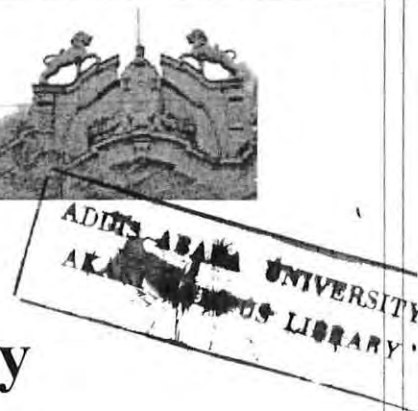


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Addis Ababa University
School of Graduate Studies
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**Smallholder Farmers' Willingness to Pay for Crop Insurance: the Case of
Dugda District, East Shewa Zone of Oromia National Regional State**

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**A Thesis submitted for partial fulfillment of the requirement for the
Degree of Masters of Arts in Development Studies
(Environment and Development)**

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APPROVAL SHEET

School of Graduate Studies Addis Ababa University

As members of the *Examiners of the M.A. Thesis Open Defense Examination*, we certify that we have read, evaluated the thesis, entitled: **"Smallholder Farmers' Willingness to Pay for Crop Insurance: The Case of Dugda District, East Shewa Zone of Oromia National Regional State."** prepared by **Jibat Alemneh** and examined the candidate. We recommended that the thesis could be accepted as fulfilling the thesis requirement and meets the accepted standard of the University with respect to originality and quality for the Degree of Masters of Art in Environment and Development.

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DEDICATION

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ABBREVIATIONS

CCIS	Comprehensive Crop Insurance Scheme
CRMG	Commodity Risk Management Group
CVM	Contingent Valuation Method
FCIP	Federal Crop Insurance Program
FGD	Focus Group discussion
GDP	Growth Domestic Product
GIIF	Global Index Insurance Facility
HHs	Household Heads
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IRI	International Research Institute
KII	Key Informant Interview
MPCI	Multi-Peril Crop Insurance
NGOs	Non-Governmental Organization
NW	North West
RMA	Risk Management Agency
SBC	Sadharan Bima Corporation
SE	South East
SNNPR	Southern Nations Nationalities People's Region
TLU	Tropical Livestock Unit
UNECA	United Nations Economic Commission for Africa
USA	United States of America
USAID	United States Agency for International Development
VIF	Variance inflation factor
WTP	Willingness to Pay
WB	World Bank

Abstract

Agricultural risk plays an important role in human livelihood, particularly for third world countries farmers are exposed to the vagaries of tragic crop failure. The most obvious aspect of Ethiopian rural life is uncertainty, because of the country over dependency on climate sensitive rain fed agricultural practice, geographical location, and low adaptive capacity making the country highly vulnerable to the adverse impact of climate change. Risk management strategies commonly used by smallholder farmers to minimize their exposure to crop production risk are contemporary informal traditional ways. On the ground of the above problem by observing the extent of smallholder farmers risk aversion behaviors and ability , designing and introducing risk transfer approach such as crop insurance has the potential to contribute significantly to sustainable development. However the program exist as a pilot project, there exist no crop insurance program developed at national level to manage natural hazard risks for poor smallholder farmers; Against this back log this study focuses on the assessment on farmers' willingness to pay for crop insurance, identify determinants and investigates the willingness of insurance companies to provide the crop insurance program. In the study, a Contingent Valuation Method (CVM) elicitation technique was used because it utilizes surveys to determine how consumers evaluate goods and services when markets are missing. The sample size of this study is 120; proportional sample household heads were surveyed. For the coding and analysis of the data collected from the household survey, SPSS and STATA were used and analyzed using descriptive statistics and logistic regression model. The result depicts the willingness to buy for crop insurance was found out to be very high accounting for 97.5 % of farm household heads. The high interest in the service can be due to high vulnerability of the area to different natural disasters. Among those willing to buy, only 36.7 % of the household heads were able to afford the premium. The mean of willingness of farmers to pay for the service was 3,502.25 Birr per hectare per year which is very much lower than the demanded insurance set premium of 6,000 ETB. The other remaining majority (63.3%) were not able to pay for the service. The logistic regression result shows that wealth, educational level of household head, size of rain fed cultivated land, knowledge and adaptive strategy positively determine farmers' participation in the service; whereas, age, dependency ratio, amount of premium set per hectare negatively affects farmers' decision to participate in crop insurance. In addition when farmers know the service being sold, they are more likely willing to pay. Nonetheless, participation of small holder farmers in the crop insurance service greatly contributes to the improved production of crops, facilitate access to credit and contribute for modernization of the crop production. Smallholder farmers are increasingly showing higher willingness and participation and insurance companies have interest of expanding the access to larger number of users. However, the insurance companies proposed that to realize the implementation of effective insurance service; policy implementation in crop insurance has to get attention from the government side, and much work has to be done in awareness creation. Crop insurance is perceived as a means by which farmers are helped increases their income and support to minimize poverty trap, for proper implementation of the program in the study area priority should be given for essential agricultural inputs, credit facility, capacity building and public intervention.

Key Words: Crop Insurance, Climate Change, WTP, CVM.

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Africa is extremely vulnerable to climate change risks principally because of over-dependency by millions of households on climate-sensitive rain-fed agriculture. Each year millions of agricultural producers face the prospects of tragic crop failure or livestock mortality as droughts become more frequent. Risk management strategies commonly used by smallholder farmers include crop diversification, intercropping, low fertilizer application, poor quality seeds and land-share cropping. Ex-post measures on the other hand include, selling/liquidation of assets (especially livestock), family mutual/reciprocal aid networks, self-insuring behavior (savings and credit reserves), off-farm employment, migratory labor, and others. Despite a seemingly wide array of risk management options at the disposal of smallholder farmers, all these strategies fail in the face of extreme weather events and weak economies (UNECA, 2011).

The report by IFPRI (2011) indicate that Ethiopia's agricultural sector, dominated by small-scale, mixed crop and livestock farming and employs 80 percent of the population is the mainstay of the country's economy. The country's dependence on agriculture makes it particularly vulnerable to the adverse impacts of climate change on crop and livestock production with agricultural production representing the major livelihood of many resource constrained farmers.

The geographical location and topography, plus a low adaptive capacity, make the country highly vulnerable to the adverse impacts of climate change.

The spectrum of risks that affect the income of agricultural producers and agribusinesses is quite broad. The two predominant risks are: price risk, reflecting variations in market prices for agricultural commodities and production inputs; and production risk, which encompasses variations in the volume or quality of the commodity produced. The most pervasive production risk is weather, which impacts all aspects of the agricultural supply chain, particularly in economies based on rain-fed agriculture. Even with the introduction of new crop varieties, production technology such as irrigation, and new management practices that offer the potential to increase yields and improve resistance to weather perils, the majority of agriculture in developing countries remain highly susceptible to extreme, uncontrollable weather events that can severely impact both quality and yield of a crop. Such events include excessive or insufficient rainfall and extreme temperatures (Winner, 2005).

Agricultural producers face many risks that can intimidate their output, their income, and eventually their consumption. Farmers face a series of risks, including idiosyncratic risks such as fire, hail, and health, which affect them independently, and systemic risks such as drought, epidemic diseases, and price, which affect a large number of producers at the same time (Mahul and Stutley, 2010).

Many studies including USAID (2006), justify seeing that the effects of weather risk are felt most acutely at the household level, particularly by poor, vulnerable agricultural households, the majority of which are subsistence farmers as weather risks are unpredictable in terms of both frequency and severity. Poor household farmers customarily have managed this risk by using less risky technologies of lower but reliably yielding drought-resistant crops; by seeking

diversification both in terms of production activities on farm and income generating activities; and by devising informal and formal risk sharing arrangements.

While these mechanisms may work well for low-magnitude losses, even if they are frequent, they often prove to be inadequate for risk that is infrequent but severe. Weather risks for example drought and flood influence entire at a time, rendering informal risk sharing arrangements insufficient. Affected farmers are often forced to employ short term coping strategies such as borrowing from money lenders or neighbors, selling assets, or cutting natural resources and availing expenditures on household goods and services.

According to Mahul and Stutley, 2010 agricultural risk management, including agricultural insurance, can contribute to raising the productivity of agriculture by helping farmers invest in more productive, but sometimes riskier, agricultural business activities.

1.2. STATEMENT OF THE PROBLEM

Agricultural risk plays an important role in human livelihood, particularly for third world countries farmers who are exposed to the vagaries of weather and price shocks. The most obvious aspect of rural life is uncertainty. The farmers do not have security because on one hand, natural factors like climatic conditions mostly threaten them to reduce the quantity of their crops and on the other hand; they face fluctuation of prices in the market. It has long been argued that poor farmers in developing countries attempt to minimize their exposure to risk by growing their own food, avoiding new technologies and risk avoidance inhibits gains from specialization and prevents third world agriculture from achieving its full potential (Sadat, 2010).

Previous studies like Carter (2005) ,for example, show that weather risks are often managed by the poor through their own means due to limited or no access to insurance and financial services, resulting in income and consumption variability and eventually, making it difficult to recover once they fall below a poverty threshold.

According to Winner (2005), agriculture is an inherently risky business. It is subject to a number of random price, climatic, biological, and geological shocks that require coping strategies and financial management instruments to deal with the implications. The same researcher in his study explained as traditional risk management strategies and ex post government provided emergency reliefs have often not proven to be sufficiently effective and strong in preventing serious economic loss or permitting a quick recovery.

As poor household farmers have little access to formal agricultural insurance products that would allow them to transfer production risk to other parties. Poor people have few assets to fall back on, and may be forced to sell owned asset in order to survive so that when the crisis is over they are in a much worse position than before. These impacts can last for years in the form of diminished productive capacity and weakened livelihoods and climate change threatens both more frequent and more severe extreme events (IPCC, 2007).

However, many studies try to justify as farmers could benefit from investing in agricultural activities that require higher initial investments but ultimately would generate higher income, if the risks affecting these investments such as weather could be managed. Since banks or other intermediaries that work with agricultural producers carry the same risks as their agricultural clients, they, too, are hesitant to invest in agriculture due to potential defaults during or after a weather event.

The costs of extreme weather events are estimated at around 1 percent of global annual GDP by the year 2050 (Stern, 2007). Low income countries are disproportionately affected, incurring 20 percent higher costs of natural disasters as a proportion of their GDP compared to high income countries, due to their lack of financial, technical and institutional adaptation capacity (Kanbur and Lustig, 2001 and Rahman et al., 2007).

Study of World Bank (2010), indicates extent to which agricultural producers averse of risk plays a key role in their risk management decision, including their demand for agricultural insurance, risk management instruments that would allow the transfer of risk to insurance markets set aside poor farmers to protect themselves against risk, to have a greater ability to plan for the season, and to access credit.

Risk transfer approaches such as crop insurance have played a role in mitigating climate risk in many parts of the world. However, many researchers including Molly et.al (2009) indicate that such programs are not generally available in developing countries, where insurance markets are limited, if they exist at all, and are not oriented towards the poor.

The same study indicate the positive aspect of crop insurance if designed and introduced carefully, it has the potential to contribute significantly to sustainable development, by addressing a gap in the existing climate risk management portfolio. However, this potential has yet to be proven; and there are some significant challenges that must first be addressed.

Winner, (2005) underscore the challenge and how to overcome obstacles and deliver efficient and sustainable crop insurance products. The principal obstacles lack of high quality information, inadequate regulatory frameworks, weak supervision, lack of actuarial expertise, lack of

professional expertise in designing and monitoring agricultural insurance products, a mass of low-income, dispersed clients, who may not be willing or able to pay actuarially sound premiums for multiple peril products, and the tendency of governments to undermine market development through inappropriate use of subsidies and disaster relief funds.

From Insurers standpoint a study by Hazell (2001), indicates associated costs of providing crop insurance schemes historically outweighed the gains from risk spreading. Advocates argue that crop insurance can play a vital role as an alternative ex-ante risk coping instrument to enable poor farmers in developing economies to cope with weather related production risk. They may significantly contribute to poverty alleviation (ProVention/IIASA, 2005; Hazell, 2001).

According to Oxfam America quarterly report (2011), vital step toward developing a sustainable crop insurance market for poor populations is an essential factor in ensuring farmers' livelihoods and food security over the long term. On the other hand, some economists describe catastrophic crop insurance as uninsurable and unsustainable in the long run as the transfer of losses from affected groups to the community at large is not feasible at an affordable premium rate (Skees *et al.*, 1999).

In contradictory to the above, a growing number of studies like Heenkenda (2011), on agricultural financial markets in developing countries provide opportunities for innovative crop insurance and this instrument is attracting an increasing amount of attention in risk management debates.

Ethiopia has experienced at least five major national droughts since 1980, along with a large number of localized droughts (World Bank 2008).

These cycles of drought create poverty traps for many households, constantly consuming their efforts to build up assets and increase income. Another research revealed that about half of all rural households in the country experienced at least one major drought from 1999 to 2004 (Dercon, 2009). With agriculture highly dependent on rainfall variability and amount, weather in general rules the lives and well-being of many rural Ethiopians. The weather determines whether they will have enough to eat, be able to provide basic necessities, and be able to earn a living. Indeed, farmers' dependence on rainfall and its irregular patterns have largely contributed to the food shortages and crises with which they regularly fight.

According to Endalkachew (2004), from weather related hazards which is affecting crop in Ethiopia the impact of drought and flood were the highest. Many Studies including Nahusenay (2011), indicates as weather risk mitigation mechanisms for agricultural product existing in the country are more of contemporary informal traditional ways. Whereas the covariant nature of the weather risk like draught cannot be copped with this traditional mechanisms. Consequently, all the above studies agree as there should be strategy of crop risk adaptation and management options including Crop insurance in the country.

There exist no crop insurance program developed at national level to manage natural hazard risks for poor smallholder farmers; however, in response to this challenge Oxfam with support of local and international partners like Swiss re are testing a crop insurance scheme project's reach to small-scale farmers in Ethiopia, which the pilot program allows the cash constrained poor farmers pay for their crop insurance premiums through their labor on community assets which reduce risk and also Oromia and Africa insurance companies in cooperation with Oromia farmer unions and other non-profit organizations are implementing the insurance scheme in risk-sharing

manner with which the feasibility in attaining the objective is questionable and needs further assessment.

Hence, this study focuses on the assessment of farmers' willingness to pay for crop insurance in Dugda district of Oromia National Regional State and investigates the willingness of insurance companies (Insurers) to provide the crop insurance program.

1.3. OBJECTIVE OF THE STUDY

This study mainly focuses on the assessment of farmers' willingness to pay for crop insurance in risk transfer approach against weather related risks, identify its determinants and test its commercial viability for Insurers.

The specific objectives of the study are to:

- To assess smallholder farmer willingness and demand for crop insurance.
- To assess determinants small holder farmers willingness to pay.
- To assess willingness of insurance companies to provide crop insurance service and its commercial viability.
- To describe the major causes of crop failure and their impact on smallholder farmers.
- To suggest pro-poor farmers effective crop insurance program.

1.4. SCOPE AND LIMITATION OF THE STUDY

This research study is limited to address the objectives mentioned in this research in the study area and undertaken using contingent valuation method (CVM) which is usually hypothetical. Geographically, the study is confined to Dugda District located in East Shewa Zone of Oromia Region state. The potential limitations of this study were time, finance and scarcity of other studies conducted in the country on the subject matter.

1.5. SIGNIFICANCE OF THE STUDY

The findings from this study will benefit local, regional and Federal, government policy makers and non-governmental organization, Insurance Companies, Banks and other financial Institutions in general. In addition, findings of the research work gives insight for researchers and students interested in similar research topic for further assessment.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. CONCEPTS AND DEFINITIONS

2.1.1. Insurance

Many scholars including Iturrioz, (2009), define Insurance as a form of risk management used to hedge against a contingent loss. The conventional definition is the equitable transfer of a risk of loss from one entity to another in exchange for a premium (payment for insurance cover) or a guaranteed and quantifiable small loss to prevent a large and possibly devastating loss. Insurance is a tool to protect against a small probability of a large unexpected loss. It is a technique of providing people a means to transfer and share risk where losses suffered by few are met from the funds accumulated through small contributions made by many who are exposed to similar risks.

2.1.2. Agricultural Insurance

Many researchers define Agricultural insurance in various ways for example, Winner(2005), defines as agricultural insurance is a financial contingency contract that transfers production risk from a producer to another party via the payment of a premium that reflects the true long-term cost of the insurer who is assuming the risks. The insurer pools the risks faced by a large number of individuals and covers losses incurred by any one individual in the pool. It serves to essentially protect assets, stabilize income, and smooth consumption. However, for insurance to be viable and sustainable, there are certain ideal conditions for the risk to be considered insurable and for a self-sustaining market to appear.

Other researchers like Mahul and Stutley (2010), defines agricultural insurance as one of the financial tools agricultural producers can use to mitigate the risk associated with adverse natural event that climate change may bring more frequent and more severe in the future. This is to describe the importance of agriculture in developing countries, explains how agricultural insurance can complement and enhance other agricultural risk management activities.

More policymakers and farmers recognize the need for more modern risk management systems in order to stabilize incomes, prevent asset depletion and to enhance competitiveness. Traditional risk management systems sometimes are not sufficiently robust to deal with the problem of weather and disease and as a result these uncontrollable events cause significant economic losses that negatively affect households, communities, and government (Mizan et.al, 2008).

The above study also indicates as agricultural insurance is a special line of property insurance applied to agricultural firms. In recognition of the specialized nature of this type of insurance, insurance companies operating in the market either have dedicated agribusiness units or outsource the underwriting to agencies that specialize in it. Agricultural insurance is not limited to crop insurance, it also applies to livestock, forestry, aquaculture, and greenhouses.

2.1.3. Crop Insurance

Crop insurance is a means of protecting the agriculturist against financial losses due to uncertainties that may arise from crop failures/losses arising from named or all unforeseen perils beyond their control (Iturrioz, 2009). It Provides protection against loss or damage to growing crops including perennial crops such as tree crops against specified or multiple perils, e.g. hail, windstorm, fire, flood etc.

Measurement of loss could be by yield basis, production costs basis, agreed value basis or rehabilitation costs basis. While most crop insurance is geared towards loss of physical production or yield, cover may also be provided to loss of the productive asset such as tree crops. Crop insurance protects farmers' investment in crop production and thus improves their risk bearing capacity. Crop insurance facilitates adoption of improved technologies, encourages higher investment resulting in higher agricultural production (Raju and Chand, 2008). On top of that the study further explains the importance of crop insurance as it brings security and stability in farm income.

