St. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

INSTITUTE OF AGRICULTURAL AND DEVELOPMENT STUDIES

FARMERS' WILLINGNESS TO JOIN AND PAY FOR WEATHER INDEX BASED CROP MICROINSURANCE: THE CASE OF SHASHEMENE DISTRICT FARMERS

BY

TAMRAT WOLDEGIORGIS

JULY 2014

ADDIS ABABA

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DECLARATION

I, the undersigned, declare that this Thesis is my original work; prepared under the guidance of …..……..……... All the sources of materials used for this thesis have been dully acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

_____ _____

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ENDORSEMENT

This thesis has been submitted to Saint Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

_____ _____

Advisor Signature and Date

DEDICATION

To my God, Jesus Christ, The Lord, Who Has helped me reach here.

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I am indebted to many that I cannot list of all of you here. Please know that, I will live to cherish the memory of your kindness.

To my dearest wife, Eyaya and all my family, your investment in my life has been invaluable and encouragement to achieve this level is inimitable.

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ACRONYMS

CSA	Central Statistics Authority of Ethiopia
CVM	Contingent Valuation Method
DBDC	Double Bounded Dichotomous Choice
FAO	Food and Agricultural Organization
MoARD	Federal Democratic Republic of Ethiopia Ministry of Agriculture
HARITA	Horn of Africa Risk Transfer for Adaptation International
IRI	International Research Institute for Climate and Society
MFI	Microfinance Institution
OLS	Ordinary Least Squares
SHG	Self Help Group
WB	World Bank
WIBCMI	Weather Index Based Crop Microinsurance
WTJ	Willingness to Join
WTP	Willingness to pay

ABSTRACT

Ethiopia is one of the African countries frequently exposed to extreme drought causing severe crop failure and economic losses. Nonetheless, it is dominated by imperfect risk pooling mechanisms and self-insurance strategies which is costly to households. Very recently, some international NGOs in collaboration with financial institutions have initiated the product-Weather Index based Crop Insurance. However, the uptake rate is found to be very minimal and even some are terminated after pilot period. Similarly, commercial viability of the product is not yet driving the supply that is pioneered by some Insurance companies in the country. Study made on the demand side is seen scarce. This study deals with determinants of Willingness to Join (WTJ) and maximum Willingness to Pay (WTP) for Weather index based crop microinsurance. The study is conducted in Shashemene District, located in the rift valley. A sample of 150 sample smallholder Farmers engaged on maize production were selected and applied Double Bounded Dichotomous Choice Contingent Valuation Method to collect primary data. Heckman's two-stage econometric estimation procedure is employed to identify the determinants. The findings of the study indicate that some 11 percent of the sample households prefer either to stay away from participating in microinsurance scheme or pay lesser amount of premium, while others (8 percent) do not want to pay as they understand that the service should be given by government or donors; and the mean WTP is below the current actuarial premium. Farmers are WTP, on average, 12.9 percent. Age, education and marriage status of household's head, product literacy, trust in management of microinsurance program, being member of SHG/MFIs, using leased land for farming and initial bid are found to be significant in influencing both households' decision making to choose the service and on determining maximum WTP. The findings of the study imply that the need for government and stakeholders' effort towards farmers' awareness and product literacy so that the current uptake rate improves. It also implies that policy on farm land leasing might have an important role on the product adoption rate.

Key Words: Weather Index Based Crop Microinsurance, Contingent valuation method

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Livelihood of rural poor people in some developing countries is so fragile that a small misfortune can destabilize those for a long term (Ruth et al, 2011). Weather related natural calamities advent by climate change is one of the causes of such misfortune. Frequency and magnitude of these weather related calamities have increased in recent years; and it disproportionately affect rural poor (Chantarat S., 2009) in the form of cyclone, drought, earthquake, torrential rainfall, flood, or in the form of extreme changes in temperature. All these perils (shocks) seriously affect agricultural production. These sorts of natural hazards increase vulnerability and exacerbate poverty level of rural farmers working in environmentally vulnerable developing countries

The majority of rural poor households in developing countries who depend on traditional rain-fed agricultural economies, variations in weather conditions put them into substantial risks (Molini et al, 2008). The main risk for them is crop failure due to unexpected variation in weather in the form of changes in rainfall pattern, prolonged drought or devastating flood, salinity intrusion from sea level rise, frequent cyclone, temperature increase and irregular monsoon. Climate change in recent years alters and causes all these augmenting irregularities and yield variations in agricultural production. There is no mechanism in place in many low income countries to protect their large losses from extreme weather events and so their income and economic activities are likely to be worsened (Angove and Tande, 2011). With few assets in the hands of these poor households, the high uninsured risk exposure caused by unexpected weather events trap them into chronic poverty (Barnett et al, 2008) when they do not have other external financial support.

Traditional risk management mechanisms like conventional micro-insurance, crop insurance, and other formal methods such as savings, loans, or informal measures like donations, gifts, mutual insurance networks with neighbors, and safety nets are less effective in covering farmers' losses (Park, 2006; Santos et al, 2011; Clarke et al, 2012b). The distinctive and

covariant weather shocks can hardly be insured and managed by rural poor using any of these mechanisms (Clarke et al, 2012a, 2012b).

Weather index based crop insurance is now using as an important risk management tool to overcome vulnerability of rural farmers caused by above mentioned disasters in low income countries. Weather index based crop insurance contract is a contingent claim contract for which payment is based on specific objective weather parameter that is closely correlated with farm level yields or revenue outcomes (Barnett et al, 2008). It protects farmers against crop losses as the index or threshold is highly correlated with crop yields Some of the weather indices used in agriculture insurance are cumulative rainfall index, cumulative temperature or soil moisture index, livestock mortality index, satellite imagery index, and droughts index (Deng et al, 2007; Barnett et al, 2008).

Weather index based crop insurance is a new product in developing countries that address the failure of traditional crop insurance due to the problem of adverse selection and moral hazard, cost of administration, monitoring, determination of indemnity, and standardization (Jim et al, 2008; Lisha Z., 2008). Crop insurance has an important social-economic spin-off (IFAD, WFP, 2011). It prevents farmers from falling into the "poverty trap", that occurs if after crop failure they have to sell their productive assets and lose their capability of gaining an income through farming- as an alternative method of funding disaster recovery assistance or relief programs. On the other hand, having insurance may allow them to obtain credit and to invest in the intensification of agricultural production by improving farmers' input utilization.

While Weather index based crop insurance promise to offer a financially sustainable mechanism to reduce the risk faced by agricultural households, by and large farmers have been reluctant to hedge substantial amounts of risk with these instruments (Munich Re Foundation and the Microinsurance Network, 2011). Whether this is due to lack of demand, or barriers to demand linked to liquidity, financial literacy or lack of trust is unclear. It is, therefore, of central importance to understand the determinants of demand for these products, and quantify their ability to affect household's economic decisions and improve well-being.

1.2. Statement of the Problem

Ethiopia is one of the African countries frequently exposed to extreme drought causing severe economic losses and crop failure (Melaku, 2013), due to the fact that agriculture is the main source of income for almost all rural households. As noted by Viste (2012) the years 1973, 1982, 1984, 1987, 1990, 1992 1999, 2002 and 2009 were the major drought years with more severity experienced in 1984 and 2002 which caused death for lots of lives.

Guush et al (2013) noted that, almost half of the rural population of the country was affected by drought from year 1999 to 2004. Consequently, the country is among the major emergency aid receiver in the years 1984 and 2002. Drought and famine are the major drivers of food aid flows to Ethiopia. Households respond with costly coping strategies, including selling productive assets or cutting consumption to minimal levels, limit themselves from using agricultural inputs those enhance productivity. Hence, the need to have effective risk management strategies and tools are an imperative agenda for both the Government and Non-Government Organizations.

Very recently, not longer than seven years, in Ethiopia, some international NGOs in collaboration with financial institutions have initiated and piloted the product-Weather Index Based Crop Insurance (WIBCMI). The take up rate is very minimal and even some are terminated after the pilot. For instance, a WIBCMI pilot at Alaba district, SNNPR, by WB and WFP with Ethiopian Insurance Corporation as intermediary in 2006 had proved hard to sell any rainfall insurance policies and eventually the pilot ceased (Mosley P., 2009). In Tigray region, insurance for '*Teff*' piloted at Adi Ha known as HARITA which was started in 2009 in collaboration with different stakeholders has depicted not significant expansion. Nyala Insurance Company with support from WFP has started the same in 2008 at Adama Zuria district for Haricot bean through existing cooperatives as intermediaries (Eyob, 2009).

On the other hand, commercial viability of the product is not yet driving the supply that is pioneered by Oromiya and Nyala Insurance companies. Theoretically, as poor individuals also display a relatively high level of risk aversion, the demand for microinsurance products is thus expected to be high (McIntosha C et al, 2013). However, practically, as found out by studies including assessment by a research team of BASIS I4 and IFPRI (Guush et al. 2013) sales of

weather index insurance were disappointing, apart from its encouraging trend in pilots with subsidies. The take up rate was between 25-37 percent where discount is offered while almost zero among those who received no discount. Similarly, Gine et al (2008) noted that, although the service is increasing in the recent years, voluntary uptake of such products has been rather limited. Moreover, there is no regulatory framework regarding weather index based microinsurance that the National Bank of Ethiopia is currently developing as a regulatory body of the sector (NBE, 2013).

Despite these realities, the reason for low uptake and limited expansion is not clear as there are no sufficient studies in the field. Particularly, as to the researcher's knowledge, there is no available study with the objective of assessing determinants of willingness to join and pay for Weather Index-based crop microinsurance among rift valley smallholder farmers of Ethiopia. Therefore, this study attempts to fill the gap through assessing the determinants in one of the rainfall scarce, rift valley district of the country-Shashemene District, Oromia Region, Ethiopia.

1.3. Basic Research Questions

The study seeks to answer the following research questions:

- What determines farmers' decision making to participate in weather index based crop microinsurance scheme?
- What are the major determinants influencing households' maximum willingness to pay for and, the extent of farmers' mean willingness to pay for weather index based crop microinsurance?

1.4. Significance of the Study

Determination of factors affecting demand to join and mean value that farmers are willing to pay for such schemes will have a particular importance for development practitioners as well as those engaged in emergency programs, while solving community problems in participatory approach. Moreover, as depicted above, the expansion and commercialization of the service in the country is yet unsatisfactory. Hence, the study uses an input to see what is missing in the current operation and believed to narrow the gap. Moreover, it has significant value to policy makers and regulators of the sector.

Additionally, as to the researcher's knowledge, this is the first work with such specific topic; and hence, it will have theoretical significance for academic and research institutions. Consequently, it encourages further research in the area where this research is limited due to resource- time and money.

1.5. Objective of the Study

The main objective of the study is to assess the willingness to join and pay for weather index based crop micro-insurance of rift valley farmers. More specifically,

- Find the determinants that influence rural farmers' WTJ to weather index based crop microinsurance scheme
- Find the determinants that influence smallholder farmers' maximum willingness to pay for weather index based crop microinsurance scheme
- Determine extent of farmers' mean WTP for weather index based crop microinsurance

1.6. Scope and Limitation of the Study

Geographically, this study is confined to one district of the rift valley region, Shashemene District, in Oromia region due to limited availability of resources; money and time. It is an area characterized by frequent drought occurrences. A sample size of 150 households is taken from two selected cluster kebeles using two-stage random sampling. Primary data is collected using schedule method through structured questionnaire. Additionally, although different crops are being produced in the area, only one crop, namely maize microinsurance is studied that may limit the generalization to farmers growing other crops.

