0.031** (0.015)	0.081*** (0.025)	0.108*** (0.035)
Attitude_2	1.550 *** (0.570)	-0.200*** (0.072)	-0.039* (0.021)	0.102** (0.040)	0.136*** (0.052)
Cut1	10.245 (2.152)				
Cut2	12.389 (2.214)				
Cut3	13.962 (2.242)				
Pseudo R-squared	0.236	Number of obs.	214		
Chi-square	131.964	Prob > chi2	0.000		

**** p<.01, ** p<.05, * p<.1*

Source: Author's computation from field survey data (August/Sept., 2023).

As observed from Table 12, the Log-Likelihood test statistic of the Ologit regression is highly significant at 1% (Prob >chi2=0.0000) which is an indication that the regressors collectively play a role in explaining the variations in the farmers' insurance purchase decisions and the level of bids chosen. Similarly, the Pseudo R^2 value (0.2361) implies the model's predictor variables are able to explain 23.61% of the observed variations in poultry farmers' willingness to choose different levels of premium for their farm insurance.

Most of the independent variables (10 out of 17) hypothesized to influence farmers WTP were statistically significant but some did not maintain their expected signs. However, the ordered logit regression coefficients presented in Table 12 do not offer any meaningful explanations of the direction and magnitude of the effects of the regressors on the categorical WTP bids. Consequently, the marginal effects of the predictor variables were generated to offer a more meaningful measure of their magnitude and direction of effects on the farmers' decision to choose each category of the bids. Marginal effects quantify how the propensity of choosing to pay and the amount of premium to pay for farm insurance varies for each unit change in the covariates, holding other conditions constant.

Educational level (number of years in school):

As seen in Table 12, the regression coefficient for educational level is positively correlated with farmers' WTP indicating that farmers' WTP increases as their educational level increases. The marginal effect for the GH₵1.00 bid is negative whilst that of the GH₵1.50 and GH₵2.00 bids are positive (and significant at 5%, 1% and 1% levels respectively). This means that as farmers attain higher education, the probability of their WTP higher

bids increases but their probability to pay lower bids decreases *ceteris paribus*. This finding implies that poultry farmers of lower educational levels were prepared to pay lower premiums but not higher premiums, whereas farmers with higher educational backgrounds would be ready to pay relatively higher premiums if other factors were held constant. Hence, a higher level of education is directly proportional to WTP higher prices and inversely proportional to WTP lower bids.

The revelation that increasing the number of years in education significantly increases the probability of farmers' willingness to pay was expected in that education improves people's intellectual capabilities and information processing skills (Botzen et al., 2012) as cited in Bannor et al. (2023). Therefore, highly educated farmers might have more access to information and a better understanding of insurance policies and their effectiveness in mitigating the negative effects of risks than farmers with lower educational levels.

The study's findings regarding the effects of education on WTP for agricultural insurance lay support to those of several other studies in Ghana and other parts of the world (Bannor et al., 2023; Dong et al., 2020; Ojogbane & Gbigbi, 2022; Danso-Abbeam et al., 2014). It however contradicts the results obtained by Abugri et al. (2017) and Kwadz et al. (2013), who observed that the educational level of farmers is negatively correlated with their WTP for crop insurance. Interestingly, some other studies have reported no significant relationship between farmers' educational level and their WTP (Adeyonu et al., 2016; Adjei et al., 2016; Islam et al., 2021; Nimoh et al., 2011).

Flock size (Number of birds reared)

The ordered logit regression coefficient was significant but negative for the flock size variable indicating a negative relationship between the number of birds produced by a farmer and the WTP for insurance. The marginal effect of the GH₵1.00 bid is positive and significant at 10% level. Comparatively, the marginal effects of both the GH₵1.50 and GH₵2.00 bids are negative and both significant at 5% levels. The positive coefficient of the GH₵1.00 bid means that as flock size increases, the probability of a farmer being willing to pay lower bids is raised. Similarly, the negative signs for the GH₵1.50 and GH₵2.00 bids mean that increasing flock size lowers the propensity of farmers agreeing to pay the moderate and higher bids, holding other factors constant.

This implies that farmers who keep a substantial number of birds would be inclined to pay lower premiums while those who have a small number of birds would desire to pay relatively higher premiums. A logical deduction from the above scenario would be that, flock size directly affects WTP lower premium and inversely affects WTP higher premium. This finding was highly anticipated since the premium was charged per bird and the hypothetical insurance cover was also calculated per bird (GH₵50.00/bird) in the event of a disaster. It is only rational that farmers with large flock sizes would opt for the smaller bids because of the financial implications.