Crop insurance also reduces the risk of becoming defaulter of institutional credit. The reimbursement of indemnities in the case of crop failure enables the farmer to repay his debts and thus, his credit line with the formal financial institutions is maintained intact (Hazell *et al.*, 1986; Pomareda 1986; Mishra 1996).

A properly designed and implemented crop insurance program will protect the numerous vulnerable small and marginal farmers from hardship, bring in stability in the farm incomes and increase the farm production (Bhende 2002).

The farmer is likely to allocate resources in profit maximizing way if he is sure that he will be compensated when his income is catastrophically low for reasons beyond his control. A farmer may grow more profitable crops even though they are risky. Similarly, farmer may adopt improved but uncertain technology when he is assured of compensation in case of failure (Hazell 1992). This will increase undoubtedly value added from agriculture, and income of the farm family.

Access and availability of insurance changes the attitude of the farmer and induces him to take decisions which, otherwise, would not have taken due to aversion to risk. In addition, according to Raju and Ramesh Chand (2008), crop insurance is based on the principle of law of large number. The risk is distributed across space and time. The losses suffered by farmers in a particular locality are borne by farmers in other areas or the reserves accumulated through premiums in good years can be used to pay the indemnities. Thus, a good crop insurance program combines both self as well as mutual help principle.

2.2. RISK MITIGATING STRATEGIES IN AGRICULTURE

Risk reduction strategies are of two main categories: risk management and risk coping. Risk management strategies attempt to address risk ex-ante risk coping strategies address risk ex-post. One can also differentiate between technical and financial risk management approaches. Agricultural insurance is typically one of many tools that farmers and herders can use as part of their comprehensive agricultural risk management strategy. Developing countries vary significantly in the extent to which they protect their agricultural sectors against agricultural risks. Countries in which financial markets are underdeveloped rely heavily on self-insurance and post-disaster aid. As financial markets become more sophisticated, price hedging and agricultural insurance often complement post-disaster assistance (World Bank, 2010).

In order to mitigate the inherent risks common to agriculture, farm operators have to use an array of risk management strategies and techniques which are more or less the same in many research works.

For example Makki, (2002) lists framers risk mitigation strategy as: crop diversification, maintaining financial reserves, reliance on off-farm employment and income generation, production contracting, marketing contracting, forward pricing, futures options contracts, leasing inputs and custom hiring, and acquiring crop and revenue insurance.

Unfortunately, many of the more modern risk management tools items listed above are not widely available or accessible in developing countries. In order for modern risk management techniques to materialize, certain market and supply conditions have to be met and appropriate infrastructure, legal/regulatory as well as physical, must be in place. Unfortunately in developing countries, many of these conditions are missing or incomplete, forcing farm operators to depend more on private, on-farm strategies that inhibits the achievement of economies of scale in production, lowers productivity, and ultimately reduces farm profits in the long-run. In contrast, when crop insurance is combined with forward pricing strategies it has been proven to be very effective in reducing both production and price risk for farm operators in developed countries.

2.2.1. Development of Agricultural and Crop insurance in some countries

According to many researches, Crop insurance is a multifaceted and not easy product to deliver in a sustainable manner especially in the region the agricultural insurance market is emerging.

In many developing countries including in Bangladesh, crop insurance has been introduced about 3 decades ago through the state owned insurance company Sadharan Bima Corporation (SBC) in 1977 as a pilot project (Mizan et.al, 2008).

The same study argues as some developing countries are continuing, while in some others, it has stopped functioning, because of incurring heavy losses.

As a stand-alone instrument, crop insurance is not financially viable anywhere in the world. Even in the industrial countries, it continues functioning as a public welfare program. In fact, agriculture sector is subsidized in all countries in many different ways. This happens more when a natural disaster hits the farmers. The Sadharan Bima Corporation of Bangladesh has again taken initiative in the form of a proposal to introduce Crop Insurance, this time in partnership with other stakeholders. But the private sector is yet to respond. Good news is that the prospect of crop insurance is improving day by day and many of the private insurance companies are considering it as an option.

In the United States crop insurance is offered through the Federal Crop Insurance Program (FCIP), a public-private partnership between the federal government and a number of private sector insurance companies, created in 1938. FCIP is a wholly owned corporation administered by the Risk Management Agency (RMA), an affiliate of the United States Department of Agriculture (USDA). The program officially aims to improve the social welfare of farmers as well as deliver insurance products in an actuarially sound manner. RMA helps design products and administer subsidies while the private insurance companies sell the products. The government provides subsidies to farmers to pay the premium. In 2004, the average premium subsidy was 59%. In addition, the government reimburses administrative and operating expense for private insurance companies that sell and service FCIP policies. The reimbursement is approximately 22 percent of total premiums. Lastly, the government provides reinsurance to the private insurance companies at an estimated subsidy rate equivalent to 14 percent of total premiums (Khan, 2008).

Crop insurance in Canada dates back to 1939 when the federal government started to provide disaster assistance to grain producers on the prairies. The idea of crop insurance emerged in India during the early part of the twentieth century, in around 1920. Yet it was not operated in a big way till recent years. Crop insurance received more attention after India's independence in 1947. Different experiments on crop insurance on a limited, ad-hoc and scattered scale started from 1972-73.

Many studies including International Fund for Agricultural Development (IFAD), 2010 publication justifies, in developing crop insurance markets, the role of governments and donors is vital by supporting the high start-up, administrative and re-insurance costs. In addition investment in educating farmers, public goods as well as capacity-building and technical support for insurance companies is viable for development-oriented crop insurance for the poor farmers and the insurers.

2.2.2. Types and features of crop insurance

Crop insurance will have a key role to play in facilitating and supporting essential and innovative financing projects that promote climate risk mitigation efforts, it has a calculated and economic interest in addressing the problems of emerging and changing climate risk to society, households and businesses, as well as identifying appropriate responses and adaptations to the increasing consequences (Patrick, 2009).

Traditional insurance products covering property related risks are written on what is often termed an "indemnity" basis. The policyholder insures a defined property, such as a building or crop, and in the event of that property being lost or damaged as a result of a covered peril, such as drought or windstorm, and then the policyholder is compensated for their financial loss, in the

case of Crop insurance the proof of loss and indemnity depends on types of cover provided and many literature the classification and types are wide but, the very common are:

Index based crop Insurance

This is a very new type of crop insurance in which an indemnity becomes payable upon the certified occurrence of the weather event to which the insurance relates. This is also known as “Coupon insurance” since coupons or tickets replace the normal insurance policies. The main difference between this and standard crop insurance is that crop losses are not measured, either on individual insured farms or on an area basis. Rather, reliance for triggering the coupon is based upon data generated by weather recording instruments, with the possibility of verification of the occurrence of the insured weather event by recourse to aerial or satellite photography.

According to Molly, (2009) index insurance is linked to an index, such as rainfall, temperature rather than actual loss with advantage of low transaction cost and is widely used in developing countries. The same researcher justifies as index insurance is financially viable for private sector insurers and affordable to small holder farmers since it is subject to less adverse selection and moral hazard.

Index (or parametric) insurance covers the same underlying perils but is not directly connected to a particular ‘property’. Instead the insurance policy pays out (the claim) in the event of a measurable occurrence of the peril. This might be when a number of rain free days have been exceeded, or if windstorm exceeds a certain threshold. This is a far more efficient way of covering these risks (World Bank, 2006). However, it has to be recognized that the policy may

pay out even if the policyholder has not sustained any loss and, more importantly, vice versa this is known as basis risk.

Oliver and Charles (2010), describes this product as Insurance in which the indemnity is based on realizations of a specific weather parameter measured over a pre specified period of time at a particular weather station. The insurance can be structured to protect against index realizations that are either so high or so low that they are expected to cause crop losses. An indemnity is paid whenever the realized value of the index exceeds or falls short of a pre specified threshold. The indemnity is calculated based on a pre agreed sum insured per unit of the index for example, dollars/millimeter or rain fall.

Payouts occur when rainfall totals over an agreed period are below an agreed threshold that can be expected to result in crop loss, according to Molly et.al (2009), unlike with traditional crop insurance, the insurance company does not need to visit farmers' fields to assess losses and determine payouts. Instead, it uses data from rain gauges near the farmer's field. If these data show the rainfall amount is below the threshold, the insurance pays out.

All Risk Multi-Peril Crop Insurance (MPCI)

A type of crop insurance in which a number of perils are covered and where the basis for establishing the sum insured is the expected yield, as determined by production history over a number of years. This type of policy is known as "yield-based".

Insurance in which an insured yield (for example, tons/hectare) is established as a percentage of the historical average yield of the insured farmer. If the realized yield is less than the insured

yield, an indemnity is paid equal to the difference between the actual yield and the insured yield, multiplied by a pre agreed value of sum insured per unit of yield. Yield-based crop insurance typically protects against multiple perils (many different causes of yield loss), because it is generally difficult to determine the exact cause of the loss.

Crop revenue insurance that combines conventional loss crop yield-based MPCl insurance with protection against loss of market price at the time of sale of the crop (Oliver et.al, 2010).

Crop Credit Insurance

Crop credit insurance is the agricultural insurance most relevant to the link between credit and the adoption and sustained development of modern technology at the farm level. Crop credit insurance provides protection against events that have an adverse impact on agricultural yields. Its unique feature is that the indemnity is paid to the lender, rather than to the farmer, and cancels the farmer's debt or some portion of it related to the insured loss.

This insurance is expected to protect the liquidity of the lender, so that lending can continue. Continuity is especially important because, to the extent farmers rely on credit, it is most crucial in the period immediately following crop loss. At that time, farmers' own resources are depleted and their creditworthiness may be in doubt as a result of the illiquidity caused by the loss. Equally as important as the restoration of the lender's liquidity, therefore, is the continued creditworthiness of the farmer when the loan is repaid by the insurance indemnity (Hazell et.al, 1986). Crop credit insurance is placed in the context primarily of small-farm credit issued by formal lenders.

This emphasis is appropriate because crop credit insurance is commonly advocated as a means of increasing credit access for risky borrowers and for those currently outside the portfolio of commercial banks, cooperatives, and other formal lenders. Small-scale farmers are concentrated in these Categories.

2.3. VALUATION METHOD IN AGRICULTURAL INSURANCE

A contingent valuation method(CVM) is a survey technique that generally provides a direct way of eliciting willingness to pay (WTP) values by asking a sample of households what they would be willing to pay for a good or service.

Contingent valuation is a method (CVM) of estimating the value that a person places on a good or service. Rather than inferring from observed behaviors in regular market places, the approach asks people to directly report their willingness to pay to obtain a specified good or service, or willingness to accept to give up a good or service(MA,2003) .

Probit and logit models are the most commonly used models in the analysis of agricultural technology adoption research (Temesgen, 2011).

Hanemann, Loomis and Kanninen (1991) proved that the double bound DC-CVM is asymptotically more efficient than the single bound model; empirical results by these authors, and by Leòn (1995), confirm this property also for finite samples. These studies show that point estimates for the mean and median produced by the two models are substantially different. Some authors interpret this finding arguing that the double bound model produces not only more efficient but also less biased estimates than the single bound. Hanemann *et al.* (1991), for example, suggest that the double bound model allows for correction of a poor choice of the initial vector of bids.

2.3.1. Theoretical Foundation of Willingness to pay (WTP) Approach

Welfare maximization theory is main idea behind which deals with economic welfare including especially various propositions relating competitive general equilibrium to the efficiency and desirability of an allocation. Generally it can be perceived as:

It analyzes social welfare however measured, in terms of economic activities of the individuals that comprise the theoretical society considered. Thus in lay man's terms, Pareto Efficiency states that no person can improve his welfare without reducing someone else's. Accordingly, individuals, with associated economic activities, are the basic units for aggregating to social welfare, whether of a group, a community, or a society, and there is no "social welfare" apart from the "welfare" associated with its individual units.

Welfare economics typically takes individual preferences as given and stipulates a welfare improvement in Pareto efficiency terms from social state *A* to social state *B* if at least one person prefers *B* and no one else opposes it. There is no requirement of a unique quantitative measure of the welfare improvement implied by this. Another aspect of welfare treats income/goods distribution including equality as a further dimension of welfare, a consumer having limited income at his /her disposal must make choice (Jonson, 1991).

Agricultural technology adoption models are based on farmers' utility or profit maximizing. The assumption here is that farmers adopt a new technology only when the perceived utility or profit from using this new technology is significantly greater than the traditional or the old method. While utility is not directly observed, the actions of economic agents are observed through the choices they make.

2.3.2. Determinants of willingness to pay

As pointed out by Holden and Shiferaw (2002), estimation of Willingness to pay (WTP) at the household level has both theoretical and empirical implications, because farm investment decisions depend on consumption as well as production parameters.

Willingness to pay for crop insurance has been determined using Contingent Valuation Method (CVM), which constructs a hypothetical market for a good or range of goods to elicit willingness to pay. Literature on willingness to pay for different micro-insurances such as crop, flood, drought and health insurance in Bangladesh, Zimbabwe and India respectively, identifies several demographic variables as determinants of willingness to pay: household size, farm size, sex, household income, primary occupation and education level of household, (Akter and Brouwer, 2007).

Studies like Jahangir also find land ownership, size of arable land, income, availability of loan, loss of food crops, effect of recent experience in terms of loss and distance to information or media, vulnerability to be significantly correlated to willingness to pay.

In other study it has been found that the factors such as gross cropped area, vulnerability to natural disaster, presence of risk in the farming, number of workers in the farm family, satisfaction with the premium rate and affordability of the insurance premium amount influence significantly and positively the adoption of insurance (Kumar et.al, 2011).

2.4. THEORETICAL AND CONCEPTUAL FRAMEWORK OF CROP INSURANCE

2.4.1. Theoretical foundation of crop Insurance

The typical framework employed to evaluate the impact of crop insurance purchase decisions on cropping patterns and/or agrochemical usage is based on the standard assumption that farmers maximize expected utility of agricultural production profit by choosing production factors such as fertilizers and pesticides, and crop insurance, (crop insurance is treated as a factor in the utility function as it affects the expected returns from the production) subject to physical and technical constraints (Wu 1999; Wu and Adams 2001). The research by Smith and Goodwin (1996), describe if farmers are insured, the farmer may adopt different farming practices to increase the expected returns from his crop insurance coverage.

It is also likely that the opportunity to adjust farming practices will affect the farmer's decision to insure his crops or not (Smith and Goodwin 1996). There seems to be an agreement in the above research that crop insurance participation decisions influence input decisions and vice versa. Disagreements among researchers arise as to whether the influence is one way or two ways, i.e., the decisions are made recursively or simultaneously, and how, to what extent and under what conditions such influence takes effect.

2.4.2. Conceptual Framework

Types of crop insurance scheme is different among countries and it usually varies depending on socio-economic standards or development of nations, however, commonly the program utilizes some very basic items like attitude of farmers including economic and social condition, risk to be covered, public support or re-insurance and premium.

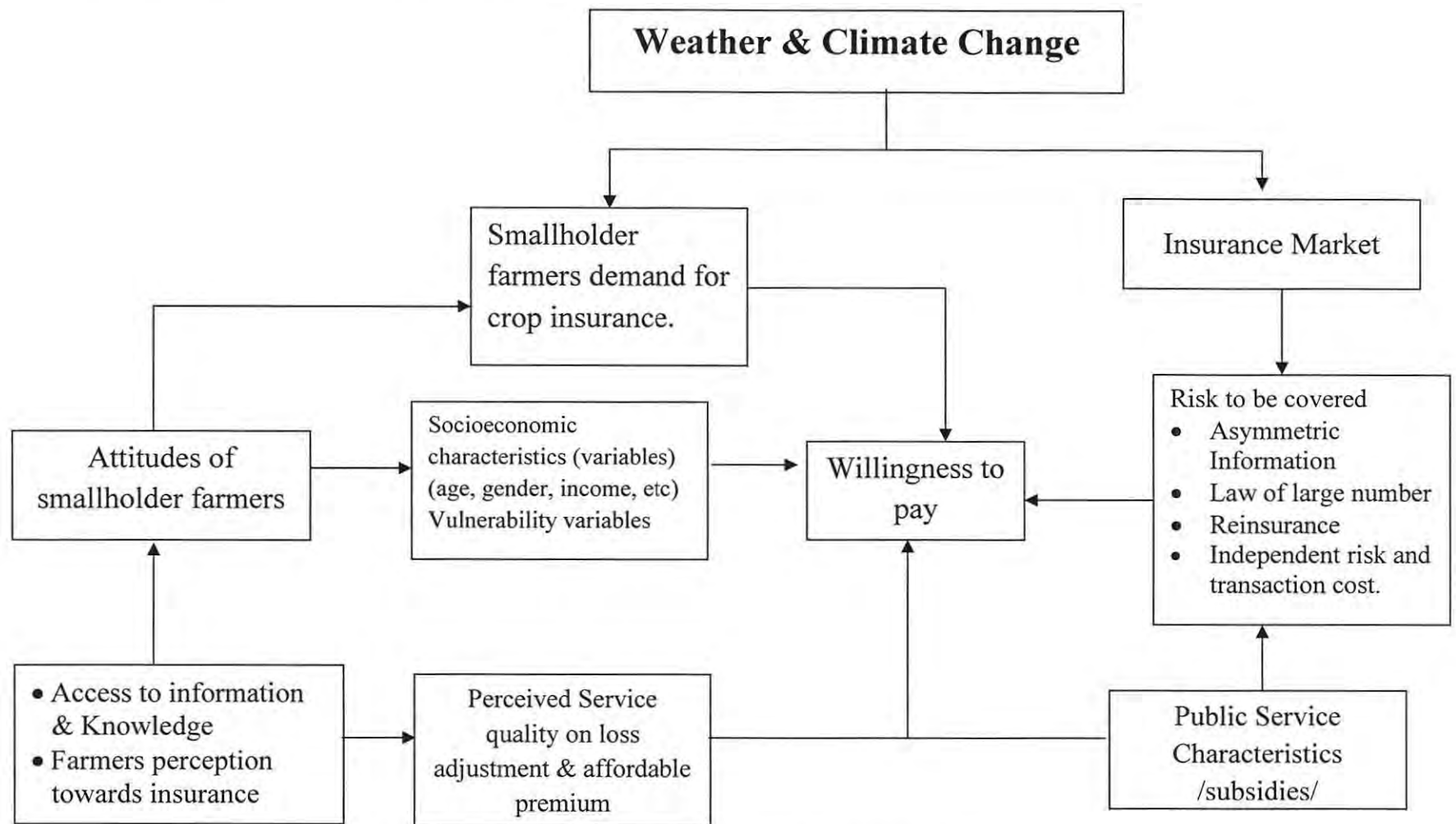
The conceptual framework implies that the demand for insurance (i.e., insurance program participation) should be influenced by the expected return to insurance. Returns to insurance will be influenced by premium rates as well as the expected indemnity payments. Goodwin (1993) found that adverse selection implied the potential for a differential response to premiums with respect to expected indemnities.