1.7. Definition of Terms

1.7.1. Conceptual Definition

- The term 'Microinsurance' was first used within the ILO in Geneva in the mid-1990 and in some academic circles in the early 1990's. It is a mechanism to protect poor people against risks (accident, illness, death in the family, natural disaster, etc) in exchange for insurance premium payments tailored to their needs, income and level of risk (Microinsurance Innovation Facility, 2008)

1.7.2. Operational definitions

- Willingness to Join: respondents willing to purchase the insurance contract
- Willingness to Pay: amount that respondents are willing to pay for the insurance contract that they are willing to purchase.
- Weather Index-based Crop Microinsurance is a scheme which pays out when weather variables such as rainfall reach certain predetermined levels; and failure of crops confirmed (James, WFP, 2010). Instead of asking farmers to document actual crop losses, the program uses a weather index. This makes the claims process simpler and lowers premiums by easing the administrative burdens of traditional crop insurance. In this study, the microinsurance scheme for the designed hypothetical product is considered as operational meaning of Weather Index Based Crop Microinsurance.

1.8. Organization of the Research Report

This paper is divided in to five chapters. The first chapter is an introduction; while the second chapter focuses on reviewing related literatures. Chapter three describes the research design and methodology; while chapter four discusses results of the study. Chapter five presents the summary, conclusion and policy implications of the study.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1. Theoretical Framework

The readiness to pay for receiving a definite amount allows an insurer market to emerge. Various types of insurance products are considered, among which contracts insuring the subscriber against loss of harvest, also called Crop microinsurance based on weather index is one that recently received considerable attention (Ombeline, 2012).

Weather index based insurance can be used as a tool for disaster relief and for development. As a tool for disaster relief, it would protect people, their lives, health and assets against catastrophic losses, through faster, more cost-effective response to disaster (P.Hazell et al, 2010). As a tool for development; helps farmers protect their investment; can open doors for ways to increase income, like access to credit, modern farming inputs, etc.; and can be part of a wider strategy to help farmers escape poverty.

Lack of data while the products offered, often resulted in relatively high premiums, since additional loading were added to compensate for the uncertainties, and which further hindered demand (Matul, 2012). This has let the practitioners learn how to collect data on risk and build foundation for the development of more complex products such as crop insurance.

Previously many products were downscaled versions of traditional lines; and product evolution has embraced reengineering to respond to the realities of the low-income market. For instance, much of the past policies might have included a list of exclusions, whereas many insurers now recognize the benefits of minimizing them to simplify policies and reduce the work involved to smallholder context. Traditional crop insurance is one with such hindrance beyond the adverse selection and moral hazard due to asymmetric information between the insured and insurer. Index based crop insurance products have been introduced in recent years as the way to avoid some of the drawbacks of traditional insurance (Bryla E. and Syroka J., 2008; and Eyob, 2009). Because the risk would be based on index (e.g., level of rainfall), greatly reduces prospects of moral hazards and adverse selection, since the farmer cannot influence the index (Jim et al, 2008). It simply uses a measurable weather index, commonly,

rainfall and temperature that are strongly correlated to farmers' losses on a particular crop over a period of time. Because there is no need to perform farm-level loss adjustments, monitoring and administrative costs also reduce.

Unfortunately index insurance is not quite a panacea, because it introduces new challenges. One challenge is basis risk, which can be described as the mismatch between the amount received because the index has been triggered, and the amount actually lost by the client (Bryla E. and Syroka J., 2008). Improved data collection and product design may be able to minimize basis risk. However, this typically makes the product more complex and more difficult for the low-income market to understand.

Farther than the low level of demand, inadequacy of infrastructure to make weather indexes prohibited expansion of index insurance, particularly in developing countries like Ethiopia (Eyob, 2009). Index data collection process is: manual, slow and may be subject to errors. Additionally, as explained by Munich Re Foundation and the Microinsurance Network (2011), lack of microinsurance experts is another challenge facing the sector in setting appropriate pricing of risks and responding for claims.

Regardless of considerable advances in both academic and applied research over the past decades, many companies still make their decisions without professional understanding of the likely response of potential buyers. As a result of lacking adequate knowledge of the customer's willingness-to-pay (WTP) for their products and services, these companies fail to pursue pricing strategy that is customized to their marketing environment.

There are different ways to estimate WTP: by observing the prices that people pay for goods in various markets; observing individual's expenditures of money; time, labor, etc to obtain goods or by directly asking people what they are willing to pay.

WTP for a product may be defined, as the amount of money an individual or household is willing to pay to purchase a product given her/his income, risk preferences and other background characteristics. Contingent valuation method (CVM) is popularly applied as a method to estimate consumers' willingness to pay resulted from theoretical and empirical analysis (Rodriguez E. et al, 2007). It stimulates a market for a non-marketed good and obtains a value for that good, contingent on the hypothetical market described during the

survey. CVM is split into different stages; setting up a hypothetical market, obtaining bids, defining different price premiums called "starting points"; estimation of WTP, aggregating the data and carrying out validity check.

Most common and broadly used approaches to obtain information on WTP is double bounded dichotomous choice (DBDC) contingent valuation method which has the advantage of higher statistical efficiency over the single bounded model (Pythagore et al, 2012). As cited by Janani (2012) from Cooper and Hanemann (1995); and Yoo and Yang (2001), this method is also preferable in estimating maximum WTP from adding third or fourth follow up bids. Procedurally, an individual is offered the product at a starting price; and two sequences of bids are offered to the respondents. First the respondent is asked whether he or she would be willing to accept or reject an initial bid, thereafter, a second bid is offered. Depending on the respondents' answer to the first bid, the second bid could be moved downwards or upwards.

While DBDC contingent valuation method helps identify a more precise estimate of WTP, it also suffers from certain limitations that includes; strategic, hypothetical, starting point, interview and compliance and payment method biases. As discussed by Wedgwood A and Sansom K (2003), strategic bias is when respondents lower their bid assuming that state or others will pay. This could be minimized through thorough discussion with respondents. Hypothetical bias is when a respondent does not understand or believe in the options. Explaining the options, benefits and attributes of the product will help avoid the bias. Another one is starting point bias. It is when the starting price for bidding game influences final WTP; and can be eliminated by varying starting prices with sampling frame. Enumerators can influence responses of respondents. Hence, they have to follow a script in order to avoid the bias.

Let us focus on the next step to identify relevant literature on factors that affect WTP. It could be influenced by factors like wealth (y), risk aversion (γ), probability of facing risk (Π) socio-economic characteristics (X; age, gender, education, household size, etc) and other unobserved factors (ε).

Hence, one can generalize that WTP for microinsurance as:

$$WTP = \Phi(q1, q0, y, X, \Pi, \gamma, \varepsilon)$$

Where q1, q0 are the levels of utility associated with and without insurance, $\Phi(.)$ the maximum value individuals are willing to give up to avoid or minimize their exposure to a particular risk. Consequently, an individual will buy the insurance policy only if:

$$V(q1, y\text{-}WTP, X, \Pi, \gamma) \geq V(q0, y, X, \Pi, \gamma); \varepsilon$$

This is the individual's utility function with and without insurance.

A study on WTJ and WTP for health insurance in India by Mathiyazhagam (1998) (as cited in Janani 2012) shows that the probability of Willingness to join was greater than willingness to pay. Households may be willing to join microinsurance program as they see the value in the product but may not be willing to pay.

2.2.Empirical Literature Review

There is very limited empirical literature on willingness to join and willingness to pay for weather based index crop microinsurance. A study by Janani (2012) in India among 400 small and marginal turmeric farmers in Tamil Nadu has identified both the willingness to join and willingness to pay using CVM. The researcher found out that 78 percent of the samples express willingness to join the microinsurance scheme, whereas out of those not willing to join, 80 percent suggested that they would register for the policy if it were provided for free by the government. The researcher also revealed that different factors, including: age of the household head, risk attitude and being member of SHG/MFI were found to be significant; and have negative influence on the WTJ and WTP. While explanatory variables, like: product literacy, average land size, growing more than one crop and education level were found to have significant positive influence on the dependent variables. On the other hand, start bid had shown significant negative influence on WTJ while it had positive and significant influence on those households who decided to join the scheme.

Another survey in the Kilimanjaro and Ruvuma regions of Tanzania by Saris et al (2006) estimated the demand for weather based crop insurance in each regions using CVM. Also the survey indicated that households are affected by a variety of shocks, of which weather related ones were found to be very important.

According to the study result of Ombeline et al (2012) age was found to have no clear relation with customers' propensity to purchase index microinsurance. As cited in the same study, observation of Jehu-Appiah (2011) revealed higher probability among women headed households than men headed ones to buy index insurance product.

From the limited studies conducted in Ethiopia, like a study by Ruth, et al (2011), who examined adoption of weather index insurance based on learning from willingness to pay among a panel of households in rural Ethiopia is one. It found out that households with good networks and having access to savings and borrowing instruments, may have lower demand for insurance than those without access to these activities, if the cost of engaging in these activities is lower than the cost of purchasing insurance. The demand for weather index insurance will be increasing with the presence of these risk management activities where it is seen to complement existing mechanisms. It is also found out that, educated individuals are more likely to purchase insurance.

In another study on the demand for microinsurance in rural Ethiopia, Daniel C. and Gautam K. (2011) found out that, despite the substantial welfare benefits that could arise from improved agricultural risk management, voluntary purchase of microinsurance products has been much lower than anticipated. They also revealed that product literacy have positive and significant influence on the decision to purchase the product.

Given the above background, this paper explores two dependent variables: beforehand, farmers' willingness to join (WTJ) the scheme is identified considering it as dependent variable taking a value of 1 if the farmer is willing to pay and 0, otherwise. Consequently, the farmers' maximum willingness to pay (WTP) is considered as a dependent variable, taking continuous value measured in birr which is the second stage estimation, estimated following the first stage estimation. This is the equation that specifies the amount (intensity) of payment in Birr. Additionally, the households' mean WTP is calculated.

Using Ordinary Least Square (OLS) estimation may result in biased and inconsistent parameter estimates. Statistical bias can arise when individuals having special characteristics make choice belonging to one group or another (Maddala, 1983). Application of Heckman two-stage estimation procedure can resolve the problem. The procedure involves two

estimation procedures. The first step involves probit equation (a participation equation). The probit model attempts to capture the determinants of households decision to join in the weather index based microinsurance with the dependent variable equal to one if a household willing to join, and zero otherwise. This equation is also used to obtain inverse Mill's ratio (Lambda) which is added to the second stage that reflects the probability that population observations with specific characteristics would be selected into the observed sample. In the second stage of Heckman's analysis, the intensity of payment or amount the household is willing to pay is determined.