The sign of the coefficient of the flock size variable was in line with the a-priory expectation. The findings of this study regarding flock size corroborate the results of Nyaaba et al. (2020) and Okoffo et al. (2016) who established that an increase in farm size reduces the probability of farmers' WTP for crop insurance in Ghana. It is however at

variance with the findings from studies by Ojogbane & Gbigbi (2022), Dong et al. (2020), Islam et al. (2021), Mutaqin & Usami, (2019), and Danso-Abbeam et al. (2014) who reported a significant and positive relationship between farm size and farmers' WTP.

Access to credit

This variable exhibited a negative correlation with farmers' WTP as indicated by the regression coefficient implying that an increase in credit access would reduce WTP for farm insurance. Meanwhile, the marginal effect of the credit variable is positive for the lower bid but negative for the other higher bids (Table 12). This means that greater access to credit raises the probability of farmers choosing the lower bid and reduces the likelihood of accepting the higher bids when all other factors are fixed. Intuitively, poultry farmers who have more access to credit would pay a smaller premium whilst those who have limited or no access to credit would pay a higher premium for their farm insurance. The findings agree with Aina et al. (2018) but contradicts Adeyonu et al. (2016), Dziwornu & Assefuah (2019) and Islam et al. (2021) who indicated that farmers who have access to credit had a higher probability of taking up farm insurance than those who did not have access to credit.

This outcome was unexpected since access to credit increases the funds available for farm investment. In addition, effective demand for a commodity (like insurance) is backed by the ability to pay, hence, the researcher anticipated that farmers with access to credit would show a greater likelihood of being willing to pay relatively higher premiums. The reason for the decreased likelihood of paying a higher amount was not obvious. However, as explained by some of the respondents during the interviews, it could partly be attributed to

the low trust that most of the farmers had for insurance companies and partly because the credit available to the farmers was not agricultural and for that matter, the farmers were unwilling to use such credit for farm investment.

Disaster experience

Memories of suffering from past disasters and shocks constitute 'bitter' experiences. Farmers who have experienced disasters and suffered the shock and devastating financial effects would more likely adopt and pay more for insurance to mitigate downside risks associated with disasters than those who have not. The signs of the marginal effects of all three categories of bids confirm the above. From Table 12, the marginal effects suggest that as the incidence and severity of disasters rise, the likelihood of being willing to pay a higher premium increases, while the probability of being willing to pay a lower premium decreases *ceteris paribus.* The implication is that farmers who reported to have experienced disaster would pay a higher premium than their counterpart farmers who had no or less disaster experience. A priory expectation of this variable was met. However, Mutaqin & Usami (2019) observed no significant association between farmers' disaster experiences and their WTP for farm insurance.

Kind of land holding (Land tenure)

Ownership of farmland or farm structure is a great incentive for higher farm investment and for that matter a good incentive for farmers' adoption of agricultural insurance to protect the investment in the event of a disaster risk. The marginal effects on Table 12 show that ownership of farmland increases the likelihood of willing to pay higher bids but decreases the probability of choosing to pay the lower bid, all things being equal. The

implication is that farmers who produced on their own land/structure would pay higher premium prices than their counterpart farmers who produced on rented or family lands. A logical explanation for this could be that family/rented lands are commonly associated with land litigation issues and unconducive tenancy terms. The positive sign of the regression coefficient lends support to those of the marginal effects and indicates that ownership of farmland reduces WTP the lower premium but increases the WTP higher premium. This outcome was expected and corroborates the results obtained by Danso-Abbeam et al. (2014) and Ngango et al. (2022) but contradicts Nimoh et al. (2011). However, Mutaqin & Usami (2019) made an insignificant contradictory observation about farmland ownership.

Farming experience

Proponents of the idea that advancing in years of experience in farming is directly proportional to farmers' willingness to pay for agricultural insurance have advanced reasons accounting for this submission. For instance, farmers with a higher number of years in cocoa production might appreciate the negative effects of farm perils on their livelihoods better than less experienced cocoa farmers (Danso-Abbeam et al., 2014). Furthermore, poultry farmers with extensive experience appreciate the inherent risks of the industry, including diseases and market instability (Bannor et al., 2023).

The results in Table 12 tell a different story as indicated by the signs of the regression coefficient and the marginal effects. The marginal effects of both the GH₵1.50 and GH₵2.00 bids are negative and significant at 10% level each but that of the GH₵1.00 bid is positive but insignificant. With each additional year of farming experience, the

probability of the farmer's WTP for the moderate and higher bids declines when all other factors are fixed. This implies that farmers who have been in production for several years exhibit a lesser tendency to pay higher premiums for their farm insurance. A possible reason for this observation is that the more experienced farmers over time could have developed varied risk management strategies that are yielding positive results. For this, they may see the occurrence of disaster risk to have a very insignificant probability, hence, no need for insurance or no need to pay a higher amount. The finding emanating from this study agrees with Okeke-Agulu & Salihu (2019) but sharply contrasts those of Bannor et al. (2023) and Ojogbane & Gbigbi (2022).

