UNIVERSITY OF CAPE COAST

FISHERMEN'S WILLINGNESS TO PAY FOR INSURANCE IN THE WESTERN REGION OF GHANA

FRANCIS AINOO

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BY

FRANCIS AINOO

Thesis submitted to the Department of Agricultural Economics and Extension of the School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast, in partial fulfilment of the requirements for award of Master of Philosophy Degree in Agricultural Economics

JUNE 2014

DECLARATION

Candidate's Declaration

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

Candidate's Signature…….. Date …….

Name: Francis Ainoo

Supervisors' Declaration

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

Principal Supervisor's Signature……..…… Date…..…….

Name: Nana Dr. Henry De-Graft Acquah

Co-supervisor's Signature……..……. Date…..…….

Name: Mr. Samuel Akuamoah-Boateng

ABSTRACT

Fishermen face a lot of risk and uncertainty in their fishing operations. One way of dealing with risks and uncertainties in the fishery sector is the adoption of insurance policy. Successful implementation of insurance scheme requires the need for demand analysis. This study therefore investigated fishermen's willingness to pay for insurance in the Western Region of Ghana.

A three stage sampling procedure was used to select 300 fishers and a structured interview guide was used to elicit data from the respondents. The data collected from the fishermen were analyzed using descriptive statistics, linear regression and logistic regression model.

The study revealed that fishing activity in the study area is an occupation for men and is mainly operated by married and middle aged adults who have no formal or basic education. About 67.7% of the fishermen were willing to pay for fishery insurance to reduce risk. The mean willingness to pay for fishery insurance is GH¢160.86. The evidence from the study shows that age, years of education, average people on-board, wearing life belt/jacket, and own house were the positively significant variables influencing willingness to pay for fishery insurance. The significant variables influencing maximum amount fishers are willing to pay were age, group fishing and wearing of life belt / jacket. The study therefore recommends that fishermen be encouraged to form viable cooperatives to enable them access credit facilities, encouraging young people to engage in fishing, educating and creating safety precaution awareness as this will significantly influence willingness to pay for fishery insurance.

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Finally to my family Emelia, Michelle and Papa Kofi Ainoo for your support, love and care towards me in making this work a reality. God richly bless you all.

DEDICATION

To my wife, Emelia Ainoo and children, Papa Kofi Ainoo-Brey Jr. and Michelle Adwoa Ainoo–Brey.

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LIST OF ABBREVIATIONS

CBFMC	Community Base Fishery resource Management committees
CLT	Central limit theorem
CVM	Contingent Valuation Method
DEO:	District Education Office
FAO:	Food and Agriculture Organization
GDP	Gross Domestic Products
GHGs	Green House Gases
ICAT	International Convention on Atlantic Tuna
IPCC	Intergovernmental Panel on Climate Change
MSE	Management Strategy Evaluation
PPAG	Plan Parenthood Association of Ghana
RMA	Risk Management Agency
SP	Stated Preference
TAC	Total Allowable Catch
USDA	United State Department of Agriculture
WTJ	Willingness to join
WTP	Willingness to pay

CHAPTER ONE

INTRODUCTION

Background to the Study

Agriculture plays vital role in the economy of Ghana in terms of its share of Gross Domestic Product (GDP), employment, foreign exchange earnings, provision of raw materials and provision of food security. Ghana's 2011economic analysis indicated that, the agriculture sector contributed 27.2% to GDP which was second to the service sector (52.6%) whiles the industrial sector contributed 20.2% (Ghana Statistical Services, 2012). Agriculture is the mainstay of the Western Region's economy, employing about 70% of the economically active population and accounts for about 60 percent of the Regional GDP (Western Regional Coordinating council, 2012). However such vital role played by agriculture could not have been realized without a boost from the fishery sector.

Ghana's agricultural sector is divided into four sub-sections namely; crops, livestock, forestry and Logging and fisheries. It is imperative to throw more light on fisheries since this study concentrates on marine fishing. The total fish catch comes from two main sources namely marine and inland rivers and lakes. Inland fishing is done in lakes, lagoons and rivers in the country. The fishing activities in the inland waters are traditional and on small-scale bases.

According to FAO (2008) from local to global levels, fisheries and aquaculture play important roles for food supply, food security and income generation. About 43.5 million people work directly in the sector, with the great majority in developing countries. Adding those who work in fishery associated sector such as processing, marketing, distribution and supply industries, it supports nearly 200 million livelihoods. Aquatic foods have high nutritional quality, contributing 20 percent or more of average per capita animal protein intake for more than 1.5 billion people, mostly from developing countries. They are also the most widely traded foodstuffs and are essential components of export earnings for many poorer countries. The sector has particular significance for small island States, who depend on fisheries and aquaculture for at least 50% of their animal protein (FAO, 2008).

In Ghana, fishery industry engages about 2.2 million (10%) of Ghanaians either as real operatives or dependant. In Ghana the average per capita fish consumption is around 20-25kg, which is higher than the world average of 13kg (Ghana Statistical Service, 2002).

Although, the Western Region's fishery sub-sector is under developed and that about 90% of the region's catch is by small scale canoe fishermen who are unable to acquire modern technologies for their operations, the sector is able to contribute about 10.7% to the national production with aquaculture contributing 0.032.(Western regional coordinating Council, 2012).

As noted in an address by the minister for fisheries at the 2007 meet the press series, held on August 28th 2007… 'the Country has fish production potential that is latent. We have good soil and a large expanse of water bodies, a resource, which needs to be harnessed to the optimum. In fact, ten (10) per cent of the entire land surface of Ghana is covered by water with a marine coastline of five hundred and fifty (550) kilometres stretching from Aflao in the East to Half Assini in the West. Also in terms of human capacity, we also have a fairly good stock of expertise and know how in the Country'.

Ghana has been a regional fishing nation with a long tradition of a very active fishing industry dating back to as early as the 1700s and 1800s when Fante fishermen embarked on ocean fishing along the coast of Ghana. Bounded on the south by the Gulf of Guinea, Ghana has a total continental shelf area of about twenty four thousand, three hundred (24,300) square kilometres to support a vibrant marine fishing industry. Fantes are reported to have been fishing in the coastal waters of Benin Republic and Cote d'Ivoire since the early 1900s (Atta-Mills, Alder & Sumaila, 2004).

The first Ghanaian fishermen are believed to have arrived in Nigeria in 1916 (Overa, 2001) and in Liberia in the 1920s (Haakonsen, 2001). From there, Ghanaian fishermen extended to Senegal and as far as the Republic of Congo by the 1940s. By the early 1950s, the development of a semi-industrial fishing presence in foreign waters had established Ghana as a fishing power throughout West Africa (Agbodeka, 1992). However, this growth in the fishing sector was stalled from the 1970s to 1980s as economic conditions in Ghana deteriorated.

The majority of the world's 200 million full and part-time fisher folk (fishers, fish processors, traders and ancillary workers) and their dependents live in areas vulnerable to human-induced climate change, or depend for a major part of their livelihood on resources whose distribution and productivity are known to be influenced by climate variation. However, relationships between the biophysical impacts of climate change and the livelihood vulnerability of poor fishing communities have seldom been investigated. Information has been lacking on the areas and people that are likely to be most vulnerable to climate-induced changes in the fisheries as it affect sustainability of capture and enhancement of fishing.

Analysis of poverty in small-scale fisheries, guided by the sustainable livelihoods has identified vulnerability to external shocks and trends, rather than asset or income poverty, as a particular threat to the sustainability of fishing-based livelihoods. A high level of vulnerability undermines the important contributions made by fisheries to poverty alleviation and nutritional security at local, regional and sometimes national levels (Akter, Brander, Brouwer & Haque, 2007).

It is widely accepted that at least part of the earth's 0.6°C warming during the last 100years is due to emissions of greenhouse gases caused by human activities. The world is expected to continue warming by 1.4 to 5.8°C by the end of the century. Other predicted impacts by 2100 are a rise in average global sea level of between 0.1 to 0.9 m and changes in weather patterns, including an increased frequency and severity of extreme events such as hurricanes, floods and droughts. Mean sea level rise will lead to extreme levels being reached more

frequently and changes in storm surge heights may result from increases in strong winds and low pressure events.

The oceanic circulation system is also likely to be strongly influenced by warming, affecting current-dependent upwelling fisheries, including the major industrial fisheries for small-pelagic fish, with consequences for global fish supplies. Although resource-dependent communities in the developing world have adapted to climate variability throughout history, through maintaining occupational and geographical mobility, projected climate change poses multiple risks to fishery dependent communities because of the increased frequency of extreme weather events. It is also no longer always possible for fisher folk to fall back on historical adaptive strategies due to increasing coastal and riparian populations, reduced fish catch rates and institutional barriers preventing or reducing the ease of geographical and occupational mobility (Akter, Brander, Brouwer & Haque, 2007).There are multiple stresses associated with coastal urbanization, changes in the frequency and intensity of coastal storms and hurricanes, and the impacts of climate change on sensitive coastal ecosystems. In projected climate change scenarios, the main threats to coastal populations and ecosystems are sea-level rise, the intensification of extreme weather events and ecosystem changes (Akter, Brander, Brouwer & Haque, 2007).

Physical and biological impacts of climate change are the modification and the distribution of marine and freshwater species. In general, warm-water species are being displaced towards the poles and are experiencing changes in the size and productivity of their habitats. In a warmed world, ecosystem productivity

is likely to be reduced in most tropical and subtropical oceans, seas and lakes and increased in high latitudes. Increased temperatures will also affect fish physiological processes; resulting in both positive and negative effects on fisheries and aquaculture systems depending on the region and latitude. Climate change is already affecting the seasonality of particular biological processes, altering marine and freshwater food webs, with unpredictable consequences for fish production. Increased risks of species invasions and spreading of vector-borne diseases provide additional concerns (FAO, 2008). Such high risk and uncertainty vulnerability in fishery industry mainly due to climate change and inappropriate policy instrument and policy enforcement could be reduced by appropriate fishing insurance policy.

Insurance is often referred to as important and effective ex post natural hazard risk coping mechanisms (Botzen & Vanden Bergh, 2008; Akter & Brouwer, 2010). Accordingly, natural hazard risk insurance programmes have been introduced alongside the existing microcredit programs in many developing countries in order to help the poor cope with increased climatic disaster risks (Akter, Aziz, Brouwer & Choudhury, 2009). In majority of the instances, such insurance products are offered by microfinance institutions that traditionally and predominantly focus on the provision of microcredit (Mechler, 2006). In some cases, providers offer micro insurance products bundled with microcredit loans.

Such schemes require the uptake of insurance as a condition for extending loans or savings arrangements to the microfinance clients. Bundled insurance schemes have three key supply side advantages. First, the system enables the

insurer to diversify risks by adding other risks to the portfolio that are uncorrelated across clients. Second, adverse selection is reduced if clients are obliged to purchase the insurance, including those facing low risk of natural hazard. Third, if the insurance is offered jointly with other products, transaction costs are lower than if they were sold separately. Recognizing the significance of fishing insurance as a tool for managing risk and uncertainties in fishery sector, this study examined the Willingness of fishermen to pay for fishing insurance premium; an important condition to implementing fishery insurance as an alternative poverty alleviation and disaster relief strategy.

Statement of the Problem

Fishermen face a lot of risk and uncertainty in their fishing operations. Some of the main risks they face include: Changes in weather patterns, severity of extreme events such as engine failure, injuries and poisoning from fish, vessel and human life loss due to collision (Mbaga, Boughanmi & Zekri, 2008).

Developments in the world sea foods suggest that fishermen are exposed to a high level of income variability (Fraser, 1992). Agriculture of which fishing is a component is very vulnerable to the unpredictability of natural factors. According to FAO (2007), the fishery industry engages about 2.2 million (10%) of Ghanaians either as real operatives or dependant. With agricultural production representing the major livelihood of many resource constrained Ghanaian farmers and fishermen, the impact of natural disasters and other agricultural risks cannot be taken lightly. The need to safeguard the interests and investments of local

fishermen and fishery industry players is of prime importance. High levels of vulnerability undermine the important contributions made by fisheries to poverty alleviation and nutritional security at local, regional and national levels. In recent years, natural disasters, particularly climate-related ones, have increased both in frequency and magnitude. Findings show that economic losses from disasters are rising dramatically – almost nine-fold in real terms from the decade of the 1960s to the 1990s (Akter, Brander, Brouwer,& Haque, 2007).

One way of dealing with these problems in the fishing sector is the adoption of insurance policy (Fraser, 1992). Insurance is an important and effective ex post natural hazard risk coping mechanisms (Akter, Brander, Brouwer,& Haque, 2007).

Studies on both demand and supply sides of fishery insurance have been carried out in other countries such as Oman (Mbaga, Boughanmi and Zekri, 2008), United State of America (Ludwig, 2002), Europe (European Commission's Agriculture Directorate-General, 2001) among others. However, fishing insurance in Ghana has not been given the needed attention and little or no rigorous statistical studies have been carried out to ascertain the demand side of the products. For instance fishermen's willingness to pay and how much they are willing to pay are not well investigated. Furthermore, although the Western Region's fisheries sub-sector is known to contribute about 10.7% to the region's GDP, fishers are confronted with many risks such as negative consequences of oil exploration on marine aquatic environment, frequent vessel collision due to increase presence of heavy vessels used for oil exploration and merchant vessels

due to Takoradi Port and habour. One way of dealing with these problems in the fishing sector is the adoption of insurance policy (Western Regional Coordinating Council, 2012). Other risks include engine failure, injuries and poisoning from fish and hostile weather. These, if not addressed, could lead to income variability and poverty among fishermen.

In order to design a useful plan of action for dealing with risk and uncertainty, it is necessary to know local people's positions towards fishery insurance. Therefore, a thorough investigation of the factors that determine fishermen's' willingness to pay for insurance is of utmost importance for policy formulation and implementation. It was against this background, that an in-depth empirical examination was carried out to throw more light on the willingness of fishermen to pay for fishery insurance.

Objectives of the Study

The general objective of the study was to analyze fishermen's willingness to pay for insurance in Ghana.

Specifically, the study sought to:

1 Determine the socio-economic characteristics of the fishermen in the Western Region of Ghana

2 Identify the major perils associated with fishery activities in the western region of Ghana

3 Determine the frequency of bids of willingness to pay and the statistics of the bids of willingness to pay for fishery insurance

4 Examine the reasons for fishers' willingness or unwillingness to pay for fishery insurance

5 Analyze the factors that influence fisher's probability of willingness to pay for fishery insurance

6 Analyze the factors that influence the maximum amount of willingness to pay for fishery insurance.

Research Questions:

1 What are the socio - economic characteristics of the fishers?

2 What are the major risks associated with fishery activities?

3 What is the frequency of the bids of willingness to pay and the statistics of bids of willingness to pay?

4 What are the reasons for fishers' willingness or unwilling to pay for insurance?

5 What are the factors that influence fishermen's probability of willingness to pay?

6 What are the factors that influence the amount of willingness to pay?

Justification of the Study

One of the major challenges in fishing insurance sector is inadequate data and policy support required for the sector in setting realistic premium and assessing the true value of claims, the findings of this research will produce

results and the knowledge can be applied to real-world situations. Therefore the study will produce result that is empirical rather than merely theorizing what could work.

Moreover, the facts and findings of the study would provide the government with the state of the domestic fishery insurance in Ghana. This will enable government formulate appropriate agricultural insurance scheme that will minimize high risk and uncertainty which characterized fishery sector in order to enhance its contribution to national growth.

In addition, a comprehensive research in fishery insurance such as this will inform policy makers, insurance providers and organized fishermen groups in setting sustainable and affordable prices that will be beneficial to ordinary fishers and insurance companies in establishing fishery insurance policy.

Finally, the findings will also serves as contribution to economic literature and serves as reference material for secondary researchers.

Variables of the Study

This work basically seeks to analyze the willingness of fishermen to pay for fishery insurance in selected fishing communities in the western region of Ghana. The variables of the study are the factors influencing fishers' willingness to pay which include risk factor, socio-economic characteristics, asset / wealth variables, vessel characteristics and attitude towards safety and precautionary measures. Risk factor was represented by fishing risk experience at sea and type of peril variables. Attitude towards safety and precautionary measures includes

variables such as wearing lifebelt \ lifejacket, listening to weather forecast, informing family before going off shore and vessel fishing in groups. The socio-economic characteristics took into account age, gender, income, family size, educational level, experience in fishing, credit access, credit use and credit repayment variables. Vessel characteristics include the age of the boat, horse power of the vessel's engine, size of the boat whiles fisher's wealth was represented by variables such as own car, own house, own land and own fishing vessel

Delimitations of the Study

The study determined fishermen's willingness to pay for fishery insurance, with specific reference to Sekondi –Takoradi Metropolis and Sharma Districts in the Western Region of Ghana. Although the concept of willingness-to-join (WTJ) is separate from the Willingness-to-pay (WTP) for a particular scheme, very few studies separate willingness to join from willingness to pay. It is very important to separate willingness-to-join from willingness-to-pay since a household may be willing to join fishing insurance programme as they see value in the product but may not be willing to pay as they do not trust the insurance provider or lack the ability to pay. This study analyzed only WTP for fishery insurance but did not separate WTJ from the WTP. Also the research did not centre on individual members of fishing communities who are not into active fishing as well as fishermen who do not belong to selected fishing communities but market their fishing products in the shores of selected fishing communities. Some of the factors this study intends to investigate include socio- economic background of

the fishermen, factors that influence the probability of fishermen's willingness to pay for insurance, determinants of fishermen's willingness to pay for an insurance premium and major perils experienced by fishers.

Limitations of the study

Like any other academic research, this work was not without constraints. The main limitation of this work might arise from computational errors and errors due to human influence in giving right answers to the research questions. Furthermore, the quality of data do not only depend on the amount of time one spend on gathering data but partially on how much money one spent in gathering them. Lack of cooperation on the part of some fishermen for fear that information about their income and asset could be used for taxing them and therefore may have given false figures might pose limitation on the research.

Organization of the Study

The research work is organized into five major chapters. Chapter one gives an introduction to fishery sector and fishery insurance with reflection on problem statement, study objectives, statement of hypothesis and justification of the study. Chapter two presents a survey and review of theoretical and conceptual issues with regards to willingness to pay. This chapter looks at the brief profile of fishery industry in Ghana and around the world, the concept of insurance and fishery insurance and its benefit, concept of risk and uncertainty and its management strategies, contingent valuation model and its application to fishery

insurance, factors influencing willingness to pay, and empirical studies on the models for the study.

Chapter three defines the population, research designs, data needs and sources, sampling procedure and sample size, instrumentation, data collection and statistical tools for addressing the problem. Chapter four gives a presentation and discussion of results. Chapter five summarizes the study, draws conclusions and presents recommendations for policy formulation as well as suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter presents a review of relevant literature on the major conceptual and theoretical issues relating to the fishery industry in Ghana and around the globe, contingent valuation method (CMV), concept of risk and uncertainty, risk and risk management strategy and its application to fishery, concept of insurance and fishery insurance, factors influencing willingness to pay, empirical studies on determinants of fishery insurance and relevant methodological concept relating to the study.

Overview of the Fishery Industry

According to FAO (2008) from local to global levels, fisheries and aquaculture play important roles for food supply, food security and income generation. About 43.5 million people work directly in the sector, with the great majority in developing countries. The sector supports nearly 200 million livelihoods. Aquatic foods have high nutritional quality, contributing 20 percent or more of average per capita animal protein intake for more than 1.5 billion people, mostly from developing countries. They are also the most widely traded

foodstuffs and are essential components of export earnings for many poorer countries

In Ghana, the fishery sector makes multiple and significant contributions to the nation's socio-economic development in the areas of employment generation, poverty reduction, food security and provision of raw materials for industries. About 2.2 million Ghanaian populations representing 10% depend on fishery sector for their livelihood. Fish is a staple and accounts for about 60% of protein consume from animal origin (Food and Agriculture Organization, 2007). In Ghana the average per capita fish consumption is said to be around 20-25kg, which is higher than the world average of 13kg. The sector also employs over 60% of women and links with other sectors in providing raw materials especially the food processing companies and the hospitality industry whiles employing the services and the products of the other sectors to operate.