Table 1: Variables and their measurement

Variable	Code	Type of variable	HO		Measurement
			WTJ	WTP	
Willingness to Join to a Crop Microinsurance scheme	WTJ	Dummy			Dependent variable which takes 1 if the farmer is WTJ and 0 otherwise
Maximum Willingness to Pay to a Crop Microinsurance	MWTP	Continuous			Dependent variable measured in Birr
Starting Bid	SBID	Continuous		+	The initial bids offered to respondents measured in birr
Household Size	HHS	Discrete	+	+	Number of members in the HH.
Age of the household head	AGE	Continuous	-	-	Measured in years
Sex of the household head	SEX	Dummy	-	-	1 if male 0 otherwise
Planted Land Quintiles Base Category Land 1 Lowest Land Area in Hectare	LANDQ1	Dummy	-	-	1=Belongs to the quintile, 0= otherwise
Land 2	LANDQ2	Dummy	-	-	1=Belongs to the quintile, 0= otherwise
Land 3	LANDQ3	Dummy	+	+	1=Belongs to the quintile, 0= otherwise
Land 4	LANDQ4	Dummy	+	+	1=Belongs to the quintile, 0= otherwise
Land 5(highest)	LANDQ5	Dummy	+	+	1=Belongs to the quintile, 0= otherwise
Education level	EDU	Continuous	+	+	Level of Grade achieved
Growing More than One crop	GMOC	Dummy	-	-	1= Yes, 0=No
Effectiveness of Substitutes	ES	Dummy	-	-	1= if effective(if access to Credit and Saving Services), 0= otherwise
Trust in the Management of the Scheme	TMS	Dummy	+	+	1= if trusting, 0 = otherwise
Product literacy	PLT	Dummy	+	+	1= if literate , 0 = otherwise
SHG/MFI Member	SHG	Dummy	-	+	1= if Member, 0 = otherwise
Marriage	MARR	Dummy	+	+	1= if Married, 0 = otherwise
Planted Land Ownership	PLO	Dummy	+	+	1= if using Own plus Leased land, 0 = otherwise

Source: Variables identified by the researcher

Price of a product is significantly determined by the demand for the product than other factors (Samuel, et al, 2000). The demand consequently depends on factors like preferences, income, substitutes and others (Peterson et al, 2009). The following factors (Table 1 above) are taken in to account as determinants of willingness to join and willingness to pay, independent variables considered and their measurement is given.

The few empirical studies explained above indicate that the determinants of households decision making to participate and maximum amount the household willing to pay. However, some of the socio-economic factors show different effect under different studies based on the specific conditions of the study area.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1. Description of the Study Area

The study district- Shashemene Zuria is situated in Oromia region, West Arsi Zone, 245 Kms south of Addis Ababa (Appendix A). It is a district in the Great East African Rift valley, where drought is persistent (Abate, 2009). This has further been aggravating due to the recent climatic trends. Moreover, due to the sandy nature of the soil, consequence of flooding during heavy rainy season is significant in the area (MoARD, 2010). The district shares border with Lake Hawassa in south and Arsi Negele in the north.

With a total population of 246,774, the district has equal proportion of male and female (CSA, 2007). Slightly below half of the total population (46.3%) is within the age of 15-60 years, and more than half (50.3%) of them are with age less than 15 years. The district covers an area of 760 square kilometer with a density of 325 persons per square kilometer. It has 45,630 households in 36 kebeles. Ninety five percent of the population is rural; and agriculture is the main stay of the economy, rich in crop production (Mitiku et al, 2012), where cereals like, maize, teff and sorghum production is predominant. On average, thirty quintals of maize is produced per hectare of land by private peasant holdings in the area (CSA, 2005). The altitude of this district ranges from 1500 to 2300 meters above sea level. Average land holding and cultivated land size per household is 1.66 and 1.28 hectare, respectively (Bureau of Finance and Economic Development of Oromia, 2009).

Oromifa is the dominant language, while Islam is the dominant religion (86%) of the population followed by Protestant and Orthodox follower (6.3& and 6.0%, respectively) (CSA, 2007).

In the study area, there are MFIs, banks and insurance companies in the district providing financial services in addition to farmers' cooperatives.

3.2. Sampling Design

The district, Shashemene Zuria is selected purposively as it is one of the drought prone districts of the country found in the Great Rift Valley area. Sample households for the study

are selected using two-stage random sampling. Lower local administration-kebele, is considered as cluster and two- namely Alelu ilu and Bute Silicha kebeles are randomly selected at first stage. List of households who lived for more than five years in the area and engaged in maize production is used as sampling frame. Respondents residing for several years in the area had sufficient and more understanding of the drought effect than those new.

In the second stage sampling, 150 sample households from the two kebeles, are selected using systematic random sampling. The sample size is more than ten percent of the sampling frame.

3.3. Data Collection Method

Primary data is collected from the households employing structured schedule method. The schedule includes: an introductory section, the socio-economic characteristics of the respondents, the detailed description of the hypothetical product that was offered to the respondent, the institutional setting in which the product is provided, the manner in which the product is paid also described.

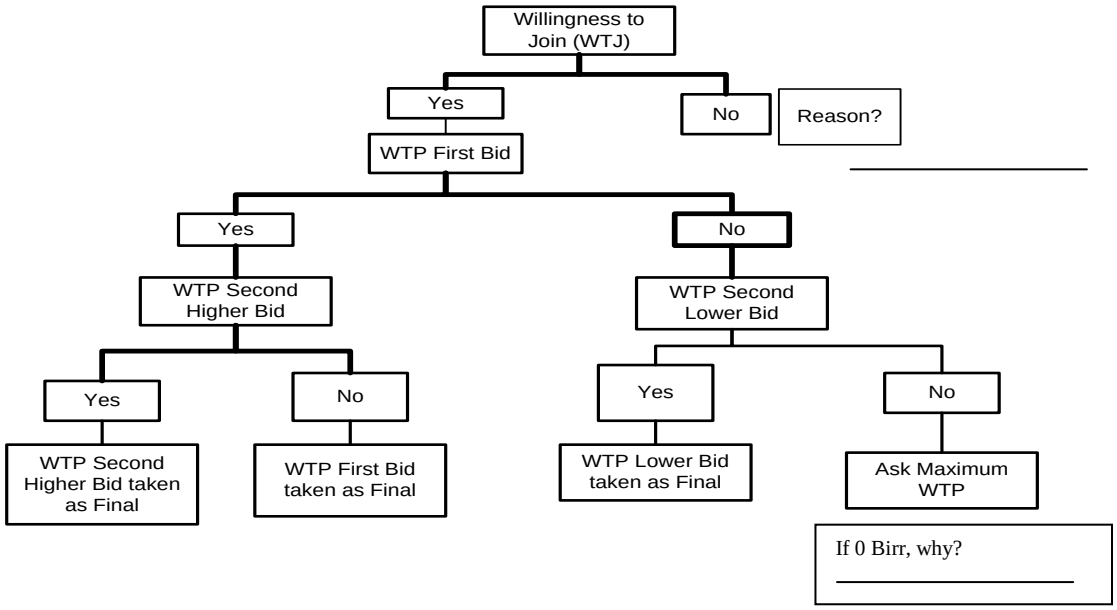
CVM is employed. That is, a Double-Bounded Dichotomous Choice (DBDC) elicitation method is used as this has the advantages of higher statistical efficiency than the single-bounded model (Pythagore H, et al., 2012). Questions related to WTJ and WTP are presented, and two enumerators who are able to communicate farmers with local language Oromifa are recruited to undertake the data collection. They are among those fully understand the local context and trained so that they can easily describe the product to the respondents. Pre-test of the schedule was conducted on 10 households and the initial bids were re-determined based on the pilot.

As the idea is to sell the concept of weather index based insurance rather than an actual product and the respondents may not have full understanding of the product, a hypothetical product is designed in a manner that it is simple and easy to understand.

Table 2: Hypothetical Product- Microinsurance for Maize

Cover: it covers short of rainfall[1] that results in confirmed failure of the Crop-maize in the specific area, and then a payment will be made to the farmer.
Payout: Birr 4,500 per half hectare of land insured[2][3].
The respondents are informed that the rainfall would be recorded in a weather station that is approximately in a radius of 20 km from the station and crop failure will be confirmed, when it happens
Starting bid: Birr 400, 500, 600, 700 and 800. The starting bid varied per 30 schedules (to avoid starting point's bias) and is distributed equally among the enumerators to ensure that each enumerator has schedule with each of the starting bid values.
The subsequent bids in the bidding game vary by birr 100.

Figure 1: Bidding Methodology



[1] For maximum production a medium maturity maize crop requires 500 to 800 mm of water depending on climate per its total growing period, that is 180 days, on average (FAO, 2013)

[2] Per CSA (2005), average yield of maize was 30 quintal per hectare. In the area, average price of maize at harvest is about birr 300.00.

[3] Drought insurance might be an attractive proposition in drought-prone agricultural areas. Studies in drought-prone areas have demonstrated that farmers are often willing to pay 12-20 percent (WFP, 2010). In Ethiopia, Nyala Insurance Company was providing crop micro insurance for Barley and Maize with premium rate of 19.96% which is same to birr 200 per half hectare (Nahu Senay, 2011). Furthermore, an insurance product offered to Adi Ha 'teff' growing farmers by Nyala insurance company with support from Oxfam America was charging premium rate of 24% (IRI, 2009). Additionally, recently, Oromia Insurance Company charges between 10-20 Percent depending on risk severity of the area, which is 20 percent in the study area, regardless of crop type which suggests premium rate of , on average, birr 600 for the payout of the hypothetical product.

3.4. Data Analysis

Both descriptive and econometric analyses are used to analyse the variables-dependent and independent variables.

3.4.1. Descriptive Analysis

The variables included in the study are described based on descriptive statistics. Their location, shape and spread are presented using the common measures of location, namely, mean, median and mode, measures of spread or dispersion- variance, standard deviation and range; and the common measures of shape- skewness.

3.4.2. Econometric Analysis

3.4.2.1. Model Specification

Most empirical studies utilized Maximum Likelihood method to analyse WTP with the framework of DBDC contingent valuation method. Dagnew et al (2010) employed the same to analyse households' WTP for improved solid waste management at Mekele city, Ethiopia; Janani A. (2012) employed the model to study WTP for index based crop microinsurance in India. Similarly, Bekabil and Anemut (2009) have used the Heckman's two-stage econometric estimation: at first stage Maximum Likelihood method and then Ordinary Least Squares (OLS) at the second stage to examine WTP and expected net losses of on parks with people conservation strategy. Pythagore et al (2011) constructed and employed likelihood function for the interval data model as this has exploits more information; and hence increase efficiency over the binary logit model. Although interval data with upper and lower bounds is collected, as the objective of the paper is to find the sample farmers' maximum WTP, the researcher is employed Heckman two-stage econometric estimation. In regressions, when the dependent variable to be modeled is limited in its range using OLS estimator results in biased, inconsistent parameter estimates and result in heteroskedasticity problem (Gujarati,2004). Assuming a linear functional form for WTJ equation (Gujarati, 2004), the WTJ can be defined as:

$$WTJ_i = ß'X_i + \varepsilon_i \qquad (1)$$

Where, ß is a vector of parameters; X_i denotes vector of exogenous characteristics; and ε_i is the random error term with mean zero and variance σ^2.

Two estimation stages are found in Heckman's estimation procedure: the first step involves or models probit equation (a participation equation) from which the selectivity term known as Inverse Mill's Ratio (Lambda) is constructed and is added to the second stage "outcome equation" that reflects the probability that population observations with specific characteristics would be selected into the observed sample (StataCorp. 2011). Significance of this ratio indicates the presence of selectivity bias, and presence of other unmeasured variables that determine the intensity of willingness to join for weather index based crop insurance scheme.

Maximum effort is put to include all the variables that could have an effect on the dependent variables. The decision to participate on weather index based crop insurance scheme is hypothesized to be affected by socio-economic and other factors. However, the household may self-select him/herself for the participation decision because of unobservable factors. Hence, in this case, the selection bias might arise. To overcome this problem, the Heckman two-stage estimation procedure is employed.