If the farmers are aware of possible natural disasters that may affect his/her production, with all information he is expected to be willing to participate in crop insurance program to get insurance cover at a time of loss which the risk is transferred or shared by the insurance company.

The insurance program may also increase the capacity of farmers to produce more using all possible inputs by avoiding traditional risk management trend of farmers and help for development agricultural production system. In developing countries the crop insurance program helps poor farmers as safety net programs there are many factors affecting farmers' ability and willingness to pay for crop insurance if the service is available.

The chart which is adopted and modified from International Food Policy Research Institute (IFPRI) 2011 and Funing Zhong, Manxiu and Li (2006) which tries to show the possible pro-poor crop insurance scheme and relationship of variables.

Figure 1: Smallholder farmers' insurance scheme



Source: Adopted from IFPRI (2011) and Funing, Manxiu and Li, (2006)

2.5. PUBLIC INTERVENTION IN AGRICULTURAL INSURANCE AND ECONOMIC RATIONALE

Public intervention in agricultural insurance markets is no different from intervention in other markets. Such intervention may be intended to address real or perceived failures of the market. In such cases, the general economic welfare may be improved as a result of the intervention. Some degree of protection and special treatment of agriculture is common in both developed and developing countries (Oliver et.al, 2010).

The same study states as a number of social and political objectives underlie many agricultural programs, usually stated in terms of the importance of agriculture to the general economy, the importance of “family farms,” and the special place of food and fiber products in society. These appeals have led to deep, longstanding intervention.

Raju and Ramesh (2008) review the existence of public involvement and conclude that the agricultural insurance schemes both in developed and developing nations are highly dependent on the government support in various forms like subsidy on premium, reimbursement of administrative expenses of insurance companies, reinsurance support for risky crop lines, technical guidance and financial support. Subsidy on insurance premium in the recent years was estimated to be 60 per cent in USA, 70 per cent in Canada, 50-60 per cent in Philippines and 58 per cent in Spain. Over 100 countries in the world have some form of crop insurance. The USA, Canada, Mexico, and Spain dominate the world crop insurance market in terms of premium. The total annual agricultural insurance premium, worldwide, in 2003 was US\$ 7.1 billion which amounted to 0.6 per cent of estimated farm gate value of agricultural production.

Hazell, Pomared and Valdes (1986) underline the two basic underlying concerns why Crop insurance programs are promoted as. First, because agricultural production risks are thought to have a substantial effect on resource allocation, crop insurance is promoted as an instrument for reducing the misallocation costs so induced. Second, complemented with other policy instruments, crop insurance is thought to mitigate the ill effects of fluctuations in farmers' income. Thus the broad objectives are to reduce inefficiency and to achieve rural income stabilization, with the underlying premise that the social benefits exceed the costs of crop insurance programs and in practice, government-supported crop insurance programs are also often used as a permanent income-transfer mechanism to benefit farmers.

Oliver and Charles (2010), among other arguments one of the most prominent arguments in favor of government intervention is that the provision, administration, and oversight of agricultural insurance programs involve systemic risk such as widespread drought or floods that affect a large number of farmers simultaneously, the argument relates, at least indirectly, to the degree and extent to which reinsurance can be obtained to cover the risks associated with widespread, though perhaps infrequent, losses. Many of the crop-yield risks faced by farmers come from the randomness induced by weather and natural growing conditions. Because such risks are typically realized over a large geographic area, catastrophic risks may be significant and difficult for insurers to diversify. Likewise, widespread animal epidemic diseases can simultaneously affect a large number of herders, generating major losses. It also argued that the systemic component of agricultural risks can generate major losses in the portfolio of agricultural insurers. Estimated probable maximum losses for major events, such as those occurring once every hundred years, exceed average expected losses by many times and Public intervention is necessary to insure against such losses because no private reinsurer or pool of reinsurers has the

capacity to cover such a large liability when the risks, even though small, may be difficult to diversify.

The notion that systemic risk is a source of market failure leads to the belief that, because private reinsurance markets may not be able to absorb the catastrophic risks associated with crops or livestock, the government should assume the role of a reinsurer of last resort. The government is assumed to have “deeper pockets” than private reinsurers and thus to be better able to provide the capital necessary to finance such systemic risks. The argument is persuasive, although many risks can be spread and diversified across different sectors by international reinsurers; the argument thus may be more accurately phrased in terms of the cost of reinsurance rather than whether any reinsurance can be obtained at any price. This line of business is marginal compared with other nonlife insurance lines. It is estimated that the value of worldwide agricultural insurance premiums represented only 1.1 percent of the value of worldwide nonlife insurance premiums in 2008 (Oliver et al, 2010). Accordingly difficulty in adverse selection for insurance service that is measuring risk, monitoring producer’s behavior, high transaction cost and uncontrollable moral hazard are other arguments stated for rationale of public intervention.

Supporting the above Hazell, Pomared and Valdes (1986) Critics of crop insurance allege two major shortcomings. First, it usually covers only yield variation and not price variation and thus contributes little to income stability. Second, crop insurance usually involves high social costs, due to moral hazard and adverse selection problems, and high administrative costs. With few exceptions, farmers are unwilling to pay the full cost of all-risk crop insurance, and thus they depend on a government subsidy.

Access to the international reinsurance market is limited in developing countries, particularly for specialized lines of business, such as agricultural insurance. Many insurance companies in developing countries identify limited access as one of the main constraints to the development of agricultural insurance; lack of infrastructure and the undeveloped crop insurance program in developing countries are other arguments for government intervention (Oliver et.al, 2010).

2.6. EMPIRICAL REVIEW OF CROP INSURANCE

A study by Horowitz and Lichtenberg (1993) discover that in the US Midwest, crop insurance exerts considerable influence on maize farmers' chemical use decisions. Those purchasing insurance applies significantly more nitrogen per acre (19 %), spend more on pesticides (21 %), and treats more acreage with both herbicides and insecticides (7 % and 63 %) than those not purchasing insurance. These results suggest that both fertilizer and pesticides may be risk-increasing inputs.

Mishra (1994) analyzed the impact of a credit-linked Comprehensive Crop Insurance Scheme (CCIS) on crop loans, especially to small farmers in Gujarat. It is observed that CCIS had a collateral effect as reflected through the increased loan amount per borrower and reduction in the proportion of non-borrowers among small farmers. The implications of credit expansion are that increased availability of credit can enhance input use and output and employment that increased share of small farmers in the total loan can have desirable effects on equity and efficiency considerations. Though crop insurance is based on area yield, it insures the loan amount.

This leads to improved access of small and marginal farmers to institutional credit. In the event of crop failure or drought, loan is repaid in the form of indemnity and thus there is reduction in the cost of recovery of loans to lending institutions and reduction in the overdue and defaults.

An analysis of data from United States agriculture indicates that the producer's first response to risk is to restrict the use of debt. Price support programs and crop insurance are substitutes in reducing producer risk. The availability of crop insurance in a setting with price supports allows producers to service higher levels of debt with no increase in risk (Atwood et al., 1996).

It is observed that insured households invest more on agricultural inputs leading to higher output and income per unit of land. Interestingly, percentage increase in output and income is more for small farms. Based on 1991 data, comprehensive crop insurance scheme was found to contribute 23, 15, and 29 per cent increase in income of insured farmers in Gujarat, Orissa and Tamil Nadu, respectively (Mishra, 1994).

Many of the risks insured under public insurance programs are essentially un-insurable risks. Moreover, they occur frequently and hence are expensive to insure. The financial performance of most of the public crop insurance has been damaging in both developed and developing countries. The multi-peril crop insurance thus is very expensive and has to be heavily subsidized (Hazell, 1992).

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. BACKGROUND OF THE DISTRICT

Dugda district is the study area which is found in East Shewa Zone of Oromia Regional State. The area is designated as famine prone zone and frequent crop failure leads to food shortage. Drought induced food insecurity has been recurrent phenomena exacerbating the vulnerability of resource poor farmer household in the area.

Agriculture is the main stay of livelihood of the people in the study areas. Rain fed agriculture is the main activity in addition to irrigation activities for horticultural crop Common rain fed crops produced by almost all farming household include maize, wheat, barley, *teff* and haricot bean. In addition to crop production, livestock production is also an important source of household income in the area. Much of livestock income is derived from the sale of cattle, goat and sheep.

Crop production of the district is limited to 'meher' season and the major types of crops that are produced includes maize, wheat, *teff*, barley and sorghum from cereals, and horse beans, chickpeas and field peas from pulses. Some small holder farmers are engaged in irrigated agriculture using water from the lake while the others rent out their holdings for others came from different cities using water pumps and generators to pump out the water from the lake and produce and sale the product in organized manner and the rest of the farmers in the district are rain dependent. Major horticultural crops around Dugda are Onions, Tomatoes, Cabbage, and Papaya and Water melon.

The information from district Agricultural and Environmental protection bureau indicates natural disaster is prevalent in the area among others two major disasters that affect farming activity in the district are flood and drought. Others include diseases and pests, lack of access to improved technologies (improved seeds, pesticides, agricultural machinery and implements due to high prices and absent of subsidy by the large majority of peasant farmers, a biotic stresses, and improper management of natural resources that lead to degradation and exhaustion of soils. Low production prices and shortage of markets oriented crops on the hand of farmers.

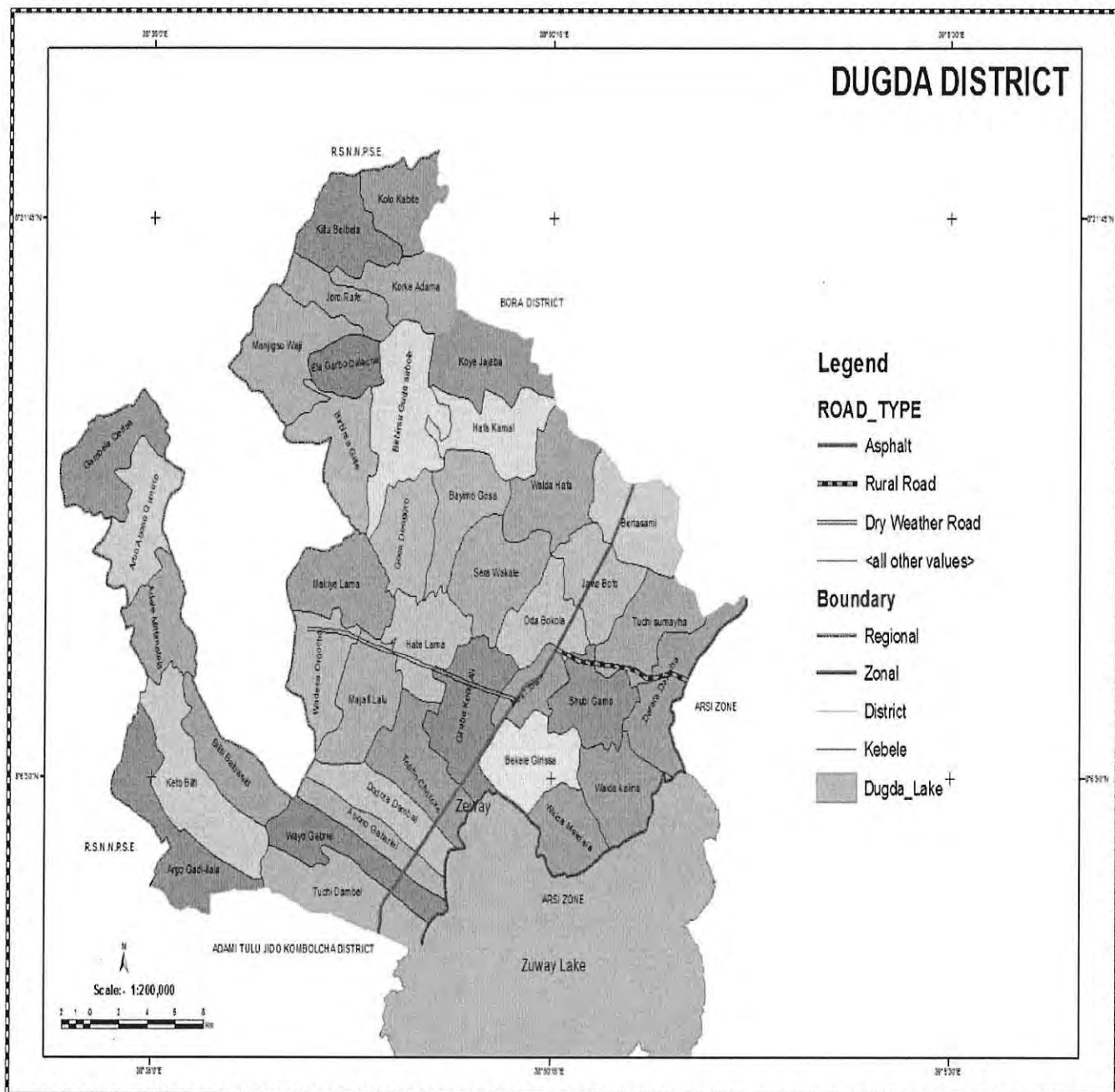
3.2. LOCATION OF THE STUDY AREA

3.2.1. Location

The district of Dugda is one of the 11 districts in the Eeast Shewa Zone Oromia Regional State of located in the central part of rift valley (southern part of Oromia region). According to Dugda District Agricultural and Rural Development Office the district lies, between $7^{\circ} 58' - 7058N$ (Latitude North) and $38^{\circ} 43' - 380 - 43^{\circ} E$ (Longitude East) in the great rift valley of Ethiopia.

According to the information gathered the district shares boundary line with Bora district in the North and Arsi in the East, Adami Tullu Jiddu Kombolicha district in the south and SNNPR in the west. The Capital town of the district is Meki which is located 134k from Addis (the capital of the country) and 88km west of Adama before reaching Ziway town, a long the highway. The town lies on the flat land that slopes regular from NW to SE with a slop range of 97.14% and sloppy land of 2.86%. It also lies 1600m - 2020m above sea level, it is also found in the floor of Rift Valley.

Figure 2: Location map of the study area



Source: Oromia Bureau of Finance and Economic Development, 2012

3.2.2. Relief, Drainage and Climate

The present land configuration of the Dugda district is the result of past tectonic and denudation activities. The relief feature of the district is dominated by flat land that has a few hills. The highest part of the district lies towards the west or along the border of Gurage zone. Mount Bora that lies to the eastern part of the district is over 2000 m.a.s.l. The total area of Dugda district is fallen in the Lake Basin. Meki River flows in the southern part of Dugda district.

The River plays quite a vital role in the promotion of irrigated agricultural practices along its course in Dugda. The Awash forms the boundary of the district with Bora district in the north and its contribution for the development of small -scale irrigated agriculture in Dugda is substantial.

Lake Dembel is one of the important Rift valley lakes covers 43,400 hectares of land. The lake has flat swampy margins on all sides except in south and south east. It is fed by a number of streams, the most important of which are the Meki river, which drains part of west island, Katar River, which drains from the Arsi mountains to the east, and also seasonal inflow to the lake. The lake has catchments 7025 km² and its overspill is carried to Lake Abjata by Bulbula River.

The lake is almost 25km long and 20km wide, it has an average depth of 4m which is the shallowest lake in the Rift valley as well as in the country. It is the second largest lake in the country and the largest lake found in the rift valley region of the country.

3.2.3. Rain fall and land use pattern

Agro-ecologically, the district lies between dry lowland 86.2% and mid-highland 13.8 of the district landmass with average annual temperature varies between of 22°C-28°C (max and min T°) in different months. The ecological coverage of the district is proportionally, about 55% of the land area the district fall under usually called lowland and the rest 45% is constituted by mid land.

The annual range of rain fall at Dugda and its surrounding is 700 to 800 mm. characterized by high variability and unpredictability. Soil class around Clay Loam 41 % and Sandy Loam is 59 % (Black Soil, Sandi Soil & Sandi Loam). It has a light texture, which is vulnerable to both wind and soil erosion. The soil types are characterized as saline and alkaline though the degree of salinity is much lower and is being utilized for irrigation farming.

According to Dugda district Agricultural and Rural Development Office the largest proportion (55%) of district area is caused by cultivated land. The natural vegetation is highly distributed through human intervention. With the exception of pocket areas currently, there are no lands occupied by forest in the district. The only existing vegetation covers of Dugda is grassland, which account for 15.7 % of the district area. The bush land and water body were respectively occupied 14.5% and 12.6% of the district area.

The major natural vegetation of the district includes woodland and savannah of junipers and vanity of vegetation followed by sub-tropical grassland located at different pocket areas of the district. Crop production and livestock rearing are the main economic engagement of the people. Agriculture is the main stay the district of the population and hence it provides almost the largest

shares livelihood of the population. However, it is characterized by lack of access to modern technology, market, low productivity, dependency on rainfall and lack of irrigation practice. As a result the sector is remained subsistence in its nature.

The district has a total area of 959.45KM². Based on the general view the current land use pattern (55 %) of the district's land is under cultivation. While, the rest 3.6%, 11.7 %, and 12.5% do respectively occupy by forest land, Grazing land, bush land, water bodies and 17 % constitutes for others. There is no closed woodland found in the plain area. Dense woodland and trees around the lake were used to support variety of wild life. Now, however they are degraded and converted into different land uses. The areas around the lake have been left with only patches of ruminants' wood and bush lands. The dominant tree species is Acacia.

3.2.4.Socio-Economic status and Land use pattern

Population dynamics of a given settlement area is the result of fertility, mortality and migration. Those demographic processes are complex phenomenon affected by social, cultural, economic, political and psychological factors.

According to district communication bureau currently, Dugda district has a total population of 157,886, about 81,238 (51%) and 76,648 (49%) of the district's population are males and females respectively about 75% of the total population (39,498 = Male 20,563 and Female 18,935) are residing in the rural parts of district and while the remaining 25% (118,388 = Male 60,675 and Female 57,713) are living in the urban areas. It contributes 10.67 % of the total Population of East Shewa Zone and the total number of Household is 39,600 of which 9,622 Female are headed once in terms of age distribution 45 % belongs to the age under 15 and 2.61 % above age 64. And the remaining 52.16 % of population belongs to age 15-64.

This fact implies that the population of Dugda district belongs to young Population that is characterized by high fertility and labor force.

In 2002 E.C. there are 36 associations that have 17,156 farmers. In 2002 E.C. 20 farmers service cooperative, 74 farmers irrigation cooperative, 38 farmers Saving and Borrowing cooperative and 38 farmers Non Agri (Mining) cooperatives where embraced in 36 associations. The total number of farmers' cooperatives is 150 and total number of member's farmer's cooperatives was 13950, of which 10,574 members were males and 3,376 members were females. Mixed farming is a common practice prevailing in the district. As a result the live hood of the rural people is dependent on both crop farming and livestock rearing. In addition to this, fishery is being practiced by the farmers who have access to the lake Zeway and Meki.