According to FAO (2011) Ghana's artisanal fishing sector includes 10,000 small, mechanized wooden boats that harvest 60–70% of the marine catch comprising mainly of small pelagic fish species and to a much lesser extent some valuable demersal fish species and employs a wide range of fishing gear which includes purse seines (poli/Watsa), beach seines, drift gill nets (DGN), and surface set nets. Artisanal fishermen also use various forms of bottom set-nets, hook and line (lagas). The lagas and the DGN fleet operate beyond the 50 meter depth zone and they are equipped with ice, food and fishing aids like fish finders and Geographical Positioning System (GPS). The artisanal fishing canoes can be found in almost all 300 landing sites in the 200 fishing villages along the

Ghanaian coastline and It is generally considered small-scale fishing because it is dependent solely on local resources. About 170 larger semi-industrial ships with inboard motors are used for trawling in shallow waters during the offseason and purse seining during upwelling seasons. Approximately 90 industrial vessels are used for shrimping, tuna lines and poles, purse seining and demersal pair trawling. The Ghanaian government has sought to expand the industrial sector in an effort to diversify exports since 1984. Inland fisheries exist on major rivers and lakes, and there is also some freshwater aquaculture of tilapia and other endemic species.

Domestically, most of the catch is processed: 60% is smoked, 20% is salted, and the remaining 20% is sold fresh. Predictably, people along the coastal areas consume the majority of fresh catch, and inland areas are more frequently supplied with processed fish. Industrial fish processing includes tuna canning and tuna fish-meal production. Canned tuna is the most important export, but other fish are also exported in frozen or smoked form (FAO, 2007).

Concerning sustainability of fish stock, the fishing sector is vital to food security and job creation to alleviate rural poverty in Ghana. However, artisanal fisheries along the coast are close to their estimated maximum sustained yield, offering little potential for expansion. In the industrial sector, tuna capture has increased significantly in recent years but still has room to grow. Sustainable catch of tuna is estimated to be 90,000–100,000 MT per year, but only 36,000 MT is currently captured. The abundance of lakes and rivers in Ghana also offers potential for increased aquaculture production.

The fish production record according to FAO (2011) including the harvest from marine sources, aquaculture and other kinds of fish from fish farming is presented figure1 below:

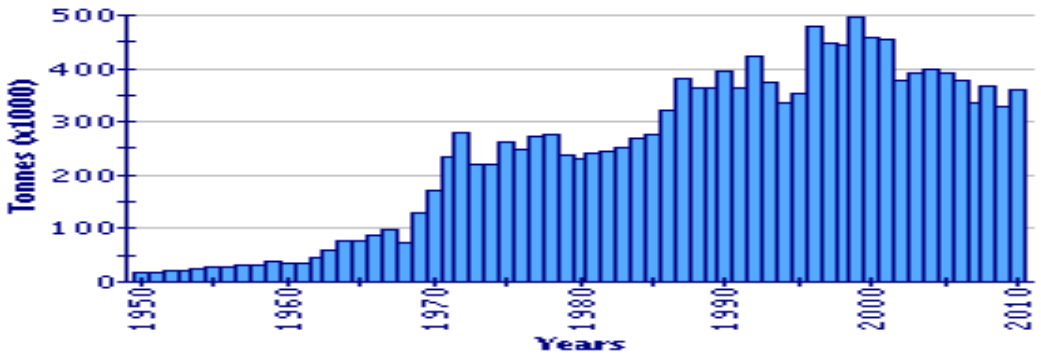

Figure 1: Ghana Fishery Production Statistics

Source: FAO, 2011

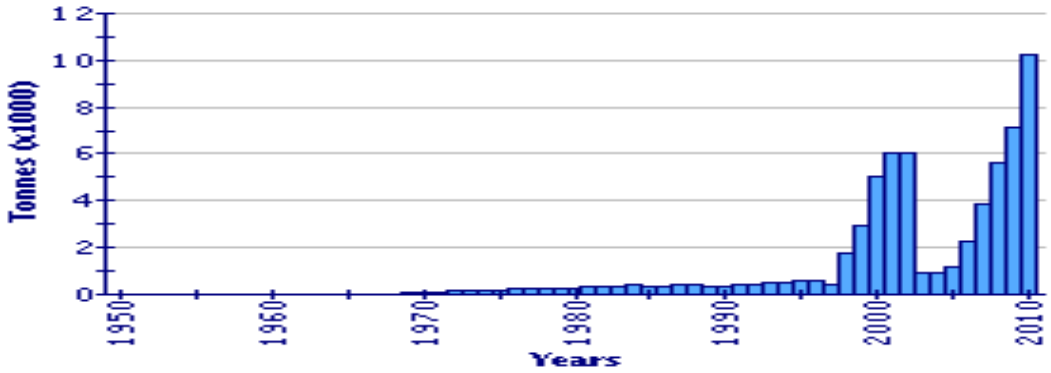

Figure 2: Ghana Aquaculture Production

Source: FAO, 2011

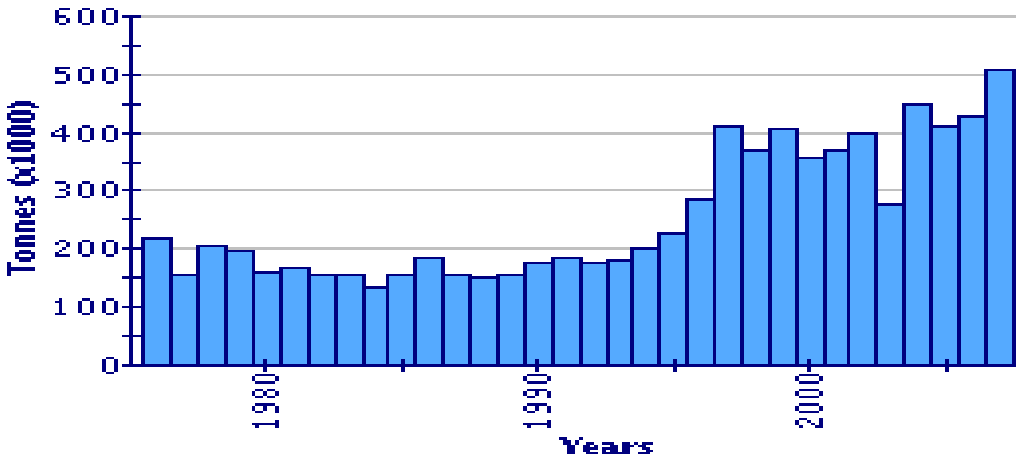

Figure 3: Ghana Fishery Commodity and Trade Statistics

Source: FAO, 2011

These database contain statistics on the annual production of fishery commodities and imports and exports (including re-exports) of fishery commodities by country and commodities in terms of volume and value from 1976.

Aquaculture has only recently been adopted as an assured way of meeting the deficit in Ghana's fish requirements. Thus, there has been no appreciable increase in annual fish production over the years. In 2003, Ghana produced only 51.7 percent of its requirements from its domestic sources and in 2004, achieved 68.1 percent of its fish requirement through domestic production and imports. Tilapia is the major species farmed and constitutes over 80 percent of aquaculture production. The catfishes (*Clarias* sp., *Heterobranchus* sp.) and *Heterotis niloticus* account for the remaining 20 percent. The aquaculture sub sector comprises largely small-scale subsistence farmers who practice extensive aquaculture in earthen ponds in contrast to the intensive practices of commercial farmers. The sector therefore lacks the organization to take up the challenges of

providing inputs such as fish seed and feed as viable commercial activities to support the development of the industry (FAO, 2005).

Major Risks Associated with the Fishery Industry

The fishery sector according to FAO (2008) is confronted with a number of challenges as the Artisanal fisheries lack access to infrastructure (dockyards, boat repair, cold-storage facilities), credit and pre-mix fuel as well as lack of fishery insurance policy framework

According to the FAO (2007), over exploitation of fish stock remains one of the global cardinal challenges of the fishery sector as overexploited and depleted stocks increased from 10% in 1974 to around 25% in the early 1990s, The proportion of fully exploited stocks declined from slightly over 50% in 1974 to around 45% in the early 1990s, but later increased to 52% in 2005.

Another challenge confronting the fishery sector is global warming. Solomon (2007) in his paper on Intergovernmental Panel on Climate Change (IPCC, 2007) report reveals that from 1961 to 2003 the average temperature of the oceans has increased globally by 0.037^{o}C to depths of 3000 m, and that the oceans have absorbed more than 80% of the heat added to the climate system. The increasing ocean temperature causes the ocean water to expand and it also accelerates the melting of Antarctic and Arctic icebergs and ice shelves. These effects have resulted in sea level rises and ferocious storm surges. The chances of the observed heat in the ocean being produced by natural internal forces alone are less than 5%. Scientists have established that anthropogenic emissions of

greenhouse gases (GHGs), notably carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), ozone (O3) and chlorofluorocarbons (CFCs) are the cause of current global warming. By affecting the physiology and ecosystems of marine fish stocks, as well as exacerbating their overexploitation, anthropogenic-induced climate change has introduced a new dimension into the marine fish crisis (Barnett, Pierce and Schnur, 2001).

According to Amarfio (2001), a number of issues have been militating against the growth of the fishery sector in Ghana. These are as follows:

1. Effective and collaborative management of fishery resources
2. Conservation of marine biodiversity
3. Oil exploration and impact on fisheries
4. Political influence and management of fishery Pre-Mix fuel

Effective and collaborative management of fishery resources: In spite of attempts by the Ministry of Food and Agriculture to encourage collaborative resource management through the establishment of community base fishery resource management committees (CBFMCs), communities are still found wanting in their participation in sustainable management of the resource and this has contributed to the rapidly depleting resource and the current inter-conflicts within the sector. These and other factors have culminated in the impoverishment of coastal communities.

A fisheries resource in Ghana particularly marine resources had been erroneously deemed to be infinite and as a nation, we ignobly supervise the destruction of the marine ecosystem. We had era where effective traditional

management system that recognizes preservation of marine ecosystem were in place. Chief fishermen wielded authority and could declare close season for at least one week to control stock harvesting. The traditional management system was further strengthened with the introduction of the community based fisheries management committees with the Chief fisherman as the chairman. However, most MMDAs have refused to gazette the bye laws rendering the community base fishery resource management committees ineffective and politicians also tend to undermine the authorities of chief fishermen (Amarfio, 2001).

Conservation of marine biodiversity: The issue of marine biodiversity conservation remains a very challenging issue for the management of the fishery sector due largely to both institutional and systematic failure in appreciating the enormous challenge in waste management and marine ecosystem conservation. Various legislations and policies have attempted to ensure proper conservation programmes for the marine ecosystem but these have not been the panacea principally due to inadequate enforcement regime. In Ghana no waste is treated, both liquid and solid and all drains are directed through natural running water bodies and end up in the sea. In the Greater Accra Region, mention can be made of the Korle lagoon Accra, Kpeshi Lagoon in La, Chemu Lagoon in Tema, and Gao in Kpone inter alia which have over the period served as sinks for both domestic and industrial waste. Similar situation can be found at Ngyeresia shore in the Sekondi – Takoradi Metropolis.

The fisheries Act 625 mandate the Minister responsible for the sector to declare close and open season in order to conserve marine species. It is however a

sad commentary that as if there has not been a need for it. No Minister since its passage in May 2002 has ever declared a season closed even for a particular fish as it has been the case for grasscutters. The International Conversion on Atlantic Tuna (ICAT) which Ghana is a member allows a quota system and basically that is the only quota system we have in Ghana for a fishery that abounds in Ghana to the extent ICAT permitted Ghana to exceed her 5000 metric tonnes quota by 2500 metric tonnes. There are no scientific bases for measuring quantities of fish species that are harvested; or any reliable seasonal baseline data or information on particular fish in Ghana (Amarfio, 2001).

Political influence and management of fishery Pre-Mix fuel: Premix which is a mixture of 29 parts normal super petrol and one part marine gasoline is 50% subsided with the Ghanaian tax payer's money. It was introduced by the PNDC regime to help reduce the cost of embarking on fishing expedition, and its sales were made a sole responsibility of fishermen. Under the NPP government, individuals were allowed to be part of the premix sales and that led to flooding the market with the products, and when supply exceeds demand, this time, prices did not fall, opportunity for diversion became rife. The NDC II decided once again to flush out the individuals and set up what may be considered one of the most inclusive committees to manage premix. As laudable as the five (5) member committee initiative seem, there were limitations that has militated against an almost perfect system. Chief Executives who have nothing to do with fishing decide as who should be on the premix committee, usurping the roles of chief fishermen. The nomination of ordinary fisherman by the representative of the

Ministry of Food and Agriculture was heavily abused and created an opening for nomination of party members most of whom never got any knowledge in fishing. Such deliberate attempt to sideline chief fishermen by party members and functionaries has negatively affected supply and distribution of the premix fuel to Ghanaian fishermen at the right place, right price and right time (Amarfio, 2001).

Concept of Risk and Uncertainty

Decision-making takes place in an environment of imperfect knowledge of the future and is associated with risk which is normally defined as "uncertainty of outcomes" resulting in losses negatively affecting an individual's welfare (Hardaker, Huirne & Anderson, 1997)

Agricultural risk is associated with negative outcomes stemming from imperfectly predictable biological, climatic, and price variables. These variables include natural adversities (for example, pests and diseases), climatic factors not within the control of agricultural producers, and adverse changes in both input and output prices **(**Word Bank, 2005).

United States Department of Agriculture defined Risk as uncertainty that affects an individual's welfare, and is often associated with adversity and loss. There are many sources of risk in agriculture, ranging from price and yield risk to the personal risks associated with injury or poor health (USDA, 1999)

Risk is uncertainty that affects an individual's welfare, and is often associated with adversity and Loss. Risk is uncertainty that "matters," and may involve the probability of losing money, possible harm to human health, repercussions that

affect economic resources. Uncertainty (a situation in which a person does not know for sure what will happen) is necessary for risk to occur, but uncertainty need not lead to a risky situation.

To take a risk is to expose oneself to a chance of injury or loss. For many decisions, risk is unimportant, since the scope of a possible loss is small and/or the probability of suffering that loss is judged to be low. However, in order to withstand adverse outcome and to avoid jeopardizing the existence of an enterprise as the base for income generation, risk has to be managed effectively, within the capacity of the individual, business or group (Hardaker, Huirne and Anderson, 1997).

Risk in agriculture is not only of concern to the individual farmer or fisher. It is also of importance to society as a whole, as risk-averse behaviour of farmers can lead to an allocation of farm resources which is not efficient, resulting in a sub-optimal overall allocation of resources and consequently lower overall welfare. For example, risk-averse fishers might not adopt a new technology – enhancing method of fishing because of potential risks associated with it, which results in a lower catch than possible.

The most important agricultural risks can be classified as follows (Hardaker, Huirne & Anderson 1997; USDA, 1999):

1. Human or personal risks: This relate to death, illness or injury of the farm operator and/or its labour force. In the case of fishery sector, death due to drowning as result of hostile weather or boat capsize and injuries due to capsize or injuries and poisoning from fish fall under this category. These

risks are common to all business operators and employees. In the European Union, basic coverage for personal risk is normally provided by sector specific or general social security systems. Additional coverage is available on insurance markets.

2. Asset risks are those associated with theft, fire and other loss or damage of equipment, buildings and other agricultural assets used for production. Fishing asset such as boat, gear or outboard motor, net generator or plant fall under this category. Losses are normally covered by insurance or, in case of catastrophic events; public disaster aid may contribute to reduce asset losses. (Hardaker, Huirne & Anderson, 1997)
3. Production or yield risk: These are often related to weather (excessive/insufficient rainfall, hail, extreme temperatures), but also include risks like plant and animal diseases. Yield risk is measured by yield variability, the randomness relative to the mean value in a yield series. Yield variability differs considerably from region to region depending on climate, soil type and production method. It can be measured at farm, regional or country level. Aggregate data can, to a considerable extent, mask variability at lower levels of aggregation or at the individual farm level. "Yield" risk is smaller in the livestock sector for most producers, as weather has a smaller influence but relatively high in the fishery sector. The risks mainly stem from disease, mechanical failure in confinement operations and variability in weight gain. The fishery risk mainly stem from highly unpredictable weather pattern and global climate

change which has affected species of fish size and distribution as well as over fishing depleting the fish stock (Hardaker, Huirne & Anderson, 1997)

4. Price risk: it is the risk of falling output and/or rising input prices after a production decision has been taken. Price risk is measured by price fluctuations. Contrary to yields or catch level as in the case of fishing, prices do not follow clear trends. Price volatility, of course, is for many products mitigated by measures of price support. In open markets, prices are generally more highly correlated across different regions than yields.
5. Institutional Risk: It is the risk associated with changes in the policy framework (agricultural and other policies) which intervene with production and/or marketing decisions and in the end negatively affect the financial result of a farm or fishery firm. Institutional risks also include contracting risk, e.g. the risk of breach of contract.
6. Financial risks: It includes rising cost of capital, exchange rate risk, insufficient liquidity and loss of equity (USDA, 1999).

The various risks are often interrelated. For example, the institutional risk of a change in price support has an influence on price risk. Likewise, imposing environmental restrictions has an impact on yield risk. Risks of all categories have an effect on the income situation of an individual.

Risk Management Strategies

Two types of risk management strategies are normally distinguished: (1) strategies concerning on-farm measures and (2) risk-sharing with others (Meuwissen, Huirne & Hardaker 1999). The latter has to do with insurance and

participation in mutual funds, marketing contracts, production contracts, vertical integration hedging on futures markets, relying on public assistance (disaster or emergency aid) or increasing the share of income from sources outside agriculture (Diversification). For the formal, risks have to be quantified and the effectiveness of different measures has to be assessed. The adoption strategies basically include selecting products with low risk exposure (e.g. products benefiting from public intervention), choosing products with short production cycles.

In diversification, it is believe that returns from various enterprises or activities are not perfectly positively correlated. A favourable result in one enterprise may help to cope with a loss in another enterprise. Diversification thus reduces overall risk. However, there may be a trade-off with cost increasing effects linked to this strategy, i.e. higher cost for additional equipment and costs in terms of foregone economies of scale which would alternatively be achievable with higher degrees of specialization. Lack of managerial expertise and market outlets as well as climate, soil quality or the availability of water may limit the opportunities for diversification of farm activities (Meuwissen, Huirne & Hardaker 1999).

In contracts and vertical integrations, a firm or an individual agrees to sell a commodity at a certain price to a buyer before the commodity is ready to be marketed. The firm retains full responsibility for all production management decisions. The contracts can take many forms. They can be based on a fixed price, or alternatively depend on the development of the commodity's futures price. The latter type of contract does not eliminate price risk completely. Price risk is zero

only in those cases, where the exact price to be paid to the producer upon delivery is fixed. The (opportunity) costs borne by the farmer, result from forgoing the opportunity of achieving a higher price on the open market. Besides reducing risk, contracting provides the farmer with an opportunity to differentiate his products from mass production and to draw an economic rent from this. (Cordier and Gouin, 2000).

Production Contracts typically give the contractor (the buyer of the commodity) considerable control over the production process. These contracts normally specify the production inputs to be used, the quality and quantity of the final product and the price to be paid to the producer. The contracts vary in the degree of control exercised by the contractor. Apart from other possible advantages for the farmer, the contract partially shifts price risk to the processor. On the downside, the farmer depends to a large extent on one buyer, thus incurring a risk of losing his only outlet following contract termination (USDA, 1999).

Hedging in Futures enables shifting risk from a firm that desires less risk (the hedger) to someone who is willing to accept the risk in exchange for a profit. A hedger can be a fisherman, farmer, a trader or a processor, who wants to "lock in" a price for a commodity he is going to sell or buy on the spot market at a later stage. Futures contracts help to protect against price risk, as futures and cash prices converge against the end of the delivery period, resulting in losses and gains in the two markets offsetting each other (USDA, 1999).

An Options gives the holder the right (without incurring the obligation) to take a futures position at a specified price (called the "strike" price) at a specific time. As opposed to futures, options giving the right to sell a futures contract do not constrain potential profits resulting from increasing prices. Such options give security against the implications of decreasing prices. The costs of achieving this security are materialized in the price to be paid for the option (USDA, 1999).