The Probit Model

Here, using Heckman's two-step technique, firstly estimated the probability of the WTJ decision of the households using a probit model as:

$$WTJ_i = \begin{cases} 1, \text{ if } WTJ_i^* > 0 \\ 0, \text{ if } WTJ_i^* \leq 0 \end{cases} \quad (2)$$

Where, $WTJ_i^* = ß'X_i + \varepsilon_i$ is a latent variable that is not observed.

Note that, in this study, WTP can only be observed if an individual is WTJ the microinsurance program. The Likelihood function is defined as follows:

$$L = \prod_{WTJi^*=-\infty}^{0} \Pr(WTJi^* \leq 0) \prod_{WTJi^*>0}^{\infty} {}_i \Pr(WTJi^*>0, Lb_i < WTP < Ub_i) \quad (3)$$

Ordinary Least Square Model (OLS)

This is the second stage where the estimated Lambda is included as an independent variable in the OLS estimates to examine the intensity of willingness to pay. Lambda, Inverse Mill's ratio, the selection control factor is derived from equation (3) and added to the second stage

estimation to see the effect of all the unmeasured characteristics which are related to the households' decision to join weather index based crop microinsurance.

This will help to correct for selectivity bias. The second stage estimation involves the use of OLS that is specified as follows. WTP conditional on WTJ:

$$[WTPi/WTJ_i^*>0] = \alpha_i X_i + \alpha_i \lambda_i(ß'X_i) + \varepsilon_i \quad (4)$$

It is the amount (intensity) of payment by the i^{th} household,

Xi is the socio-economic and institutional characteristics of the i^{th} household,

α_i represents parameters of the model, $\alpha_\lambda = \rho\sigma_\varepsilon$ and

Inverse Mill's ratio that is $\hat{\lambda}_i(\beta' X_i) = \dfrac{\phi(\beta' X_i)}{\Phi(\beta' X_i)}$,

$\phi(\ )$ & $\Phi(\ )$ represent the density and distribution functions for the standard normal variable, respectively; and ε_i & v_i bivariate normal $(0, 0, \rho, \sigma)$.

3.4.2.2. Definition and Hypothesis of Variables

Based on the theoretical base and objectives of the study, the following dependent and independent variables are defined and hypothesized:

i. Dependent Variables:

In this case, there are two dependent variables: one showing the participation decision to purchase the microinsurance service; and the other showing the intensity of the amount of willing to pay for the service. For the Microinsurance scheme, not only the willingness to join is important; but, also the amount that they are willing to pay for the service is essential. Therefore, once the farmer has the decision to join, the decision step is on the amount he or she is willing to pay. The two dependent variables are:

a. **Willingness to Join to a Crop Microinsurance Scheme (WTJ):** It is dummy and has dichotomous nature representing households' willingness to join. Therefore, it was represented in the model as Y_1=1 for the household that is willing to join;; and Y_1=0 for a household that do not want. This variable is used in the probit analysis of Heckman's two stage estimation procedure.

b. Maximum Willingness to Pay (MWTP): This is the second dependent variable in the Heckman's two-stage estimation procedure. It indicates maximum willingness to pay for a given level of services specified under the hypothetical model product, which measures the intensity of payment. It is a continuous variable.

ii. Explanatory Variables:

- **Starting bid (STRTBID):** Is the initial bids offered to respondents measured in birr (continuous). Though Dagnew et al (2010) found out that starting bid does not have significant impact on the amount of WTP, the finding of Janani (2012) indicates start bid has a positive impact on the amount a household is WTP. In this research it is assumed that the variable has a positive impact as long as the respondent is WTJ to the scheme.
- **Age (AGE)**: Is a continuous variable that refers to age of the household head. Although it is indicated as it does not seem to have clear relation with customers' propensity to purchase index microinsurance (Ombeline et al, 2012), the researcher assumes that the variable to have negative relationship since younger people are assumed to be more knowledgeable than older people of such recent innovation-crop microinsurance. Besides, it is assumed to have negative relation with WTP consistent to the finding obtained in the study of Janani (2012) depicting that, age has a significant impact and negatively relates with WTP.
- **Sex (SEX)**: Is a dummy variable representing the gender of the household head. It takes 1 for male and 0 otherwise. It is assumed that women headed households are more likely to buy the product than men headed households (Jehu-Appiah, 2011) as cited by Ombeline et al (2012)
- **Education level (EDU)**: This is a continuous variable, and expected to have a positive relationship with purchase of the product-microinsurance and amount households' willing to pay, since literate people are relatively familiar with recent innovations. This is in agreement with the findings of Ruth, et al (2011). Educated individuals were more likely to purchase insurance than uneducated ones.
- **Household size (HHS)**: This is a discrete variable representing the number of members in a household. Although not significant as founded by Janani (2012) by a

study conducted in India, it is included in this analysis to see its effect hypothesizing positive relation with both dependent variables.

- **Growing more than one crop (GMOC):** Farmers growing more than one crop type are not willing to join the scheme assuming that, they can diversify their risk on a crop. It is a dummy variable with negative and significant relation with WTJ.
- **Planted land size (PLS)**: This focuses on crop production and indicates the size of land the sample respondent has used to plant. Planted land size is divided in to five intervals taking the actual average land holding of the study area as median. It is found that in a study conducted in India (Janani, 2012), WTJ in the scheme is significantly high among farmers with medium planted land size than those with smaller or higher land size.
- **Effectiveness of substitutes /ES** (like access to borrowings and saving services and other sources of income). It is a dummy variable; and assumed to have significant and negative relationship with WTJ and WTP. However, P.Hazell et al (2010) noted that farmers willing to buy insurance may be greater when it is tied to credit.
- **Risk aversion or trust in the management of the scheme (TMS):** Lack of trust on the institution by some may lead to not to join in the scheme as they consider insurance as "risk"; and hence averse the risk. That is, the more risk averse an individual is, the less likely he or she is to join the scheme and less likely is to pay higher amount.
- **Awareness/understanding of insurance (Product Literacy) (PLT):** Product literacy increases the probability of the respondents' belongingness to the scheme; and the amount he/she is willing to pay may increase. A study on the demand for microinsurance in rural Ethiopia by Daniel C. and Gautam K. (2011) reveales that product literacy was found to have positive and significant influence on the decision to purchase the product.
- **SHG/MFI Member (SHG):** Being member of SHG/MFI decreases willingness to join in the scheme as people may choose to borrow from these institutions rather than invest in the scheme. They consider the being member of SHG/MFI as substitute for the scheme. It has a significant and negative relation with WTJ, as identified by Janani (2012). For the second dependent variable- MWTP, however, it is assumed have

positive and significant influence as long as ones the households have decided to join in the scheme.

- **Married (MARR):** Married people are risk averse than single ones; and hence, willingness to join is assumed to be high among married respondents and positively relates with WTP.
- **Planted Land Ownership (PLO):** There are farmers who use leased land to farm in addition to their own land (under his/her custody). It is assumed that such farmers are risk averse than those who do not go for leased land; and hence, WTJ the scheme and WTP is high among these farmers.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Findings of the Study

The study is conducted by taking 150 sample farmers as the representatives of the total population of the district. Data obtained covered socio-economic and demographic characteristics of households, including gender, age, marital status, educational level of household head, household size, product literacy, whether the respondent grow other crops, member of SHG/MFI, trust on institutions, hectare of land size he or she own, planted land size, whether it is only own or additional rented land. Additionally, respondents unwilling to join the scheme are inquired to share why they preferred; and similarly those willing to join but not willing to pay are also requested to share their judgment.

4.1.1. Household's Socio-Economic Characteristics

Table 3 below provides WTJ and WTP for the microinsurance scheme responses in relation to the socio-economic characteristics of the sample farmers. One-third of the respondents are households headed by females while the rest are male headed. Greater proportion (85 percent) of male respondents had positive WTP for the microinsurance scheme compared to female respondents (76 percent). Some 79 percent of the males and 62 percent of female respondents are aware of about the product or proxy product types, like vehicle insurance.

On average, females and males have 2.4 and 4.4 years of education, respectively. Mean education level, in number of years, for those responding WTP is 3.88; while of those not WTP is 1.9 implying education has direct and positive relation with willingness to pay for the product. About 26 percent of the total sample respondents and 22.7 percent of those respondents WTP are illiterate. Mean education level, in number of years, for the total sample respondents is 3.73.

When sample respondents were asked, whether they grow additional crop, all of them responded that they grow additional one or more crops, like *teff*, potato, etc. in addition to maize indicating diversified income sources. Fifty eight percent of the households have access to effective substitutes, like borrowings and savings and other income sources. Higher interest

to join in the scheme is observed for households having effective substitutes. Ninety three percent of the sample respondents who have access to effective substitutes are WTP against 67 percent of those who do not have effective substitute.

Table 3: WTJ and WTP versus Socio-Economic Characteristics of Sample Households

Socio-economic characteristics of Households			**Total**		**WTJ**			WTP			**Proportion of WTP/variable**
Variables				**Percentage**	**Yes**	**No**	**Percentage of Yes**	**Yes**	**No**	**Percentage of Yes**	
Gender	Male		100	67%	94	6	70%	85	9	69%	85%
	Female		50	33%	40	10	30%	38	2	31%	76%
	Total		**150**	**100%**	**134**	**16**	**100%**	123	11	100%	
Education	Zero year	Male	17	17%	16	1	17%	10	6	12%	
		Female	22	44%	18	4	45%	18	0	47%	
	>Zero years	Male	83	83%	78	5	83%	75	3	88%	
		Female	28	56%	22	6	55%	20	2	53%	
Marriage	Married		117	78%	105	12	78%	97	8	79%	83%
	Single		33	22%	29	4	22%	26	3	21%	79%
	Total		**150**	**100%**	**134**		**100%**	123	11	100%	
Effectiveness of Substitute	Yes		87	58%	82	5	61%	81	1	66%	93%
	No		63	42%	52	11	39%	42	10	34%	67%
	Total		**150**	**100%**	**134**		**100%**	123	11	100%	
Trust in management	Yes		91	61%	86	5	64%	86	0	70%	
	No		59	39%	48	11	36%	37	11	30%	
	Total		**150**	**100%**	**134**		**100%**	123	11	100%	
Product literacy	Yes		115	77%	110	5	82%	109	1	89%	
	No		35	23%	24	11	18%	14	10	11%	
	Total		**150**	**100%**	**134**		**100%**	123	11	100%	
Member of SHG/MFI	Yes		62	41%	60	2	45%	60	0	49%	
	No		88	59%	74	14	55%	63	11	51%	
	Total		150	**100%**	134	16	**100%**	123	11	100%	
Planted land Ownership	Own		128	85%	113	15	94%	102	11	100%	
	Own + Leased		22	15%	21	1	6%	21	0	0%	
	Total		150	**100%**	134	16	**100%**	123	11	**100%**	

Source: Computation from survey data of the study

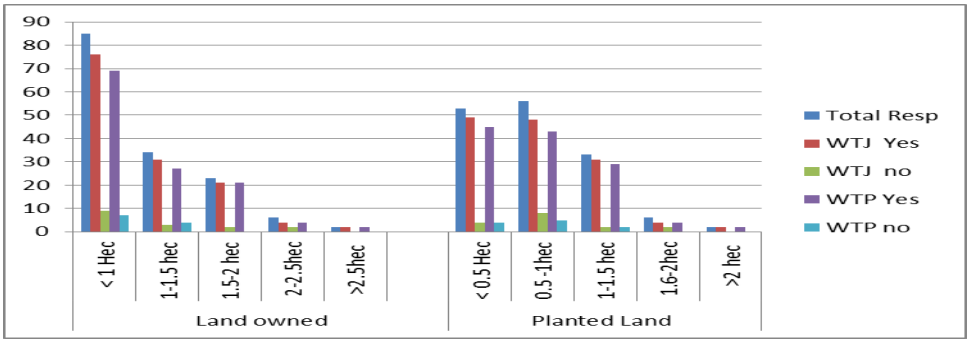
Married households have higher willingness to pay than singles. Eighty three percent of the married and 79 percent of the singles sample respondents are WTP. Close to two-third of the respondents trust institutions in providing financial services, like credit and savings. Part of them are members of either SHG or MFI; and others trust institutions based on evidence what they heard from their friends and neighbors. Some 95 percent of the sample respondents trusting institutions are WTP for the product. All the respondents who do not trust institutions

are not willing to purchase the product. About 77 percent of the respondents had knowledge about microinsurance correlating the product with how other insurance products, like property insurance for vehicle and others functions. Product literacy has significant influence on the WTP; about 95 percent of product literate households are WTP for the product.