3.2.5. Environmental Conditions in Dugda district

In Dugda like other districts of East Shewa zone, deforestation of natural vegetation is the major environmental problem. Its proximity to major urban centers (Ziway, Meki), the highway that runs through it together with the highly growing population caused the devastation of the vegetation cover for settlement, cultivation, construction, fuel wood and charcoal production. Deforestation, together with the sandy nature of the soils, has brought about serious problem of erosion of the topsoil by water and wind. It has increased surface run-off which in turn has intensified gully creation.

The eventual result of deforestation is the influence it causes on the climatic condition of the area. Isolated evidences indicate that in the floor of the rift valley, which forms the greater part of Dugda temperature is constantly raising.

One justification for this is the decreasing level of the lakes as well as rising salinity in both the lakes and the soils. Rainfall, too, is getting meager from time to time. The lakes region, which includes Dugda is an area where the growing period of crops is getting reduced from year to year and recurrent drought is registered.

Another environmental problem in the area, though not easily observable, is the one related to irrigation practices. In the district irrigation activities are conducted along the courses of the Meki as well as along the shores of Lake Ziway at medium and small-scale levels. Most such irrigation schemes lack the tradition of efficient water management practices, which is making water available to crops in the right quantity at the right time. Excess water used in irrigation schemes is either lost through seepage into the ground causing ground water table to rise, or is lost to space through evaporation. Both situations facilitate excessive salt to be drawn to the surface which eventually ends in increasing total soil salinity as well as salinity in the lake itself.

The natural vegetation of the district is highly deforested; moreover, the landform of the district is exposed to windy. As a result the majority of area is under the risk of different soil erosions. However there are traditional and modern methods of maintaining and conservation soil fertility, the district ecosystem is highly threatened, and the environmental values due to environmental degradation and ecological imbalance. The causes contributing to environmental degradation are interrelated demographic explosion, deforestation while searching for farming and grazing land and charcoal.

Environmental crises in Dugda is characterized by decrease vegetation and water resource, as time passes vegetations and water resources have become less dense.

The district water sourced from the nearby lake and rivers shrinking in size. Due to high ecological change existing in the district two major disasters affecting the live hood of the society were flood and drought.

Recurrent climate disasters such as the above affect subsistence farmers in the district in addition the district immense activity of horticultural development through low cost small-scale irrigation being another environmental problem.

3.3. REASERCH METHODOLOGY

3.3.1. The study Design

The study makes use of descriptive research designs by taking one risky district from East shewa Zone of Oromia Regional State. It also utilized cross-sectional study approach as it investigates various aspects of survey households at given point of time.

3.3.2. Sample Size and Sampling Techniques

At the first stage Dugda district of East Shewa Zone was selected in view of the riskiness to drought and flood disasters based on the information obtained from the Oromia Agricultural and Rural Development Bureau.

Then, from 36 *kebeles* existing in the district six *kebeles* in local language also known as *Ganda* namely Bekele Girissa, Mukiye Lamman, Tuchi Danbal, Tuchi Sumayya, Wayyo Gabre'l and Walda Qelina which are assumed to be highly risky to the disaster was selected by the help of the district Agriculture and Rural Development Office.

The sample size of this study is 120; proportional sample household heads were surveyed. These households were drawn from 6 *kebeles* in the district, target *kebeles* contributed to sample relative to its household size as shown in table below.

Table 1. Size of sample households by their kebele

S/No.	Name of <i>kebeles</i>	Household size	Sample drawn	Percent of total sample
1	Baaqalee Girsaa	677	23	19.1
2	Mukiye Laamaa	519	18	15.2
3	Tuchii daanbal	359	13	10.8
4	Tuchii Sumayaa	512	18	15
5	Waldaa Qalinaa	614	22	18.3
6	Wayuu Gabr'el	718	26	21.6
Total		3399	120	100

The sample survey households were selected by proportionate simple random sampling method as the disaster affects all households in the same way.

3.4. NATURE AND SOURCE OF DATA

Data for this study was collected from both primary and secondary sources. Primary data was generated from the response of the respondents of the survey questionnaire, focus group discussions, and key informants. The secondary data used sourced from related studies, journal, books and local authority records.

3.5. DATA COLLECTION METHODS

The nature of this study necessitates the use of both quantitative and qualitative data collection methods. The qualitative method employed elicit information from the survey households and other pertinent sources of information on issues of farmers' willingness to pay for the program,

insurers' view on the subject and farmers risk coping mechanisms. On the other hand, quantitative method will be used to obtain information on such issues as production of farmers, frequencies of disaster and the like. These two methods were deployed to acquire information from the respondents through survey questionnaires, focus group discussions, and key informant interview.

3.6. DATA COLLECTION TOOLS

3.6.1. Sample household Survey

First a structured questionnaire was well constructed taking in to consideration the objectives set for the study. That is focuses on compiling basic social demographic and householders' economic information.

After the questionnaire is developed, a pre-testing was done to ensure that the questions are clear to the respondents before conducting the real collection of data. For the enumerators, four very experienced groups who participated in different research works able to communicate the respondent in local language and training was given to make sure that they are all aware of the contents and meanings of each question. Then, a questionnaire was administered to the survey households to get all the necessary information to achieve the works of the research successfully.

3.6.2. Key Informants Interview

Interview held with nine individuals which were selected through purposive sampling who are having pertinent information on the subject matter of the study that is district Rural and agricultural development experts, agricultural extension workers, disaster presentation office experts, farmers' cooperative union management members, Insurance companies.

For the realization of this objective, a checklist was prepared and done accordingly. The key informant interview with people who have specialized knowledge about the issues was used in providing information that supplements and / or clarifies what we already collected from focus group discussion.

Other potential key informants that are contacted are Regional Agriculture and Rural Development Office, Region Disaster Preparedness and Prevention Office, local elderly and International NGOs like Oxfam America were communicated.

3.6.3. Focus Group Discussions

To get access to valuable information, brainstorming focus group discussions sessions was held with selected *kebeles* administrative, extension workers, natural resource management, agricultural development bureau representatives, farmers' (two group from three *kebeles* having 8 individuals), totally six FGD were done, some uninsured and some having insurance cover for their crop based on the checklists prepared that lists the main topics to be covered in the discussion to keep the session on track and allocate the respondents to talk freely and spontaneously. It was conducted to probe such information as pervasiveness of the disaster, coping mechanisms of the households and their willingness to pay for crop insurance, type of insurance they prefer and also to get farmers opinion about the exiting insurance scheme by Oromia insurance with collaboration with Maki-Batu farmers union, in this regard valuable and important information were gathered. During focus group discussion participants were given the opportunity to express their thoughts and feelings using the probe questions.

The questions were open-ended to give the participants opportunities to articulate their opinion and position depending on their specific situations. The technique permitted the required information to be gathered in a undisturbed and informal situation.

3.7. ECONOMETRIC MODEL SPECIFICATION AND DEFINITION OF VARIABLES WITH HYPOTHESIS

Previous approaches to modeling households' willingness to pay (WTP) for agricultural technologies in developing countries usually used a Contingent Valuation Method (CVM) elicitation technique, which utilizes surveys to determine how consumers evaluate goods and services when markets are missing (Holden and Shiferaw 2002), which this economic valuation technique is used in this research work as CVM considered to be very adaptable and widely used.

CVM technique is superior to other valuation methods because it is able to capture use and non-use values and it is easy for data collection (Aggey and Douglasson, 2010).

As per Haab and McConnell (2002), the purpose of econometric model in WTP study is to analyze and allow households head socio-economic and demographic variables in to WTP function, because those variables assist the researcher contain adequate information on reliability, soundness and dependency obtained from of result.

The analysis of willingness to pay for crop insurance needs to address how factors affect probability of buying insurance and the extent of their impact on the willingness to pay amount. The dependent variable in this study is willingness to pay for crop insurance.

Therefore, depending on the nature of the data collected and type of study logistic regression model was found appropriate and used to analyze the WTP of household heads in the research. According to Haab and McConnell (2002), main element of the logit model is specification of indirect utility function for CVM respondents. A general form of the model followed from Cameron and Quiggin, (1994) can be stated as:

$$Y_i = \beta X_i + \varepsilon_i \quad I = 1 \quad \text{if } Y_i \geq t_i, I = 0 \quad \text{if } Y_i < t_i$$

Where

Let $Y_i = i^{\text{th}}$ respondent's willingness to pay for crop insurance of 100 % which is about 6000 Ethiopian birr per hectare per year.

β = a coefficient for X

I = discrete response of a respondent for the WTP question (1=Yes, or 0= No)

ε_i = unobservable random component distributed $N(0, \sigma)$

X_i = observable attributes of the respondent t_i

Table 2: Definition of variables in the empirical model

Dependent variable	
WTP (Yi)	Farmer willingness to pay for crop Insurance 1 if willing and 0, otherwise
Independent variables	
Sex(X1)	Sex of the Farmer (household head) (=1 if respondent is male; 0;otherwise, is a dummy variable, since more access to resource is mostly related to male positive relation is expected.
Age (X2)	Age of the farmer (house hold head), measured in year, this is a continuous variable with negative expected sign on the assumption that the aged people prefer traditional way of risk management with low WTP.
Dependency Ratio (X3)	Ratio of dependent household family members in number, the family dependency increases with decreases WTP due to shortage of saving and high demand of consumption thus negative association is expected.
Initial bid (X4)	It is a continuous variable which takes value equal to the amount of birr the respondent is willing to pay. Negative correlation is expected between initial bid and WTP as the bid amount increases the WTP decreases due to unaffordability of higher amount.

Education (X5)	Farmer's education level (household head): 1 if he is able to read and 0, otherwise, positive sign is expected because household head with higher educational level are more aware about benefit of crop insurance.
Ln_wealth(X6)	Farmer household income from all sources measured in Birr. Wealth is the other socio economic variable and it is farmers income from all sources which negative relationship is expected with the assumption that farmers with good economic capacity will relay on their risk retention behavior.
Farm size (X7)	Amount of rain fed cultivated farm land size holding, measured in hectare, it is a continuous variable. The expected sign is positive that is farmers with more cultivated land will have higher WTP.
Probability (X8)	Probability of occurrence of natural disaster in a year time, (=1 for yes, 0 other wise). Is a variable with positive expected sign household with higher probability to possible natural disaster having greater WTP.
Knowledge (X9)	Knowledge about Crop insurance (=1 if the household have information=1; 0 otherwise), households with prior knowledge about Crop insurance is expected to be willing to pay for crop insurance due to the information they have.

Vulnerability (X10)

Vulnerability to natural disaster (=1 if vulnerable; 0 otherwise). Is awareness of farmers about their susceptibility to natural disaster or past experience to crop failure expected to have positive association with WTP since it was believed that past risk exposure will give lesson.

Information (X11)

(=1 if the household has access to information sources; 0 otherwise). Information access is house hold contact to media having better awareness, since knowledge about the risk associated with their agricultural output will lead to have higher WTP.

Adaptation strategy (X12)

(=1 if the household takes ex-ante adaptation' strategy against flood or drought; 0 otherwise), Ex-ante adaptive is dummy variable with possible positive expected sign; which indicates household's practice on taking adaptation strategy will initiate farmers to increase their willingness to other risk management methods including crop insurance.

3.8. METHODS OF DATA ANALYSIS

For this study, both quantitative and qualitative tools of data analysis were used. For the coding and analysis of the data collected from the household survey, SPSS and STATA were used. Descriptive statistics and econometric regression model were used to analyze the collected data.

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

This chapter discusses the major findings of the study generated from the household survey, focus group discussion (FGD) and key informant interview (KII) data. In this chapter the major issues analyzed include demographic characteristics of respondents; access to basic assets, livelihood basis and income of household heads, vulnerabilities and adaptive strategies, willingness and demand for crop insurance and importance of use of crop insurance. The details of the analysis of findings from the study are presented as follows.

4.1.SAMPLE HOUSEHOLDS' SOCIO ECONOMIC CHARACTERISTICS

4.1.1. Demographic Characteristics of Respondents

As indicated in Table 3 below; of the sampled 120 household heads; 80.8 % were male headed and the remaining 19.2% being female headed. This indicates the fair composition of the sex of the household heads in the sample. Regarding the educational status of the household heads; it was found that 44.2 % were illiterate and 55.8 % are educated. It shows that majority of the farmers have got access to basic education. The other demographic data assessed by the study is age of the household head and the mean age of the household head is 45 with minimum age of 20 and maximum of 88 years.

With regards to the religious affiliation of the respondents; the great majority (93.3%) of the respondents were found to be orthodox religion followers, Wakefeta and Catholic religion followers constitute 4.2 % and 2.5 % of respondents respectively. Of the sampled household heads, the dominant ethnicities with a share of 85.8% are Oromo followed by Amhara with

12.5%. In terms of occupation across sample household 69.2 % were farmers, 30% being engaged in mixed farming and 0.8 % being employee. This shows that farming is sole means of livelihood for majority of the community.

Table 3: General characteristics of the of the respondents

S. No.	Household Characteristics	Frequency	Percentage
1.	Sex of respondents		
	Male	97	80.8
	Female	23	19.2
2.	Educational Level of Respondents		
	Illiterate	53	44.2
	Basic Education	67	55.8
3.	Religion affiliation of Respondents		
	Orthodox	112	93.3
	Catholic	3	2.5
	Wakefata	5	4.2
4.	Ethnic Group of Respondents		
	Orormo	103	85.8
	Guraghe	1	.8
	Amhara	15	12.5
	Tigrie	1	.8
5.	Occupation of HH Head		
	Farming	83	69.2
	Mixed farming	36	30.0
	Contract employee in private or government institutions	1	.8

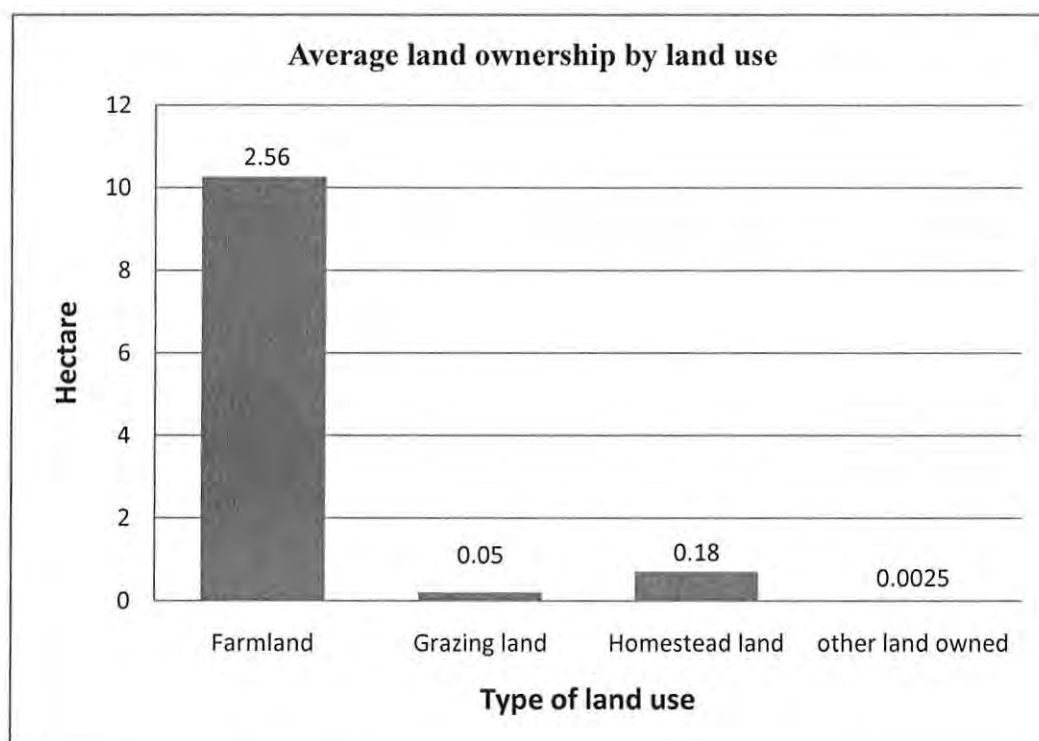
Source: Own survey data, 2012

The other demographic variable assessed by the study is family size of the respondents. From the survey it is observed that the average family size was 5.42 with maximum of 15 and minimum being 1. It shows that there are larger family sizes for some household heads which can be used as labor force if productively employed otherwise it creates dependency problem on the family.

4.1.2. Economic profile and Livelihood Basis of the respondents

Peoples in the study area are predominantly engaged in crop production which relies on the land holdings and it is characterized by traditional farming. Hence, land is one of pillar economic asset and it becomes apparent to analyze the holding and use of the resource. The land use of sample households depicts that farmers allocate their land for diversified purposes such as farmland, grazing land, homestead land. Considerable proportion of land (91.7%) is used as farm land, and 6.3%, and 1.9%, 0.1 % being used for homestead, grazing and other purposes respectively. The mean of land size owned for different land uses is depicted in figure 3 below.

Figure 3: Land ownership by type of land use

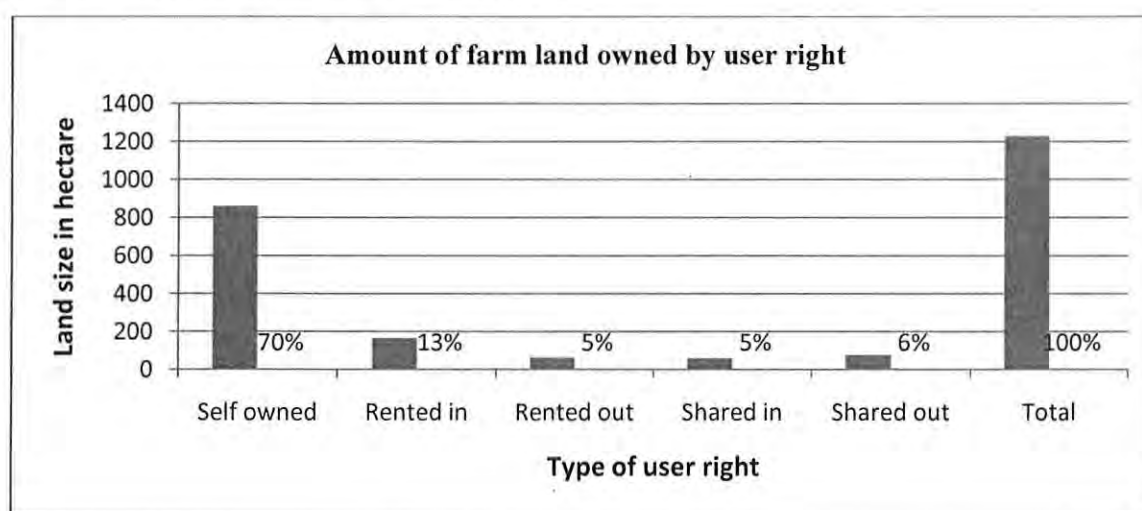


Source: Own survey data, 2012

The mean land holding of farmland, grazing land, homestead land and other land are 2.56, 0.05, 0.18 and 0.0025 hectare respectively. It demonstrates that farming has taken greater proportion than that of other activities like livestock rearing as the land allotted for grazing land is negligible. As the district shares the water body of Lake Ziway and Dembela; the surrounding farmers practice both rain fed and irrigation farming. Hence, the farmland owned by the farmers can be classified as rain fed and irrigated one. But the greatest proportion of farmland which accounts for 90.5 % is rain fed while the remaining other 9.5 % of the land was irrigated farm land. This, therefore, implies that although rain fed farming is the main type of farming practiced, irrigation farming also plays its role in the livelihood of the community.