Insurance is often used by farmers and fishers to mitigate yield (and hence, revenue) risk, and is obviously prevalent outside of agriculture. Property, health, automobile, and liability insurance are all forms of insurance regularly purchased by individuals to mitigate risk. For an individual, the use of insurance involves the exchange of a fixed, relatively small payment (the premium) for protection from uncertain, but potentially large, losses. When losses occur, virtually all types of insurance policies require a deductible, meaning that the individual must assume a portion of the value of the loss. Indemnities compensate individuals for losses up to the level of the insurance guarantee, which is based on the deductible chosen by the insured within ranges set by policy terms, (USDA, 1999). A key characteristic of an insurance market involves the concept of risk pooling. Risk pooling involves combining the risks faced by a large number of individuals who contribute through premiums to a common fund, which is used to pay the losses due any individual in the pool (European Commission's Agriculture Directorate-General, 2001).

In order for a risk to be insurable, two basic requirements have to be met:

Managing the adverse effects of "asymmetric information" and overcoming the implications of "systemic risks". Asymmetric information relates to the problem that the buyer of insurance and the insurance company may not have the same information as regards the probability of losses occurring. Asymmetric information has two dimensions 1.Adverse selection: occurs if those more at risk buy more insurance than others, without the insurance company being aware of this. A common tool insurance companies use to minimise adverse selection is to ask the insured to disclose any factors that may lead to above normal risk. Based on that information premia can be differentiated for different classes of risk.

2. Moral hazard: moral hazard refers to an individual´s change in behaviour after having taken out an insurance policy. The change in behaviour results in an increase in the potential magnitude and/or probability of a loss. Tools insurance companies generally use to minimise moral hazard includes deductibles or co-payments (the insured has to bear part of the loss: a fixed amount or a percentage of the total loss), No-claim bonuses (premium discounts when over a certain period of time no claims are made), Checks to verify whether the insured takes the precautionary measures agreed upon to prevent losses and indemnification based on an objective index which cannot be influenced by the insured (European Commission's Agriculture Directorate-General, 2001).

The Concept of Fishery Insurance

Insurance is often referred to as important and effective ex post natural hazard risk coping mechanisms (Akter, Brander, Brouwer & Haque, 2007, Botzen & van den Bergh, 2008; Akter & Brouwer, 2010). Fishing is a risky enterprise

due to its cyclical nature. There is risk of losing life, fishery equipment and asset such fishing vessel, vessel engine/outboard motor, power generator, fishing net, fish and injuries to poisoning from fish which may be due to one of the following: vile weather changes(hostile storms, waves, roaring thunder), collision with other vessels, vessel sinking, vessel running into rocks and icebergs. As a result, it has becomes imperative for the fishers to purchase insurance in order to prevent total loss of fishery properties, catch or revenue through a fall in agricultural and fishery products prices or other disasters.

Individual fishers can react to inherent risks in ways that increase their own future risks and jeopardize the sustainability of fish stocks. Faced with declining catches, fishers may react in several ways that affect the uncertainties in fish stocks and revenues. They may continue to fish at the regulated effort level, leave the industry, or they might increase catch effort, thereby overexploiting resources in the short term. Risk can be reduced through structural design measures that move fishery management to become more robust to the uncertainty that pervades fishery systems through, for example, adaptive management that reduces uncertainty by learning about the fishery system over time (USDA, 1999).

The uptake of insurance services in the agricultural sector is generally low as compared to other sectors of the economy like manufacturing, mining and services sectors across the world, and Ghana is no exception. Fishers and farmers view insurance as an unnecessary expense rather than an investment to curtail future risk, especially given the small size of their holdings. Whether such a view

is based on economic rationale or on mere opinions, is still a subject of debate in academia (USDA, 1999).

According to Iturrioz (2009), agricultural insurance can be classified into three main groups based on the method of determining how claims are calculated. These are Indemnity based; Index-based and Crop-revenue-based agricultural insurance. Yusuf (2010), on the other hand, identifies the various types of agricultural insurance which relate to Iturrioz's classification. These are multiple peril crop insurance, named peril, rainfall index, livestock and aquaculture insurance, index-based insurance products and input-based insurance Products. These six forms can be matched with Iturrioz's framework as follows: Indemnity based insurance comprising multiple peril crop insurance, named peril or livestock and aquaculture; Index-based insurance aligns with rainfall or weather index and index-based insurance products. Crop revenue-based insurance relates to input-based insurance products. This study adopts Iturrioz's (2009) classification whose three distinct categories embrace the various forms of agricultural insurance given by the other authors.

Indemnity-based insurance products determine claim payment based on the actual loss incurred by the policy holder. If an insured event occurs, an assessment of the loss and a determination of the indemnity is made at the level of the insured party. The classification is often divided into two sub-classes—named peril and multiple peril agricultural insurance. Under named peril insurance, the sum insured is defined on an agreed basis, based on the production costs or on the expected crop revenue. Multiple peril crop insurance provides insurance against

all perils that affect production unless specific perils have been explicitly excluded in the contract of insurance. It is the traditional form of crop insurance. MPCI covers the broad perils of drought, flood, insects and disease which may affect many insured farmers at the same time and present the insurer with excessive losses. Binswager (1986) in Makaudze & Miranda (2010) concluded that the cost of traditional crop insurance has been the greatest obstacle to the development of agricultural insurance markets.

Index-Based insurance products according to Iturrioz (2009) pay out claims based on an index measurement and not on losses measured in the field. The index is a variable that is highly correlated with losses and that cannot be influenced by the insured. Indices can include rainfall, temperature, regional yield or river levels. As a result of the limitations and high costs associated with traditional multiple peril crop insurance, researchers and practitioners have developed a growing interest in alternative agricultural insurance approaches based on indices (Makaudze & Miranda, 2010). Index insurance indemnifies agricultural producers based on an objectively observable variable that is highly correlated with production losses.

Crop revenue insurance according to Iturrioz (2009), protects insured parties from the consequences of low yields, low prices or a combination of both. It provides significant benefits to producers that rely on short term crop financing which is repaid from agricultural revenues and financiers who have extended the crop finance. It gives both the producer and the financier certainty that revenues estimates on which loans are based will largely be realized.

Property insurance can be viewed as an indirect form of agricultural insurance as it is not taken on the actual crop but rather on the farm assets used in production. This form of insurance is taken by farmers to protect their farm property against theft and fire. This may be taken on tractors, trucks, fishing vessel, fishing gears and any other farm equipment.

Many capture-fishing risks have been, and continue to be, covered by insurance, including vessel, gear, and crew safety policies. However, the application of insurance to catch, price, or revenue variation is more problematic, because there has been less actuarial information on which to base risk assessments related to production variables in wild fisheries, which explains the scarcity of examples in the literature. Such problems arise from the cryptic nature of fish stocks and the difficulty in attributing causes to losses on an actuarial basis. The harvests of several specific marine fisheries are already covered in Japan by a government-backed Mutual Insurance Scheme, in which the aim is to maintain a viable industry to secure production capacity (FAO, 2005).

The scheme enables fishers to share risks, shielding individual fishers from ruin caused by natural disasters and other uncertainties. However, the distinguishing feature of these fisheries is that the species are, as in aquaculture, geographically well-defined and contained, such as kelp, sedentary shellfish, and algae.

The following section summarizes two important published studies concerning the application of insurance to genuinely wild capture, common resource, mobile fisheries; the first is a theoretical application of insurance theory

by Ludwig and the second is a more applied approach in which the USDA considered extending Risk Management Agency-RMA's crop-insurance principles to wild sockeye salmon in Bristol Bay, Alaska (Greenberg, Hermann, Geie and Hamel, 2001).

Ludwig (2002) begins with the premise that fisheries management needs to be precautionary and builds on the idea that taxes and charges can be better instruments in achieving risk-averse management of fisheries than direct regulations (such as total allowable catch or effort control), then demonstrates the utility of insurance with some simple models. The insurance regime is mandatory because one of the objectives of an insurance regime, as conceived by Ludwig (2002), is to place an extra burden (rather than bestow a subsidy) on fishers. In this context, the fishers are creating the risks of stock collapse which are borne by the general public, and the compulsory purchase of insurance by fishers would partly shift the burden back onto the generators of risk. Ludwig does not consider designing an insurance scheme according to the needs of fishers, but rather as a tool to internalize the hazard that excessive fishing effort can have on an ecosystem. He claims that a bond or insurance regime can achieve several objectives (Ludwig, 2002).

Ludwig (2002) uses a stochastic surplus production model with three different harvest control rules: constant harvest rate, constant catch, and adjustable harvest rates, based on abundance level to obtain a target catch. He claims that the main difficulties in setting up an insurance regime are political, institutional, and philosophical, and that sound actuarial calculations can be made

for fisheries. He does not substantiate this last claim. However, the management strategy evaluation (MSE) approach would allow the equivalent of an actuarial basis, because management is based on modeled populations rather than real population attributes (Kell, Pastoors, Scott, Smith & Vanbeek, 2005). Therefore, if the response behaviour of fish stocks and fishing effort can be modeled plausibly in the MSE approach, it would form a suitable foundation on which to add insurance as a management component, because the necessary actuarial data could be generated as a component of model output.

In 2001, the RMA (Risk Management Agency) of the USDA contracted the University of Alaska Fairbanks Agricultural and Forestry Experiment Station to scope a pilot crop-insurance programme for the Bristol Bay commercial salmon fishery (Greenberg, Herrmann, Geier & Hamel, 2001). It was the first attempt to extend USDA crop insurance to wild fisheries. The report concluded that until the fishery reached stability, it would be difficult to design and administer an insurance policy that would benefit the industry. As a result, an insurance programme was not set up. However, the initial design phase identified many practical issues regarding guarantees, insurance triggers, and indemnity payouts relevant to the design of potential insurance schemes in other wild fisheries.

The salmon study drew some important differences between risk factors and insurance schemes in agriculture and wild fisheries. The RMA identifies three important components for crop insurance, peril, moral hazard, and adverse selection. In agriculture, peril is defined as unanticipated/unavoidable events that affect some outcome, such as low yields caused by bad weather, fire, and

uncontrollable pest-induced losses. In fisheries, the definition of peril needs to be modified because it is difficult, perhaps impossible, to develop a sound actuarial basis to determine the contributory effect of natural events to catches in a given year.

For this reason, the authors suggested that peril in wild fisheries should be redefined as an outcome: low catches or low fishery ex-vessel revenues rather than identifiable causes. Moral hazard is defined by the RMA as producers taking an action to maximize their return from the insurance product by willfully undermining their production of the insured crop. Controlling moral hazard requires good risk insurance design to avoid incentives for harvesters to "fish" the insurance. Good design would likewise ensure that insurers were able to differentiate between legitimate and illegitimate claims and, conversely, prevent insurers from rejecting legitimate claims (Greenberg, Herrmann, Geier & Hamel, 2001).

A marine fishery equivalent to "best agricultural practice" was not easy to define, which would have made it difficult for loss adjusters to identify causes and weights of contributing factors. For these reasons, individual performance-based guarantees were rejected, and various group-based catch-per-unit-effort triggers were simulated in the salmon-study calculations of modeled insurance payouts. The third RMA component, adverse selection against the insurance provider, occurs when the insured person has better knowledge of the relative risk of a particular situation than does the insurance provider. In fisheries, harvests are dependent on biological phenomena. Fishers may be able to predict insurable

events in years when poor catches were expected, which would severely compromise an insurance programme. A multiyear obligation to subscribe to insurance was suggested as a solution to prevent fishers taking out insurance only in those years when they were anticipating payouts (Greenberg, Herrmann, Geier & Hamel, 2001).

Unlike in crop insurance, the insurable units in fisheries are rarely homogeneous: fishing opportunities do not determine individual performance. For this reason, the report suggested that indemnity payouts should be paid based on average performance histories (APH) of individual fishers within the fleet so that, in poor years, they would be compensated commensurate with their fishing performance in previous years, assuming demonstrably similar effort.

The sockeye salmon fishery in Alaska was suffering from poor prices at the time of the study as a result of other salmon species gaining favour in the Japanese market. As a result, Bristol Bay fishers desired revenue-based triggers so they would be covered for poor catches and/or lower prices. Finally, the report raised a concern that insurance could interfere with the economically and ecologically based need to reduce capacity in the fishery by essentially subsidizing fishers that would otherwise leave either permanently or temporarily (Greenberg, Herrmann, Geier & Hamel, 2001).

The success of insurance in agriculture, aquaculture, and certain wild fisheries in Japan makes the issue of wider use of insurance in fisheries worthy of further investigation. Setting up experiments to discover features of a viable

insurance scheme, as was attempted in the salmon study, is costly. For a particular fish, it is cost-efficient to use a simulation approach to analyze the implications of different sources of uncertainty for insurance costs and the effectiveness of a particular insurance scheme to mitigate risks. Here, we construct a simple model to illustrate the potential for model-based investigations of fisheries insurance issues and to provide some graphical representations of how an insurance regime can function in fisheries. Simulation models have been widely used to evaluate alternative management decisions (Kell Pastoors, Scott and Smith, 2005). Adding an insurance component to such models can provide a measure of risk via the calculation of insurance premiums. The cost of insurance is generally familiar to stakeholders and can be used as a way of measuring the costs of risk mitigation. Therefore, expanding MSE models with insurance features would be an easy-to-communicate method for quantifying the benefits of reducing uncertainty (through either different management actions or improvements to stock assessments).

Cunningham and Maguire (2002) observed that uncertainty is a major factor of unsustainability, and that its effects increase as the fishery management system becomes more elaborate. In the absence of management, fishers are confronted with uncertainties related to the natural variability of the environment and of that of the markets. Under active management, uncertainties about management decisions, their effects and their implementation are added. Current fishery management approaches have evolved from control theory which may not be appropriate to control unpredictable and complex systems such as fisheries.

Charles (2007) argued that structural uncertainty (model, implementation, and institutional) is best dealt with by robust management, e.g. by creating an adaptive portfolio of mutually reinforcing management tools. Insurance could be one tool in that portfolio.

Overview of Contingent Valuation Model and its Application to Fishery Insurance

The contingent valuation method (CVM) is utilized in this study. CVM is a direct valuation method in which respondents are asked to express a Willingness to Pay or willingness to accept in response to a hypothetical market situation (Carson 2000). Contingent valuation method often employs questionnaires, interviews, creating scenarios or through focus group discussions to help discover a person's willingness to pay for a particular good or service. It normally uses the following

1 Open-ended question
2 Close-ended question (single bid/ 2-bounded)
3 Contingent ranking approach (many projects)
4 Bidding game
5 Contingent activity question

Historically, the economic valuation of natural resources using stated preference (SP) information has come to be known as contingent valuation (CV), given that the value estimates obtained are contingent on the information previously provided to the respondent in the survey. CV is deeply rooted in welfare

economics: to be precise, in the neoclassical concept of economic value under the framework of individual utility maximization.

CV surveys are capable of directly obtaining a monetary measure of welfare associated with a discrete change in the provision of an environmental good, by substituting one good for another or the marginal substitution of different attributes of an existing good. There are some other terms that have been used for the value estimates derived from stated preference information, depending on the elicitation format used: discrete choice experiment, bidding game, open-ended question, choice based conjoint analysis, contingent ranking, single- or double-bounded dichotomous choice, paired comparisons, payment card (Green, Jacowitz, Kahneman & McFadden, 1998).

CVM has been widely accepted by academics and policy makers for valuation of resources, environmental goods, and services (Whittington, 2002; Wang, Zhang & Li, 2006). Davis (1963) was the first to apply the CV method proposed by Ciriacy-Wiantrup to measure the recreational value of an area of Maine woods to hunters and other users. Davis employed an open-ended protocol, implementing a program proposed by Ciriacy-Wantrup in 1947, which asked subjects for a stated WTP for a good (Green, Jacowitz, Kahneman & McFadden, 1998). The CVM has since been widely used to measure the use and non-use values of environmental quality, biodiversity, urban green spaces, national parks, world heritage sites and insurance (Carlson & Johansson-Stenman, 2000; Marques & Salazar, 2005).

The CVM technique is superior to other valuation methods because it is able to capture use and non-use values. Other valuation methods like Hedonic

Pricing and Travel Cost method tend to underestimate satisfaction derived from services rendered since they measure use values only. As Freeman (1993) noted non-use values could be larger in some cases, and, as such, the use of measurement techniques that capture only use values underestimates the total derived values. The other reason for using CVM is its ease of data collection and requirement compared to other valuation methods. The CVM technique however suffers from one major drawback despite its ability to measure total economic values. CVM is subject to a number of limitations that affect the validity and reliability of results, including embedding, sequencing, information and elicitation effects, and hypothetical and strategic biases (Venkatachalam, 2004). The hypothetical nature of the questions used in CVM surveys may pose problems since respondents may have little incentive to provide information on their true willingness to pay. In order to reduce these possible deficiencies, a scenario, which includes sufficient accurate information about the resource being valued, is usually provided to the respondent prior to asking for the amount he or she is willing to pay for insurance (Reynisdottir, Song & Agrusa 2008).

Various methods of eliciting WTP have been employed previously, including open-ended questions (Beltran & Rojas 1996; Bille, 1997), a payments card (Peters & Hawkins 2009), dichotomous choice (Pollicino & Maddison, 2001), iterative bidding games, and referendums (Dutta, Banerjee, & Hussain, 2007). This study draws from previous studies and employs dichotomous choice and open-ended questions in eliciting fisher's maximum willingness to pay. The

Ghanaian currency Cedis (GH¢) was used, with the exchange rate of US$1.00 = GHC 1.96 at the time of data collection in March, 2013.

According to Carson (2000), the disadvantage of the open ended is that, it lacks clues given to the respondent about the expected value of the services. It is associated with some biases and free rider. That is to say it encounters difficulties in that people might not think much about valuing the product, particularly if they were previously free and find it difficult to estimate an economic value. Bidding game has its own disadvantages since they are slightly more sophisticated methods, requiring the respondent either to go through a series of bids until negative response is generated and threshold established or to select from range of values. Here the questioner suggests the first bid called the starting point and the respondents agrees or disagrees that they would be willing to pay that price. An iterative process follows: the starting point price is increased to see if the respondent would be willing to pay for the product until respondent declares that he or she is not willing to pay the extra increment bid. The last accepted bid is the maximum willingness to pay.

The payment card runs a greater risk of bids and the range of possible and much carefully determined. Contingent ranking method differ from the other methods in that a list of multi-attribute alternative options are presented to the respondent, these will each have a WTP value or cost assign to them. The respondent is then asked to rank the options according to preference. With this the calculation to analyze the results is complicated. The researchers indicate that the National Oceanic and Atmospheric Administration (NOAA) Panel finds the

referendum method preferable since there is no strategic reason for respondent to answer untruthfully (Carson, 2000). However Ahmed & Gotoh (2007) argued that, the referendum format does not also present the actual willingness to pay value of respondent. Although open ended questions approach might result in under estimation of WTP due to lack of knowledge of costs and benefits and free riding, however it provides straight forward actual valuation of amenities (Ahmed & Gotoh, 2007). Ahmed & Gotoh (2007) further reported that follow-up questions are used to increase the precision of the estimate with DC question. The NOAA blue ribbon panel advocated this method as the most appropriate one in most circumstances. Choosing a suitable method for eliciting information for willingness to pay estimate depends on the managerial task underlying the estimation of WTP and is influenced by both conceptual considerations (Breidert, Hahsler & Reutterer, 2006)

Contingent valuation survey has been used by a number of researchers to measure the willingness to pay. Mbaga, Boughanmi & Zekri (2008) used contingent valuation survey to evaluate Thalassorama fishermen willingness to participate in an Insurance Program in Oman. They found out that most fishermen showed a low level of prudence except for community controlled measure. Results from the linear model show that virtually all the socioeconomic, boat characteristics, attitudinal, and wealth variables are important in explaining the amount of the insurance premium the fishermen are willing to pay for; however, only a few variables were significant in the logit model. Overall, 52% of the respondents indicated WTP for insurance, which is a clear indication that the

demand for insurance is substantial. Their estimated annual insurance premium varies between Rials Omani (RO) 23.13 and RO 29.25, depending on whether it is a voluntary or legally required and WTP is estimated at RO 18.7.