Only less than half of the total respondents (41 percent) had the chance of being member of either SHG or MFI. These households have shown higher preference to pay for the service. Study area farmers have experience of using leased land for farming. Fifteen percent of the household use leased land for crop production in addition to their own land and; all of them are willing to pay for the service.

The other variable considered in the study was marriage status of the sample respondents. Some 78 percent of the respondents are married while the rest are either single, widowed or divorced onse. Married households have higher interest to join the scheme than single ones but, in reverse single households have slightly higher WTP for the scheme than married households. That is 93 percent for single while 90 percent for married households.

Figure 2: Land Owned and Planted Land Size Distribution of Households



Source: own computation from survey data of the study

Figure 2 depicts more than half of the respondents (57 percent) have land size of less than one hectare. The distribution is skewed to the right (positively) that almost none of the households (1 percent) have land size of greater than 2.5 hectare. Eighty percent of the sample respondents have land size less than the actual holding average for the region which is 1.6 hectare per household (Bureau of Finance and Economic Development of Oromia, 2009) showing scarcity of land in the study area compared to its regional state - Oromia. Similar pattern is observed for planted land size of households. About 35 percent of the sample

respondents have planted land size of less than half hectare; and the majority (72 percent) has less than the regional average (1.2 hectare).

4.1.2. Description of Some Continuous Socio-Economic Variables.

As indicated in Table 4 below, average age for the total respondents is 37.1 years with standard deviation of 12.7; and sample respondents who are WTJ have average age of 35.8 years, while for those who are not WTJ is 48.5 years. Age distribution is slightly skewed to the right with median of 35. Majority of the households (18 percent) are with age of 25 years.

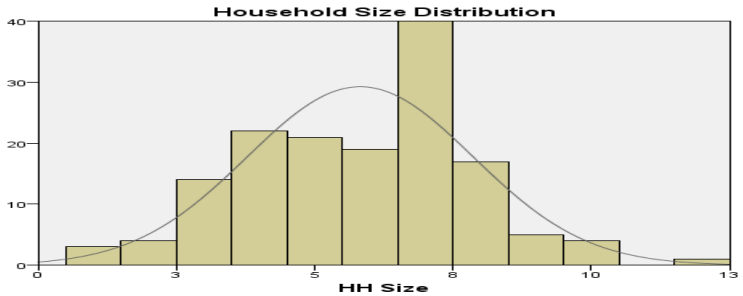
Table 4: Descriptive Statistics for Some Continues Socio-Economic Variables

Variables	Number of Observation	Minimum	Maximum	Mean	Std. Deviation
Age	150	20	76	37.14	12.66
Education	150	0	12	3.73	3.32
HHs	150	1	12	5.82	2.04
Start Bid	134	400	800	594.31	140.32
MWTP	134	0	900	578.06	256.22

Source: Own computation from survey data of the study

Another important variable of concern is the household size. As indicated under Table 4 above, the mean household size of the total sample respondents is 5.8 which is slightly higher than the district average (5.2) for rural households (CSA, 2007). Household size varies from one to twelve persons per household, distributed near normal with median of 6 and standard deviation of 2.04 (Figure 3). The majority of the sample respondents have on average household size of 7 people (27 percent).

Figure 3: Distribution of Household Size of the Sample Respondents



Source: Own computation from survey data of the study

There are households who rely on God to rescue their crop than joining in the scheme. About 11 percent of the total samples have such belief. Older people had more slanted towards this belief compared to younger individuals.

Start bid assigned to respondents ranges from birr 400 to 800 where a respondent has only one start bid. Table 4 above provides that the mean start bid for those respondents willing to join is 594.3 with standard deviation of 140.3. There are respondents who want to get the service but not willing to pay any amount of money for the service. Eleven respondents are under this set; some expect the service to be provided by the government or donor since they believe that providing the service to the community is the responsibility of the government or donors while others thought the payment as an additional burden to them on top of other payments like farming land use tax. Moreover, few of them, elderly respondents in particular, mentioned their retirement as a reason for their rejection as they are not able to shoulder such payments.

Near two-third (64 percent) of the households are willing to pay the amount of premium more than the start bid randomly assigned to them. Some 16 percent of the samples are willing to pay amount equal to the start bid they were asked for; and 19 percent of them are willing to pay less than the starting bid while 8 percent of them are not willing to pay any amount.

4.1.3. Econometric Model Results

This section presents regression results of most important determinants which have influence over the willingness to join and willingness to pay. Prior to the estimation of the model parameters, the problem of multicollinearity or association among the potential explanatory variables is tested. Variance inflation factor (VIF) was used to check the multicollinearity problem in continuous variables, and contingency coefficient (CC) was used for dummy variables. Two variables, namely: growing more than One Crop (GMOC) and base category land which is the lowest land area in hectare (LANDQ1) are omitted from the model due to collinearity. Out of this, based on the result of VIF, the data had no serious problem of multicollinearity. This is because, for all continuous explanatory variables, the values of VIF are by far less than 10; hence, these continuous explanatory variables are included in the model.

Likewise, CC was investigated to check association between the dummy variables. The result shows that there was no association problem since the respective coefficients were very low (that is, less than 0.75), showing only presence of weak degree of association among the variables.

Once the decision about the variables to be included in the model is made, the data is entered and analyses was carried out using STATA software to derive the parameter estimates of the Heckman's two stage econometric model.

4.1.3.1. First stage estimation-Probit Model Results

The Table 5 below provides the explanatory variables for the dependent variable household's willingness to join in weather index based crop microinsurance.

As shown in Table 5 below, fourteen explanatory variables are entered in the model for the first dependent variable (WTJ). Out of the total explanatory variables, only 9 variables of which 2 are continuous and 7 dummy variables are found to be significantly influencing households' decision to join weather index crop microinsurance scheme. Specifically, age, marriage and educational status of the household, effectiveness of substitutes, risk aversion or trust in the management of the scheme, awareness of insurance (product literacy), membership in SHG or MFIs, planted land ownership (whether the farmer used leased land) and fourth quintile of planted land size with size of 1.6 to 2 hectares are found to be statistically significant at 1 percent, 5 percent and 10 percent levels.

Age (AGE): It was hypothesized that age of a household would have negative relation with willingness to join. However, according to the econometric estimation results (see Table 5 below), this variable takes an unanticipated sign which is not consistent to the literature (Janani, 2012) and contrast the findings of Ombeline et al (2012). The variable was found to be significant at 1 percent and has a positive influence on the probability of the household's willingness to join the scheme. A marginal change in age from the average of 35.78 years is associated with 43.4 percent increase in household decision to join in the scheme, other variables being constant.

Table 5: Results of the Heckman's Two Stage Econometric Model-Probit Model Results

Variables	Coefficient	Std. Err.	z	Marginal Effect	x=Mean
SEX	0.024	0.036	0.660	-0.002	0.701
AGE	0.012***	0.002	6.450	0.434	35.78
MARR	0.159***	0.044	3.640	0.126	0.784
EDU	0.011*	0.006	1.820	0.026	3.738
HHS	0.014	0.011	1.310	0.088	5.813
ES	0.097***	0.036	2.740	0.055	0.612
TMS	0.165***	0.044	3.750	0.102	0.642
PLT	0.156**	0.073	2.130	0.172	0.821
SHG	-0.081**	0.032	-2.520	-0.034	0.448
PLO	0.092**	0.037	2.490	0.018	0.157
LANDQ2	0.042	0.051	0.820	0.022	0.358
LANDQ3	-0.013	0.042	-0.310	-0.001	0.231
LANDQ4	-0.181**	0.074	-2.440	-0.005	0.03
LANDQ5	-0.001	0.052	-0.020	0.005	0.015

Log likelihood = 59.50927

***, ** and * indicate statistically significance at 1%, 5% and 10% probability levels, respectively

Source: Survey data of this study

Education (EDU): Consistent with Ruth, et al (2011) findings, and as hypothesised in the study, regression results indicate, educational status of households appears to have positive and significant relation with the decision of households to participate in the weather index based crop microinsurance scheme. A marginal change in education from the average 3.73 years of education is associated with 2.6 percent increase in household decision to join in the scheme, other variables remain constant.

Marriage Status (MARR): The regression result showed that, marriage has a positive and significant relationship with household's willingness to join in the scheme as hypothesized. The probability of household's decision to participate in the scheme is found to be high among married households. The marginal effects imply that, married households have a 12.6 percent higher probability of participation in the microinsurance scheme.

Effectiveness of Substitutes (ES): Contrasting to the expectation, the result of the regression (Table 5) shows that effectiveness of substitutes, like access to borrowings and saving services and other sources of income is found to be positively and significantly related to household's decision to choose participation in the scheme. The same finding is observed by P.Hazell et al (2010). The marginal effects imply that a household who has access to borrowings and saving services and other sources of income would have a 5.5 percent higher probability of participation in the microinsurance scheme than a household who has no access to the same facilities.

Risk Aversion or Trust in the Management of the Scheme (TMS): It was hypothesised that, since lack of trust on an institution by households may lead to not to join in the scheme as they consider insurance as "risk", the likelihood of households belonging in the scheme is less. Hence, trust in the management was expected to have positive and significant relation with willingness to join the scheme. The result of the regression shows that (Table 5), the variable is found to positively and significantly influencing the dependent variables. It is significant at 1 percent level. It is true from the marginal effect that, as management of the scheme is seen trustworthy by households; the probability of their participation becomes higher by 10.2 percent, other variables being constant.

Awareness/understanding of Insurance (Product Literacy) (PLT): The result of the model shows that product literacy positively and significantly influences household's willingness to join weather index based crop microinsurance. This is consistent to finding of Daniel C. and Gautam K. (2011) in their study on the demand for microinsurance in rural Ethiopia. It is also consistent to the hypothesis made for the variable. The result of marginal effect implies that, product literate individual has 17.2 percent higher probability of participation in the microinsurance scheme than product illiterate individual.