Gender of respondents

Based on the literature reviewed not much attention has been given to gender/sex as a hypothetical factor that determines farmers' WTP for farm insurance. The results in Table 12 tell that the marginal effects of gender were negative and significant for both the GH₵1.50 and GH₵2.00 bids but positive and insignificant for the GH₵1.00 bid. What this means is that, holding all other factors constant, being a female farmer decreases the likelihood of being willing to pay higher premiums but increases the probability of being willing to pay the lower bid. The implication is that female farmers who would agree to subscribe to insurance would pay a lesser premium while their counterpart male farmers would pay a higher premium. This came as a surprise because generally, in the study area men are family heads and therefore shoulder a lot of family responsibilities. The expectation with respect to this was that male farmers would align to paying smaller premiums as a result of their financial burden.

Insurance subscription experience

The experiences poultry farmers had with insurance companies regarding the policies they subscribed to, the terms and conditions of the contracts and procedures in the settlement of claims and benefits could have a significant influence on farmers' decisions to purchase farm insurance. As shown in Table 12, the marginal effects of insurance subscriptions were negative but insignificant for the lower bid but positive and significant (at a 10% level each) for the GH₵1.50 and GH₵2.00 bids. Hence, increased knowledge of insurance policies leads to a higher tendency of willingness to pay moderate and higher premiums but a decreased likelihood to pay lower premiums with all other factors held constant. An inference based on this could be that experience in insurance subscription is directly related to poultry insurance adoption. Mention however must be made that; this would be subject to the treatment received by the farmer from the agency that provided the non-agricultural insurance policy to the farmer. Unfavourable experiences could trigger a lesser probability of willingness to pay as more favourable experiences could lead to a higher probability of willingness to pay.

Farmers' risk perception about poultry enterprises and risk attitude

Risk management strategies adopted by farmers are influenced by their perceptions and attitudes towards risks. The risk perception variable turned out to be positively related to farmers' insurance uptake decisions but not statistically significant. Risk-averse and risk-loving attitudes of farmers are noted to have a diverse significant influence on farmers' WTP. The results of this study as presented in Table 12 reveal that the ordered logit regression coefficient for risk-averse attitude (coded as attitude_1) is positive and

significant. This indicates that as farmers become more risk-averse in their attitudes, the probability of their WTP for farm insurance increases. Similarly, the marginal effects of risk-averse attitude are positive and significant (both at a 1% level) for the moderate and higher bids. This means that a rise in farmers' risk aversion behaviour level leads to an increased likelihood of being willing to pay for the two higher bids *ceteris paribus*.

On the other hand, the coefficient of the marginal effects of the (GH₵1.00) premium was negative and significant (at a 5% level) indicating that all things being equal, as farmers' risk aversion attitude increases, the likelihood of their willingness to pay for the lower bid decreases. It can be inferred from the foregoing analysis that farmers with risk aversion attitudes demonstrated a high willingness to pay higher insurance premiums but were less willing to pay lower premiums. The possible explanation to this revelation could be that being risk averse in nature farmers would prefer to take insurance cover so that in the event of a disaster risk, the shocks due to the financial loss are reduced to the barest minimum. Reardon (2001) and Islam et al. (2021) also observed a direct relationship between farmers' risk-averse attitude and their willingness to adopt farm insurance to lessen the adverse effects of risks. However, Ngango et al. (2022) observed a negative but insignificant correlation between the risk-averse attitude of crop farmers and WTP for agricultural insurance in Rwanda.

Attitude_2 (risk-neutral attitude) turned out to produce similar results as the risk-averse variable. The logit regression coefficient (Table 12) was significant and positive indicating that the neutral attitude of farmers increases their possibility of WTP for poultry farm

insurance. Likewise, the marginal effects of the GH₵1.50 and GH₵2.00 bids are positive and significant (at 5% and 1% levels respectively) implying that as farmers become more risk neutral in their attitude, the probability of their WTP the moderate and higher premium increases holding other factors constant. The significant but negative marginal effect of the GH₵1.00 bid, on the other hand, implies that as farmers become more risk-neutral in their attitude, the probability of being willing to pay the GH₵1.00 bid declines when all other factors are fixed. Following the above scenario, a deduction that could be made is that, the majority of farmers with a neutral attitude towards risks would be willing to pay a higher premium.

The risk-averse and risk-neutral attitudes were compared to the risk-loving attitude since the risk-loving attitude was benchmarked in the ordered logistic regression analysis. The results in Table 12 show that a statistically significant difference existed between the risk-averse and risk-neutral attitudes compared to the risk-loving behaviour. Thus, risk-averse and risk-neutral farmers had a higher probability of being willing to pay moderate (GH₵1.50) and high (GH₵2.00) insurance premiums compared to their risk-loving counterparts. This confirms the report by Islam et al. (2021) that farmers' risk aversion attitude positively influenced their adoption of agricultural insurance.