Fang, Yang, Wang & Xu (2006) in their work of Estimating willingness to pay for environmental conservation: a contingent valuation study of Kanas Nature Reserve, Xinjiang in China, found out that Seventy-three percent of the 412 respondents were willing to pay at different levels, and the mean WTP value was RMB 54.60 ($8.03). The results of this survey struck an optimistic note that publics were willing to contribute to improve environmental quality.

Nuva & Shamsudin (2009) used dichotomous choice Contingent Valuation Method (CVM) to determine visitors Willingness to Pay towards the Conservation of Ecotourism Resources at Gunung Gede Pangrango National Park, West Java, Indonesia. Their results indicate that income, gender (male) and residential (urban) were the significant factors that influencing the visitors' WTP for the entrance fee to TNGP. The mean WTP is found to be RP 7629.77 per visit.

Akter & Naureen (2010) used double bounded contingent valuation study, to investigate the role of microcredit and micro insurance in coping with natural hazard risks. Over 500 flood stricken farmers were asked for their preferences to pay premium to protect themselves against crop damage risks. Their results show a negative relationship between farmers' access to post disaster microcredit and their willingness to pay premium for a crop insurance contract. This finding was consistent across institutional characteristics of the rural credit market. This result has a number of policy implications. The most important of all is that the recent

and growing trend of offering compulsory bundled insurance scheme is likely to curb the demand for microfinance products that are linked with weather related income generation activities in developing countries.

Finally, Acquah (2011) employed open-ended questions method of contingent valuation in eliciting farmer's maximum willingness to pay in his work "farmers' perception and adaptation to climate change: a willingness to pay analysis". Farmers' level of adaptation was found to be relatively high with majority of the farmers using changing planting dates, different crop varieties and soil conservation methods as the major adaptation measures. Logistic regression estimation finds age, years of farming experience, farm land owner, farm size and other income generating activity as significant predictors of the probability to pay for climate change policy.

Empirical Studies on Willingness to Pay for Fishery Insurance

Willingness to pay for fishing insurance implies uptake of fishery insurance programme. Fishery insurance uptake may therefore be described as, the acceptance or adoption of insurance by fishers. Consequently, in determining the factors affecting uptake of agricultural insurance by fishers, factors affecting the demand of agricultural insurance are considered. According to Parkin , Powell & Matthews (2002), the determinants of demand for a product are own price of the good, price of substitutes, complementary goods, level of income, consumer expectations about future prices or incomes and tastes and preferences of consumers (fishers) . These factors are not considered in isolation as they affect each other and are all evaluated by fishers in purchasing insurance.

Own price factor is the premium or price that the fisherman pays monthly or as a one off annual payment for the insurance policy for a given level of coverage or indemnity. A high premium, relative to low coverage, would reduce demand for a particular policy and conversely, a low premium, relative to high coverage, will increase uptake. Availability of substitutes refers to the ease of access and the costs and returns available from other agricultural risk management alternatives such as diversification of fishing activities, Contracts and vertical integration, hedging in futures and options markets, mutual funds (cooperatives), liquidity, leasing input and hiring custom work and other income generating activities. These risk management tools have been discussed above.

Income factor includes the level of income from the fishery activities and off-fishery activities. The higher the level of income generated from fishing activities, the more the need for fishery insurance to protect against income loss, whereas the existence of off-fishery income may be taken as a form of diversification and a risk management tool, thus may act to reduce the demand for fishery insurance. Consumer expectations about future prices or income in the form of yield (catch level) forecasts, revenue forecasts, weather forecasts and its expected effects, expected return from insurance [(expected indemnity-premium)/premium] and probability of receiving claim payment, may act to determine the level of fishery insurance uptake.

Tastes and preferences refers to factors such as, age, experience in fishing, level of education of the fisher, vessel size and engine capacity, reputation of insurer and satisfaction with insurance. Complementary goods refer to those

goods where an increase in demand of one good will result in the increase in demand of the complementary good (derived demand). For example an increase in credit facilities that require insurance guarantees will result in the increase in demand for fishery insurance (Parkin, Powell & Matthews 2002).

Complementary goods may also refer to those goods that are offered in bundles, for example, insurance companies and financial institutions that offer credit facilities to fishermen and farmers can have stop-order facilities compatible with marketing association activities. In most cases, providers offer micro insurance products bundled with microcredit loans. Such schemes require the uptake of insurance as a condition for extending loans or savings arrangements to the fishermen (Mechler, 2006).

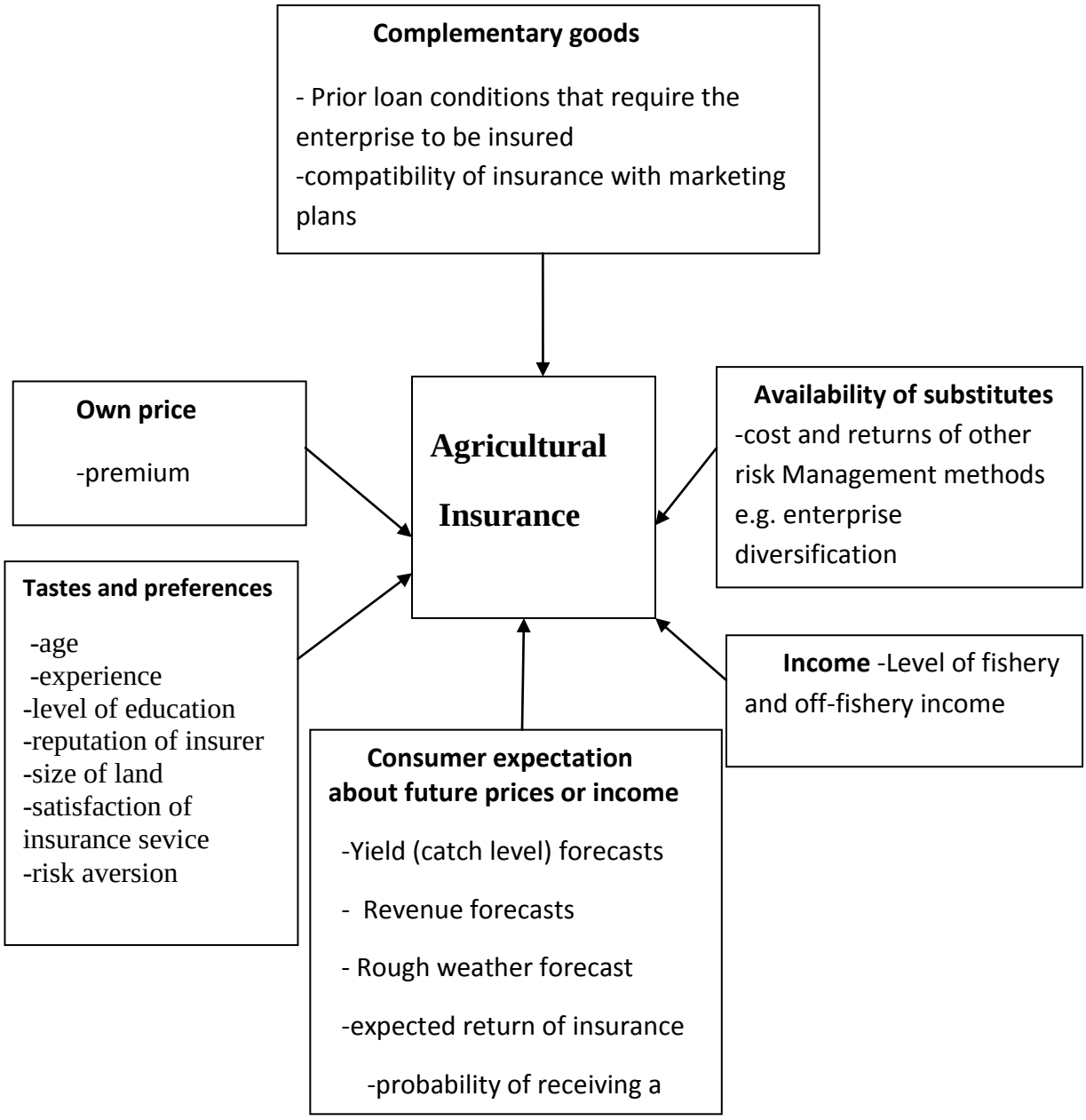

Figure 4: Factors affecting the demand/uptake for fishery insurance

Source: Adapted from Parkin , Powell and Matthews (2002)

Akter and Nuareen (2010) also made similar assertion to that of Parkin, Powell and Matthews (2002), discussed above. According to them, demand for a commodity is determined by the availability of its substitute and complement products. The demand for insurance, an ex post hazard coping strategy, is expected to depend upon the availability of alternative ex ante and ex post hazard risk coping instruments. According to them economic literature indicate that households with higher number of non-nature dependent income sources were better able to cope with disaster. Therefore, it can be expected that fishers with larger number of non-nature dependent income sources would be less likely to purchase fish insurance.

Access to post disaster credit facility, ex post disaster relief and savings are common ex post hazard coping strategies in developing economies. The relationship between ex post hazard relief and hazard insurance is fairly straight forward and well documented in the natural hazard literature, i.e. the provision of ex post disaster relief reduces incentives to buy private insurance. Ex-post hazard relief refers to distribution of food, drinking water, clothing, financial and medical assistance by government and non-government organizations during and after the natural hazard. (Akter & Naureen, 2010)

Another significant factor that affects willingness to pay is the wealth of an individual. Mansfield (1988) is of the view that, for a rational individual, the greater the value of his asset, the more insurance he buys and vice versa. According to him, the value of an individual's asset if it is stricken by a disaster is inversely related to their value if it is not stricken by a disaster. It implies that the

greater the value of fisher's wealth (asset) the more rationally he should buy insurance.

A number of studies have identified many variables with regard to the uptake of insurance decisions. The economic literature indicates that the WTP for insurance generally depends on socio-economic and demographic factors, such as number of employees, income, family size, fisherman's age, safety measures, and experience Mbaga Boughanmi & Zekri, (2008). In their work entitle, Thalassorama Fishermen willingness to participate in an insurance program in Oman. They found out that virtually all the socioeconomic, boat characteristics (engine age, engine HP, travel time, average people on boat), attitudinal(wear life jacket, vessel going in groups, listen to weather forecast, informing family before leaving) and wealth (own house, own car) variables are important in explaining the amount of the insurance premium the fishermen are willing to pay for.

Similarly, Fang, Yang, Wang and Xu (2006) in their work of estimating willingness to pay for environment conservation: a contingent valuation study of Kanas Nature Reserve, Xinjiang in China, and found out that attitude towards environmental protection, impression of the reserve, age, educational status and the individuals monthly income of the respondents as significant predictors for willingness to pay in relations to the amount.

Acquah (2011) employed open-ended questions method of contingent valuation in eliciting farmer's maximum willingness to pay in his work "farmers' perception and adaptation to climate change: a willingness to pay analysis". He found out from his logistic regression estimation that age, years of farming experience, farm land owner, farm size and other income generating

activity as significant predictors of the probability to pay for climate change policy. Where- as age and farm size negatively influence willingness to pay for climate change mitigation policy, household size, years of education, years of farming experience, owner of farm land and other income generating activity positively influenced willingness to pay for climate change mitigation policy.

Duangmany, Voravong, Kaisorn, Souphonphacdy & Baylatry(2009) in their studies of Valuing Environmental Services Using Contingent Valuation Method "Case Studies From Lao PDR" showed that the monthly contribution that would be acceptable to the people is 5,000 kip. The logit regression shows that WTP value is influenced by bid prices, gender, and educational levels. Kuwornu & Amadu (2013) analyse the social, economic, demographic characteristics of farmers and their current risk management practices. They found family size, farm size, land tenure and livestock enterprise are all significant factors affecting farmers' willingness to participate in market-based insurance whereas financial structure, wealth, attitudinal attributes were not significant.

Chantarat, Mude & Barrett (2009) used a double-bounded contingent valuation technique to elicit willingness to pay for Index Based Livestock Insurance (IBLI) among pastoralists in five arid and semi-arid locations in northern Kenya. They found out that wealth, risk preference, perceived basis risk and subjective expectation of loss were the key determinants of willingness to pay. Bostan- Budak &Kaçira (2010) used contingent valuation Method in their study about Livestock producers' needs and willingness to pay for extension services in Adana province of Turkey. They found that producers' most needed

information was marketing of their products. It was determined that, 52.5% of producers were willing to pay for extension service. Producers' education had no effect on their willingness to pay for extension service, while the number of herd size had a positive relation with willingness to pay.

Hill, Olubiyo and Webster (2009) study econometric analysis of the impact of agricultural insurance on farming systems in the middle belt of Nigeria. The study found that the sampled farmers differ in their use of farm resources and the level of output produced. Higher proportions of insured farmers applied improved farming practices and were more commercially oriented. The insured farmers ventured into more risky enterprises and released a greater proportion of their output to the market for sale. However, contrary to expectations, uninsured farmers were found to be more productive and efficient in their resource use than the insured farmers.

Finally, Oyinbo, Abdulmalik and Sami (2013) studied factors influencing farmers' participation in agricultural insurance in the federal capital territory in Nigeria. The result of the logistic regression shows that age, educational level, accessibility to credit and farm size were significant variables that influenced the participation of the farmers in Agricultural insurance scheme.

Models for the Study

Empirically, two models were used in this study. The first is a Logit model where the WTP is assumed to be dichotomous; that is, whether or not the fishermen are willing to pay for the insurance or not. The logit model was selected over tobit and logit because it is an extension and improvement of the

tobit and probit models. The objective of the Logit model is to estimate the probability of participating in an insurance program. The second model is linear where the WTP is a continuous variable. The objective of the linear model is to estimate the insurance premium for which fishermen are willing to pay.

The Logit Model

Vasisht (2007) define logistic regression (logit) analysis as a uni / multivariate technique that allows for estimating probability that an event occurs or not by predicting a binary dependent outcome from a set of independent variables. The model is believed to have been used by most researchers for its asymptotic characteristics and mathematical simplicity. The Logit model belongs to the general class of binary choice models, where the dependent variable is dichotomous (Islam, Loehman, & Sinha 2001; 2002).

The Logit model is an extension and improvement of the linear probability model, which in the context of insurance WTP takes the following regression form:

$$Y_i = X_i' \beta + \varepsilon_i , \quad (4)$$

where *Xi′* is a vector of independent variables representing a number of socio-economic and attitude characteristics related to the *i*th fisherman. The dependent variable, *Yi*, is equal to 1 if the fisherman is willing to pay for insurance and zero otherwise. Since *E*(*Yi*), the expected value of *Yi*, is equal to *P*(*Yi* = 1), the regression above can be interpreted as describing the probability that a fisherman is willing to obtain insurance. The value of the parameters, β, measures the

marginal impact of a unit change in the fishermen's socio-economic profiles and attributes on the probability of WTP for insurance.

The Linear Model

The simple linear regression describes the linear relationship between one dependent and an independent variable. The model is specified as:

$$y_i = \alpha + \beta x_I + \varepsilon_i$$

Where α and β are the model parameters. α is the intercept of the line and it is interpreted as the expected value of the dependent variable (y) when there is no independent variable (x). The slope of the line is β and it is interpreted as a change in y per unit change in x. Since all the points are sometimes unlikely to fall precisely on the straight line, a stochastic or error term, ε_i , is added to the model to account for any non-randomness. Other reasons for the existence of the stochastic term include omitted variables and measurement error.

The simple linear regression model assumes that:

1. The error term is normally distributed.
2. The expected value or mean of the error term is zero.
3. The variance of the error term is constant. Thus all observations have the same precision.
4. The value which the error term assumes in one period is uncorrelated or unrelated to the error term in any other period.

5. The explanatory variables assume fixed values that can be obtained in repeated samples so that the explanatory variable is also uncorrelated with the error term.

Violation of these assumptions leads to various consequences for model estimation and inference. It is therefore important to test violation of these assumptions and apply the appropriate remedial measure if applicable. For instance, violations of the assumption of constant variance lead to the problem of heteroskedasticity and can be detected using Goldfeld-Quandt or the Breusch-Pagan test.

Multiple Linear Regression

The multiple linear regression is an extension of the simple linear regression in that it describes a linear relationship between one response variable and at least two predictor variables. The multiple regression is specified as

$$y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \varepsilon_i$$

Where β_0, β_1, β_2,....., β_k are the model parameters and ε_i, the error term. The parameter β_0 has similar interpretation as described in the case of simple linear regression but that of the other parameters differ. β_1, for instance is interpreted as a change in the response variable per unit change in x_1 when all other terms are held constant. β_2, β_3 …., β_k can be interpreted in similar fashion. The assumptions specified for the simple linear regression holds for the multiple linear regression.

The multiple linear regression further assumes that there is lack of multicollinearity or no exact linear relationship between explanatory variables leads to the problem of multicollinearity (Acquah, 2013).

The linear model was used by Casey, Kahn, and Rivas (2006) for the wtp studies. In this study the linear model is assumed to take the following form:

$$WTP_i = \alpha + \beta ECONi + \delta DEMOi + \lambda ASSETi + \gamma ATTDi + \varepsilon_i, \quad (9)$$

where: ECON: Economic variables related to income, credit use, and availability for the *i*th fisherman; DEMO: Demographic variables including the age of the fisherman and family size; ASSET: Asset variables related to whether the fisherman owns a fishing vessel, a car and/or a house, and the characteristics of the engine boat (*i.e.*, age and horse power); ATTD: Attitude variables towards precaution and safety measures (wearing a lifebelt, listening to the weather forecast, informing family before going off shore, *etc.*).

of the explanatory variables.

Conceptual Framework

Willingness to pay can be thought of as a function of socio economic characteristics (x_1), environmental/ risk factors (x_2), attitude(X_3) of fishermen, Boat Characteristics (x_4), wealth variables (X_5) in addition to the cost of the insurance service. **WTP = *f* (X_1, X_2, X_3, X_4, X_5).** Below is the diagrammatic representation of the conceptual framework

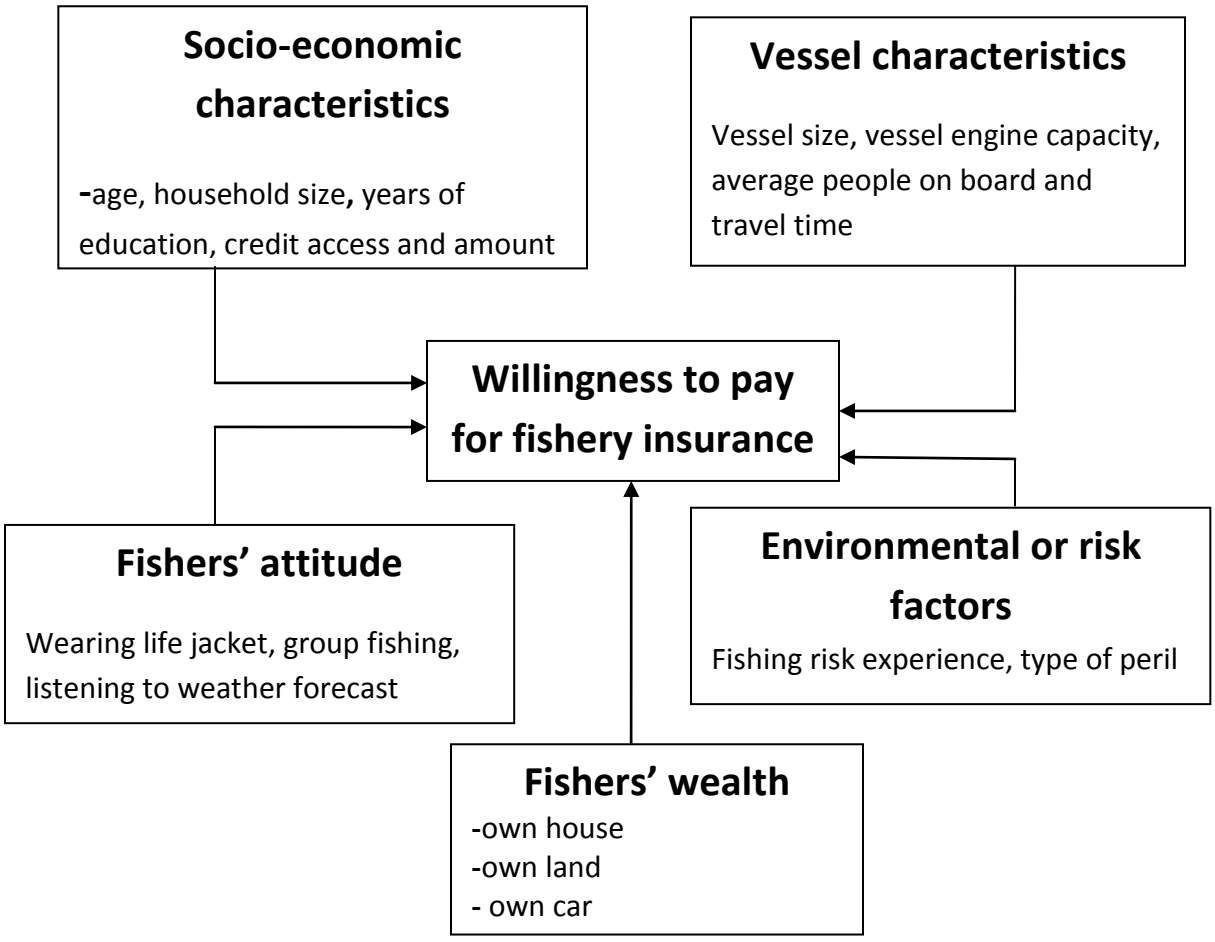

Figure 7: Conceptual Framework of the Study

Source**:** Author's Construct

Willingness to pay is influence by interaction of several variables according to economic literature. These variables are grouped broadly into five according to this study. They are socio-economic characteristics, fishing vessel characteristics, wealth variables and attitude of fishers as well as risk factor.