As it is observed from the survey finding, farmers hold land through different user right types which includes; self ownership, rent in and share in. On the other hand, those who are unable to cultivate their land due to some reasons may share or rent out their land. The different sources of farm land and the use of own land by the farmers is delineated in the figure 4 below.

Figure 4: Total land possession by user type

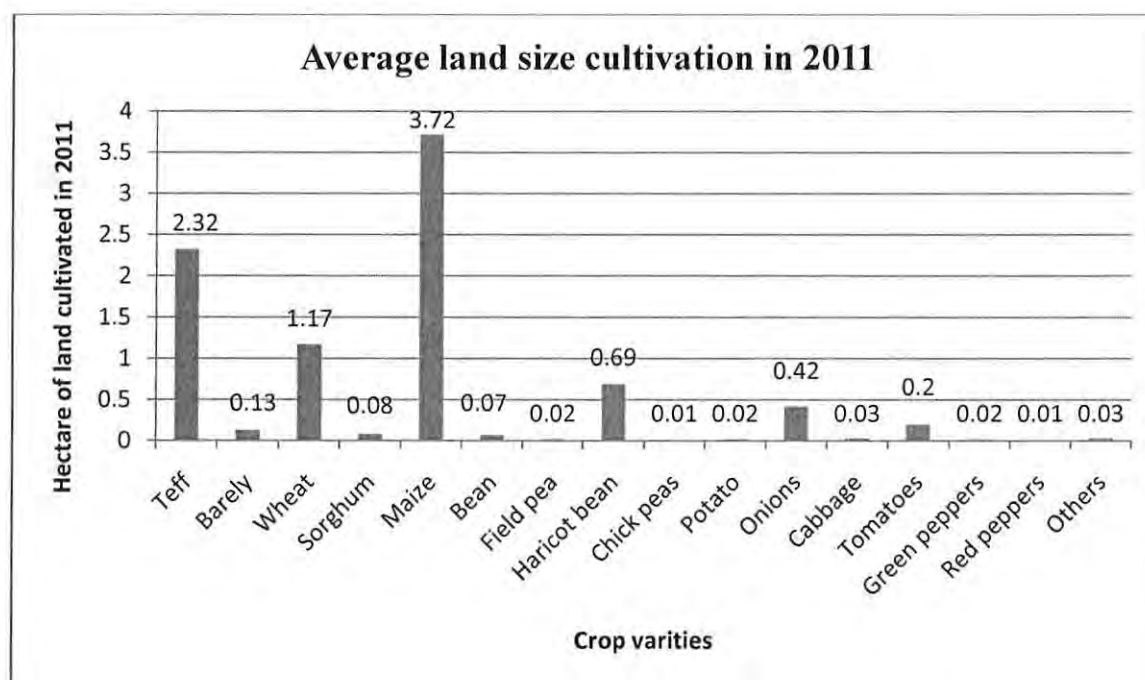


Source: Own survey data, 2012

As can be observed from figure 4, 70% of hectare of total land owned by the respondents was self ownership. In addition to the land they own, some farmers rent and share in farm lands which accounts for 13% and 5% of the total land ownership respectively. On the other hand, the sharing out and renting out farmland occupied 6% and 5% of the land ownership respectively.

In the study area, the staple crop produced include; maize, wheat, *teff*, barely, sorghum, bean, and haricot bean. Whereas, the major vegetables produced include; potato, onion, cabbage and tomatoes. The average farm land size cultivated in 2011 for the different crops and vegetables in hectare is depicted in the figure 5.

Figure 5: Average hectare of crop and vegetable land cultivated in 2011



Source: Own survey data, 2012

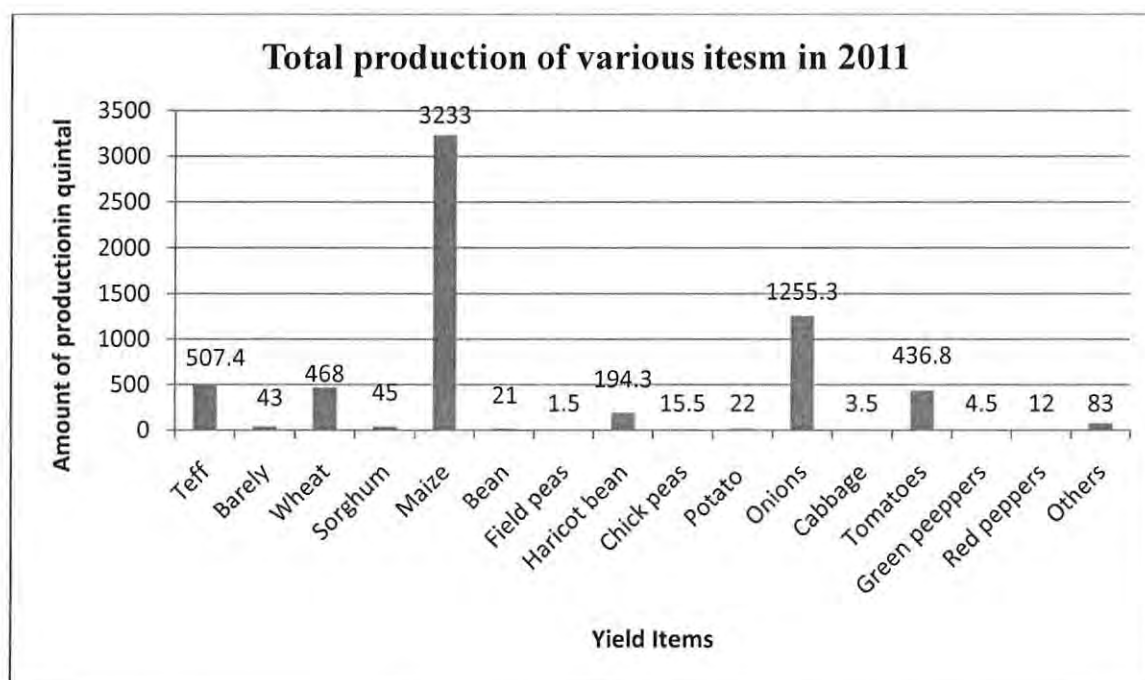
As demonstrated in the figure 5, the three major crops cultivation occupying greater share of farm land area on average include maize (3.7 hectare), *teff* (2.3 hectare), and wheat (1.2 hectare). Regarding vegetable cultivation, the predominant productions are onions and tomatoes with average cultivation of 0.42 and 0.2 hectare of land respectively.

The total production obtained from maize, *teff* and wheat take the lion share with average production of 3,233, 507 and 468 quintals respectively as indicated in figure 6.

This indicates that the area is more suitable for production of the three crop items. On the other hand; Potato and tomato are predominantly produced vegetables. The reason for higher production of the two vegetables can be proximity of the area to major markets like (Addis Ababa and Adama) Owing to main road and availability of adequate water resource for irrigation.

However, from the FGD made, it was observed that farmers do not have the power to fix prices on the output produced as the market price is usually set by brokers (who do not have value adding role). This indicates that farmers have problem of getting reasonable income rather brokers take economic advantage on farmers.

Figure 6: Total production of crop and vegetable varieties

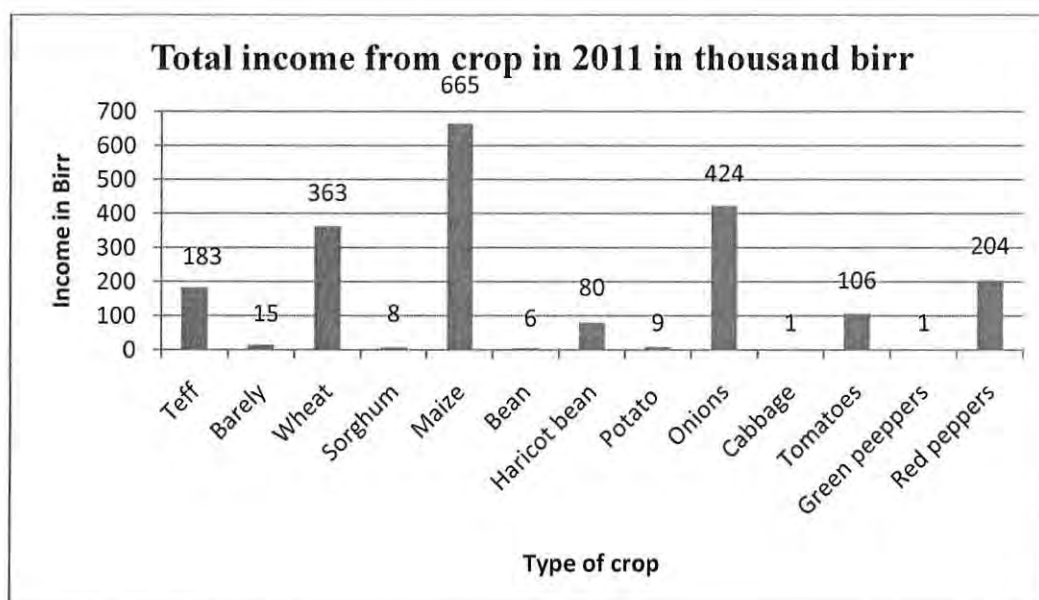


Source: Own survey data, 2012

With respect to income generation of different types of crops, the result below clearly indicates a total income from the sale of maize in 2011 was Birr 665,291.00 and that of wheat and *teff* was 362,770.00 and Birr 182,670.00 respectively. The listed crops are the most important staple crops in the area. Regarding total income from vegetables, due to their marketable nature and main purpose of production is for sale; the income from sale of onion, tomato and red peppers as sources of income contributing Birr 424,156.25, 105,868.00 and Birr 204,200.00 respectively to

annual income of the total sample household heads as depicted in the figure 7 below indicating that they are main income sources in vegetable category.

Figure 7: Total income from various types of crops and vegetables



Source: Own survey data, 2012

In the study area, the second most important source of livelihood next to farming is livestock rearing. Of the total sample household heads; 97.5 % of the respondents' rear livestock but not at a larger scale may be due to greater land allocated for farming. The average livestock ownership of the respondents for all livestock types is 6.05 with higher rearing of cattle (4.78) as compared with other livestock ownership in TLU (Tropical Livestock Unit) being less than 1 the result of which is shown below.

Table 4: Number of livestock possessed by sample HHs in TLU

S. No.	Livestock Variety	Total Livestock in Count	Weights of the Livestock	Total Livestock in TLU	Average Possession in TLU
1.	Cattle	764	0.75	573	4.78
2.	Goat	238	0.2	47.6	0.40
3.	Sheep	164	0.2	32.8	0.27
4.	Donkey	78	0.7	54.6	0.46
5.	Horses	15	1	15	0.13
6.	Mule	2	1	2	0.02
Total		1261	-	725	6.05

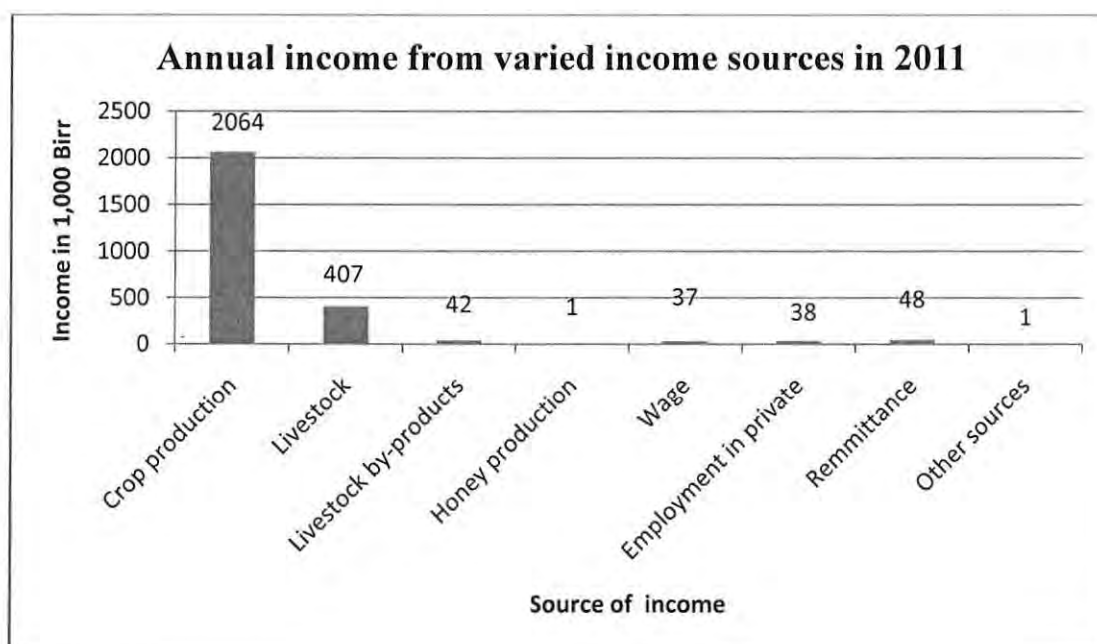
Source: Own survey data, 2012

Note: TLU stands for Tropical Livestock Unit which is the conversion of different livestock in to same measurement level for consideration of different livestock as one unit due to the difference in weight/value of the different livestock.

Household income source is important factor in analysis of willingness and demand for crop insurance as it indicates the capability of small holder farmers for buying the insurance. In the study area; the smallholder farmers generates income from different livelihood activities as shown in figure 8 below. Considerable portion of annual income which is 78.26% was obtained from crop production followed by livestock rearing 15.43% and remittance, sale of livestock by-products, employment in private and public institutions, and wage account for 1.83%, 1.6%, 1.43%, and 1.39% proportion of their income respectively and other source of income include fishery, and income from sale of local liquor (*katikala*) and charcoal .

This indicates that crop production predominate the livelihood activities of the majority of the households. This could also be due to the fact that their major land is allotted for farming and convenience of the area for the activity. In general, as can be observed from the figure below, it is possible to infer that the economic contribution of the crop production is very high followed by livestock. However, the nonfarm income sources represents insignificant fraction of total household income.

Figure 8 : Annual income from varied income source



Source: Own survey data, 2012

4.2. VULNERABILITIES AND ADAPTIVE STRATEGIES

It is clear that agricultural production in general and farming in particular is subjected to vagaries of natural disasters. In the study area, the major causes of vulnerabilities of crop production among others include occurrence of drought, flood, disease, pests and infestation by wild animals like birds and inappropriate use of improved seeds, and improper management of natural resources which leads to soil degradation.

Among the measurement of vulnerability of a given activity to disasters; frequency and degree of exposure to the risks are paramount. From the result of the survey, it was realized that the highest proportion which is (93.3%) of the respondents had experience of crop failure. One of the prominent cause of the crop failure as reported by the sample household is prevalence of drought. With this respect, for majority of the small holder farmer (58.3%) drought effect is found to faced once in less than or equal to 2 years. On the other hand, 34.1 % of the respondents reported to encounter the effects of drought once in 3 to 5 years time. The degree of severity of the disasters is considered to be very high and high by 22.3% and 42 % by the respondents respectively. On the other hand, 21.4% of household heads considered the effect of the drought on their crop yield as moderate. While the remaining 11.6 and 2.7 % considered the effect of the drought as low and very low respectively. The difference in the effect of the drought is mainly due to the variation in altitude of the sampled *kebeles* and disparity in proximity to the moisture of the lake. The summary of the degree of severity is shown in table 5 as follows.

Table 5: Degree of severity of drought disaster

S. No.	Degree of severity	Frequency	Percent
1.	Very high	25	22.3
2.	High	47	42.0
3.	Moderate	24	21.4
4.	Low	13	11.6
5.	Very Low	3	2.7
Total		112	100.0

Source: Own survey data, 2012

The main causes of crop failure affecting agricultural productivity as identified by the study is drought which is characterized by shortage of rain or short-lived rain taking about 37% of cases of crop failure followed by rain fall on-set and off-set irregularities which constitutes about 24% of the responses. Outbreak of disease, infestation of pests, flood, infestation of weeds, extreme temperature and a biotic stresses are among the other causes of crop failures in the study area as presented in the table 6 below.

Table 6 : Causes of crop failure

S. No.	Causes of crop failure	Frequency	Percentage
1	Rain fall on-set and off-set irregularities	58	24
2	Shortage or insufficient rain /drought	90	37
3	Flood disaster	16	7
4	Infestation of pests	20	8
5	Infestation of weeds	8	3
6	Outbreak of disease	27	11
7	Extreme temperature (e.g. cold/ <i>Wirch</i> /)	2	1
8	Others	23	9
Total		244	100

Source: Own survey data, 2012

It is vivid that farmers use different traditional adaptive strategies including physical risk mitigation strategies to minimize or avoid the effects of vulnerabilities to their crop failure. Table 7 below provides evidence that most widely used adaptive strategies in the area are irrigation deployed by 34% of the farm household heads and the other 24% make changing the planting and harvesting time as an adaptation to the possibility of crop failure. About 20% of the respondents used improved crop variety (usually short period harvest and disease resistant crops as adaptive strategy). On the other hand, about 6% of small holder farmers' reduce their production costs as mechanism of minimizing the effects of various vulnerabilities to their crop and the other 5 % used reduction in production costs. Only, 2 % of the respondents reported as

though they acquire crop insurance as an adaptive strategy. The other 4% used other adaptive strategies such as a forestation, aid and sale of livestock. Last but not least, about 6% of the respondents reported not to have any kinds of adaptive strategies in mitigating the negative effects of crop failure. It shows one that although the community has diverse methods of mitigating the effects of crop failure; some strategies such as contraction of the level of production and reduction of agricultural production costs has negative impact on the amount of yield obtained from the activity.