4.8 Implications of Findings to Insurance Provision

The survey explored the preparedness of poultry farmers to accept and hence, pay insurance premiums for their farm insurance. Traditional risk management techniques employed by poultry farmers including contract farming and selling farm assets etc. (Bannor et al., 2023), are criticized for being ineffective since they have failed to provide

sufficient protection for farmers (Kahan, 2013). Agricultural insurance is believed to be the most effective approach to counter the negative financial consequences of risks and uncertainties on the welfare of farmers and economies of developing nations (Kwadz et al., 2013; Mandal et al., 2009). The obvious question in view of the above is whether poultry farmers are prepared to pay a premium for their farm insurance and what amount they are prepared to pay. This research has broadened the body of knowledge on WTP for poultry insurance in Tamale. The results have established that there is a viable poultry insurance market in Tamale as farmers' WTP for the product is very high.

Notwithstanding the high WTP, poor understanding of insurance policies and distrust in insurance companies are major setbacks to insurance adoption. Enhancing poultry farmers' access to information and proper education on insurance policies could help disabuse some farmers' minds of certain misconceptions about insurance. Again public-private partnerships in the provision of insurance could build farmers' confidence and positively influence adoption.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter of the study provides a summary of the entire work, draws conclusions and makes recommendations in line with the findings. These recommendations are envisaged to be made use of by the government and other policymakers, non-governmental development agencies and investors. This chapter also highlights the limitations of this study and provides recommendations for future investigations into poultry insurance.

5.2 Summary

The study sought to examine poultry farmers' WTP for poultry insurance in Tamale. Specifically, investigations on farmers' risk perceptions of the poultry business, their risk perception of insurance subscription as well as their risk attitudes. It further examined how much poultry farmers were ready to spend on farm insurance and the factors that influenced their WTP decisions.

A comprehensive semi-structured questionnaire was used to obtain data from 214 systematically sampled respondents through face-to-face interviews for analysis. The Likert scale, summative model, and risk factor analysis together with DOSPERT were used to explore farmers' risk perceptions and risk attitudes while the actual amount poultry farmers were willing to pay was elicited through the contingent valuation method (DBDC). The factors influencing farmers' WTP at different levels of bids were analyzed using the Ordered logit model.

5.2.1 Key findings of the study

- A greater proportion (86%) of the surveyed farmers perceived poultry production as a highly risky venture while 14% had a low-risk perception about the business. On average, 96% of respondents perceived climatic/production risks as the highest risk source posing a serious threat to the business. This was followed by market risk and transportation risk with Institutional/financial risk perceived as the least significant risk source in the poultry industry.
- In general, a majority (75%) of farmers indicated low trust in insurance companies while 25% indicated they have high trust in insurance companies' commitment to claim settlements and enhancing clients' welfare. A large percentage (72%) of farmers were of the view that subscription to insurance in itself is financially risky as 25% associated no risk to insurance subscription. It is however worth noting that the risk level in insurance subscriptions was generally perceived to be low (65% of respondents).
- Most (61%) of the farmers interviewed demonstrated a risk-averse attitude, while 30% exhibited risk risk-loving attitude with the remaining 9% observed as risk-neutral farmers.
- A good number (64%) of respondents indicated their willingness to pay insurance premiums to insure their farms whilst about 36% declined to subscribe to the insurance policy.
- A greater number (36%) of the respondents chose the highest bid (GH₵2.00/bird) as their maximum WTP over the lower bids (GH₵1.50/bird and GH₵1.00). Thus; 30% and 34% respectively.

- The mean premium farmers in the study area were prepared to pay for their farm insurance was GH₵ 1.52 per bird/production cycle in anticipation of GH₵ 50.00 indemnity per bird.
- Female poultry farmers and so as farmers who were into off-farm income-generating ventures demonstrated a willingness to pay more with a MWTP premium of GH₵ 1.70 and GH₵ 1.54 per bird/production cycle respectively.
- Most (92%) of the farmers who declined to accept poultry insurance cited a lack of trust in insurance companies as the chief reason for their unwillingness to pay. Other reasons were bureaucratic procedures in claim settlements, poor understanding of policy and difficulty in meeting policy conditions.
- Obtaining financial backing to restart business after a disaster risk, increased confidence in investment and improved technology adoption were the major reasons farmers demonstrated their preparedness to adopt farm insurance.
- Farmers' WTP for poultry farm insurance was significantly influenced by their level of education, flock size, access to credit, their disaster experiences, the kind of land holding practiced, their experience (number of years) in poultry production, Sex, insurance subscription experiences as well as their risk aversion and risk-neutral attitudes.
- Among these significant variables, the educational level of respondents, disaster experience, land tenure system, insurance subscription, risk aversion and risk-neutral attitudes of farmers directly influenced WTP for the higher bids whereas farm size, access to credit, farming experience and gender of respondents inversely affected WTP the higher bids but increased their WTP to pay the lower bid.