Socio-economic characteristics such as age, marital status, household size, years of education are all likely to influence insurance uptake decision process. Vessel characteristics include fishing vessel size, vessel engine capacity, average people on board, and the travel time of the fishing engine. The wealth variables are the asset of the fishers other than the fishing vessel which include whether fishers own land, house or vehicle and attitude variables are whether fishers apply safety measures such as wearing life jacket, going to fishing in groups, listen to weather forecast before going to sea.

The risk factor refers to whether fisherman has ever experience fishing risk or not. All these variables are all likely to influence fisher's insurance uptake or not decision process. Mbaga, Boughanmi and Zekri (2008) found out that the socioeconomic, boat characteristics, attitudinal, and wealth variables are important in determining the amount of the insurance premium the fishermen are willing to pay for. Mansfield (1988) asserts that, for a rational individual, the greater the value of his asset, the more insurance he buys and vice versa. It implies that the greater the value of fisher's wealth (asset) the more rationally he should buy insurance.

CHAPTER THREE

METHODOLOGY

Overview

This chapter presents the study area research design, research population, sampling prcedure, sample size instrumentation, pretesting, data collection procedure and data analysis.

Study Area

The Western Region is one of the ten (10) Administrative Regions of Ghana. It was carved out of the Western province in the early 1960s. Western Region is situated in the South-Western part of Ghana between latitudes 5^0N and 30^0N and longitudes 3^0W and 32^0W. It covers a total land area of 23,921sq km forming about 10 percent of the total size of the country's land mass. It covers a total land area of 23,921sq km forming about 10 percent of the total size of the country's land mass. It is bordered on the North by Ashanti and Brong Ahafo Regions, East by Central Region and West by La Cote d' Ivoire.

The Southern part is bordered by the Gulf of Guinea stretching to about 192km. The total population of the Region according to the 2000 Population and Housing Census is 1,924,577 which represent 10.2 percent of the country's total population with the average annual growth rate of 3.2 percent (Ghana Statistical Service, 2005).

Research Design

The study estimates fishermen's willingness to pay for insurance in two political districts in the Western Region of Ghana. Research design according to Amedehe (2006) is the specific strategy employed in collecting, analyzing and reporting a research. The design must be appropriate to enable researchers collect relevant data to test hypothesis. This study is a contingent valuation and employed cross sectional survey as the research design. The design was used because the study has to do more with quantitative measurement. Survey research is often used to assess thoughts, opinions, and feelings and it can be used for both exploratory and descriptive purposes (Singleton, Straits & Straits, 1993).

The design was used due to the following qualities:

1 it describes characteristics of that population at one time without time bound
2 it allows one to generalize the findings from the sample to the population
3 its relatively quick and easy to conduct(i.e. it does not need long periods of follow – up)
4 data on all variables is collected once
5 it studies participants in their natural setting
6 it maximizes realism

The limitations of the design may include the following:

1 it cannot give any insight as to the causes of population characteristics because it is a predictive and correlational
2 it is limited in its ability to draw valid conclusions about any association or possible causality i.e. cause and effects relationship.

3 non- response is a particular problem affecting cross-sectional studies and can result in bias of the measures of outcome. This is a particular problem when the characteristics of non-responders differ from responders to recall bias (Barratt and Kirwan, 2011).

Study Population

The target population for the study was fishermen in the Western region of Ghana. The study concentrated on fishermen who live in the selected fishing communities in the Sekondi / Takoradi Metropolis and Shama District.

The total population of the Region according to the 2000 Population and Housing Census is 1,924,577 which represent 10.2 percent of the country's total population with the average annual growth rate of 3.2 percent (Ghana Statistical Service, 2005). The estimated fishers' population in the Shama district is 12864 fishers and that of Sekond – Takoradi metropolis is 13136 fishers, (Western Regional Fisheries' Directorate, 2013).

Sampling procedure and Sample size

Jacobs (2003) indicated that size of the sample influences both the representativeness of the sample and the statistical analysis of the data. The larger the population size, the smaller the percentage of the population required to get a representative sample. He added that beyond a certain point when $N \geq 500$, the population size is irrelevant and suggested that a sample size of 300 may be adequate.

Due to practical difficulties with responses from large survey groups, a

meaningful survey sample size had to be determined. An appropriate sample size was calculated. A representative sample size with known confidence and risk levels was selected, based on the work of Yamane (1967).

$$n = \frac{N}{1 + e}$$

Where $e = N(0.05)^2$

$$n = \frac{N}{1 + N(0.05)^2}$$

Where;

n = the sample size

N = the population size (the total number of households in the district), and

e = the level of precision. The level of precision, sometimes called sampling error, is the range in which the true value of the population is estimated to be. By using Yamane's formula of sample size with an error of 5% and with confidence interval of 95%, the calculation from a population of 26000 fishers for Shama district and Sekondi – Takoradi metropolis came up to 339.93.

Hence; using Yamane's formula, the sample size was calculated as;

n = $\frac{26000}{1+26000(0.05)^2}$ = 339.93 fishers

The simple random technique was employed to obtain the required sample size. A total of 342 fishermen comprising 57 fishermen each from the six selected fishing communities in the two districts were selected. The selected fishing communities were Shama, Aboadze and Abuesi in the Shama District and Ngeriesia, Sekondi and New Takoradi in the Sekondi – Takoradi Metropolis. However, 300 fishers' responses were used for the analysis and remaining 42

questionnaires were rejected due to inconsistency and incomplete information on them. Hence the sample size consisted of 1 region, 2 districts, 6 communities and 300 respondents.

Selection of Region and Districts

The study employed the multi-stage sampling procedure in selecting respondent. It first used purposive sampling technique to select the region. Purposive sampling according to Frankfort-Nachmias and Nachmias (1996) is the process of selecting sampling units subjectively to obtain a sample that appears to be a representative of the population, and the underlying assumption as the representativeness of the selected sample to their respective populations. The selection criteria were based on the fishermen population and fishery production. Ghana has 10 Administrative regions. These are: Central Region, Eastern Region, Ashanti Region, Greater Accra Region, Brong –Ahafo Region, Volta Region, Upper West Region, Upper East Region, Northern Region and Western Region. Out of these ten regions, four of them – Western, Greater Accra, Central and Volta are coastal regions and Western region was purposively selected due to its vibrant fishery sector (i.e. volume of fish production) and the risk pose by oil exploration and port and habour activities. Western region has six coastal district which include; Ahanta West, Jomoro, Ellembelle, Axim Municipal and Sekondi – Takoradi, Metropolis. Sekondi – Takoradi, Metropolis and Shama District were selected through simple random technique.

Selection of Communities and respondents

In selecting the fishing communities in the selected districts, a sampling frame of the number of fishing communities in each district was obtained from Department of Fisheries of Ministry of Food and Agriculture. Then the lottery method of simple random sampling was used to select three communities from each district. The respondents were then selected from organized fishing groups in various landing sites in each selected communities. Data were then collected from these selected communities according to their landing sites and organized groups.

Instrumentation

Primary data was solely used for this research and the data was sourced from fishermen in the study area. The instruments employed in the study process were structured questionnaire (interview schedule) and personal observations. The instruments were specifically design to measure variables relating to fishing insurance as reviewed in the literature. The variables were broadly categorized into socio-economic characteristics, vessel characteristics, attitude variables, wealth variables and risk factors. The questionnaire consisted of 71 items grouped into six sections i.e. A-F. The questionnaire was of both close and open ended types.

Section A consists of 15 items that sourced information on socio-economic background of respondent, section B consists of 16 items that sourced information on wealth variables of fisher's, section C consists of 6 items that draw information about fishing vessel characteristics, section D was on attitude variables comprising 6 items on risk factors whilst section E was on information

about fishers willingness to pay with 4 items and section F was on information risk experience with 24 items.

Both structured and semi structured interviews were employed using interview checklist. Observation was employed in the study by paying regular visits to selected fishing community sites to observe and record fishing and fishing processing practices with standardized checklist. The research instruments were given to supervisors and other experts in agricultural economics to assess its content. Based on their comments appropriate corrections were effected so as to ensure validity and reliability of the research instrument.

Pre-testing

Prior to the data collection, the research instrument was pre-tested on Tuesday, 12th February, 2013 at Elmina in the central region of Ghana. The purpose of the pre-test was to identify errors associated with the instrument and omit double questions and ambiguous statements. Furthermore, pre-testing was conducted to detect issues that were not anticipated and to assess: clarity of questions regarding fishing insurance, whether the questions are understandable and whether the order and wording of the questions elicited the desired responses for each question. The total number of questionnaires administered was 20.

Based on the responses provided, modifications were made in the research instruments before administration.

Data Collection Procedure

The data collection began on the 4th March, 2013 and ended on 26th April, 2013.The questionnaire was self administered with the help of six trained field assistants. This was done after necessary permission has been sort and consultations done. Necessary guidelines were given to respondent on how and when to complete the questionnaire. The research instrument was well explained to the respondents in the local dialect and the information was recorded by the field assistants in English for respondents who have low or no educational background.

The field assistants were trained to understand the concept of the study including the objectives, purpose and methods of data collection. They were also trained to have a common understanding of the questions of the research instruments and to ask the questions to the understanding of the respondents. The selection criteria for field assistance were as follows: 1) relevant Educational background, 2) Previous research experience and 3) Knowledge of the local language (Fanti and twi).

Method of Data Analysis

Willingness of fishermen to pay for insurance is a contingent valuation study in that the assessment is based on hypothetical market situation (Carson, 2000). A major setback of willingness to pay is the hypothetical nature of the questions used in CVM surveys. This may pose problems since respondents may have little incentive to provide information on their true willingness to pay. As a

result individuals may actually behave differently when confronted with real insurance scheme (Reynisdottir, Song & Agrusa, 2008).

However, willingness to pay study is superior to other valuation methods because it is able to capture use and non-use values and it eases data collection compared to other valuation methods. It can also provide a first assessment of the price elasticity of insurance demand and welfare implications, thereby informing a decision on whether to subsidize insurance scheme or not (Freeman, 1993).

This study draws from previous studies and employs dichotomous choice and open-ended questions in eliciting fisher's maximum willingness to pay.

Both descriptive statistics and econometric methods were employed in the analysis of data. Frequencies and percentages were computed for the descriptive while logistic and linear regression analyses were done for the econometrics. The descriptive statistics and econometric methods employed for the analysis of the data collected are summarized below:

1 Descriptive statistics was used for the analysis of socio- economic, boat, attitude and wealth characteristics as well as fishing risk experience and reasons for willingness or unwillingness to pay.

2 Estimation of willingness to pay was done using

Frequency of bids to pay

Mean, median, standard Deviation., skewness and kurtosis for the statistics of willingness to pay

3 Probability of willingness to pay was evaluated using the logistic regression model

4 Factors influencing the insurance premium fishermen were willing to pay was done using the linear model.

The statistical software used for the analyses of the data were SPSS 16.0 and STATA 12 versions.

The Logit Model

The Logit model belongs to the general class of binary choice models, where the dependent variable is dichotomous (Islam, Loehman, & Sinha 2001; Maddala 1987; Greene 2003; and Magnac 2002). The Logit model is an extension and improvement of the linear probability model, which in the context of insurance WTP takes the following regression form:

$$Y_i = X_i' \beta + \varepsilon_i , \qquad (4)$$

Where Xi' is a vector of independent variables representing a number of socio-economic, vessel, wealth and attitude characteristics as well as risk experience related to the *i*th fisherman.

The dependent variable, *Yi*, is equal to 1 if the fisherman is willing to pay for insurance and zero if he is unwilling to pay. Since $E(Yi)$, the expected value of *Yi*, is equal to $P(Yi = 1)$, the regression above can be interpreted as describing the probability that a fisherman is willing to obtain insurance. The value of the parameters, β, measures the marginal impact of a unit change in the fishermen's socio-economic profiles and attributes on the probability of WTP for insurance. To avoid the serious weakness of having predicted values, *Yi* falling outside the range of (0,1), which is not possible if they are to be interpreted as probabilities,

the linear model is transformed into a cumulative probability function that may be presented as:

$$P_i = f(X_i'\beta). \quad (5)$$

If the cumulative probability function, *f*(.), is logistic, then we have the Logit model, which takes the following form:

$$P_i = \frac{1}{1+e^{-Xi\beta*}} \quad (6)$$

The Logit model is fundamentally non-linear; therefore, estimating the parameters using Ordinary Least Squares (OLS) is inappropriate. The use of OLS leads to unbiased but inefficient estimators. Logit models are usually estimated using a maximum likelihood estimation technique, which is a routine in most modern econometric packages, such as SPSS (Statistical Package for Social Sciences) and Stata 12.0, a package that was used in this study. The marginal effect of a particular variable x_k on the probability that a particular fisherman is willing to pay for insurance is given by:

$$\frac{\partial P_i}{\partial x_k} = f(X'\beta).\beta_k \quad (7)$$

where *f*(.) is the logistic probability density function given by:

$$f(X'_\beta) = \frac{e^{-x\prime\beta}}{(1+e^{-x\prime\beta})^2} \quad (8)$$

Therefore the probability of WT, P ($y_i = 1$) for fishery insurance was represented as

$$\ln \left[\frac{P(y_i = 1)}{1 - P(y_i = 1)}\right] = b_0 + b_i x_i + \varepsilon \quad (10)$$

Where; $i = 1, 2, 3, 4 \ldots\ldots n$

P ($y_i = 1$) =is the probability function of fishers willingness to pay for fishery insurance.

1 - P ($y_i = 1$) = is the probability function of fishers unwillingness to pay for fishery insurance.

x_i = is the factors relating to the respondents which include socio-economic, vessel, attitude and wealth characteristics and risk factors of the respondents

ε_i= error term

Hence WTP = $b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} + \varepsilon$

Where X_1 = Age

X_2 = Years of education

$X_{3=}$ Household size

X_4 = Income

X_5 = Vessel engine capacity

X_6 = Average people on board the vessel

X_7 = Travel time

X_8 = Fishing risk experience

X_9 = Group fishing

X_{10} = Wearing life belt / jacket

X_{11} = Own land

X_{12} = Own house

$b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, b_{10}, b_{11}, b_{12}$ = Coefficient of the parameters

b_o = Slope of parameter estimates

ε = Error term

Assumptions underlining logistic regression are: 1. the true conditional probabilities are a logistic function of the independent variables; 2.no important variables are omitted; 3.no extraneous variables are included; 4.The independent variables are measured without error; 5.The observations are independent 6. There should be very little or no multicollinearity (Stata, 2009).

Interpretation of the Logistic Regresion Results

Logit model considers positive and negative signs of the estimated coefficient as well as the significant level of coefficient and indicate the effect of covariate on the actual probability of an event. However, regression coefficient tell us little about the effects and direction of covariate on the actual probability of an event and DeMaris (1995) recommends marginal effect or probabilities when the purpose of the analysis is to forecast the probability of an event, given a set of respondent characteristics and odds ratio when one is merely interested in the impact of independent variables. In this Study, the marginal effect of a particular variable x_k on the probability that a particular fisherman is willing to pay for insurance is given in equations 7 and 8.

Multicollinearity in Regression Model

Multicollinearity is a condition where independent variables are strongly correlated with each other. When multicollinearity exists in your model, you may see very high standard error and low t statistics, unexpected changes in coefficient magnitudes or signs, or non-significant coefficients despite a high R-square and can cause the regression coefficients to be misinterpreted (Stata, 2009) Two main diagnostic procedures are often used to detect severe multicollinearity that includes: 1.checking the correlation coefficients between all pairs of independent variables in the sample. In this case coefficient greater than 0.5 indicate the presence of severe multicollinearity. 2. Use of Variance Inflation Factors which is similar to the correlation coefficient; the rule is that a variance inflation factor should not exceed 10, otherwise severe multicollinearity is present (Stata, 2009)

Link Test

When we build a logistic regression model, we assume that the logit of the outcome variable is a linear combination of the independent variables. This involves two aspects, as we are dealing with the two sides of our logistic regression equation. First, consider the link function of the outcome variable on the left hand side of the equation. We assume that the logit function (in logistic regression) is the correct function to use. Secondly, on the right hand side of the equation, we assume that we have included all the relevant variables, which we have not included any variables that should not be in the model, and the logit function is a linear combination of the predictors. It could happen that the logit

function as the link function is not the correct choice or the relationship between the logit of outcome variable and the independent variables is not linear. In either case, we have a specification error.

The misspecification of the link function is usually not too severe compared with using other alternative link function choices such as probit (based on the normal distribution). In practice, we are more concerned with whether our model has all the relevant predictors and if the linear combination of them is sufficient. The idea behind **linktest** is that if the model is properly specified, one should not be able to find any additional predictors that are statistically significant except by chance. **linktest** uses the linear predicted value (**_hat**) and linear predicted value squared (**_hatsq**) as the predictors to rebuild the model. The variable **_hat** should be a statistically significant predictor, since it is the predicted value from the model. This will be the case unless the model is completely misspecified. On the other hand, if our model is properly specified, variable **_hatsq** shouldn't have much predictive power except by chance. Therefore, if **_hatsq** is significant, then the **linktest** is significant. This usually means that either we have omitted relevant variable(s) or our link function is not correctly specified. (Stata, 2009)

Statistical significance

For each parameter coefficient, the null hypothesis that the parameter coefficient is zero can be accepted or rejected based on p value using Wald test (Acquah 2013).

The Linear Model

The linear model used for this study was based on that of Casey, Kahn, and Rivas (2006) and is assumed to take the following form:

$$WTP_i = \alpha + \beta SOC\text{-}ECONi + \delta VESSELi + \lambda ASSETi + \gamma ATTDi + \zeta RISKi + \varepsilon_i, \quad (9)$$

where: SOC- ECON: Socio-conomic variables related to age, years of education, income, and household size for the *i*th fisherman; VESSL: Fishing vessel characteristics including vessel engine capacity, average people on-board the fishing vessel and travel time of the vessel ; ASSET: Asset variables related to whether the fisherman owns a fishing vessel, a vehicle land or house, ATTD: Attitude variables towards precaution and safety measures such as wearing a lifebelt/ jacket, listening to the weather forecast and vessels fishing in groups. ε_i: Disturbance or error term, α : slope of parameter estimates

$_i$: 1, 2, 3, 4, ……n and β δ γ λ ζ : Model parameters.