Table 7: Adaptive strategies

S. No.	Adaptive Strategies	Frequencies	Percentage
1	Irrigation	64	34
2	Change planting and harvesting time	45	24
3	Using improved crop variety	38	20
4	Production contracting/reduction	11	6
5	Acquiring crop and revenue insurance	3	2
6	Reduce production costs	9	5
7	We have no adaptation	12	6
8	Other adaptation strategies	8	4
Total		190	100

Source: Own survey data, 2012

Information on saving and credit practice provides an imminent understanding of various risk-management strategies. Hence, an investigation on the saving practice of the sample household heads indicates that 87.5 % of respondent have saving and the remaining 12.5% do not save any portion of their income as indicated in table 8 below. It indicates one that higher proportions of the community do not live a subsistence life which can be due to the engagement of the farmers in both consumption and commercial farming (tomatoes, onions and green pepper) as the area is well known for such vegetables.

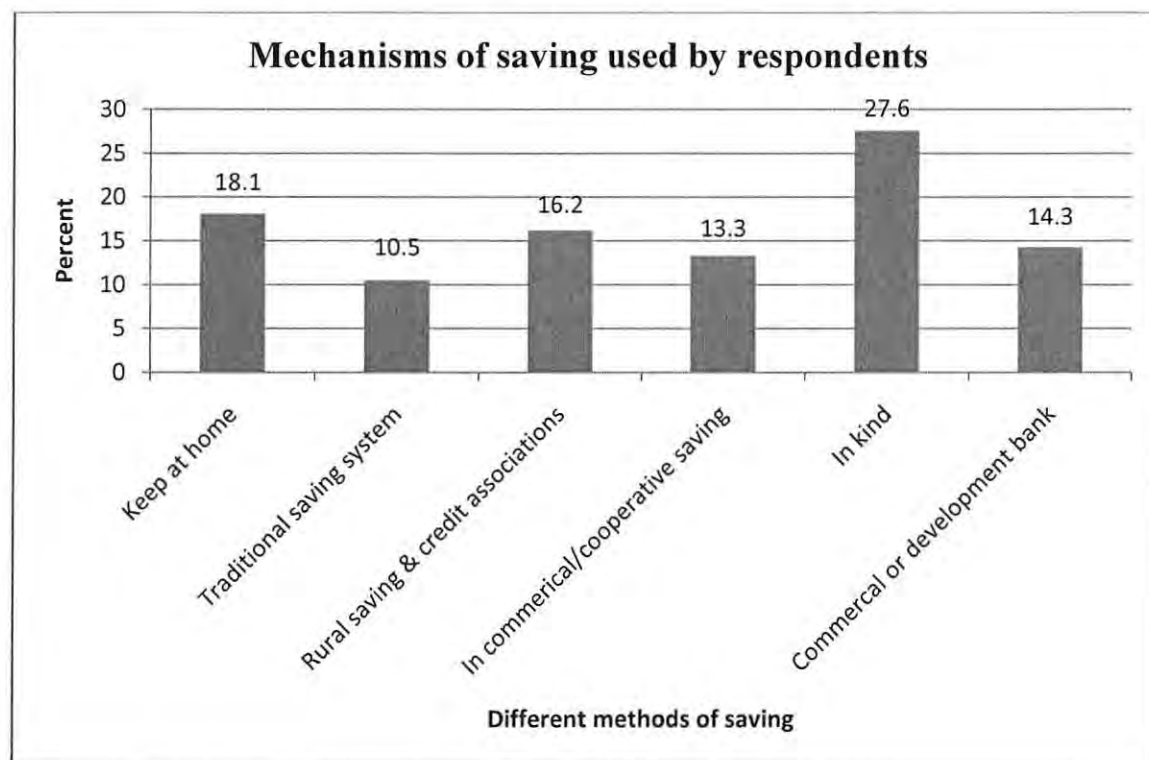
Table 8: Saving practice of the respondents

S. No.	Does your HH have cash saving?	Frequency	Percent
1.	Yes	105	87.5
2.	No	15	12.5
Total		120	100.0

Source: Own survey data, 2012

With regards to the saving method used by sample households; in kind saving accounts for 27.6 % of cases followed by keeping money at home (18.1%). The use of formal financial institution such as banks, cooperatives and rural savings and credit associations constitute 14.3, 13.3 and 16.2 % of the saving methods used respectively. Figure 9 shows one that there are diversified methods of savings used by the community although some types of saving keeping money at home is not recommended from commercial point of view.

Figure 9: Different saving mechanisms used by respondent



Source: Own survey data, 2012

The other most important variable assessed in vulnerability section is household heads access to credit service. Access to credit has its own impact on both coping with vulnerabilities of various hazards and improving the household heads access to finance which can in turn affects their decision on use of non-production and productivity reducing adaptive strategies such as insuring their crop production. With regards to access to credit facility, about 95% of the respondents reported to have access to credit service from different sources as indicated in the table 9 below. The predominant source of credit for the farmers was found to be rural saving and credit association, followed by relatives/neighbors and traditional lenders respectively.

On the other hand access to credit service by formal financial institutions such as banks is found to be least mainly due to the assets owned by the small farmer household heads cannot be used for collateral purpose and lack of infrastructure. The detail of the various sources of credit reported by sample households is presented as table below.

Table 9: Sources of credit by respondents

S. No.	Sources of credit	Frequency	Percent
1	Relatives or neighbor	17	15
2	Rural saving and credit association	46	40
3	Cooperatives (Unions)	9	8
4	Traditional lenders	14	13
5	NGOs	5	4
6	Commercial bank/development bank	2	2
7	Micro finance institutions	13	11
8	Others	8	7
Total		114	100

Source: Own survey data, 2012

The other variable worthwhile to be discussed under vulnerability and use of adaptive strategies is access to agricultural extension service. This is due to the fact that, the delivery of such service is expected to enhance farmer's knowledge on the methods of reducing vulnerabilities to crop

failures and make use of the advantageous adaptive strategies. With regards to access to the service, it was observed that all farmers have access to the service. But in my opinion the commitment and strength of agricultural extension matters in changing the risk averting nature of small holder farmers.

In addition to the service provided by the agricultural extension workers; access of farmers to different sources of information their knowledge of the nature, causes matters and consequences of the different vulnerabilities and make the rational use of adaptive strategies. From the survey, it was noted that most of the respondents of household heads have access to radio and telephone service while the majority are lacking access to Television and its associate use of electricity.

Table 10: Households ownership of means of information and related basic infrastructures

S. No.	Ownership of tool of information	Response				
		Yes		No		Total
		Frequency	Percent	Frequency	Percent	Percent
1	Whether a HH has radio?	63	53	57	48	100
2	Whether a HH has TV?	17	14	103	86	100
3	Whether a HH has electricity?	43	36	77	64	100
4	Whether a HH has telephone (fixed or mobile phone)?	66	55	54	45	100

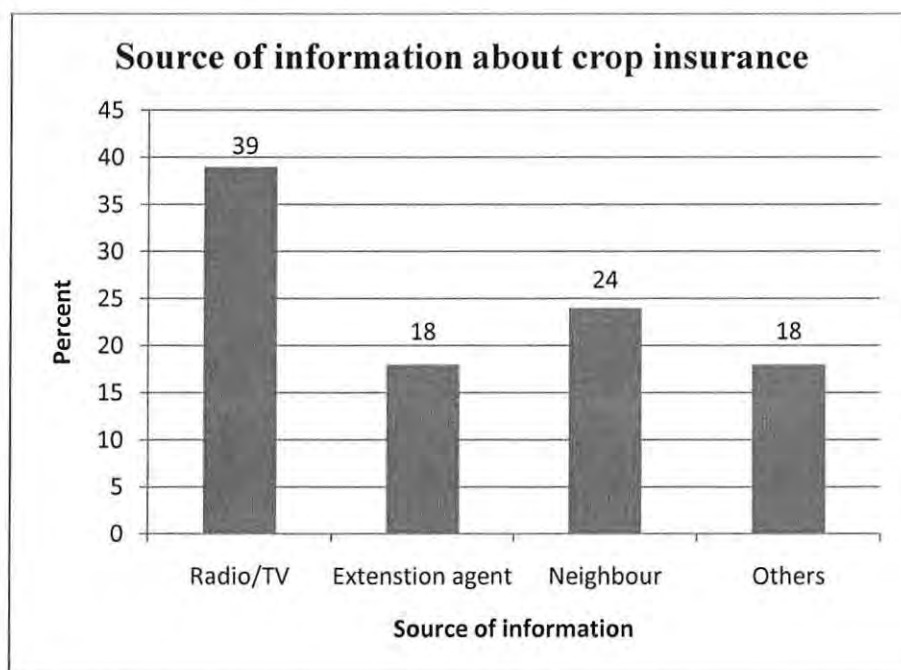
Source: Own survey data, 2012

4.3. CROP INSURANCE

The Knowledge about insurance in general and crop insurance in particular help to understand the awareness of small holder farmers in accessing and using the possible schemes. To this end, farmers were inquired whether they know what is meant by insurance and more specifically crop insurance. From the study finding it was observed that 53.3% of the respondents have no idea about insurance; whereas, 79.2% of smallholder farmers do not have the concept of crop insurance at all. This indicates that there is very limited awareness or knowledge of the community about the existence of insurance or crop insurance service indicating little has been done in introducing the product concept.

However, although there was limited information about the issue some farmers do already have information about the service. As far as the source of information about crop insurance is concerned; 39% of respondents who have information on the subject matter; accessed the information from radio and /or Television program, 24% from neighbors and 18% sourced from agricultural extension agents and others from cooperatives as depicted in figure 10 below.

Figure 10: Source of information about crop insurance



Source: Own survey data, 2012

From the surveyed total household; it was learned that 90 % of them have not accessed the service as indicated in table 11 below; may be due to limited knowledge of the service and partly due to its unaffordable insurance premium. Only 10 % of the farmers have obtained the service delivered by Oromia Insurance Company. As per the information obtained from FGD conducted with the farmers in order to get access to the crop insurance service one has to be member of farmer cooperatives and use improved seeds supplied by the cooperative.

Table 11: Access to crop insurance

Have you ever accessed Crop insurance	Frequency	Percent
Responses		
Yes	12	10.0
No	108	90.0
Total	120	100.0

Source: Own survey data, 2012

Due to the risk averse nature and resistance of small holder farmers to involve in new services; it becomes apparent to exemplify the advantage of using a given service. Surprisingly, of those 12 household heads who had insurance coverage; 83.3% had faced crop failure since they became client of the company (in less than two years time) indicating the importance of the service to the farmers.

Table 12: Experience of crop disaster after accessing insurance service

Did you face crop failure since your membership in insurance company	Frequency	Percent
Responses		
Yes	10	83.3
No	2	16.7
Total	12	100.0

Source: Own survey data, 2012

Of this disaster afflicted farmer household heads, 8 of them (80%) have been paid a compensation for their crop failure. However, the FGD reveals that the amount of compensation was reported to be unsatisfactory, do not commensurate with the actual loss to the farmers as they do not have any direct link with insurance company to figure out the exact amount of claim settlement.

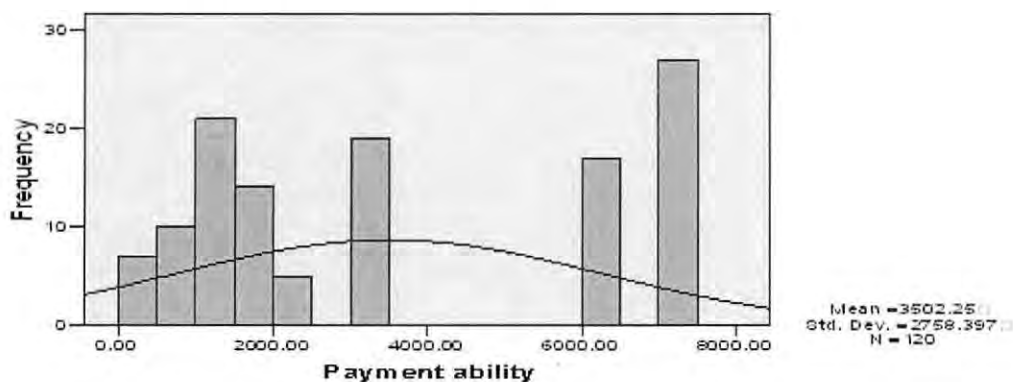
4.4. WILLINGNESS AND DEMAND OF FARMERS TO PAY FOR CROP INSURANCE

The data set on farmers' WTP for crop insurance is acquired from a household survey executed after the experimental sessions on crop insurance. Using the contingent valuation method, the survey asked a variety of questions related to crop insurance. To begin with, detail description of how this insurance policy/contract works was presented to farmers. After this description, farmers were asked as whether such a contract would interest them or not. Then, the questionnaire proceeded to ask whether farmers would be willing to pay various amounts for given crop insurance service. One hypothetical crop insurance scheme was designed, offering a progressive full insurance coverage, for a correspondingly higher premium. In particular, farmers were asked about their willingness to pay for an average annual premium of 6,000ETB per hectare (computed for major crop) for 100% crop insurance coverage. Then after, the bid was flexible with the response of the respondent for the bid. Finally, they were asked an open ended WTP question to elicit their minimum demand for the insurance scheme.

Unexpectedly, the willingness to buy crop insurance was found out to be very high accounting for 97.5 % of farm household heads. The high interest in the service can be due to high vulnerability of the area to different natural disasters. Among those willing to buy, only 36.7 % of the household heads were able to afford the premium. The mean of willingness of farmers to pay for the service as indicated in bar figure below was 3,502.25 Birr per hectare per year which is very much lower than the demanded insurance set premium of 6,000 ETB. The other remaining majority (63.3%) were not able to pay for the service.

The survey result justifies the argument that crop insurance premium subsidies are necessary to get participation of small holder farmers to pay for crop insurance coverage, since the premium set is not affordable to the majority of the farmers. Affordability of crop insurance premium is linked to excess risk, administrative as well as operational costs and profit margin of the insurance companies.

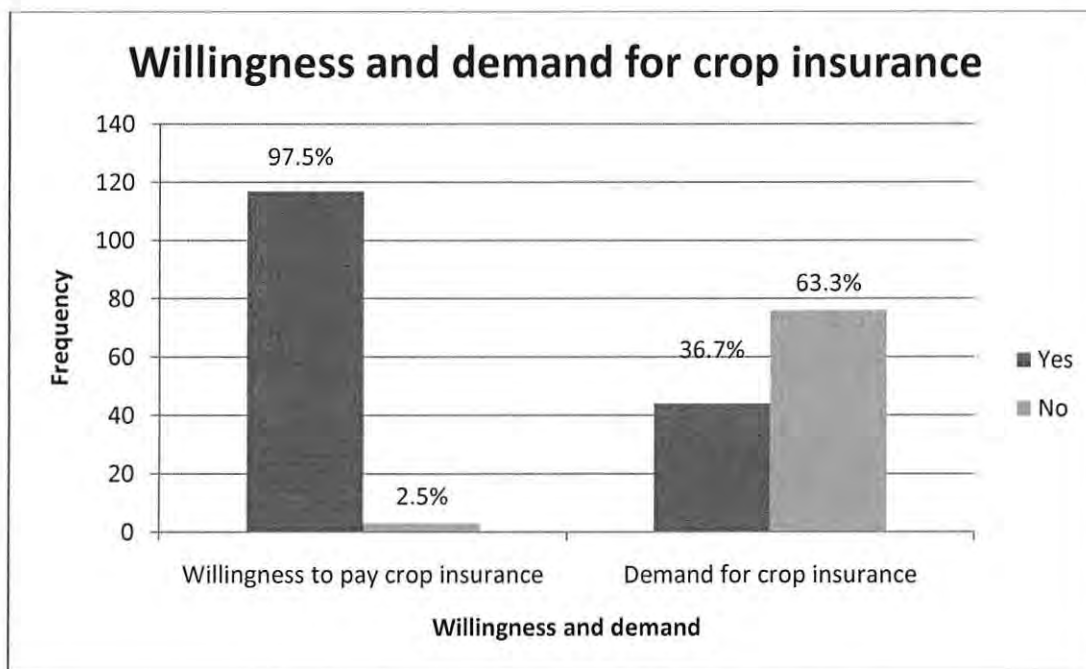
Figure 11. Shows distribution of ability to pay (demand)



Source: Own survey data, 2012

The comparison of willingness and demand for crop insurance is presented in the figure 12 below.

Figure 12: Willingness to pay and demand for crop insurance



Source: Own survey data, 2012

4.5. LOGISTIC REGRESSION MODEL RESULTS OF CROP INSURANCE

This section discusses the results that were derived from logit model estimates of willingness to pay (WTP) for crop insurance, when a 100% crop insurance coverage is available.

Before fitting this model, the problem of multicollinearity among explanatory variables was checked by using variance inflation factor (VIF). Appendix table 1: presents the value of VIF and tolerance ($1/VIF$) for all variables. As a result, the problem of multicollinearity was not serious among variables because VIF values were less than 10. Binary logit estimate was compared with estimates of binary probit for selection of best fit model.

The LRT indicate that binary logit model is the best fit for the data. Bivairiate regression is done to observe the association between dependent and independent variables.

In logistic regression analysis different socioeconomic and demographic variables that are expected to explain the dependent variable are included. In order to estimate the coefficients and odds for those variables and to identify determinants of willingness to pay for crop insurance, logistic regression model with maximum likelihood estimation method was employed (Greene, 2003).

The results of the logistic regression model in Table 12, where the dependent variable is the respondent's WTP category (WTP=0, if willingness to pay is less Birr 6000 and WTP=1, if willing to pay is greater or equal to Birr 6000"). To correct for possible heteroscedasticity, the White estimator of variances (StataCorp, 2001) is used, instead of the conventional ML variance estimator. The reported standard errors are, therefore, robust standard errors. First of all, a note of caution is warranted about interpretation of the results in the model. In our logistic regression model, the dependent variable is the probability of paying the demanded premium where at maximum takes value number one (1) and others value zero (0). Therefore, a positive coefficient sign indicates higher demand for 100% crop insurance coverage/ a reduction in the degree of risk aversion.

The Wald Chi-Square test that at least one of the predictors' regression coefficients is not equal to zero in the model, which is a measure of the overall goodness of fit of the model, provides evidence of a strong fit (p-value of 0.000) in the regression. The least value of the Pseudo R^2 is 0.48, acceptable value in (cross-sectional) studies like this.

Therefore, variables such as household head sex, age of the household head, dependency ratio, education level, wealth, amount of rain fed land, probability crop disaster occurrence, knowledge about crop insurance, adaptive strategy, initial bid , vulnerability and awareness(information access) were included in the model. The maximum likelihood estimates of logistic regression model are presented in the Table 12 below.