5.3 Concluding remarks

The study's findings led to the under-listed conclusions:

A significant number of farmers in Tamale perceive poultry production as a highly risky venture. For this poultry farmers would more likely put in place measures (including the adoption of poultry insurance) to mitigate the effects in the event of a risk.

Among diverse risks, climatic/production and biological risks were identified as the primary sources of threat to the business. This could mean that farmers are less capable of managing such risks and therefore need technical support to minimize the adverse effects of such risks. A high degree of these risks could also take farmers out of business.

The forms of disaster risks poultry farmers in Tamale frequently experience are pest and disease infection, rainstorms and flooding, stampede and heat stress with feed contamination and cannibalism being the least. The implications are that farmers would suffer losses due to increased mortality and reduced productivity and also suffer additional costs of treatment and possible damage to farm structure.

Risk aversion was the most dominant attitude farmers demonstrated towards poultry production. This observation could mean that because of their risk-averse attitudes, the farmers may be less likely to adopt innovative technologies that come with additional costs. They may also be more likely to adopt conservative management strategies such as low-input farming and invest very little in their farms.

Risk perception about insurance subscriptions is generally low among poultry farmers. The farmers' experiences with agencies that provide other forms of insurance could play a key role in their decisions to adopt poultry insurance or otherwise.

A greater percentage of farmers demonstrated a willingness to pay for poultry farm insurance, with a mean amount of GH₵ 1.52 per bird per production cycle for an anticipated indemnity of GH₵ 50.00 per bird. This implies that most farmers appreciate insurance adoption as an efficient risk mitigation tool. With insurance adoption, farmers could increase their farm investment.

The average willingness to pay amounts varied significantly between female and male farmers (GHc 1.70 and GHc 1.45 respectively) as well as farmers who had off-farm jobs and those without off-farm jobs (GHc1.54 and GHc 1.31) respectively. This indicates that female farmers and farmers with off-farm jobs would likely pay higher premiums than other farmers.

Socioeconomic characteristics of farmers such as risk aversion attitudes, number of years spent in school and experience of disaster showed a positive correlation with WTP higher premium whereas farming experience and flock size showed a significant negative correlation. The positive correlation suggests that highly educated farmers and farmers who had disaster experience are more likely to adopt insurance while farmers with extensive production experience would be less likely to adopt agricultural insurance. In the long run, however, farmers with higher educational levels and experience with disasters may become more resilient to future disasters and this may reduce their reliance on agricultural insurance as a risk management tool.

Lack of trust in insurance companies as well as bureaucratic procedures in claim settlements played major roles in farmers' unwillingness to pay decisions. Farmers' socio-demographic characteristics as well as farm characteristics significantly influenced their WTP for poultry insurance.

5.4 Policy recommendations

- *Education and training on risk management:* Policymakers and extension services could establish education and training programmes for farmers to enhance their competencies in risk management strategies, including agricultural insurance to help them mitigate disaster-related losses and build positive attitudes towards risks.

- *Market Potential for Investors:* The revelations of the study point out that WTP for poultry insurance was high and so was the price farmers were prepared to pay. In respect of this, investors could take advantage of the poultry farm insurance market potential in Tamale and its surrounding communities. Investors in the insurance market could work with researchers to develop tailored poultry insurance products that meet farmers' needs.
- *Education on Agricultural Insurance schemes:* Educational campaigns could be rolled out by the MoFA (Extension services) and private insurance companies to create awareness, sensitize farmers, enhance their understanding of agricultural insurance benefits and disabuse their minds of some misconceptions the farmers have about insurance companies.
- *Public-Private-Partnership**:*** Since farmers in the study area generally have low trust in insurance companies, private investors could collaborate with government agencies in the provision of poultry insurance packages to farmers to boost farmers' trust and confidence to increase their willingness to subscribe. Government agencies could establish regulatory frameworks to monitor the activities of private

investors and if possible, offer subsidies to encourage farmers (particularly those with lower educational levels) to purchase poultry insurance.

- In the insurance policy design, potential investors should include very devastating disaster risks such as New Castle disease, Bird flu and stampede among the perils covered by the policy and also provide flexible (such as minimal flock size) and comprehensive conditions that farmers can meet.
- In addition, attention could be focused on female farmer groups, highly educated farmers and farmers who have less farming experience as they demonstrated WTP for the higher bids and could be relied upon to influence other farmers to accept poultry farm insurance.

5.5 Limitations of the study

- Difficulty in accessing literature on poultry insurance. Specifically, the literature on poultry insurance studies carried out in Ghana was very limited compared with similar studies on crop insurance.
- None of the existing insurance companies operating in the study area provided poultry insurance policy, hence, poultry farmers had very little or no knowledge at all about poultry insurance. This could have limited their understanding of the hypothetical poultry insurance product designed for the study.
- It was extremely difficult to get access to a full and comprehensive insurance policy document from insurance companies for use in crafting the hypothetical insurance product for the study.