Model Parameter Estimation

The model parameters α and β can be estimated using two methods - the maximum likelihood method and the weighted least squares. Acquah (2013) prefers the formal and that the maximum likelihood estimator is the same as the ordinary least square estimator in simple linear regression that employs a technique for fitting best strait line by minimizing sum of squares error (residual). Its underlying principle is Gaus-Markov theorem of Best Linear Unbiased Estimator (BLUE).

Heteroskedascity in Linear regression

In linear regression, heteroskedascity is very common and the term means "differing variance" and comes from the Greek "hetero" ('different') and "skedasis" ('dispersion'). That is, the variance of the error term is constant (Homoskedasticity). If the error terms do not have constant variance, they are said to be heteroskedasticity. Mathematically, homoscedasticity and heteroskedasticity may be defined: Homoskedasticity: $\sigma^2_{ui} = \sigma^2_{ui}$ same for all observations

Heteroskedastic: σ^2_{ui} not the same for all observations

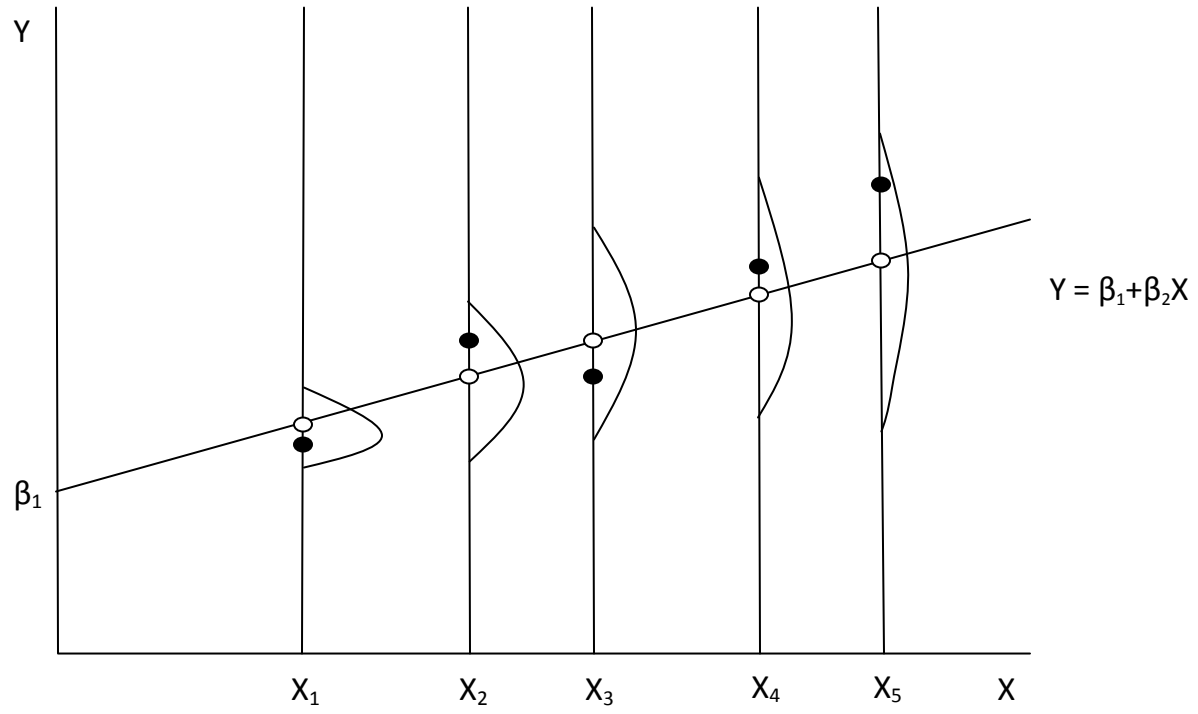

Figure 5: Heteroskedasticity of a Linear Regression Model

Source: Gujarati (2003)

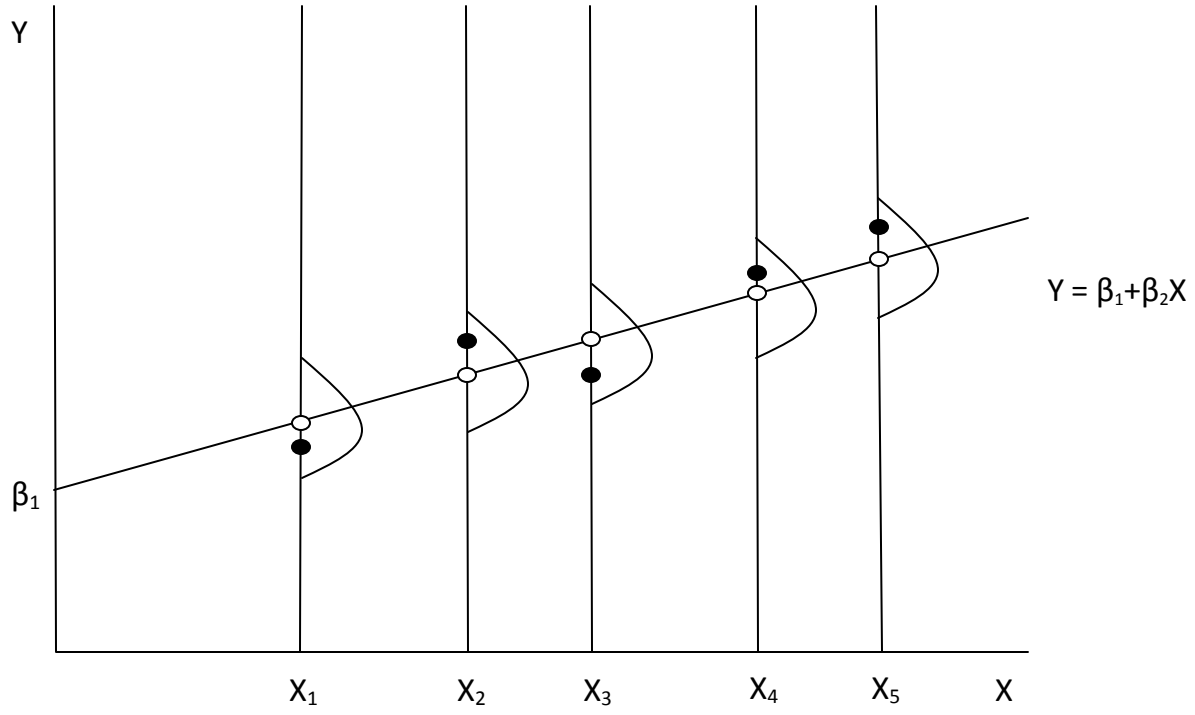

Figure 6: Homoskedasticity of a Linear Regression Model

Source: Gujarati (2003)

In logistic regression, heteroskedasticity can produce biased and misleading parameter estimates especially in categorical data analysis class causing the OLS estimates to violate the BLUE principles.

The standard errors are biased when heteroskedasticity is present. This in turn leads to bias in test statistics and confidence intervals.

The Breusch-Pagan test is designed to detect any linear form of heteroscedasticity Breusch-Pagan / Cook-Weisberg tests the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables. For example, if the alternative hypothesis states that the error variances increase (or decrease) as the predicted

values of Y increase, then the bigger the predicted value of Y, the bigger the error variance is. A large chi-square would indicate that heteroskedasticity was present. In this case the chi-square value was small, indicating heteroskedasticity was probably not a problem (or at least that if it was a problem, it wasn't a multiplicative function of the predicted values (Dougherty, 2007).

Multicollinearity in Linear Regression

Multicollinearity is a condition where independent variables are strongly correlated with each other. When multicollinearity exists in your model, you may see very high standard error and low t statistics, unexpected changes in coefficient magnitudes or signs, or non-significant coefficients despite a high R-square.

Multicollinearity in linear models can be detected using two indexes called tolerance (Tol) and variance inflation factor (VIF). Values of VIF lower than 10 or values of Tol larger than 0.1 are usually considered to be acceptable. You can check for multicollinearity by running a regression having each of the predictor variables as the dependent variable, against all the other predictors. Then examine how much of the variable's effect is independent of other predictors in the case of VIF. VIF column shows by how much other coefficients variances (and standard errors) are increased due to the inclusion of that predictor. 1/VIF gives the same values as 1-R2 (Stata, 2009).

Omitted variable test

In multiple regression, Specification of the correct model is important because if the model is misspecified we can lose some or all of the desirable properties of our estimators: unbiasedness, efficiency and consistency. We are concerned with the following issues as long as model specification is concern:
The correct functional form, omitted variables, irrelevant variables and multicollinearity problem.

A regression model suffers from functional form misspecification when it does not properly account for the relationship between the dependent and the observed explanatory variables. The regression specification error test (RESET) is one of the tests proposed to detect general functional form misspecification.
RESET test adds polynomials in the OLS fitted values to the equation to detect general kinds of functional form misspecification.
The problem of omitted variables arises usually when there is a lack of data omitted variables can cause considerable bias in estimation. Ramsey RESET test using powers of the fitted values of amount is used to test against the null hypothesis that the model has no omitted variables. Based on p – value the null hypothesis is accepted or rejected at 10% significance level.

Normality Assumption

Normality is one of the assumptions of linear regression that the error term is normally distributed with constant variance and zero mean which should not be violated. Population represents the combined influence (on the dependent variable) of a large number of independent variables that are not explicitly

introduced in the regression model. It is believe that the influence of these omitted or neglected variables is small and at best random. The central limit theorem (CLT) of statistics can show that if there are a large number of independent and identically distributed random variables, then, with a few exceptions, the distribution of their sum tends to be a normal distribution as the number of such variables increase indefinitely.

CLT proves that violation of the normality assumption is virtually inconsequential for sample sizes that are sufficiently large. It is however necessary to meet the normality assumption in sample sizes that small before regression coefficient (p-value and t - statistics) can be validated (Gujarati, 2003). Acquah (2013), indicated that normality in linear regression can be tested using Shapiro-Wilk test. It tests for the null hypothesis is that the residuals are normal and when the p values are large we do not reject the null hypothesis. The Shapiro-Wilk test can be used in conjunction with Normal Quantile Quantile (Q-Q) plots and Histogram in other to investigate normality of the residuals he added.

Goodness of Fit (R^2)

The R^2 value is also known as the coefficient of determination and it mearsures how much variation in y is explained by the predictor variable (x). The value is independent of the original variable and belongs to the interval $0 \leq R^2 \leq 1$. A higher R^2 value suggests a good fit (Acquah, 2013). Wooldridge (2005) indicated that low R^2 in regression equations are common, especially for cross-sectional analysis. He is of the view that the size of R^2 is not necessarily

important as the economic and statistical significance of the explanatory variables.

Analytic Framework

The study employed descriptive statistics and econometric methods to analyze the data collected from the respondents. The summary of analytical framework is presented below

Analytical Framework of the Study

Objectives	**Variables to be measured**	**Type of analysis**
Examine socio-economic characteristics of fishermen	Income, Age, Sex, Marital status Experience in fishing and Educational level, family size, credit availability and repayment	Descriptive statistics • Mean • Standard Deviation • Frequency • percentages
Identify major perils associated with fishing activity	Type of peril Frequency of peril	Descriptive statistics Frequency Percentage
Estimate willingness to pay for insurance Bids of willingness to pay and statistics of willingness to pay	Attitudes(Group fishing, listen to weather forecast, Wear life jacket, use dangerous weapon) Wealth(own house, vehicle, Land)	Skewness, kurtosis Standard deviation Frequency Mean,median
Estimates Fishermen's Probability of willingness to pay	Attitude towards insurance • positive • negative	Logit Model
Analyze factors influencing amount fisher's are willing to pay as premium	Economic variables (income credit use & availability) Asset(own house/car/engine hp Attitude(wear lifebelt, Listing weather news , inform family) Demographic(Age Family size) Risk factor(type of risk, severity & frequency of risk)	Linear Model

Source: Authors construct

Variables of the Study

Willingness to pay is a dichotomous dependent variable, *Yi*, where willingness to pay is equal to 1 (i.e. WTP = 1) if the fisherman is willing to pay for insurance and WTP = 0 if otherwise. A number of explanatory variables believed to have a link with dependent variable were hypothesized to have association with the willingness to pay for hypothetical fishery insurance scheme are presented below: Age variable is categorical and measures the age of respondent, it was coded as 1=15 to 20, 2 = 21 to 30, 3 = 31 to 40, 4 = 41to50, 5=51 to 60, 6=61to 70, 7=71-80, 8= more than 80 and above. As indicated by Mbaga, Boughanmi and Zekri, (2008) that there is a positive correlation between risk aversion and that the older the household size the more likely he is willing to enroll in an insurance program. This seems to imply that the older the fisherman, the more he values his life and feels more responsible towards family members who in case of death will benefit from the insurance claim.

Years of education variable (yrs_edu) is continous and refers to the number of years and highest level of education attained by the respondent, it was coded as 0 = Non formal, 1 = Primary, 2 = JHS/MLSC, 3 = Secondary, 4 = Tertiary. Education inculcates skills that enable individuals turn their opportunities into wealth and in so doing move above the poverty line (Andoh, 2007). As such education influence individuals decision making process and besides decision as whether to purchase insurance or not thrives on the flow of information which is usually understood a bit better by the elite

The variable household size (hse_ h_size) refers to the total number of family members that are dependents on respondent. It is a categorical variable and was coded as 1=1 to 2, 2 = 3 to 4 , 3 = 5 to 6, 4 = 7 to 8, 5=9 to10 and 6 = more than 10. Acquah (2011) found household size to have positive correlation with respect to probability of willingness to pay for climate change mitigation policy. However, as household size increases household heads willingness to pay for insurance premium may decreases as results of increased dependants on respondent's income.

The variable group fishing (group_fishing) refers to situation where fishermen go to fishing in groups as a way of avoiding risks. There is a general feeling among fishers that group fishing is a step away from experiencing risk on sea. Mbaga, Boughanmi and Zekri, (2008) found out fishermen rely on solidarity within their communities and on relatives as safety measures by fishing in groups, informing their families about the site where they are going to fish and get informed about weather conditions before leaving.

The variable (life_belt) is a dummy which takes 1 if a fisherman wears life belt or life jacket and 0 if otherwise. It refers to crew members' willingness to wear safety equipment such as life belt or life jacket as safety precaution mearsures. Mbaga, Boughanmi and Zekri, (2008) found out availability of safety equipment on boat makes fishers think they have enough security and highly increases their unwillingness to pay for insurance scheme.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter presents the empirical results and analytical findings of willingness to pay for fishery insurance. Section one deals with the socio-economic characteristics of respondents. Section two deals with the fishing perils associated with fishery activities in the Western Region. Section three presents the frequency of the bids of willingness to pay and the statistics of bids of willingness to pay for insurance. Section four examines the determinants of fishers' willingness to pay for insurance. Section five discusses the factors that influence the premium amount fishers are willing to pay. Section six investigates the reasons for respondents' willingness and unwillingness to pay for fishery insurance

Section One: Socio-Economic Characteristics of Respondents

Age Distribution

As seen from Table 1, 3.67% of the respondents interviewed were between the ages of 15-20 years; 28.33% between 21-30 years; 23.33% between 31- 40 years, 26.67% between 41- 50 years; 12.33% between 51- 60; 4.00% between 61-70 years; 1.33% between 71-80 years and 0.33% were above 80 years with the mean age of 39.54 years and the standard deviation of 12.85 years

Table1.0. The indications of the figures are that most fishers (55.33%) are between the ages of 15 to 40 which suggest fairly youthful fishermen in the fishery industry.

This finding is consistent with Mbenga (1996) who found out that more than 50% of the Gambian fishers are between the ages of 15 – 40 years. The age related results can be attributed to the nature of the fishing communities; the predominant occupation in these communities is fishing and because most of the people are primary and junior high school drop outs, they could only find solace in fishing

Table 1: Distribution of Fishers' Age

Age (years)	Frequency	Percentage
15 to 20	11	3.67
21 to 30	85	28.33
31 to 40	70	23.33
41 to 50	80	26.67
51 to 60	37	12.33
61 to 70	12	4
71 to 80	4	1.33
More than 80 years	1	0.33
Total	300	100

Source: Field data, 2013

Educational Level

In the view of Asenso-Okyere (2001), the proportion of the poor in society reduces steadily as the level of education increases. In connection with this statement, respondents in this study were asked to indicate their levels of

education. This is because education inculcates skills that enable individuals turn their opportunities into wealth and in so doing move above the poverty line (Andoh, 2007). Besides, fishery resources conservation management thrives on the flow of information which is usually understood by the elite.

Though educational levels of the respondents ranged from non formal to the tertiary levels, the number of years spent at these levels differed with the respondents. The results showed that 45.67% of the respondents had no formal education; 32.00% had primary education; 20.33% had attained basic education (middle/JSS/JHS education), 1.00% attained secondary education ('A' or 'O' level/SHS) and1.00% acquired education up to the tertiary level with mean years of education of 3.56 and the standard deviation of 4.01.

Results indicated that majority (52.33%) of the respondents completed primary and middle school level. The study suggests that people with higher education do not show much interest in fishing in the study area. This result is consistent with Fang, Yang, Wang and Xu (2006) who found out that more than 50% of Kanas fishers in China have educational level up to basic level.

Table 2: Distribution of Fishers' Educational Levels

Educational level	Frequency	Percentage
No formal education	137	45.67
Primary	96	32.00
JSS/JHS/Middle school leaver	61	20.33
Secondary level	3	1.00
Tertiary	3	1.00
Total	300	100

Source: Field data, 2013

Household Size

With respect to the household size as shown in Table 3, 12.69% of the respondents had household size between 1-2, 41.67% between 3-4, 38% between 5-6; 17% between 7-8; 7% between 9-10 and 3.67% had more than 10 household size. The result showed that a larger proportion 55% of the respondent have family size between 5 to8. As a result, it is likely that majority of the Vessel owners with large family size may engage family members to work in their vessel whereas those with less family size may depend on hired fishers to work in their vessel.

Table 3: Distribution of Fishers' Household size

Household size	Frequency	Percentage
Up to 2	38	12.67
3 to 4	65	21.67
5 to 6	114	38
7 to 8	51	17
9 to 10	21	7
More than 10	11	3.67
Total	300	100

Source: Field data, 2013

Distribution of Fishing Experience

With regards to the respondents' experience in fishing (Table 4), 13.67% had 1-9 years of fishing experience, 32.67% had 10-19 years, 27.33% had 20-29 years, 16.00% had 30-39 years 7.00 had 40-49 years and 4.33%, 50 and above years of fishing experience. The study revealed that the majority (32.67%) of the fishers have been fishing for 10-19 years. This is followed by those who have fish for between 20-29 years constituting 27.33 percent. The least distribution of years of fishing was 60 years and above (1.33%). The years of fishing suggest that the fishermen began fishing in their early years of their lives when compare to their ages. This finding agrees with Mbenga (1996) who indicated that most fishers' in Gambia have garnered more years of experience in fishing hence they tend to be more risk averse.

Table 4: Distribution of Fishers Fishing Experience

Experience in Fishing (Years)	Frequency	Percentage
0 to 9	41.00	13.67
10 to 19	98.00	32.67
20 to 29	82.00	27.33
30 to 39	48.00	16.00
40 to 49	21.00	7.00
50 to 59	6.00	2.00
60 and above	4.00	1.33
Total	300.00	100.00

Source: Field data, 2013

With respect to the marital status of the respondents, 13% had never married, 2.3% were Divorced and all the remaining (84.7%) were married. As seen from Table 5, majority of the respondents (84.7%) were married may imply that fishers are more responsible for their family and the more likely to be willing to pay for insurance. This finding is consistent with Mbaga, Boughanmi and Zekri (2008) who found out fishing activities in Oman is predominantly operated by married people.

Table 5: Distribution of Fishers Marital Status

Status	Frequency	Percent
Never married	39	13.0
Married	254	84.7
Divorced	7	2.3
Total	300	100

Source: Field data, 2013

Distribution of Fishers' Credit Access, Sources, Amount and Repayment

With respect to credit access Table (6), 33.67% of the respondents have access to credit whereas 66.33% do not have access to credit facility. Out of the 101 respondent (33.67%) who indicated their affirmative to access to credit facility, said their main sources of credit facilities are relatives (8.91%), money lenders (1.98%), micro finance/credit Unions (7.92%), banks (44.55%), Vessel owners (15.84%), fish buyers (20.79%).