SHG/MFI Member (SHG): The result of the regression analysis (see Table 5) also shows that, being a member of SHG/MFI negatively and significantly influences decision making of households to join the scheme. Ruth, et al (2011) who examined adoption of weather index insurance based on learning from willingness to pay among a panel of households in rural Ethiopia had found out the same result. A household who is member of SHG/MFI has 3.4

percent lower probability of participation in the scheme than a household not member of SHG/MFI.

Planted Land Ownership (PLO): It was hypothesised that, those farmers who used leased land as an addition to their own land has positive interest to join the scheme than those who only use own land for crop production in the season. Similarly, the regression result shows that using leased land would be significant at 5 percent level; and have a positive influence on the households' decision making to join in weather index based crop microinsurance scheme (see Table 5 above). The marginal effect of the regression result indicates that, a household using rented land would have a 1.8 percent higher probability of participation than those not using leased land.

Planted land size (PLS): It was hypothesized that, those who have average planted land size have higher willingness to join the scheme than those having smaller or higher land size. However, no significant relation is observed between this explanatory variable and households' probability of decision making to join the scheme. The result is not consistent to the results founded by Janani (2012). A quintile (size of 1.6 to 2 hectares) of land which is above the median planted land size (1 to 1.5 hectare) would be significant at 5 percent level; and have a negative influence on households' decision to join the scheme. Farmers who have cultivated a land size of 1.6 to 2 hectares have 0.5 percent lower probability of participation in the scheme than those having planted land size of the lowest quintile (less than 0.5 hectares). All land quintiles, except the base category or the lowest quintile and the second quintile, are found to have no direct relation with the probability of participation in the scheme.

4.1.3.2. Second stage estimation- OLS Model Results

The results of OLS estimation in the second stage of Heckman's model for maximum willingness to pay for weather index based crop microinsurance are presented in Table 6 below. Sixteen explanatory variables, including LAMBDA were entered in the model to determine coefficients' statistical significance for the second dependent variable (MWTP). Start bid was included as an explanatory variable for MWTP for households who decided to join the scheme. Of these, eight were found to be statistically significant at 1 percent, 5 percent and 10 percent significance levels influencing the extent of maximum willingness to pay for weather index based crop microinsurance The variables are: age and education level

of households, trust in management of the scheme, product literacy, being member of SHG/MFI, additional leased land use for cultivation, initial bid amount and variable included to correct selectivity bias (LAMBDA). The coefficients of the rest of the variables are not statistically significant, implying that they are less important in influencing MWTP pay for weather index crop microinsurance.

As the measure of goodness of fit (Adj R-squared) indicates, 67 percent of the total variation in the dependent variable is explained by the model (explanatory variables). The estimated coefficients measure the marginal effects of explanatory variables on the birr amount WTP.

Table 6: Results of the Second Stage Econometric Model-OLS Regression Results

Variables	Coefficient	Std. Err.	t
SEX	-31.3674	29.7462	-1.05
AGE	-2.7607*	1.5966	-1.73
MARR	-38.0263	33.6178	-1.13
EDU	15.8824***	5.1643	3.08
HHS	-0.7733	8.0879	-0.10
ES	-3.8478	37.5721	-0.10
TMS	-71.9066*	40.3531	-1.78
PLT	176.5729***	38.2398	4.62
SHG	69.4970**	32.0530	2.17
PLO	67.3149*	37.4684	1.79
LANDQ2	-30.1936	32.7880	-0.92
LANDQ3	8.3149	36.2039	0.23
LANDQ4	72.5680	83.8418	0.87
LANDQ5	51.3661	112.4270	0.46
STRTBID	0.7898***	0.0973	8.12
LAMBDA	-23.1390***	4.3749	-5.29
Constant	99.8103	98.0847	1.02
R-squared = 0.7066 Adj R-squared = 0.6665 ***, ** and * indicate statistically significant at 1%, 5% and 10% probability levels, respectively			

Source: Survey data of this study

Age (AGE): Consistent to the hypothesis made and the finding by Janani (2012), but contrast to finding of Ombeline et al (2012), the regression result (see table 6) shows that age of a

household head is negatively related to the maximum willingness to pay for weather index based crop microinsurance at 5 percent level of significance. Aged household heads have shown interest to join but pay less than the younger counterparts. The marginal effect shows that, on the average, as the age of a household head gets older by a year, maximum willingness to pay for weather index based crop microinsurance reduces by 2.76, other variables being constant.

Education level (EDU): It is significant at 5 percent level and positive relation with the household's maximum willingness to pay as it was hypothesized which is consistent to the finding of Ruth, et al (2011). The marginal effect shows that, as education level of a household improves by one grade, the maximum willingness to pay for the product increases, on average, by 15.88, other variables being constant.

Risk aversion or Trust in the management of the scheme (TMS): Since lack of trust on the institution by some may lead to not to join in the scheme as they consider insurance as "risk", the likelihood of households belonging in the scheme is less and may not be willing to pay higher amount. Hence, trust in the management was hypothesized as positive and significant relation with willingness to pay. However, the regression result shows that the variable to be negatively and significantly influencing the dependent variable. This finding is not consistent to Janani's finding (2012) which indicates no relation between the variables. It is significant at 10 percent level. The marginal effect shows that as management of the scheme is seen trustworthy by a household, the maximum willingness to pay for the scheme decreases on average by 71.91, other variables being constant. It is not clear why and how this relation happened which suggests the need for further study.

Awareness/understanding of insurance (Product Literacy) (PLT): Consistent to the hypothesis made and the empirical finding of Daniel C. and Gautam K. (2011) the regression result indicates the variable to be significant at 1 percent; and positively influences the household's maximum willingness to pay for the product. Marginal effect tells that, literacy of the product and understanding what insurance is, increases the maximum willingness to pay for the product, on average, by 176.57 than those households who do not understand and unaware of the product, other variables held constant.

SHG/MFI Member (SHG): Consistent to the hypothesis made, being a member of SHG/MFI is found to be significant at 5 percent, and have positive influence on the household's maximum willingness to pay for weather index based crop microinsurance. But, Ruth, et al (2011) had found that households with good networks and having access to savings and borrowing instruments may have lower demand for insurance than those without access to these facilities. On average, being a member of SHG/MFIs would increase the maximum willingness to pay by 69.5, other variables remaining constant.

Planted land ownership (PLO): As hypothesised by the researcher, the regression result (Table 6) reveals that the variable has positive and significant influence on the households' maximum willingness to pay for the product. The marginal effect shows that, on average, using leased land for farming increases households maximum willingness to pay for the product by 57.31, other variables remaining constant.

Starting bid (STRTBID): This explanatory variable which was included in the determination of MWTP was hypothesised to have positive and significant influence on the amount a household is willing to pay. In confirmation of the expectation, the regression analysis result shows that, the initial bid offered to the sample respondents is found to be significant at 1 percent, and has positive influence on the household's MWTP for weather index based crop microinsurance. The result is consistent with Janani's (2012) finding. As the start bid increases by one birr, the MWTP increases by 0.789, other variables remaining constant.

Inverse Mill's Ratio (LAMBDA): The inverse Mill's Ratio is related to the intensity of MWTP and found to be statistically significant on the basis of the regression analysis result indicating the presence of selectivity bias. This implies that there are other unmeasured factors that determine the intensity of payment for the product other than those variables which are included in the model.

Mean Willingness To Pay (mean WTP): The mean WTP (μ) using the regression results of the Heckman's two stage procedure for CVM is calculated as follows (Dagnew, et al, 2010):

$\mu = -\alpha/\beta$ where, α is the intercept; and β is the coefficient of start bid (STRTBID).

Accordingly, the mean WTP of the sample households for the weather index based crop microinsurance can be computed using the above formula; and it is found to be Ethiopian Birr 578.40 (= -(-71.64)/0.122).

Similarly, as shown in Table 4, the same result (birr 578.40) is found to appear under descriptive statistics that is computed using the double bounded dichotomous choice contingent valuation format. Therefore, household's MWTP for weather index based crop microinsurance is to be Birr 578.40 per half hectare of land insured to get payout of Birr 4,500.00 during rainfall scarcity leading to maize failure as stipulated under the hypothetical microinsurance. That means, maize producing small holder households in the rift valley area (study area) are willing to pay, on average, premium rate of 12.9%.

4.2. Discussion

Regression results show that variables: age, marriage and educational status of the household, effectiveness of substitutes, trust in the management of the scheme, product literacy, membership in SHG or MFIs, planted land ownership (whether the farmer used leased land), fourth quintile of planted land size with size of 1.6 to 2 hectares, initial bid amount and variable included to correct selectivity bias (LAMBDA) are found to be statistically significant at 1 percent, 5 percent and 10 percent levels in influencing households decision to participate and WTP for weather index based crop microinsurance.

Aged household heads have shown higher interest to join; but, willing to pay fewer premiums for WIBCMI than the younger ones. Although hypothesised consistent to Janani's (2012) finding, the result of the regression indicates the variable is found to have positive relation with WTJ. The positive relation resulted might be due to the fact that at old ages, people might have preference to be risk averse as a result of which they might be reducing risks associated to their households' livelihoods. In contrast to the above, the variable is found to have negative relation with WTP. This might be due to the reason that aged people might not understand the real benefit of the scheme than younger people.

As Ruth, et al (2011) found out, and in confirmation with the hypothesis made, educational status is found to be significant and positive relation with the dependent variables. This might be because literate people are relatively familiar with recent innovations, including weather

index based crop microinsurance; and have relative capability to analyse cost-benefits of the scheme.

Marriage status is observed to be a determinant factor for households' participation in the scheme-WIBCMI, which is in confirmation with the hypothesis made. Probability of participation is high among married households. This might be because of the reason that married households shoulder responsibilities of feeding family members beyond themselves. This would also include dependent family members.

Households who have access to services like savings and borrowings and other sources of income, were shown higher probability of participation. The result is consistent to the findings of P.Hall et al (2010) and the hypothesis made. One of the reasons might be when such new and not familiar schemes are tied to already existing effective services, like credit and savings, people might easily understand the benefits of the scheme.

The regression result shows that, as people trust the management of a scheme, the probability of their participation increases. The result is in confirmation with the hypothesis made and empirical finding by Janani (2012). However, the variable is observed to have negative relation with the dependent variable WTP in contrast to hypothesis made in this study and literature where the reason why and how this relation happened is not clear, suggesting the need for further study.

A study by Daniel C. and Gautam K. (2011) depicts product literate farmers are found to have higher probability of decision to choose to participate and pay more than illiterate ones as hypothesised for the variable. In agreement with the empirical finding, positive relation is observed from the model regression. This might since literate people are able to weigh the benefits and costs of the scheme.

A study by Ruth, et al (2011), who examined adoption of weather index insurance based on learning from willingness to pay among a panel of households in rural Ethiopia had found out that, being a member of a SHG/MFI negatively and significantly influences decision making of households to join the scheme. In confirmation with the empirical finding, negative relation between the two variables is obtained from the participation (probit) model regression. This might be due to the fact that they consider the determinants (being membership in SHG or

MFIs) as substitute for the scheme; and they would rather prefer to borrow from SHG/MFI rather than investing in microinsurance scheme (paying premium). On the other, positive relation is resulted between the variable and households' maximum willingness to pay. Once households have decided to join the scheme, they are willing to pay higher amount equating to the benefits. Being a member of SHG/MFIs might help them better understand the benefits they could get from the scheme -microinsurance.