5.6 Suggestions for future research

- Given that most poultry farmers demonstrated a stronger desire to pay higher premiums for farm insurance, future research should explore the extent to which insurance companies are prepared to offer poultry insurance.
- The current study used a hypothetical insurance product for the study. Future studies should consider using real insurance products from an insurance company to investigate the actual WTP amount.
- If possible different insurance packages from different insurance companies could be used. In this case, future studies should consider combining the CVM with choice experiments for examining farmers' WTP for poultry insurance packages with specific attributes. This will enable the determination of which type of poultry insurance farmers would be willing to adopt, considering their varying characteristics in price points, indemnities and other attributes.
- Future studies could evaluate the impact of agricultural insurance on poultry farmers' livelihoods. Such empirical evidence could be used by extension service providers and other stakeholders to motivate farmers and increase the uptake of poultry insurance.

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APPENDIX A

QUESTIONNAIRE

Department of Agricultural Economics

Faculty of Agriculture, Food and Consumer Sciences

UNIVERSITY FOR DEVELOPMENT STUDIES
NYANKPALA—TAMALE

WILLINGNESS TO PARTICIPATE IN POULTRY INSURANCE SCHEME BY SMALLHOLDER POULTRY FARMERS IN TAMALE

Please note that this research is intended for academic purposes only and all information provided shall be used exclusively for this objective, but policymakers may draw insights from its findings to plan farm insurance policies. The information given to us shall be kept confidential and thus will not be given to any third party without your prior approval. We would appreciate it if you could respond to the questions as honestly as possible. The information you provide will be added to those of other participants for analysis. Please be assured that your responses will be handled with complete confidentiality. Thank you for considering this request.

PART I

FARMERS' RISK PERCEPTIONS OF THE POULTRY BUSINESS

In your assessment of risk associated with poultry production, please rate the level of risk in the poultry business by ticking the most appropriate box in the following statement:

1. How do you perceive the riskiness/risk level of the poultry business?

Not at all Risky ☐ Somewhat Risky ☐ Moderately Risky ☐

Risky ☐ Very Risky ☐

For Interviewer: Explain the four categories of risk sources indicated in the table below to the respondent. Now take the respondent through the following:

2. Please assign a score to each of these risk categories based on the incidence (how often it occurs) and severity (how devastating it is when it occurs) on a scale of 1 to 5.

(1—Never, 2—Rarely, 3—Sometimes, 4—Often, 5—Very often) — Incidence

(1—very low, 2—Low, 3—Moderate, 4—High, 5—Very high) — Severity

Risk source (Dimension)	Specific Risk	Incidence (x)	Severity (z)	Risk Factor (x + z)
Production/ Climatic risk	Extreme temperatures (heat and cold)			
	Rainstorms and flooding			
	Shortage of feed, drugs, vaccines and labour			
Market risk	Uncertainty about prices and quantities of inputs (for example, increase in prices)			
	Uncertainty about prices and quantities of outputs (decrease in prices and output)			
	Transportation risks			
Biological risk	Pests and disease infestation			
	Contamination of feed, water and equipment			
	Predator attack (Snakes, cats, moles etc)			
Financial risk	Limited/No access to credit			
	Fluctuations in interest rates			
	Inadequate finance to pay loans			

PART II

FARMERS RISK ATTITUDES

3. Please indicate your level of agreement or disagreement with the following statements on a scale of 1 to 5 by ticking the most appropriate box in the table below:

Risk statement	***SD (1)***	***D (2)***	***NS (3)***	***A (4)***	***SA (5)***	***Score***
I like experimenting with new ways of doing things in the poultry business						
I will significantly reduce the quantity of feed and skip recommended vaccines if prices go very high						
I am willing to take higher financial risks than others in producing and marketing poultry products.						
I have to take higher risk to be successful in the poultry business						
I'm willing to try new technology and poultry production methods even before others try them.						
In selling poultry products, I prefer higher credit sales to lower cash sales.						
I am willing to lend the whole of my farm's monthly sales to a friend in need.						
				Total Score		

SD – Strongly disagree, D – Disagree, NS – Not sure, A—Agree, SA – Strongly agree

PART III

FARMERS' INSURANCE SUBSCRIPTION EXPERIENCE AND RISK PERCEPTIONS ABOUT INSURANCE CONTRACTS

4. Have you ever subscribed to an insurance policy of any kind? Yes ☐ No ☐

If No, skip 5 and 6 and proceed with question 7

5. If yes specify the kind of insurance …….
6. Indicate your level of trust in insurance companies' commitment to honour their responsibility of settling claims due clients.

   High trust ☐ Low trust ☐ No trust ☐
7. Do you associate risk with paying a premium to an insurance company to subscribe to an insurance package? Yes ☐ No ☐
8. If yes, at what level would you rate the risk involved in paying a premium to purchase an insurance package for your poultry farm?