Table 6: Distribution of Fishers' Access to Credit

Response	Frequency	Percent
No	199	66.33
Yes	101	33.66
Total	300	100.00

Source: Field data, 2013

With respect to credit amount accessible to fishers (Table 7), nearly one forth (25.74%) of the respondents receive credit facility between GH¢ 50 - GH¢500. This is followed by 15% of the respondents who receive GH¢1500-2000 and very few respondents (0.99%) receive GH¢4,100 - 4,500 as credit facility.

Table 7: Distribution of Credit Amount Accessible to Fishers

Amount of Credit (GH¢)	Frequency	Percentage
0-500	26	25.74
600-1000	14	13.86
1100-1500	10	9.9
1500-2000	17	16.83
2100-2500	3	2.97
2600-3000	8	7.92
3100-3500	3	2.97
3600-4000	5	4.95
4100-4500	1	0.99
4600-5000	6	5.94
More than 5000	8	7.92
Total	101	100

Source: Field data 201

Of the 101 respondents who indicated their access to credit, all of them (100%) affirm their ability to pay for their loan amount and they all (100%) use the credit for the intended purpose for which the loan was acquired.

When ask their sources of credit repayment, only two of the respondents (1.98%) indicated sale of assets for credit repayment, the rest (98.02%) indicated the sale of fishery products.

The analyses indicate that limited number of fishers have access to insufficient credit amount resulting in their inability to expand their business hence low catch level. This explains the statement contain in the Medium Term Development Plans of the Districts in the Western Region which indicates that

about 90% of the Region's catch is by small scale canoe fishermen who are unable to acquire modern technologies for their operations due to lack of access to credit facilities (Western Regional Coordinating Council, 2012)

Distribution of Fishers Other Occupation

With respect to other occupation (Table 8), 15.7% of the respondents had other income generating activities while 84.3% depend on only fishing as their primary economic activity for their income. This finding is consistent with Mbaga, Boughanmi and Zekri (2008) who found out that less than quarter of Thalassorama fishers in Oman had income from other economic ventures.

Table 8: Distribution of Fishers Other Occupation

Response	Frequency	Percent
No	253	84.33
Yes	47	15.67
Total	300	100

Source: Field data 2013

Income Distribution of Fishermen

Majority of the respondents constituting 76.33% interviewed earned annual income between GH¢50 - GH¢500. This is followed by 15% of the respondents who earn between GH¢600 - GH¢1000. Only 0.67% of the respondents earn above GH¢5000 which is the highest amount earn among the respondent and the rest of the respondents (8.67 %) earn between GH¢1100-GH¢4500. The mean yearly income for respondent is GH¢ 548.967 and the median of the yearly income is GH¢ 375 indicating a positively skewed response distribution. The result indicate that the daily mean income of the fishers is GH¢1.53 when computed from yearly income. The amount is far below the

GH¢5.24 daily minimum wage in Ghana. This finding confirms with the findings of Fraser (1992) who indicated that developments in the world sea foods suggest that fishermen are exposed to a high level of income variability.

Table 9: Income Distribution of Fishermen

Income categories (Gh¢)	Frequency	Percentage
50-500	229	76.33
600-1000	45	15
1100-1500	12	4
1500-2000	6	2
2600-3000	3	1
3600-4000	1	0.33
4100-4500	2	0.67
more than 5000	2	0.67
Total	300	100
N	300	

Source: Field data 2013

Table 10: Statistics of Income of Respondents

	Income (Gh¢)
Median	375
Mean	548.97
Observation	300
St. deviation	784.03
Skewness	4.947
Kurtosis	33.40
Minimum	50
Maximum	7000
N	300

Source: Field data 2013

Section Two: Perils Experienced by Fishers

According to the views of Makaudze and Miranda (2010) who assert that the fishers who purchase insurance are likely to have experienced significant losses in the past and that fishers in geographical areas that are prone to disaster

tend to have high levels of insurance uptake, as they seek to protect themselves against the high risk of loss. In line with the above views when fishers were asked whether they have ever experience fishing risk, 182 of them responded in affirmative whiles 118 indicated they have never experienced any peril (see Table 11).

Out of the 182 respondent who had experienced fishing perils, the most popular perils were fishing net loss 127 (69.78%), fishing vessel damage 44 (24.18%) and Vessel engine damage 42 (23.08%). The least popular responses were injuries and poisons from fish 5 (2.75%) and human life loss due to collision or/and hostile weather 9 (4.95%). It should be noted that the respondents indicated more than one type of peril. This analysis of multiple peril confirms with that of Mbaga , Boughanmi and Zekri, (2008) who indicated that fishermen face a lot of risk and uncertainty in their fishing operations. Some of the main risks they face include: Changes in weather patterns, severity of extreme events, engine failure, injuries and poisoning from fish, vessel and human life loss due to collision.

Table11: Perils Experienced by Fishers

		No	Yes	Total	Number
Fishing risk Experience	Frequency	118	182	300	300
	Percentage	39.33	60.67	100	
Human Life Loss	Frequency	173	9	182	182
	Percentage	95.05	4.95	100	
Vessel damage	Frequency	138	44	182	182
	Percentage	75.82	24.18	100	
Engine damage	Frequency	140	42	182	182
	Percentage	76.92	23.08	100	
Injury or poison	Frequency	177	5	182	182
	Percentage	97.25	2.75	100	
Fish Loss	Frequency	162	20	182	182
	Percentage	89.01	10.99	100	
Net loss	Frequency	55	127	182	182
	Percentage	30.22	69.78	100	

Source: Field data 2013

Section Three: Determination of the Frequency of Bids of Willingness to Pay and the statistics of Willingness to Pay

Results from the contingent valuation study indicates that about 67.7% of the respondents were willing to pay for fishery insurance whilst 32.3% were not willing to pay anything from their income for fishery insurance. About 32.3% which is slightly above quarter of respondents is quite high and could be attributed to: The absence of regulations requiring any kind of insurance;

Fishermen's perception that their boats are safe enough; Fishermen's reliance on solidarity within their community in case of problem.

Table 12: Frequency of Bids of Willingness to Pay for Insurance

Amount (GH¢)	Frequency	Percentage
0	97	32.33
3	1	0.33
5	9	3.00
10	15	5.00
12	1	0.33
15	1	0.33
20	30	10.00
25	4	1.33
30	11	3.67
40	1	0.33
50	11	3.67
60	8	2.67
80	3	1.00
100	24	8.00
120	6	2.00
150	8	2.67
180	7	2.33
200	25	8.33
240	4	1.33
250	1	0.33
300	7	2.33
400	4	1.33
500	8	2.67
600	7	2.33
800	3	1.00
1000	4	1.33
Total	300	100

Source: Field data 2013

Of 67.7% who were willing to pay, GH¢ **10**, **20**, **100** and **200** were the most popular responses. The mean bid and the median bid are GH¢160.86 and GH¢100 respectively. The median is lower than the mean, indicating that the

majority of the respondents are willing to pay an amount less than the mean offer and that the response distribution is skewed by a small number of high bidders. In effects most fishers in the western region are willing to pay an amount which is less than the mean for insurance.

Table 13 : Statistics of Bids of Willingness to Pay

	Amount bid (Gh¢)
Median	100
Mode	20
Mean	160.86
Skewness	2.20
Variance	42508.67
Standard Deviation	206.18
Kurtosis	7.99
Minimum	3
Maximum	1000
N	203

Source: Field data 2013

SECTION Four: Fishers' Reasons for Willing or Unwilling to Pay for Fishery Insurance

Fishers' Reasons for Willingness to Pay for Fishery Insurance

The respondent's reasons for willingness to pay is presented in Table 14. The result indicates that majority of the respondents (92.61%) who indicated their willingness to pay believe indemnity will be paid to them in case of disaster. The indications are that majority of the respondents have confidence in insurance and thus if fishery insurance is made regulatory requirement, fishers will be willing to

comply with. It was followed by 3.94% of the respondents who believes they are not certain when disaster will occur. 1.94% responded that they will be in a position to access credit facility from financial institutions for their fishery activities. Only 1.48% of the respondents indicated their willingness to pay but do not know why.

Table 14: Fishers' Reasons for willingness to pay (WTP) for Fishery Insurance

Reasons for Willing to Pay	Frequency	Percentage
I believe indemnity will be paid	188	92.61
I will be in a position to access credit facility	4	1.97
I am not certain when disaster will occur	8	3.94
I don't know	3	1.48
Total	203	100

Source: field data (2013)

Fishers' Reasons for Non-willingness to Pay for Fishery Insurance

The respondent's reasons for not willing to pay are presented in Table 15. The result indicates that out of 97 of the respondents who indicated their unwillingness to pay for fishery insurance majority of them 39 (40.21%) believe they don't trust this kind of insurance. This was followed by 11.74% of the respondents who believe the application process might be long and complex. 10.31% responded they will only take decision when they see the insurance product and terms of conditions. 7.22 % of the respondents are of the view that claiming indemnity might be a problem. Only one respondent said has a way of dealing with risks.

Finally quite considerable proportion 29.9% of the respondents who indicated their unwillingness to pay just don't know why they should pay.

Table 15: Fishers' Reasons for Non Willingness to Pay for Fishery Insurance

Reasons for not Willing to Pay	Frequency	Percentage
I don't trust this kind of insurance	39	40.21
I have a way of dealing with risks	1	1.03
the application process might be long	11	11.34
Claiming indemnity might be a problem	7	7.22
I will only pay when I see the product	10	10.31
I don't know	29	29.9
Total	97	100

Source: field data (2013)

Section Five: Determinants of willingness to pay for fishery insurance

Logistic regression was employed to determine the factors that explain a fisherman's decision to pay for fishery insurance. The fishers' decision of willingness or unwillingness to pay for fishery insurance scheme is hypothesized to depend on a number of socio-economic variables, vessel characteristics, attitude variables, wealth variables and risk factors. These variables include

Age: Age of respondents, **yrs_edu**: Years of education of respondents, **loginc:** Log of income, **cap_ves_eng**: Fishing Vessel's engine capacity, **avg_ppl**: Average People onboard fishing vessel, **trav_time:** Vessel's travel time, **hse_size:** Household size, **fish_risks_exp:** Fishing risk experience,

group_fishing: Fishers going in groups, **life belt:** Wearing life belt, **own_land**: Respondents ownership of land, **own_hse:** Respondents owning house

Table 16 presents the logistic regression analysis of the factors that determine the probability of fishers's willingness to pay for fishery insurance.

Table 16: Determinants of willingness to pay (Logit Model)

	Variables	Coefficient	t statistics	Marginal Effects
Socio-Economic Variables	Age	**0.0456****	2.17	0.008
	yrs_edu	**0.248*****	3.88	0.041
	hse_size	**-0.237*****	-2.8	-0.039
	Loginc	0.147	0.54	0.024
Vessel Characteristics	cap_ves_eng	**-0.00168*****	-2.87	-0.00
	avg_ppl	**0.0793***	1.87	0.013
	trav_time	**-0.0411****	-2.03	-0.007
Risk factor	Fish risks exp	0.548	1.23	0.095
Attitude Variables	group_fishing	**-1.748****	-2.54	-0.207
	life_belt	**-1.261***	-1.88	-0.16
Wealth Variables	own_land	-0.574	-1.26	-0.097
	own_hse	**1.354*****	2.96	0.205
	_cons	-0.14	-0.226	
	N	180	180	
	Prob > chi2	0.0000		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: field data (2013)

The econometric results showed that all the socio-economic variables of the respondents are statistically significant at 5% for age and 1% for household size and years of education except income of respondents which is not significant

even at 10% but was important in explaining respondents' probability of wtp. This finding is consistent with that of Acquah (2011) who found out that age and education are significant predictors of the probability of farmers' willingness to pay for climate change mitigation policy. Age of the respondent is positively related implying the older the fisherman; the more likely he will be willing to pay for fishery insurance. This may imply that the older the fisherman, the more he values his life and feels more responsible towards family members whom, in case of death, will benefit from his insurance claim.

Years of education is highly statistically significant and also positively correlated with probability of wtp for fishery insurance. The indication is that the more years of education respondents receive, the more he is likely to pay for insurance. This agrees with Fang Han, Zhaoping Yang, Hui Wang and Xu (2010) who found educational status as significant determinant for probability of willingness to pay. Household Size is negatively related with probability of willingness to pay, indicating that the higher the number of household members who are dependents on the fisher, the more likely he will be unwilling to pay for fishery insurance. This may be due to heavy stress on respondents' income due large number of household dependant on their income. The negative parameter of household size is in variance with that of Acquah (2011) who found household size to have positive relationship with respect to probability of willingness to pay for climate change mitigation policy.

All the boat characteristic variables which is represented by vessel engine capacity (engine house power-HP), the travel hours and average number of people

on the boat were statistically significant at 1%, 5% and 10% respectively. Vessel engine capacity and the travel time or hours are negatively related with probability of willingness to pay and may be explained by the general feeling among fishers that vessels with high engine house powers and vessel engines that travel quick and long hours provide enough safety and high financial returns that gives them trusted security than insurance scheme. Average people on board the fishing vessel is however positively related with probability of willingness to pay for insurance which agrees with the findings of Boughanmi, Mbaga, and Zekri (2008) who found average people on board the vessel to be significant and positively related . This may indicate that the more people on board the fishing vessel, the more fishers feel responsible for their lives and want to be insured.

Concerning attitude variables which are represented by group fishing and wearing life belt or life jacket are all statistically significant. They are however negatively related with the probability of being willing to pay for fishery insurance. This is explained by the general feeling by some fishermen that the availability of lifejacket which is used as safety equipment on the boat is sufficient to secure their lives, and thus there is no need to pay for insurance. This implies that there is the need for any fishery insurance policy to incorporate educational programme for fishermen about fishing safety and the importance of insurance even if safety equipment is on board.

With respect to wealth variables which are represented by owning land and owning house, the latter was highly significant at 1% while the former is insignificant with reference to the fisher's probability of willingness to pay.

House ownership is however positively related with fishers' probability of willingness to pay whilst land ownership is negatively related with fishers' probability of willingness to pay which implies fishers who own land decrease the probability of willingness to pay whilst house ownership increases the fishers' probability of willingness to pay for fishery insurance. This finding agrees with that of Boughanmi, Mbaga,and Zekri (2008) who affirm that Wealth variables weakly explain the probability of willingness to pay for insurance in their logistic model for willingness to pay for fishery insurance, and the coefficients are not significant. This could be attributed to government inability to make an insurance obligation for fishermen which could be explained by the absence of third party effects caused by sea accidents as most of the accidents are not collisions between vessels.

The fishing risks experience at sea variable was found to be statistically insignificant but positively related to willingness to pay. This implies that as fishing risk experience increase, willingness to pay for fishery insurance also increases. It is obvious that fishers who have ever experience risk at sea with serious economic losses and injuries are likely to buy insurance than those who have never experience any fishery risk.

The logit model considers the significance and the sign of the logit coefficient and tells us little about the effect of the covariate on the actual probability of an event. However, it is more useful and informative to discuss how much a change in a variable changes the probability of the main outcome as recommended by DeMeris (1995). For that reason, the estimated parameters in

Table 2.30 were transformed into marginal effects. The computed marginal effects give the magnitude of the change in the probability of willingness to pay for fishery insurance when a predictor increases by 1 unit.

Negative sign of Marginal effects for parameters indicates that high values of the variables tend to decrease the probability of willingness to pay for fishery insurance policy. A positive sign of marginal effects implies that high values of the variables will increase the probability of willingness to pay for fishery insurance. For instance years of education was found to have marginal effect of 0.041 which is positive, implying that as years of education increases by a unit, the probability of fishers paying for insurance increases by 0.041%. Also household size variable was found to have marginal effects of -0.039 which is negative implies that increase in household size by a unit will decrease the probability of paying for insurance by 0.039%.

Before one can use the logistic model to make any statistical inference, there is the need to check that the model fits sufficiently well and check for influential observations that have impact on the estimates of the coefficients. Model diagnostics tests are run to ascertain how the model fit well. As a result goodness of fit test and link test was run for logistic model which are presented below:

Goodness of Fit test

Logistic model for wtp, goodness-of-fit test

number of observations =	180
Pearson $chi^2(167)$ =	177.68
Prob > chi^2 =	0.2714

Goodness- of- fit chi-squared test help to assess the fit of the model. If the goodness- of- fit chi-squared test is statistically significant, it indicates the data do not fit the model well. On the other hand, if the goodness- of- fit chi-squared test is statistically insignificant, it suggests the data fits the model sufficiently well (Stata 12, 2011). Therefore goodness- of- fit chi-squared test favours the logistic model for willingness to pay because the goodness- of- fit chi-squared test p-value of 0.2714 is highly insignificant and provide the basis for no evidence of lack of fit. In other words the data fit the model sufficiently well due to large P-value. The model also passed the Hosmer-Lemeshow test for goodness of fit. Using a group of ten fishers' decision to pay for fishery insurance had a Hosmer-Lemeshow chi-square of 11.73 with probability of 0.1638 (see appendix A)

Table 17: Link Test for Logistic Regression

Wtp	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
_hat	0.9998876	0.246267	4.06	0.000	0.517214	1.482561
_hatsq	0.0000736	0.109917	0.00	0.999	-0.21536	0.215506
_cons	-0.0000409	0.22802	0.00	1	-0.44695	0.446871

Source: field data (2013)

The link test (Table 17) shows that logit model has no specification error and that it is properly specified because the linear predicted value (**_hat**) is highly significant whilst linear predicted value squared (**_hatsq**) is highly insignificant. This is because if **_hatsq** is significant, then the **linktest** is significant. This

usually means that either there is omitted relevant variable(s) or our link function is not correctly specified (Stata, 2009).

SECTION Six: Insurance Amounts Fishers are Willing to Pay

To explore the determinants of amounts that fishers are willing to pay for fishery insurance, the Ordinary Least Square (OLS) regression was employed. All variables that were used to explore the willingness of fishers to pay for fishery insurance scheme were estimated using the OLS regressions. The variables include: **Age**: Age of respondents, **yrs_edu**: Years of education of respondents, **loginc:** Log of income, **cap_ves_eng**: Fishing Vessel's engine capacity, **avg_ppl**: Average People onboard fishing vessel, **trav_time:** Vessel's travel time, **hse_size:** Household size, **fish_risks_exp:** Fishing risk experience, **group_fishing:** Fishers going in groups, **life belt:** Wearing life belt, **own_land**: Respondents ownership of land, **own_hse:** Respondents owning house The results of OLS estimations are presented in Table 18.

Table 18: Linear Regression Model

	Variable	Coefficient	t statitics
Socio-economic variables	age	**0.0181***	1.87
	yrs_edu	-0.0265	-1.08
	Loginc	-0.0325	-0.26
	hse_size	-0.0737	-1.49
Vessel characteristics	cap_ves_eng	0.00029	1.06
	avg_ppl	0.0078	0.41
	trav_time	0.00855	0.8
Attitude variable	group_fishing	**1.070*****	4.16
	life_belt	**0.842****	2.61
Wealth variables	own_land	-0.0779	-0.33
	own_hse	0.0674	0.3
	_cons	**3.346*****	-4.24
	R^2	0.366	
	R^2 Adjusted	0.3	
	Logliklihood	-839.8	
	N	127	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$

Source: field data (2013)

As Table 18 reveals, for those who will voluntarily buy fish insurance, the amount involved is positively affected by the age of the household head, i.e., the older the household heads, the more they are likely to pay for fishery insurance. This statistically significant positive relationship indicates that the older the household heads, the more risk averse they are than the younger households heads

because they may probably value their lives so much and feel more responsible towards their family members who are dependants on them. The significant level for age variable is at 10%

Household size of the respondents is statistically not significant but has negative influence on premium amount fishers are willing to pay for insurance. Indications are that as the household size increases household heads willingness to pay for insurance premium decreases as results of increased dependants on respondent. It might imply that small household heads value their lives and that of their relatively small family members more and may feel more responsibility towards them or may imply that fishers with large family size may have extra financial responsibilities towards their family members which put financial strain on their income and thereby making it difficult to pay for insurance premium.