From the logistic regression result eight variables were found significant at less than 1, 5 and 10 percent level of significance. These variables include, Age of the household head (Age), dependency ratio (Dependendency), education level of the respondent (Education), wealth of the household head (ln_wealth), amount of cultivated rain fed land (farm size), initial bid amount(initial bid), knowledge about crop insurance (knowledge) and taking ex-ante adaptation strategies against flood or drought (adaptive strategy) .

However, Sex, Probability of crop disaster occurrence (Probability), facing crop failure (Vulnerability), and information access or awareness (Information) were found insignificant. This means that the respondents' saving and investment in crop insurance behavior was independent of differences in gender, probability of crop disaster occurrence, vulnerability and Information access. However Baliram *et al* (2001) showed statistically significant and positive correlation between with farmer's awareness or information access.

As discussed above, it was hypothesized that different factors will affect the willingness to pay across households. In our prior hypothesis about increase risk aversion behavior and WTP for crop insurance coverage with young age of farmer, it was found negative correlation and statistically significant between age of the household head and WTP at less than 5% probability.

This means a unit increase in age, the odds in favor of paying the demand WTP by insurance company decrease by 1.01 this indicates that younger farmers are more willing for 100% insurance coverage than older ones. As we hypothesized prior, dependency ratio (Dependency) was negatively related with WTP for crop insurance and it was statistically significant at 1% level. Therefore, crop insurance in private saving decreases with higher old and young dependency ratio.

Those households with higher old and young dependency ratio were not willing to pay insurance premium in the higher category ($WTP \geq 6000$ ETB) per hectare. A higher dependency ratio means (the ratio of young and old dependents to the working age population) was assumed to decrease the demand for crop insurance coverage and decrease the demand for saving through crop insurance premium. The odds ratio in favor of paying the demanded premium decreases by 0.55.

Moreover, initial bid amount has been found to be negatively and significantly related at less than 1% level with willingness to pay for crop insurance. This implies that the probability of a 'yes' declines with increase in the bid which indicates that the likelihood of accepting an offered bid amount increases as the bid amount goes down and vice versa which makes sense.

We hypothesized that higher wealth decreases demand for insurance to the extent they proxy higher human and physical capital and capacity to manage/cope with risk more cheaply; the alternative hypothesis being that such assets proxy for better seasonal cash flow and thus capacity to actually purchase insurance. In line with the alternative hypothesis, Wealth had positive significant effect on the willingness to pay for crop insurance at less than 5% level. The result in our logistic regression is similar to the hypothesis that as the household wealth increase, the willingness to pay for crop insurance will increase.

When one unit increase in wealth, the odds in favor of paying WTP greater than or equal to 6000 birr increases by 2.19. The positive effects of increase in household wealth on willingness to pay for crop insurance is consistent with the findings of McCarthy (2003) and supports the economic theory that explains wealth is positively related with demand in general and the same with insurance services demand in particular. This also indicates that crop insurance is a normal good since its demand increases with wealth.

Similar to our expectation, a higher level of education in a population was positively correlated with demand for any type of crop insurance product. Having education level increases the odds in favor of paying the demanded insurance premium by 18.36. The education variable was positive and significant at ($P \leq 5\%$). The conclusion to be drawn is that a higher level of education increase peoples' ability to understand the benefits of risk management and long term saving and therefore increased their risk aversion. This result is in line with Baliram *et al* (2001) in his economic analysis of crop insurance in India. However as pointed out by Yesuf (2007), risk aversion might be negatively related with education.

The other hypothesized variable as a factor that affects farmers WTP for crop insurance was the amount of rain fed land owned by the farmer. Based on result in table 12, it increased the demand for 100% crop insurance coverage through private saving. The model result revealed that WTP of farmers who own rain fed farming practices were increased the odds in favor by 1.27. This positive and statistically significant ($P \leq 1\%$) result is credited to the increased uncertainty with the seasonal nature of rain feed agriculture and therefore higher risk aversion behavior of farmers. Similar to the hypothesis having ex-ante adaptive strategy found to be significant at less than 10% significant level, famers with practice of taking adaptive strategy are also willing to pay for crop insurance.

In line with our prior hypothesis those who do have knowledge about crop insurance before found more willing to pay higher insurance premium and interested to save. So knowledge about crop insurance was significant at ($P \leq 1\%$) and affect farmers ability to pay positively. Prior Knowledge about crop insurance increases the odds in favor of paying the demanded premium increases odds ratio by 0.17. Therefore, the probability of choosing the highest payment category for 100% crop insurance coverage were increased with prior information about crop insurance.

Table 13: The Maximum likelihood estimates of the logistic regression model

WTP	Coefficients	Odds Ratio	Standard Err.
Sex	-1.22626	.392857	.8630135
Age	-.0009936**	1.013375	.0040138
Education	3.51804**	18.3662	.8891467
Farmland	.260604***	1.276348	.0794555
Vulnerability	-2.573956	.0574927	1.517276
Probability	.5712662	2.441371	.568592
Adaptivestratgy	.4599099*	1.251389	.23859
Knowledge	1.754019***	.1730769	.4189033
Intialbid	-2.42676***	.088964	.744320
Dependency	-1.01258***	.5497521	.3497912
Ln_wealth	.6187917**	2.198321	.2834324
Information	1.667468	5.298735	1.573167
logistic regression number of obs =120			
Log likelihood = -40.782606			
LR chi2(11) = 74.31			
Pseudo R2 = 0.4767			

Source: own computation, 2012

***, ** and * are significant at less than 1%, 5% and 10% probability level, respectively.

In general, most variables have a significant effect and the coefficients resulted in expected signs. Therefore, the study by using logistic regression model has revealed that encouraging wealth creating activities, age of household, young and old dependency ratio, educational level, initial bid amount, engaging in rain fed agriculture, taking adaptive strategy and knowledge about crop insurance as key determinants of farmers demand for crop insurance purchase. Educational level of farmers has emerged as a critical factor for enhancing awareness about innovative products like crop insurance among poor stallholder farmers indicating attending higher education level positively affect the demand of crop insurance. Income from all sources, having higher physical and financial capital, and the presence of a number of earning members in the family (proxy for wealth) encourages the farmers to pay for crop insurance. The indicators of income from many sources, having higher physical and financial capital, and the presence of a number of earning members in the family (wealth) were significant and have the unexpected positive effect on risk aversion (i.e. positive sign in the results). This result is consistent with the literature and demand theory. At higher WTP level ($WTP \geq 6000$), these variable appeared to increase risk aversion behavior.

4.6. WILLINGNESS OF INSURANCE COMPANIES IN DELIVERING CROP INSURANCE SERVICE

For the sake of assessing the willingness and interest of insurance companies in providing crop insurance to the wider farmers; the views of Oromia Insurance Company and Africa Insurance Company is solicited and analyzed by data obtained from insurers through KII with the concerned officials. But, before their willingness is investigated information regarding brief introduction to the crop insurance services they provided was collected and presented as follows.

Oromia Insurance Company started providing crop insurance since 2009/10. It delivers insurance service for staple crops such as Maize, *Teff*, Wheat, Barely, Haricot Bead, Chick Pea, Bea, Pea, Sesame, Lentil etc. for risks such as shortage of rain fall, drought, fire and lightening, hail and storm, flood and rust peril. There are three products of crop insurances: Multi-peril Crop Insurance, Index Based Crop Insurance and Peril Crop Insurance which are used to compensate for crop losses caused by the above mentioned factors.

On the other hand, Africa Insurance Company has started providing index based crop insurance against the risk of drought, shortage of rain, storm, flood and fire for cereal crops such as *teff*, rice, wheat, barley, sorghum, and maize and so on since 20011 at 38 villages for more than 13,000 farmers in Tigray region in collaboration with Dede-bit Microfinance, Oxfam America University of Colombia and Swiss reinsurance. The insurance program allows the cash constrained poor farmers pay for their crop insurance premiums through their labor the technical issues are dealt by the international Organization and it's a pilot program.

In both insurance companies, damage to the crops due to vermin, pests, infestations and lack of good handling are not covered.

Crop insurance service of Oromia Insurance Company is distributed in different districts of Oromia regional estate it break new ground in introducing better structured more diversified and approaching farmers with calculated premium with local expertise like other class of business in the insurance industry. The crop insurance program works as follows; the cooperative unions together with district Agriculture and Rural Development prepares proposal that has essential data such as name of farmers to be insured, type of crop, and area to be insured in hectares per each crops.

Then the union provides the insurer with proposals, the insurance company and the union will sign the policy and then insurance company provides certificates to individual farmers through the delivery channels (unions). Stop loss reinsurance treaty agreement with Africa Reinsurance Company is signed. The reinsurance treaty that Oromia insurance company opted to hedge against big loss is not that preferable compared to other reinsurance treaties.

According to the insurance companies, the reason for low participation of farmers in the service is lack of awareness of the community about the service, higher premium level, lack of trust and dissatisfaction of customers by the service. On the side of the insurance company; lack of professional staff, lack of reinsurance cover, complexity of loss assessment along with poor public support, existence of moral hazard, scattered and remoteness of settlement of most farmers and lack of transportation infrastructures such as road, reluctance of the unions or intermediaries of the insurance to facilitate the service delivery, lack of expertise in the activity and request of farmers for compensation of non-agreed causes of disaster are some of the challenges deterring the delivery of the service.

Unlike the initial time of introducing the service, farmers are increasingly showing higher willingness and participation and both insurance companies have interest of expanding the access to larger number of users if subsidy is available in different areas. However, the insurance companies proposed that to realize the implementation of effective insurance service; policy implementation in crop insurance has to get attention from the government side, and much work has to be done in awareness creation.

4.7. IMPORTANCE OF USE OF CROP INSURANCE

As is perceived by policy makers and stated in many theories backed by empirical experiences of studies from corners of the world; crop insurance has indispensable role in enhancing crop production, provision of safety net, it contribute to modernization of agriculture, used as instrument to increase poor household farmers income and could also be used to support means of climate change adaptation by facilitating infrastructure to loan in climate resilient farm activities. This happens due to increased determination of farmers to invest more in the activity without fear of crop failure.

In order to analyze the possible effects of having insurance coverage; farmers were inquired whether or not there will be changes to their crop production system the service is to be accessed. With this regard; of the 120 sample household heads ; 93 % reported that they will increase their area of land cultivation if they are able to get insurance coverage for their crop; while 6% reporting no change will be made and only 1% reported to decrease land size cultivated. Similar to area of cultivation; 93% reported to increase use of fertilizers if they have access to insurance service. Use of pesticides is reported to be increased for 68% of the respondents and access to modern agricultural production technologies will also increase for 89% of the sampled household heads. Diversification of crop production which have importance in maintaining the fertility of the soil and reducing the vulnerability of farmers to severe crop failure is reported to increase for 62 % of the sample household heads while 38% showing no interest of diversifying their produce. This diversification could also include introduction of new crop varieties without which farmers may not scarify his capital.

Receipt of loan for betterment of crop yields is also reported to increase for 83 % as the existence of insurance coverage guarantees them dependable source of crop production income for repayment of their loans. In general, if crop insurance service is made publicized for the farmers a lot of changes boosting agricultural production will be realized.

Table 14: Expected changes on agricultural production if crop insurance is accessed

S. No.	Changes on the agricultural production and productivity	Response							
		Increase		Same		Decrease		Total	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
1	Area of cultivation	112	93	7	6	1	1	120	100
2	Use of fertilizers	112	93	6	5	2	2	120	100
3	Use of high yield seeds	118	98	2	2	0		120	100
4	Use of pesticides	82	68	31	26	7	6	120	100
5	Use of modern agricultural production technologies	107	89	13	11	0		120	100
6	Diversification of crop production	74	62	46	38	0		120	100
7	Amount of loan received for improved crop production	100	83	15	13	5	4	120	100

Source: Own survey data, 2012

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

The overarching objective of the study is to assess the willingness and demand of smallholder farmers to pay for crop insurance with the effective functioning of the service. For realization of this objective data was mainly collected from primary sources. Agro-ecologically Dugda district is characterized to have both dry lowland and mid-highland nature with farming activity playing a predominant role in the livelihood of the community.

The natural resource management system used in Dugda is not sustainable the extraction of water from lake Zeway has increased due to increase of large irrigation activity and it brings unexpected ecological disaster to the farmers, which this indirectly affect growth of vegetation and leads to the depletion of organisms. The major crops produced in the area are maize, *teff* and wheat. The area is well known for their production of vegetables such as tomatoes and onions. In addition to farming, the community generates income from livestock rearing, working as daily laborer, employment in different activities, honey production and remittance.

Although farming activity is major source of livelihood of the community it is vulnerable to recurrent drought and flood disasters. The other causes of crop failure include; outbreak of diseases, infestation of pests, and infestation gangs of birds. As an adaptive strategy to the crop disasters the farmers mainly use irrigation, rotation planting and harvesting periods, and make use of improved crop varieties. In addition to this smallholder farmers prefer production contracting, reducing costs of production as means which these endangers their livelihood.

Using crop insurance service as an adaptive strategy is very much minimal partly due to lack of information about the service by the farmers and partly due to unaffordable insurance premium set to crop insurance by insurers. Besides, one has to be member of cooperatives/unions to get the service as the insurance companies administer the service through cooperatives. Mutual insurance scheme between farmers' cooperative union and the insurance company exists. Hence, access to the service is not open to all farmers in the study area.

After being briefed about crop insurance service, most farmers were found to be interested to the service but failed to agree to pay the premium set by the insurance company as the premium is unaffordable. The logistic regression result shows that wealth, educational level of household head, size of land cultivated, knowledge and adaptive strategy positively determine farmers' participation in the service; whereas, age, dependency ratio, amount of premium set per hectare negatively affects farmers' decision to participate in crop insurance. In addition when farmers know the service being sold, they are more likely willing to pay. Nonetheless, participation of small holder farmers in the crop insurance service greatly contributes to the improved production of crops, facilitate access to credit and contribute for modernization of crop production.

Limited number of local private insurance companies such as Oromia and Africa insurance companies in collaboration with cooperative unions, microfinance and donors are providing the service in risk sharing and risk transfer approach, penetrating the new insurance market and playing their role in financial management of crop production risks, where householder's knowledge and trust of insurance were important.

5.2. RECOMMENDATIONS

- A. Despite of the fact that the district is potential rich particularly for farming practice. Its agro-climatic condition is suitable for production of cereals. But meager and erratic rainfall distribution has been occurring in the district does impact on agriculture and should be managed by using modern risk management tools like crop insurance. In addition intensified utilization of wood products is resulting in deforestation in the district. Measures should be taken to change this situation through introducing other energy resource alter natives.
- B. Farmers' cooperative union role as intermediaries or an agent between the Oromia insurance Company and client farmers is considerable, however method of premium payment and indemnities should first be explicitly explained to farmers since farmers justify that they do not have clear information as how much premium is paid for the insurance cover and compensation paid for the loss.
- C. The claim paid to farmers does not consider the actual loss and it also must be attractive as the existing risk sharing insurance scheme is unable to meet the purpose, in addition particular attention should be given to attract other uninsured farmers. Furthermore, the bond between the farmers and insurance company should be much strong.

- D. In the study area Crop insurance program alone cannot resolve problems of poor household farmers income and poverty ,it is feasible if and only if first priority is given for essential agricultural service like extension services, timely availability and accessibility of correct agricultural inputs , timely access of seeds, fertilizers, demanding farmer training and often credit with which to buy these inputs and efficient and strong marketing channels for agricultural outputs are in set . Only then famers will have the ability to pay for the crop insurance. Small holder poor farmers usually expend most of their income on production inputs.
- E. Developing sustainable crop insurance program will not be easy yet; insurance companies who are insuring this risk needs highly technical, operational expertise and financial strength as crop insurance service is multifaceted class of business.
- F. It can expose insurers to major losses because of the nature of most agricultural production risks. Other local insurers especially the one owned by government due to capital potential should involve in the sector and play role in development. It can subsidize private insurers to insure at lowest cost and/ or it can be subsidizing the reinsurance cost.
- G. To encourage participation of farmers on insurance service credit facility has to be made available as farmers may not have cash income to pay to the insurer. Usually when crop insurance is linked with credit it is just insuring the loan, this will give guarantee to financial institution to finance the sector which could avoid default of farmers at time of crop disaster and also access to credit promote climate adaptation crop production methods.

- H. Since there is limited awareness of farmers regarding the service, different responsible bodies have to intensively raise knowledge and advantage of becoming client of the service as it can boost the national crop production.
- I. In collaboration with concerned body, insurers should give attention to the development of sustainable and affordable crop insurance aiming at farmers actual risk exposures for such many traditional small holding farming practice by establishing strong legal and regulatory frame work in the long run that attract small holder farmers.
- J. The supervisory authority of financial institutions in the country should allow microfinance institutions to act as insurance and eventually to retain recurrent risks and frequent but more severe losses to be transferred to local insurance companies.
- K. As policy recommendation in this research , crop insurance is perceived as a means by which farmers are helped increase their income and support to minimize poverty trap. However, public intervention is necessary for viability of the service in our country, policy makers should carefully need to take action by observing the economic implications of government subsidized crop insurance programs in other countries and establish Public and Private Partnership Crop Insurance Fund Office at a national level.

The major role of the proposed mutual crop insurance fund is expected to deal with;

- Helping domestic insurance companies pool their risks into more diversified and better-structured portfolios providing farmers with affordable and effective crop insurance scheme which is sustainable in the long run.
- Since cost of re-insurance is too expensive or not available, the fund can act as local reinsurer by pooling capital from all crop insurers, because there is no reinsurer in our country and if available the capacity to cover large liability risk is uncertain.
- The funds subsidize the administration cost, training of expertise in insurance industry or Subsidizing insurance premiums. Where usually premium subsidies will apply to specific small holder farmers to promote crop insurance.
- The proposed fund office may focus on establishing regulatory framework, and capacity building, or assist insurance industry in establishing policy terms and conditions, and establishing loss assessment guidelines in collaboration with voluntary donors.