   Highly risky ☐ Less risky ☐ Not risky ☐

PART IV: ELICITATION OF HOW MUCH POULTRY FARMERS ARE WILLING TO PAY FOR FARM INSURANCE

At this stage, I would like to introduce agricultural insurance to you by providing you with some basic information.

The poultry business is faced with varied risks and uncertainties that militates against the growth of the industry and has the tendency of taking affected farmers out of business. To counter this adverse effect of risks, agricultural insurance is recommended to farmers as novel risk management strategy. It is envisaged that in the event of a disaster, the insurance would eliminate the effects of the financial loss associated with the disaster through claim settlements. Subscribing to an insurance policy would also facilitate the access to credit from financial institutions and boost the farmer's confidence in adopting improved technologies of production since the farmer is assured that the financial loss due to the insured peril would be transferred to the insurance company. To enjoy these benefits and others in the event of a disaster, the farmer's responsibility is to sign a contract and pay insurance premium and observe other conditions.

This poultry insurance requires that the farmer pays a one-time premium in the life cycle of the birds (Layers-maximum age of 72 weeks, Broilers- maximum age of 8 weeks). The premium is calculated as a percentage (less than or equal to 5%) of the total cost of initial investment on stock. The insured is indemnified in the event of mortality of the stock from the farm during the period of the insurance. The policy covers mortality resulting from insured perils including; accidents occurring on the farm, fire outbreak, lightning and thunder, flooding and diseases (with exception to bird flu, New Castle disease and Paramyxovirus 1). The policy does not cover mortality resulting from famine, cannibalism, stampede and food poisoning.

Amount covered (Indemnity) is calculated as the value of the stock at the time of loss. The value of stock is obtained from the total number of birds and the individual values according to the size/ weight or age of the bird as stated in the last stock declaration before the loss.

Conditions to be fulfilled by the insured: The insured must

- ***vaccinate stock according to the recommended vaccination programme***
- ***employ the services of a veterinary doctor to administer any form of medication***
- ***keep proper records and provide monthly stock declaration.***
- ***Observe strict biosecurity measures***

9. Given the above information, would you be willing to pay a premium to subscribe to the poultry insurance scheme? [Please remember that if you choose to pay, you may have to reduce expenditures for your other needs because your budget is constrained.]

   Yes ☐ No ☐

10. If no to question (9) state reasons by ticking appropriately (multiple answers are allowed).

1. I am not aware of poultry insurance	
2. Premium is expensive, I can't afford	
3. My farm is not at risk	
4. Conditions are difficult to meet	
5. I do not properly understand the policy	
6. I can't trust insurance companies	
7. It is difficult to get claims	

Other reasons, please specify,

……

……

……

……

For interviewer: ***If a respondent answers yes to question (9), skip question 10 and ask the respondent to choose a premium percentage randomly from a hat. Interviewer presents actual premium value corresponding to the chosen percentage. 3%(GHc300), 4%(GHc (450) and 5%(GHc 600). Write the actual value in the blank space provided below.***

11. Would you be willing to pay GHc…… as an insurance premium per production cycle for every 300 birds to purchase an insurance package for your farm given that the expected claim per same number of birds is GHc15000?

Yes ☐ No ☐

If the respondent answers yes to the first bid, present a second higher bid for the respondent to decide whether or not he/she will pay.
Write the concrete amount of the bid in the blank space in question 12. If the respondent answers yes to second higher bid present the third (highest) bid to the respondent. Continue this iteration till the respondent answers no. Record the last bid preceding the no answer as the respondent's maximum WTP.
If the respondent picks 5% as first bid (in question 11) and agrees to pay, record this as the maximum WTP and move to question 14

12. Would you be willing to pay GHc …….. as a premium per production cycle for 300 birds to purchase an insurance package for your farm given that the expected claim per the same number of birds is GHc15000? [Remember that your budget is constrained and you may have to reduce the expenditure for your other needs if you choose to pay].

Yes ☐ No ☐

Maximum willingness to pay GHc…… (last bid accepted after iteration)

Please skip question 13 if a maximum WTP is obtained in question 12. However, if the respondent answers no to the first bid (in question 11), a second lower bid is presented. Thus, 1% less the percentage of the first bid is used to determine the second lower bid amount.
Write this amount in the blank space in question 13 below and present to the respondent. Continue this iteration till the respondent answers yes. Record the last bid accepted as the respondent's maximum WTP.

13. Would you be willing to pay GHc …….. as a premium per production cycle for every 300 birds to purchase an insurance package for your farm given that the expected claim per the same number of birds is GHc15000?