Years of education of the respondents is statistically not significant but negatively influence the premium amount fishers are willing to pay. The indications of this negative relationship are that, as the years of education for a fisher increase, willingness to pay decreases.

Yearly income of respondents is also not significant and negatively influences the premium amount that respondents are willing to pay. This negative relationship indicates that the more fisher's income increases, willingness to pay for fishery insurance amount reduces. This may imply that as fisher's income increases they become potential investors in other sectors other than fisher sector which gives them trusted financial security to cover disasters or may imply that as

respondents' income increase they develop a notion that they have become financially sound to deal with any future disaster. The policy implication of this to fishery insurance is that national fishery insurance policy should be compulsory and be accompanied with educational programme.

All the vessel characteristics variables represented by vessel's engine capacity, average people on board and travel time of the vessel engine are all not statistically significant in influencing the insurance amount the fishers are willing to offer. The vessel's engine capacity is positively correlated with regards to insurance premium. This positive relationship indicate that as fishers increase the acquisition of larger vessel engine capacity, the more fishers value it and wish to protect it, hence the need to pay more to secure it from being lost or damaged. The travel time of the vessel engine is also positively correlated with respect to premium amount. The indications are that the longer the travel time and the further the distance traveled from the shore, the more the fishermen are exposed to risks. As a result, the amount of premium the fishermen are willing to pay is higher. The average people on board the fishing vessel is also positively influence the premium amount the fishers are willing to pay. This positive relationship indicate that as the people on board the fishing vessel as crew increases the more vessel owners and crew members exhibit more concern for their lives and tend to be risk averse and consequently wish to pay more towards insurance

All the attitude variables which are represented by fishing in a group and wearing life belt are statistically significant at 1% and 5% levels and have positive relationship to amount the respondents are willing to pay as insurance premium.

Both variables (fishing in a group and wearing life belt) reflect the risk awareness level of fishers and explain the willingness to pay for more insurance premium.

With regard to wealth variables represented by land ownership and house ownership, they are all statistically insignificant even at 10% level. However, the land ownership variable has negative relationship to insurance amount. This might imply that as fishers increase owning land, the amount they will be willing to pay decreases. This may be explained that, because land can easily be converted into liquid capital to cover up economic losses when disaster occurs, fishers' find it reluctant to join insurance scheme. This finding agrees with Barry and Baker (1998) who indicated that another aspect of financial risk management is liquidity, which involves the fisher's ability to convert his asset into liquid capital (cash) quickly and efficiently in order to meet his or her financial obligations. House ownership has positive relationship to insurance amount fishers' are willing to pay. This indicates as number of house ownership increases, willingness to pay for insurance premium amount also increases. The implications may be that fishers view their building as an asset which represents their social status and wouldn't like to convert into liquid asset (liquidation) when disaster occurs hence their willingness to pay increase as their building asset increases.

Model diagnostics Tests for Linear regression Model

1 Omitted variable test

Ramsey RESET test using powers of the fitted values of amount

Ho: model has no omitted variables

F(3, 111) = 0.88

Prob > F = 0.4540

2 Heteroskedasticity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of amount

Chi^2 (1) = 0.62

Prob > Chi^2 = 0.4307

3 Test of multicollinearity

Variable	VIF	1/VIF
cap_ves_eng	1.83	0.546202
Age	1.76	0.568216
avg_ppl	1.68	0.594552
hse_size	1.62	0.61637
trav_time	1.59	0.628745
life_belt	1.49	0.671577
own_land	1.33	0.753765
Loginc	1.3	0.769789
own_hse	1.22	0.821467
fish_risks~p	1.15	0.866301
yrs_edu	1.14	0.875508
group_fish~g	1.1	0.910909
Mean VIF	1.43	

In multiple regression, specification of the correct model is important because if the model is misspecified we can lose some or all of the desirable properties of our estimators: unbiasedness, efficiency and consistency. It is concerned with the following issues as long as model specification is concern: the correct functional form, omitted variables, irrelevant variables and multicollinearity problem.

A multiple regression model suffers from functional form misspecification when it does not properly account for the relationship between the dependent and the observed explanatory variables. The regression specification error test (RESET) is one of the tests proposed to detect general functional form misspecification. RESET test adds polynomials in the OLS fitted values to the equation to detect general kinds of functional form misspecification (Stata, 2009).

In this model, a Ramsey RESET test shows that there is sufficient evidence against the null hypothesis of an omitted variable bias in the model indicating estimation of regression coefficient are unbiased.

The regression model explains 36.6% of total variations ($R^2 = 0.366$). The diagnostic tests favoured the regression model. The Breusch–Pagan/Cook-Weisberg test shows that heteroscedasticity is not present in the model. This is because the p-value 0.4307 is not significant and very high hence we fail to reject the null hypothesis of homoskedasticity (constant variance).

Multicollinearity problem is common in multiple regression. Multicollinearity is a condition where independent variables are strongly

correlated with each other. When multicollinearity exists in your model, you may see very high standard error and low t statistics, unexpected changes in coefficient magnitudes or signs, or non-significant coefficients despite a high R-square. A Variance inflation factor (VIF) test was conducted to check the presence of multicollinearity. A variance inflation factor (VIF) test with its maximum value of 1.43 indicates that there is no multicollinearity in the regression model.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter summarises the study, draws conclusions and presents recommendations for policy formulation. It also suggests future areas of research in line with a broader and in-depth understanding of the marine fishery insurance

Summary

Lack of regulatory fishery insurance policy in Ghana has been a source of worry to stakeholders over many decades although there is the need to safeguard the interests and investments of local fishermen and fishery industry players. This is based on the perception that it is difficult to design and administer an insurance policy that would benefit the fishery industry until the fishery stock reached stability. Currently no insurance company has fishery insurance products for fishermen due to inadequate information and empirical literature on the demand side of the fishery insurance. This study therefore sought to empirically determine the willingness of fishermen to pay for insurance programme in the Western Region of Ghana. Econometric models and descriptive statistics were employed to investigate the problem of the study. Both the former and the latter relate to primary data.

The study employed cross-sectional survey as research design. A sample size of 300 fishermen was used for the study. The research instruments were pretested at Elmina in the central region and the data was collected with the help of five field assistants. The data collected was coded and statistically analyzed using SPSS and STATA data analysis software.

The key findings of the study with respect to the objectives of the study are presented below.

1. Socioeconomic Characteristics of Fishers in the Study Area

The fishery sector in the western region is predominately operated mainly by males who are middle-aged (21-40 years) adult with majority (84.7%) of respondent married with household size ranging between 1-10. The study found out that most of the fishers had experience ranging between 10 – 29 years and 45.7% had no formal education, 32% had primary education, 20.33% hard basic/middle school education and 2% had attended school from secondary school up to tertiary education level. Majority of the respondent (76.3%) earned monthly income ranging between GH¢ 0-500. Most of the fishers have no access to credit (66.3%) whilst 33.7% had limited access to credit ranging from GH¢500 - GH¢5000. The study also revealed that (63.3%, 65.3% and 98%) of respondents do not own land, house and vehicle respectively.

2. Fishery Perils Experience by Fishers

The major risks associated with fishing activities in the study area are: Fishing net loss, vessel damage due to collision or bad weather, vessel engine

damage due to hostile weather / rough sea, vessel damage, injuries and poisons from fish or vessel collision and human life loss due to collision or and hostile weather with varying degrees of experience. For instance fishing net loss was (69.78%), fishing vessel damage was (24.18%), Vessel engine damage was (23.08%), injuries and poisons from fish was (2.75%) and human life loss due to collision or and hostile weather was (4.95%).

3. Fishermen Willingness to Pay for Fishery Insurance

About 67.7% of the fishermen were willing to pay while 32.3% were not willing to pay anything at all from their income for fishery insurance. The most popular amount of premium fishers are willing to offer for insurance scheme were GH¢20, GH¢100 and GH¢200. The mean of the amount bid for fishery insurance scheme is GH¢160.86 and the median of the amount bid is GH¢100. The minimum and maximum premium amount respondents wish to pay for fishery insurance scheme were GH¢ 3 and GH¢ 1000 respectively.

4. Fishers' Reasons for Willing or Non-willing to Pay for Insurance

The major reason given by most of the fisher who were willing to pay for insurance scheme were that, they believed indemnity would be paid to them when disaster occurs and were also not certain when disaster would occur, whereas for those who are not willing to pay indicated that they do not trust any fishery insurance scheme among others.

5: Factors Influencing Fishers' Willingness to Pay for Insurance

The results of the logistic regression analysis revealed that socio-economic variables represented by age and years of education; vessel characteristics represented by average people on-board and wealth variable represented by own house positively influence fishers' willingness to pay for fishery insurance whiles household size, vessel engine capacity, travel time, group fishing and wearing life belt/jacket variables negatively influence fishers' willingness to pay for fishery insurance.

6. Factors Influencing Insurance Amounts Fishers are Willing to Pay

Empirical result from the linear model analysis established that age, group fishing and wearing of life belt / jacket positively influenced the maximum amount fishers' are willing to pay for fishery insurance.

Conclusions

The following conclusions are drawn from the findings of the study:

1 Fishing in the Western Region of Ghana is a male dominated activity and it is predominantly operated by married and middle-aged adults who have no formal to middle school / Junior high school education. Most of the fishers do not have access to credit facility with majority earning income below the national minimum wage.

2 The major perils experience by fishermen are fishing net loss, vessel damage due to collision or bad weather and vessel engine damage due to hostile weather / rough sea

3 Most fishermen are willing to pay for fishery insurance scheme as one of the risk averse tools. Mean willingness to pay was high implying fishers were willing to pay more for insurance. However mean willingness to pay amount might have been over-estimated because mean is sensitive to outliers in the data and that the response distribution is skewed by a small number of high bidders.

4 The most motivational reason for fishers willingness to pay for fishery insurance is payment of indemnity whereas the most challenging factor for respondent unwillingness to pay is lack of trust in insurance scheme

5 Age, years of education, household size, vessel engine capacity, average people on-board and travel time, wearing life belt/jacket, group fishing and own house are significant determinant factors of probability of willingness to pay for fishery insurance

6 Age, group fishing and wearing of life belt / jacket are key factors influencing insurance premium amounts fishers are willing to pay for insurance scheme.

Recommendations

Based on the findings of the study the following recommendations are made:

1 Fishermen should be encouraged by government and non-governmental organizations to form viable cooperatives to enable them access credit

facilities from financial institutions for their fishing activities and alternative economic enterprise. This is due to the fact that most of the fishers in the study area do not have access to credit facilities from financial institutions.

Moreover, government through Non-formal Education sector of the Ministry of Education should increase their effort to improve literacy in the fishing communities. This is due to the finding that fishing in the study area is left for people who have little and no formal education.

In addition, religious bodies, government and non-governmental organizations should institute alternative livelihood programme in the fishing communities which would be geared towards improving fishers' income by providing fishers alternative entrepreneurial skills. This is based on the fact that majority of the fishers in the study area earn monthly income far below the minimum wage.

2 Fishing net loss, vessel damage due to collision or bad weather and vessel engine damage / failure are the predominant perils experienced by fishers. This should be carefully considered by insurers since it can pose heavy financial threat for insurance companies in paying indemnity claims. It is therefore recommended for insurance delivery service providers to design products for such perils.

3 Government should enact a regulatory national fishery insurance policy. Pricing component of insurance scheme by government and insurance service providers should take into consideration the mean and the median

willingness to pay. Considerations should be placed more on median willingness to pay value as mean was found to be sensitive to outliers and could lead to raising price of insurance higher that may deny services from poor fishers.

4 National Insurance Commission should ensure effective management and supervision for regulatory national fishery insurance policy to ensuring prompt payment of indemnity to win fishers trust. This is based on the findings that fishers' unwillingness to pay was mainly due to mistrust.

5 Government through fisheries department and organized fisher groups as well as local government authorities should create enabling environment and encourage youth and well educated people to actively engage in fishery activities. Also Public Health department of Ghana Health Service and Plan Parenthood Association of Ghana (PPAG) should intensify family planning education outreach to fishing communities about the need to have relatively small family size. These are based on the finding that fisher's household size negatively influence fisher's probability of willingness to pay, while fisher's age and years of education positively influence fishers' willingness to pay in the study area

6 Government through National Insurance Commission and insurance services providers should ensure safety precaution awareness either take precedence or go in hand with insurance policy in other to increase maximum amount of willingness to pay as group fishing and wearing of

safety belt were positive significant predictors of premium amount of fishers' willingness to pay.

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APPENDICES

Appendix A: Model Diagnostic Test for Logistic Regression

Chi - Square Goodness of Fit test

Logistic model for wtp, goodness-of-fit test

number of observations = 180

number of covariate patterns = 180

Pearson chi2(167) = 177.68

Prob > chi2 = 0.2714

Link test for Logistic regresion

Wtp	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
_hat	0.9998876	0.246267	4.06	0.000	0.517214	1.482561
_hatsq	0.0000736	0.109917	0.00	0.999	-0.21536	0.215506
_cons	-0.0000409	0.22802	0.00	1	-0.44695	0.446871

Hosmer-Lemeshow Chi-Square Goodness of Fit test

Number of observations = 180

Number of groups = 10

Hosmer-Lemeshow chi2 (8) = 11.73

Prob> chi2 = 0.1638

Appendix B: Model Diagnostic Test for Linear Regression Model

Omitted variable test

Ramsey RESET test using powers of the fitted values of amount

Ho: model has no omitted variables

F(3, 111) = 0.88

Prob > F = 0.4540

Heteroskedasticity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of amount

chi2(1) = 0.62

Prob > chi2 = 0.4307

Test of multicollinearity

Variable	VIF	1/VIF
cap_ves_eng	1.83	0.546202
age	1.76	0.568216
avg_ppl	1.68	0.594552
hse_size	1.62	0.61637
trav_time	1.59	0.628745
life_belt	1.49	0.671577
own_land	1.33	0.753765
loginc	1.3	0.769789
own_hse	1.22	0.821467
fish_risks~p	1.15	0.866301
yrs_edu	1.14	0.875508
group_fish~g	1.1	0.910909
Mean VIF	1.43	

Appendix C

Marginal Effects of the Logit Model

	b	Se	z	p
age	0.008	0.003	2.219	0.027
yrs_edu	0.041	0.010	4.277	0.000
loginc	0.024	0.045	0.538	0.590
cap_ves_eng	-0.000	0.000	-2.997	0.003
avg_ppl	0.013	0.007	1.922	0.055
trav_time	-0.007	0.003	-2.056	0.040
hse_size	-0.039	0.014	-2.831	0.005
fish_risks_exp	0.095	0.080	1.181	0.238
group_fishing	-0.207	0.054	-3.832	0.000
life_belt	0.160	0.063	2.538	0.011
own_land	-0.097	0.078	-1.246	0.213
own_hse	0.205	0.063	3.254	0.001
N	180			

Appendix D: Summary of Key Socio-Economic Characteristics of Fishers'

Summary of Key Socio-Economic Characteristics of Respondents

Variable	N	Mean	Variance	Standard deviation	Skewness	Kurtosis
Years of Fishing	300	21.70	148.81	12.20	0.80	3.38
Household size	300	5.42	7.84	2.80	1.31	8.78
Years of Education	300	3.56	16.10	4.01	0.83	2.81
Monthly income	300	548.97	614706.30	784.03	4.92	33.40
Age	300	39.54	165.12	12.85	0.61	3.14

Source: Field data, 2013

Appendix E: Questionnaires and Interview Schedule

UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

INTRODUCTION: This questionnaire is purely for academic purposes and all information given will be treated as such. Information provided will be handled with the highest degree of confidentiality. Thank you in advance for your time.

TOPIC: Willingness of fishermen to participate in an insurance programme in Western Region of Ghana

Date of survey…….. Location: …….

Please, kindly respond to the questions by putting a tick mark [√] or writing where appropriately.

Section A: Socio-economic characteristics of respondents

1. Sex a) Male b) Female
2. Age (yrs)……
3. Marital status a) Single b) Married c) Divorced d) Widow
4. Education level obtained a) No formal education b) Primary
   (c) JSS/JHS/Middle School Leaver d) Secondary School Leaver e) Tertiary
5. How many years of education have you obtained? ……
6. Household size……
7. How many years have you been a fishermen? ……

8. A) Do you often have access to credit for your fishing activities?

   a) yes b) No

   B) If 'Yes', what is the sources of your credit? a) Relatives

   b) Money Lenders

   c) Micro Finance/credit Union companies d) Banks e) Vessel owners f) fish buyers

   C) What amount do you often get as credit? ……

   D) Are you able to pay your entire loan amount plus the interest there on? a) Yes b) No

   E) If 'No', give reason(s) ……

   F) Do you often use the credit for the intended purpose? a) Yes b) No

   G) What are your Sources of funds for credit repayment? a) Sale of fishery products b) sale of assets c) Another loan d) Others Specify)……

9. Do you have other occupation apart from fishing? a) Yes b) No

10. What is your monthly average income? GH₵……

Section B: Wealth Variables of Respondents

11. Do you own any of these?

   A) Land (a) Yes (b) No

   B) Vehicle (a) Yes (b) No

   C) House (a) Yes (b) No

   D) Fishing Vessel (a) Yes (b) No

12. If 'yes', to any of the above specify the following

Type of asset	Number/ Acreage	Type	No of years since acquired
Land		Farm / Industrial / Residential	
Vehicle			
House			
Fishing Vessel			

Section C: Fishing Vessel Characteristics of Fishers

13. Indicate the following characteristics of the fishing vessel you own

A) Engine Age……B) Engine Capacity/ HP ……

C) Travel Time …… D) Average People on Board……

14. Do you fish with your own Vessel/canoe? a)Yes b) No

15. What type of vessel do you use to fish?

a) Small Canoe without outboard motor b) Canoe with small outboard motor

b) Canoe with high HP outboard Motor d) Boat with high HP engine

Section D: Fishers Attitude

16. Are you on any fishery insurance? a)Yes b) No
17. Would you be interested in insurance that protects you against fishing risks?
    a) Yes b) No c) Indifference
18. Do you often inform your family or friends before going to fishing? a) Yes b) No
19. Does the Vessel you fish with go in groups? a)Yes b) No
20. Do you listen to Weather Forecast before leaving offshore? a)Yes b) No
21. Do you wear life belt / Life jacket during fishing? a) Yes b) No

Section E: Information on Willingness to pay for fishery insurance

22. Are you willing to pay for fishery insurance? a) Yes b) No
    A) If 'Yes', state the reason for your willingness to pay fishery insurance
        a) I believe indemnity will be paid to me in case there is a disaster
        b) I will be in a position to access credit from the bank for fishing activities
        c) I have enough money to pay for fishery insurance
        d) I am not certain when disaster will occur
        e) Because of my experience
        f) I don't know
        g) Others (specify) ……

B) If 'No', state your reason for not willing to pay for fishery insurance

a) I don't trust this type of insurance

b) I have a way of dealing with risk and uncertainties

c) The application processes might be too long and complex

d) Claiming indemnity might be a problem

e) I'm poor hence I cannot afford to pay extra money for fishery insurance

f) I don't know

g) Others (specify) ……

23. How much are you willing to pay for fishery insurance? GH¢……

Section F: Risk in Fishing

24. Have you experience any fishing risks before? (a) Yes (b) No

Indicate below the type of fishing risk you have encountered before

A. Human Life Loss due to collision or weather changes (a) Yes (b) No

B. Vessel Loss due to collision or weather changes (a) Yes (b) No

C. Engine Loss / failure (a) Yes (b) No

D. Injuries and poisoning from fish (a) Yes (b) No

E. Fishing Net Loss (a) Yes (b) No

If 'Yes', to any of the above, please give details

Type of Risk	Frequency of peril per year	Total loss value in GH¢
Human Life Loss due to collision or weather changes		
Vessel Loss due to collision or weather changes		
Engine Loss / failure		
Injuries and poisoning from fish		
Fishing Net Loss		
Others …….		