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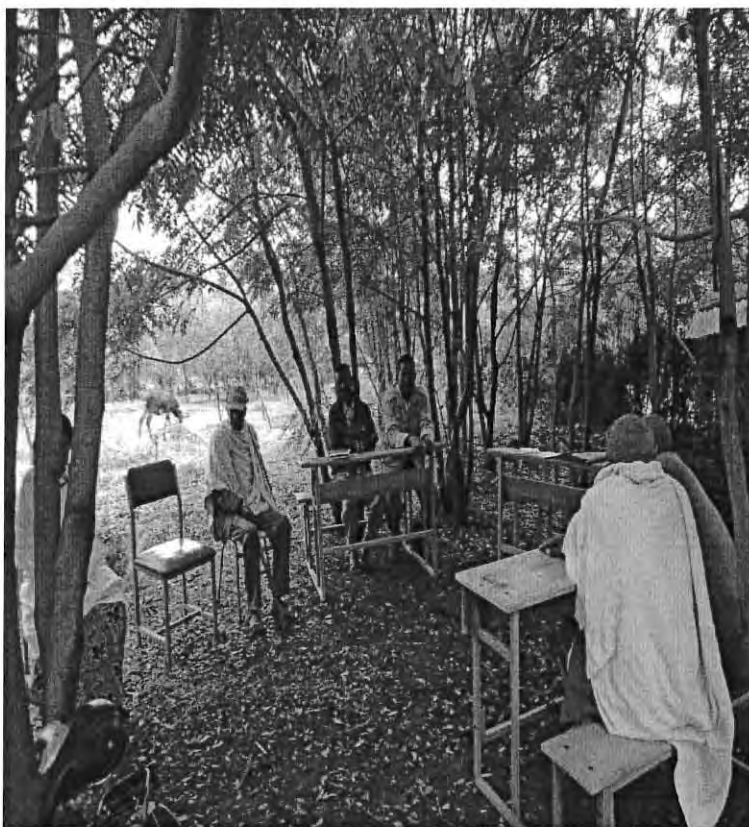
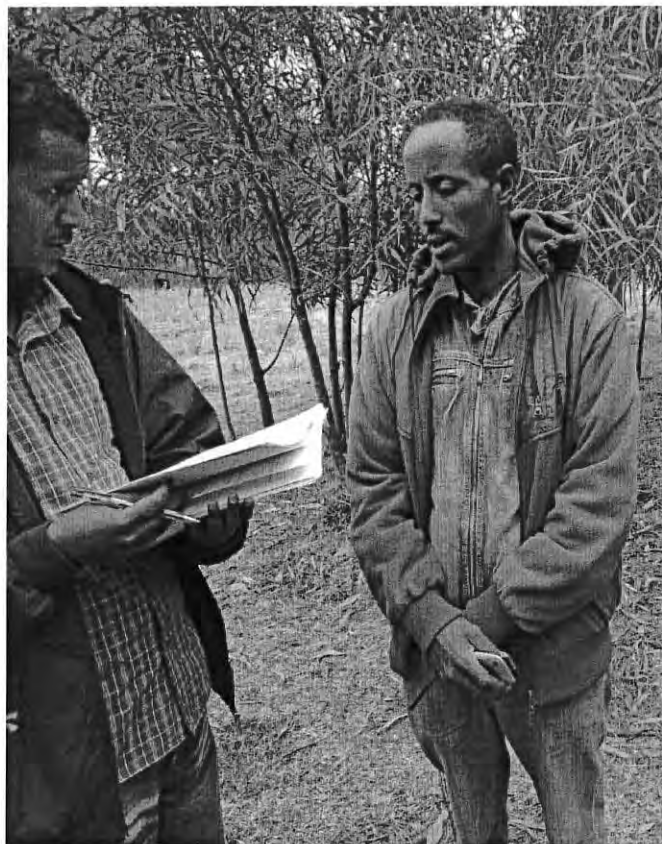
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Annex 1: VIF of logistic regression

Appendix Table1 VIF.

Variable	VIF	1/VIF
Do_know_cr~e	1.63	0.614583
Educational	1.59	0.628611
Age	1.49	0.669695
Cultivated	1.39	0.718455
Faced_crop~e	1.30	0.769490
Depend_ratio	1.28	0.783438
Initial Bid	1.27	0.789543
Do_you_hav~c	1.22	0.817017
Sex	1.20	0.836711
Awareness	1.17	0.854319
ln_wealth	1.09	0.917976
Probability	1.06	0.942916

Annex 2: Photo of FGD and KII



Annex 3: Household survey questionnaire

Title: Smallholder Farmers' Willingness to Pay for Crop Insurance: The Case of Dugda Wereda, East Shewa zone of Oromia National Regional State, Ethiopia

Note for enumerator: *Introduce yourself and explain the purpose of the household survey. State that the survey is being done for academic purpose as part of M.A thesis to understand the smallholder farmers' willingness to pay for crop insurance and insurance companies' willingness to provide insurance coverage for climate change risk. Explain that none of name of the respondent will be put in the data base and none of the information from the respondent is used for other purposes beyond the objective of this study.*

I. General information about the Respondent

1. Name of *Kebele*: _____
2. Name of Village (Community) _____
3. Respondent name or code : _____
4. Date: _____
5. Name of the enumerator: _____

II. Background of the Respondent

1. Sex of the respondent (*respondent must be households head*)? 1=Male 2= Female
2. Age of the households head? _____ (in years)
3. Education level of the household head : _____ (0 if illiterate, 1 if educated)
4. Marital status of the household head: 1= Married 2= Unmarried
3=Divorced 4= Widowed
5. Religion of household head: 1= Orthodox 2= Muslim 3= Protestant
4=Catholic 5= Wakefeta 6= others (specify) _____
6. To which ethnic group do you belong? 1. Oromo 2. Guraghe 3. Amhara
4. Tigri 5.Others (Specify) _____

7. Main Occupation of **household head**? 1=Farming 2=livestock rearing
 3= Mixed farming 4=Daily labor
 5= Contract employed in private or in gov't institutions
 6= Petty trade 7=Others, Specify_____

8. Main Occupation of **spouse** (if applicable)? 1=Farming 2=livestock rearing
 3= Mixed farming 4=Daily labor
 5= Employed in private or in gov't institutions
 6= Petty trade 7=Others, Specify_____

9. Family size of a household: Male ____; Female ____; Total ____ (in numbers, including household head)

10. Please fill the composition of the family Characteristics:

Ser No	Sex (Code A)	Age in years	Educational level (Code B)	Relationship in the HH (Code C)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Code A: 1= Female, 2=Male

Code B: Write 00 = illiterate, 01= reading and writing (acquired by informal education), *for formal education write in grades coded as* 1= Grade 1 2= Grade 2 3= Grade 3 4= Grade 4 5= Grade 5 6= Grade 6 7= Grade 7 8= Grade 8 9= Grade 9 10. Grade 10 11. 10+1 12= 10 +2 13= Diploma (10 +3) 14= First Degree 15= Greater than Degree

Code C: Write 1=for husband 2= for wife 3=for son 4= for daughter 5= for other (specifying the r/ship)

III. Asset holding of household

1. What type of house do you live in? 1=local hut (thatch grass roof) 2= Iron corrugate roof
2. Whether a household has land? 1=Yes 2= No
3. If your answer is yes, land use and use right types (in 2010/11)?

Item	Ownership	Rain fed Area size		Irrigated Area	
		in kert	In hectare	In kert	(in ha) ^{####}
1. Cultivated land	Owned				
	Rented-in				
	Shared-in				
	Rented-out				
	Shared-out				
Grazing land					
Forest land					
Homestead land					
Others (specify) _____					
Total					

^{####}: Note that in this column you write area irrigated from cultivated, if none then write 0.

4. Fill the following table for crop production (for the Year 2010/11)

(A) Type of crop	Land size Cultivated		(D) Amount produced (In Kg)	(E) Price per kg	(F) Amount sold (Kg)	(G) Income in 2010/11 (G=D x F)
	(B) in kert	(C) In hectare				
<i>Teff</i>						
Barley						
Wheat						
Sorghum						
Maize						
Bean(<i>Bakela</i>)						
Field pea (<i>Ater</i>)						
Haricot beans (<i>boloke</i>)						
Chickpeas (<i>shenbera</i>)						
Lentils (<i>Misir</i>)						
Niger seed (<i>nug</i>)						
Linseed (<i>telba</i>)						
other pulses						
Potato (<i>dinich</i>)						
Onions (<i>shenkurt</i>)						
Other root crops						
Cabbage (<i>gomen</i>)						
Tomatoes (<i>timatim</i>)						
Green peppers (<i>Karia</i>)						
Red peppers (<i>berbere</i>)						
Others specify _____						

5. Do you have livestock? 1=Yes

2= No

6. If Yes, list the livestock holding:

(A) Type	(B) Number owned now	(C) No. sold in 2010/11	(D) Market price per Unit	(E) Income in 2010/11 (E=C x D)
1. Oxen				
2. Cows				
3. Heifers (<i>gider</i>)				
4. Young bulls (<i>weyfen</i>)				
5. Calves				
6. Sheep (adult)				
7. Goats (adult)				
8. Camel (Adult)				
9. Donkeys (adult)				
10. Horses (adult)				
11. Mules (adult)				
12. Chicken (adult)				
13. Others (Specify) _____				

7. Income from livestock products

Items	Unit of measurement	Quantity sold	Price per unit	Income in 2010/11
Milk	Liter			
Butter	Kilogram			
Egg	Number			
List other()				

8. Income sources other than crop and livestock in 2010/11 (in the last 12 months)

S/N	Income source categories	Annual income obtained in Birr
1.	Honey Production	
2.	Off-farm activities	
	a) Wage	
	b) Business (Trade)	
	c) Employee (contract/ permanent)	
	d) Other (specify) _____	
3.	Remittance/ aid	
4.	Others (specify)	

9. Other assets

Whether a household has?	Responses
Radio	1=Yes 2=No
Cassette/ CD player	1=Yes 2=No
TV	1=Yes 2=No
Watch, clock	1=Yes 2=No
Electricity	1=Yes 2=No
Telephone (fixed or mobile phone)	1=Yes 2=No
Internet service	1=Yes 2=No
Satellite Dish	1=Yes 2=No

IV. Crop production risks

1. Have you faced crop failure in the last five years? 1=Yes 2= No
2. If yes, how do you rate its severity?
1=Very high 2= High 3= Moderate 4= Low 5=Very Low
3. What is the frequency of the crop failure in your area?
1= Once every year 2= Once in two years 3= Once in three years
4= Once in four years 5= Once in five years 6=Once in more than 5 years
7= the probability is unpredictable 8= I have not faced yet
4. Do you think that there will be probability of drought/other crop disaster occurrence once a year that endangers your crop production? 1= Yes 2= No 3= I cannot say anything

5. What is the adaptive strategy you use for crop failure risk? (*multiple answer is possible*)

1=Irrigation

2= Change planting and harvesting time

3= using improved crop variety

4=production contracting/reduction

5= acquiring crop and revenue insurance

6= to minimizing risk I reduce production costs

7= we have no adaptation

8= If any other adaptation strategies (specify) _____

6. What are the common causes of the crop failure in your area? (*multiple answer is possible*)

1= Rain fall on-set and off-set irregularities

2= shortage or insufficient rain /draught

3=Flood disaster

4= Infestation of pests

5= Infestation of weeds

6= Outbreak of disease

7= Extreme temperature (e.g cold/*Wirchl*/)

8=Others (specify) _____

V. Demand for crop insurance

1. Do you know what insurance is? 1= Yes 2= No

2. If question 1 is yes, how did you get information about it? 1= Radio/TV 2= Extension agent

3= neighbor 4= others (specify) _____

3. Do you know the idea of crop insurance? 1= Yes 2= No

4. If question 3 is yes, how did you get information about it? 1= Radio/TV 2= Extension agent

3= neighbor

4= others (specify) _____

5. Are you aware of any institutions providing crop insurance in your area?

1= Yes 2= No

6. If yes, what is the name of the organization/s providing the crop insurance? _____

7. Have you ever accessed crop insurance service? 1= Yes 2= No

8. If yes, how did you decide to be a client of insurance company?

1= There is frequency of drought

2= There are events of excessive/erratic rainfall

3= Prevalence of crop disease

4= There is high probability damage by animals

5= other reasons, specify _____

9. Have you faced crop disaster since you became client of insurance company?

1= Yes

2=No

10. If your answer is yes to Q. 9, have you been paid compensation for the damage?

1= Yes

2=No

11. If Q.10 is yes, what was the premium you paid _____ (in birr) and what was the amount of compensation you received for the loss _____ (in birr)?

12. Do you have access to crop insurance, in case you in need of the service?

1= Yes

2=No

Now, let me describe the type of insurance that is currently to be implemented in this area as pilot project. The crop insurance works like this: you are required to pay a given amount of money called premium to get your crop insured against crop losses (production risk) caused by disasters like drought, flood, frost, fire, and damage by wild animals and the like. To get the service, you need to sign an agreement with the insurance company up on which you pay a premium amount depending on the amount of expected yield you want to safeguard and the extent of which you would like to transfer risk to the insuring company. In case you face a yield loss the insurer will pay (compensate) you sum of money you have lost due to insured peril that is covered disaster. But the amount you will be compensated will depend on the extent to which you like to transfer risk to the insurer. The crop insurance will pay at the time of loss if and only if you pay some amount of money called premium. There are three plans or option available for you to participate in the plan. Having this in mind please answer the following questions:

13. So are you willing to pay the premium for the implementation of the crop insurance scheme or pay for the insurance coverage?

1=Yes

2=No

3= I cannot decide it now

14. You say **no** to Q.7 what is your justification?

1=I have no saving to do so 2=I do not have trust on the service

3=my crop land is small

4=there is less probability of crop damage 5= others (specify) _____

15. **Plan1:** in this plan there is 100% cover of loss (compensation) you have to pay 6,000 birr as crop insurance premium on average per hectare for insurance covered crop are you willing to pay? 1= Yes
2= No

A. if answer for Q 15 in no, are you willing to pay 3,000 birr? 1= Yes 2= No

B. if answer for Q 15 in yes, are you willing to pay 7,500 birr. 1= Yes 2= No

C. then how much are you willing to pay for this 100 % coverage _____ birr.

18. Let's assume there is an insurance scheme in which you pay as crop insurance premium in kind such that you give, for instance, a quintal of maize this year at the time of production to buy crop insurance for the next production year. Do you prefer this approach than the cash payment approach for respective crop production year? 1=Yes 2= No

19. Assume, you have got access to crop insurance, what changes do you think you will make to your crop production system?

a. Area of cultivation 1= Increase 2=Same 3= Decrease

b. Use of fertilizers 1= Increase 2= Same 3= Decrease

c. Use of high yield seeds 1= Increase 2= Same 3= Decrease

d. Use of pesticides 1= Increase 2= Same 3=Decrease

e. Use of modern agricultural production technologies 1=Increase 2= Same 3= Decrease

f. Diversification of crop production 1= Improve 2= Same 3= reduce

g. Amount of loan received for improved crop production 1. Improve 2. Same 3. Reduce

VI. Savings and Access to credit

1. Does your HH have cash saving from your income? 1=yes 2.=no
2. If yes, how much do you save during the last 12 months? 1. _____ (birr) 2. Not willing to tell
3. Are you using any of the following system of income saving?
 - 1=Keep at home 2=Traditional saving system (*Iqube*)
 - 3= Rural saving and credit association
 - 4=In Commercial or cooperative banks
 - 5= kind (purchase of any asset, animal etc)
 - 6=other, specify _____
4. Do you have access to credit? 1= Yes 2=No
5. If yes, what is your main source of the credit?
 - 1=Relatives or neighbor 2=Rural saving and credit association
 - 3=Cooperatives (Unions) 4=Traditional lenders 5= NGOs
 - 6=Commercial bank/development bank
 - 7=Micro finance institutions 8=others _____

VIII. Access to Agricultural Extension Service

1. Do you get service from agricultural extension workers on crop production matters?
 - 1=Yes 2=No
2. Have they ever oriented you on options of crop failure mitigation strategies?
 - 1= Yes 2= No

FGD Checklist

Focus on insurance and crop failure and related issues only

1. What are the risks/shocks associated with the livelihood activities (drought, flood, disease...etc)in your locality?: state the risks for each of the activities
2. How do you rank the rate the impact of the following causing crop loss?

Causes of crop loss	Level of risk (1= <i>very low</i> ; 2= <i>low</i> ; 3= <i>medium</i> ; 4= <i>high</i> ; 5= <i>very high</i>)
1. Rain fall on-set and off-set irregularities	
2. shortage or insufficient rain or drought	
3. drought disaster	
4. Flood disaster	
5. Infestation of pest	
6. Infestation of weed	
7. Outbreak of diseases	
8. Wild animals attack	
9. Extreme temperature (e.g cold/ <i>Wirch</i> /)	
10. Wild fire	
11. Theft/stealing	
12. Others (Specify)_____	

3. What are risk mitigating strategies you use?
4. What are risk coping strategies you use?
5. Do you have idea of insurance? Do you also know about crop insurance in particular? (If yes, state what they say but if no explain to them about the matter)
6. Is there crop insurance service in your locality?
7. If there is the service can you tell us how it works?

8. Does the community have trust on the insurance service?
9. Do you think that people are willing to pay certain amount of money for insurance companies to safeguard their crop failure? If yes, what initiates them to do so? If no, what is their rationale?
10. What determines farmers' willingness to pay for crop insurance service in your locality?
11. What kind of crop insurance service do the farmers need?
12. What challenges do people face in accessing crop insurance service?
13. What solutions do you propose for effective crop insurance policy implementation?

Key Informant Interview Checklist for District level

1. What are the basic livelihood activities in your locality (farming, livestock rearing...etc)?
2. What are the risks/shocks associated with the livelihood activities (drought, flood, disease...etc)in your locality?: state the risks for each of the activities
3. What are risk mitigating strategies do the community use?
4. What are risk coping strategies do the community use?
5. What is the role of your organization in helping farmers cope up with risks?
6. Do you know that there are insurance companies that provide insurance service for crop failures?
7. What determines farmers' willingness to pay for crop insurance service in your locality?
8. Have you ever initiated farmers to buy crop insurance?
9. How do you perceive farmers willingness to pay for insurance service?
10. What problems do you think will make farmers unable or unwilling to buy crop insurance coverage?
11. What solutions do you propose for effective crop insurance service implementation in your area?

Checklist for Insurance Companies

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1. Does your company provide agriculture related insurance services? For which agricultural activity (crop production, livestock rearing, bee keeping, forestry etc) there are insurance services?
2. What are the various risks associated with crop production?
3. Do you provide crop insurance service? When did you start the service?
4. If you provide crop insurance service can you tell us how it works?
5. Which of the crop loss risk factors your company covers?
6. Is crop insurance feasible insurance operation?
7. Is your organization interested in expanding the service to large number of farmers and various kinds of crops? If so, what is your plan in this regard?
8. How do you perceive farmers willingness to pay for crop insurance?
9. What determines farmers' willingness to pay for crop insurance service?
10. What factors do you think constrains farmers from buying crop insurance service?
11. What challenges are you facing in providing crop insurance service to the farmers?
12. What do you propose for effective insurance policy implementation in crop insurance?