Farmers using additional land (through leasing) beyond their own land for farming are found to have higher probability to join and pay for WIBCMI. This is in agreement with the hypothesis made. One of the reasons for this might be farmers using additional leased land are risk averse than those who do not, because in case of crop failure they can receive payouts that, at least substantiate to cover their lease expense.

Statistical significance of the coefficient for selectivity bias (Inverse Mill's Ratio) indicates that there are other unmeasured factors that determine the intensity of payment for the product other than those variables which are included in the model. This suggests the need for further study to identify additional significantly determining variables.

The small holder households in the rift valley of the study area are willing to pay, on average, premium rate of 12.9% (birr 578.40 premium to insure a half hectare to receive payout of birr 4,500.00) which is slightly lesser than the current average rate charged by pioneering insurance companies.

CHAPTER FIVE
SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.1. Summary and Conclusion

Agriculture is the main stay of the Ethiopian economy in which livelihood of more than 83% (CSA, 2009) of the population is attached, where frequently exposed to extreme drought causing severe crop failure and economic losses. Households respond with costly coping strategies, including selling productive assets or cutting consumption to minimal levels, limit themselves from using agricultural inputs that enhance productivity. Some international NGOs with financial institutions has initiated piloting the product-Weather Index based Crop Insurance. Theory depicts that as poor individuals also display a relatively high level of risk aversion, the demand for microinsurance products is expected to be high. However, the pilots as well as commercialization of the service encountered with minimal up take rate.

The central objective of this study is to identify and analyse the major socio-economic factors that determine maize producing smallholder households' decision making to whether or not participate and maximum willingness to pay for weather index based crop microinsurance scheme at the rift valley region of Shashemene district. It also aimed to assess the extent that these farmers were willing to pay for weather index based crop microinsurance.

The study is confined to smallholder maize producers in two kebeles the district which is located in the Great East African rift Valley exposed to recurrent drought. The primary data was collected through structured schedule from samples of 150 respondents residing in the area for the last five years using two-stage random sampling technique. Detailed description of a simple hypothetical product is presented to the respondents to understand type of product that is proxy to the actual. Double-Bounded Dichotomous Choice elicitation method of Contingent valuation Method was used to collect the data. Variables described based on descriptive statistics: location, shape and spread are presented using the common measures. Heckman's two stage econometric estimation was employed to analyze the effects of different explanatory variables on households' decision to participate in weather index based crop microinsurance or not and maximum amount willing to pay.

The descriptive statistics shows that about 89 percent of the respondents demanded to join microinsurance scheme while 92 percent of those respondents demanded to join, shown willingness to pay amount greater than zero. Households may be willing to join microinsurance programs as they see the value in the product; but, may not be willing to pay as they lack the ability to pay, since they perceive service provision as responsibility of the government or donors.

From the Heckman's two-stage estimation, out of the 14 explanatory variables hypothesized in determining households' decision making, only 9 are found to be significant at 1 percent, 5 percent and 10 percent significance levels. The variables turned out to be significant include: age of the household, marriage status of the household, education level, effectiveness of substitutes, risk aversion or trust in the management of the scheme, awareness of insurance (product literacy), membership in SHG or microfinance institutions, households using leased land and fourth quintile of planted land size with size of 1.6 to 2 hectares. The rest of the variables have no significant impact on the likelihood that the respondents would provide attitude towards choosing participation in the scheme.

In the second stage estimation, sixteen explanatory variables including Start bid and invers Mill's ratio were entered in the model to determine coefficients statistically significant for the second dependent variable (MWTP). Only eight of them are found to be statistically significant influencing the extent of willingness to pay for weather index based crop microinsurance. Namely, age of the household, education status of the household, risk aversion or trust in the management of the scheme, awareness of insurance (product literacy), membership in SHG or microfinance institutions, planted land ownership (whether the farmer uses leased land) and start bid were found to be statistically significant including the Invers Mill's Ratio. They have significant marginal effect on the dependent variable.

As household heads are educated and aware about the microinsurance product, their capacity to determine benefits and costs of the product increase which substantially influences their participation decision and amount they are willing to pay. Aged household heads have shown higher interest to join but willing to pay fewer premiums for WIBCMI than the younger ones. Married households shoulder additional responsibilities beyond themselves, depicting higher their interest to join.

Tying microinsurance product with existing services like savings and credit increases the rate of the product uptake by the farmers. At the initial stage, they may consider these existing services (savings and credit) as substitute for microinsurance. However, after once the farmers decided to join, they are willing to pay higher amount.

Results of Heckman two stage regression and descriptive statistics, of the maize producing smallholder households' Mean Willingness to Pay (Mean WTP), was found to be Birr 578.40 per half hectare of land insured to get pay out of Birr 4,500 with an average premium rate of 12.9%.

5.2. Policy Implications

Farmers in the study kebeles have had no prior experience with index-based insurance policies. Some households prefer either to stay away from participating in microinsurance program or pay lesser amount of premium for the service due to reasons identified above.

Education level of a household head has a positive and significant influence on participation decision making intensity of payment to get the microinsurance service. Household heads that are better educated may have better access to information related to the benefits of microinsurance. Therefore, enhancing the educational status of the farmers through adult education in the current farmers' training center and expansion of primary education is suggested to influence and improve farmers' choice and amount of payment for weather index based crop microinsurance.

Product literacy has significant and positive impact on both probability of decision making and amount households are willing to pay. Educating households on how formal insurance works, and how they can cater to catastrophic shocks by pooling risks across larger geographies may encourage them to invest in market-based formal risk management techniques, such as microinsurance to deal with shocks in the long run. Microinsurance education showing long term impacts of the existing risk coping mechanisms of farm households and how these measures may fail in certain circumstances could help households to re-think their risk coping strategies. Hence, the researcher suggests putting efforts towards promoting farmers' awareness. Integrating the subject in the current farmers' training centers,

advocating using local mass media, attaching the subject with one of the duties of extension workers would help address the knowledge gap.

For those households who those decided to participate in microinsurance program, being membership of either SHG or MFIs is found to have a positive and significant influence on the maximum amount the household is willing to pay for the program. However, being a member of SHG/MFI was observed as a roadblock on households' preference of microinsurance as a risk coping mechanism. Savings, borrowings, diversification etc. may help transition out of smaller losses. However, such measures tend to fail in the event of catastrophic shocks. Microinsurance, being a market-based solution, is designed in a manner that it can effectively cater to both small and large scale shocks. Hence, it is advisable working on advocating and enhancing the awareness of farmers and looking for strategies on how crop microinsurance is tied with other existing services such as credit to farming.

It is apparent that, risk of shocks limits willingness of farmers' to invest in measures that might increase their productivity and improve their economic situation. Hence, providing market-led risk coping strategies to foster development through encouraging investment. On the other hand, the study result shown that that households who have invested on leased land as an additional farm land have shown positive and significant preference on choosing the microinsurance service and willingness to pay higher mean value to the service than those using only own land. Therefore, this is an interesting point to realize how current land leasing procedures and implementation are smoothen-up so that households can participate and expand their farming. This could be done through capacity development of local leaders, awareness creation on existing policies and procedures of farming land leasing, formulating new and/or revising existing policies and procedures if any gap is observed.

The empirical study result of this study indicates that mean willing to pay for the service by the sample households is found to be slightly lower than the average premium rate for similar product offered by pioneering insurance companies operating in the region. Therefore, consideration to the gap and working to minimize through increasing operational efficiency and reducing inflated costs the premium rate would help improve the uptake rate.

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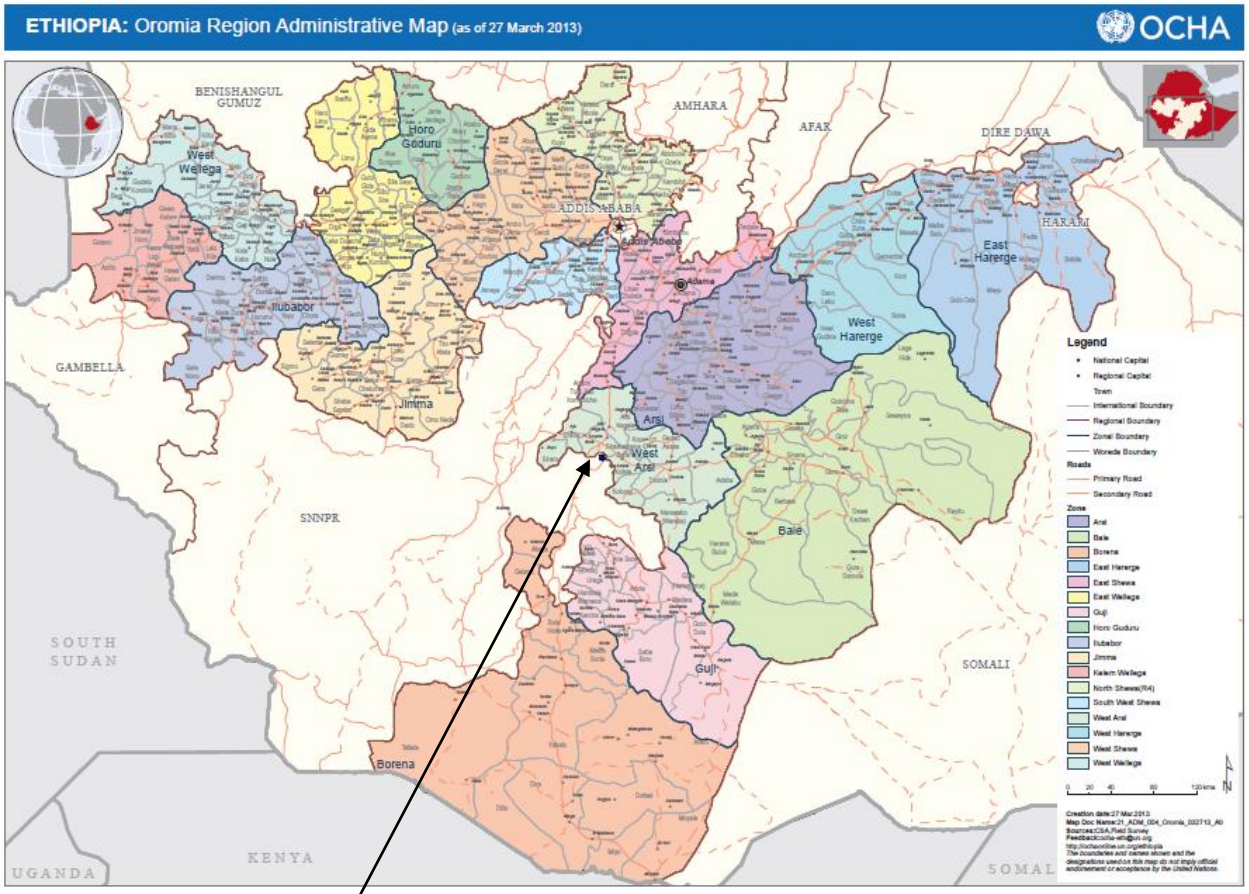
APPENDICES

Appendix A: Administrative Map of Study District



Shashemene Zuria District

Source: UN Office for the Coordination of Humanitarian Affairs, http://reliefweb.int/map/ethiopia/ethiopia-oromia-region-administrative-map-27-march-2013