Yes ☐ No ☐

Maximum willingness to pay GHc …… (last bid accepted after iteration)

14. Please indicate why you would be willing to pay a premium to purchase an insurance scheme for your farm. Please tick the most appropriate box that matches your reason(s).

i. To transfer the financial loss to the insurer in the event of a disaster ☐
ii. To obtain financial backing so I can restart my business in the event of a disaster ☐
iii. To enhance my chances of obtaining credit to expand the business ☐
iv. To enhance my confidence in adopting improved technologies of production ☐

Others, please specify

……

……

……

PART V:
FACTORS THAT INFLUENCE FARMERS' DECISION TO PAY PREMIUM TO PURCHASE POULTRY INSURANCE

A. Socio-economic Factors

15. Gender of poultry farmer Male ☐ Female ☐

16. How old are you? ……

17. What is your highest level of education?

Basic ☐ SHS ☐ Tertiary ☐ None ☐

If basic or SHS, at which class did you drop ……

*** Number of years of education ……..

18. What is your marital status?

Single ☐ Married ☐ Divorced ☐ Widow/widower ☐

19. How many people in your household depend solely on you? ☐

20. How many years have you been in poultry production? ☐

21. Are you aware of the availability of a poultry insurance scheme in Tamale?

22. Yes ☐ No ☐

23. Have you subscribed to any form of insurance?

24. Yes ☐ No ☐

If yes please specify the kind of insurance …….

25. What is your average income per month? Select the appropriate range

GHc1000 – GHc 2400 ☐ GHc 2500 – GHc 3000 ☐

GHc 3100—GHc 4000 ☐ > GHc 4000 ☐

26. Do you engage in any off-farm income-generating activity?

Yes ☐ No ☐

If yes, please specify the name of the activity and income earned per month.

Activity…….. Income GHc……

B. Farm characteristics and Institutional Networks That Influence WTP

27. How many birds do you rear currently?

Specific Number ☐

< 300 ☐ 300 – 500 ☐ 600 – 1000 ☐ > 1000 ☐

28. Which breed of birds do you rear? Layers ☐ Broilers ☐

29. How much income did your farm generate in the last production cycle on average?

Specific amount GHc ……

GHc 5000 – GHc 10000 ☐ GHc 11000 — GHc15000 ☐

GHc 16000—GHc 20000 ☐ > GHc 20000 ☐

30. What kind of farmland holding/ownership do you practice?

Family building ☐ Rented building ☐ Farmer's own building ☐

31. Have you ever experienced a disaster on your farm? Yes ☐ No ☐

If yes please specify the kind of disaster ……

32. Do you have access to credit from a financial institution if the need arises?

Yes ☐ No ☐

33. If yes, please indicate the financial institution

…….

34. Do you belong to any poultry farmers' association? Yes ☐ No ☐

If yes specify the name of the association

……

35. Do you have contact with extension officers (animal service)?

Yes ☐ No ☐

If yes indicate how you get in touch with the officer

……

C. Attributes of Agricultural Insurance Package and WTP

36. How do you rate the premium prices presented to you in part A of this interview?

Very high ☐ High ☐ Moderate ☐ Low ☐

37. On a scale of 1 to 4 how would you rate the amount covered (Indemnity) by the insurance package presented to you considering the premium you would be expected to pay?

i. Very satisfactory ☐ ii . Satisfactory ☐

ii. Less satisfactory ☐ iv. Not satisfactory ☐

38. What category of risk would you prefer the insurance cover?

39. Production risks ☐ Biological risks ☐ Marketing risks ☐
40. How often would you be willing to pay a premium for an insurance package?
    Once per production cycle ☐ Twice per production cycle ☐
41. What kind of insurance would you prefer?
    Individual insurance ☐ Group insurance ☐
42. Please indicate your level of agreement or disagreement on how the following factors would influence your decision to subscribe to poultry insurance.

Statement	SA	A	NS	DA	SDA
The premium to pay plays a key role in my decision to purchase insurance					
I would critically examine the amount covered by the policy in my decision to purchase insurance					
The number of times the premium is paid will not determine my decision to pay for insurance for my farm.					
The kind of risk covered by the policy is of great concern to me					
I would choose individual insurance over group insurance in deciding to purchase an insurance scheme					

SA — Strongly agree, A — Agree, NS — Not sure,
DA — Disagree, SDA — Strongly disagree

APPENDIX B

SCALES USED IN DOSPERT

Table 1. Adapted from (Blais & Weber, 2006)

Risk-taking Scale						
1	2	3	4	5	6	7
Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely
Risk-Perception Scale						
1	2	3	4	5	6	7
Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky

Sample statements from the 30 items describing Risk-taking behaviour/risk perception relating to the five (5) domains of life.

1. Investing 5% of your annual income in a very speculative stock. (F)
2. Disagreeing with an authority figure on a major issue. (S)
3. Passing off somebody else's work as your own. (E)
4. Drinking heavily at a social function. (H/S)
5. Going camping in the wilderness. (R)

Where: E= Ethical**, F=** Financial**, H/S=** Health/Safety**, R=** Recreation and **S=** Social