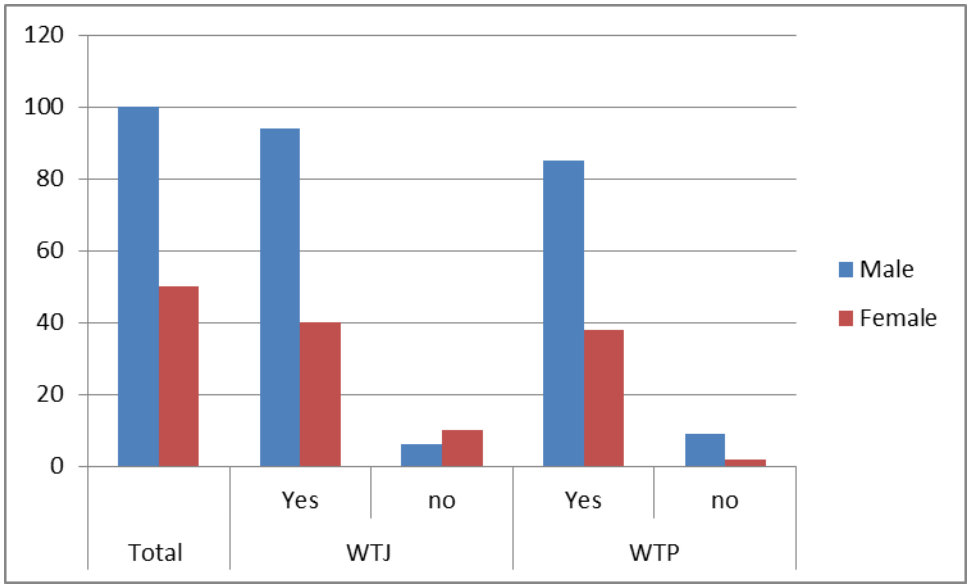
Appendix B: Tables and Figures

Table 7: Land owning and Planted Land Size distribution of Sample Households

		Total		Willingness To Join			Willingness To Pay		
			%	Yes	No	% of Yes from Total	Yes	No	% of Yes from Total
Land owned	< 1 hectare	85	57%	76	9	57%	69	7	56%
	1-1.5 hectare	34	23%	31	3	23%	27	4	22%
	1.5-2 hectare	23	15%	21	2	16%	21	0	17%
	2-2.5 hectare	6	4%	4	2	3%	4	0	3%
	>2.5 hectare	2	1%	2	0	1%	2	0	2%
	Total	150	100%	134	16	100%	123	11	100%
Planted Land	< 0.5 hectare	53	35%	49	4	37%	45	4	37%
	0.5 -1 hectare	56	37%	48	8	36%	43	5	35%
	1-1.5 hectare	33	22%	31	2	23%	29	2	24%
	1.6-2 hectare	6	4%	4	2	3%	4	0	3%
	>2 hectare	2	1%	2	0	1%	2	0	2%
	Total	150	100%	134	16	100%	123	11	100%

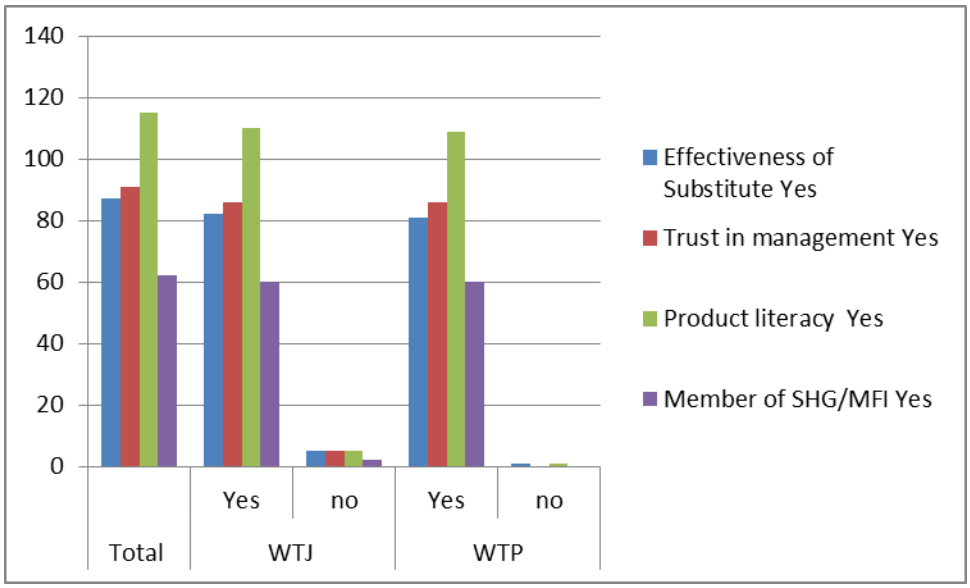
Source: own computation from survey data of the study

Figure 4: WTJ and WTP among the Married and Single Respondents



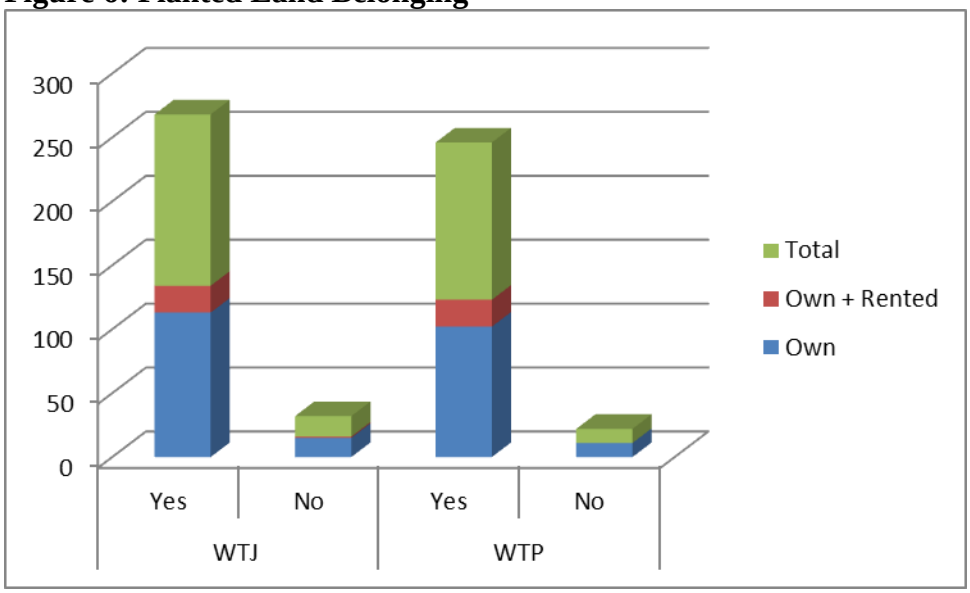
Source: own computation from survey data of the study

Figure 5: Respondents WTJ and WTP based on Effectiveness of Substitute, Trust in management, Product Literacy and Members of SHG/MFI



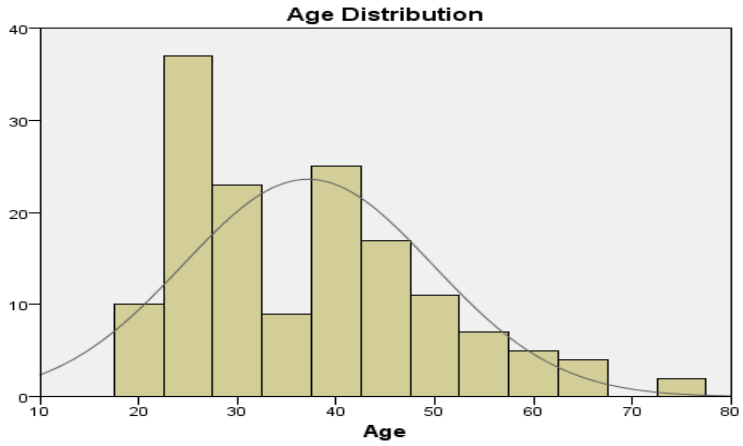
Source: own computation from survey data of the study

Figure 6: Planted Land Belonging



Source: own computation from survey data of the study

Figure 7: Distribution of Age of the Sample Households



Source: own computation from survey data of the study

Table 8: Variance inflation factors for continuous variables

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
AGE	.849	1.177
EDU	.913	1.095
HHS	.897	1.114
STRTBID	.983	1.018

Source: Regression result of the survey

Table 9: Contingency coefficients for dummy variables

	SEX	MARR	ES	TMS	PLT	SHG	PLO	LANDQ2	LANDQ3	LANDQ4	LANDQ5	WTJ
SEX	1.0000											
MARR	0.1024	1.0000										
ES	-0.0287	0.0698	1.0000									
TMS	-0.0193	-0.0323	0.6144	1.0000								
PLT	0.2118	0.0875	0.2651	0.3625	1.0000							
SHG	-0.0383	0.0863	0.5223	0.4541	0.2710	1.0000						
PLO	0.0533	-0.1438	-0.0290	0.1409	0.0505	0.0347	1.0000					
LANDQ2	-0.0097	-0.1224	-0.1810	-0.0275	-0.1282	-0.0321	0.1086	1.0000				
LANDQ3	0.0683	0.0101	0.0933	-0.0007	0.0647	0.0771	0.0528	-0.4099	1.0000			
LANDQ4	0.0722	0.0263	0.0358	-0.0446	0.1126	0.0359	-0.0846	-0.1576	-0.1084	1.0000		
LANDQ5	0.0822	0.0617	-0.1366	-0.1444	0.0641	-0.0976	-0.0482	-0.0897	-0.0617	-0.0237	1.0000	
WTJ	0.2138	0.0250	0.1873	0.2081	0.3710	0.2023	0.0822	-0.0905	0.0792	-0.1499	0.0402	1.0000

Source: Regression result of the survey

Table 10: Heckman's Two stage Econometric Model

WTJ	Coef.	Std. Err.	z
SEX	0.024	0.036	0.660
AGE	0.012	0.002	6.450
MARR	0.159	0.044	3.640
EDU	0.011	0.006	1.820
HHS	0.014	0.011	1.310
ES	0.097	0.036	2.740
TMS	0.165	0.044	3.750
PLT	0.156	0.073	2.130
SHG	-0.081	0.032	-2.520
PLO	0.092	0.037	2.490
LANDQ2	0.042	0.051	0.820
LANDQ3	-0.013	0.042	-0.310
LANDQ4	-0.181	0.074	-2.440
LANDQ5	-0.001	0.052	-0.020
MWTP			
SEX	-14.788	14.508	-1.020
AGE	-1.141	0.538	-2.120
MARR	-30.269	17.377	-1.740
EDU	5.595	2.137	2.620
HHS	9.594	4.676	2.050
ES	3.967	11.992	0.330
TMS	35.837	15.475	2.320
PLT	42.084	16.148	2.610
SHG	105.655	26.496	3.990
PLO	79.235	22.047	3.590
LANDQ2	-1.946	11.154	-0.170
LANDQ3	-30.031	13.345	-2.250
LANDQ4	-40.220	30.080	-1.340
LANDQ5	-21.983	17.154	-1.280
STRTBID	0.122	0.051	2.390
Constant	-71.638	27.096	-2.640

Source: Regression result of the survey

Appendix C: Study Questionnaire

Saint Mary's University
School of Graduate Studies
Department of Agricultural Economics

Introduction

The purpose of this schedule is to collect information about Willingness of Farmers to pay for Weather Index Based Crop Microinsurance, particularly Maize. The information to be obtained from this schedule is going to be used only for research purpose that is expected to substantiate towards initiation and improvement of the service provision by stakeholders. The success of this study will highly depend upon your frank, genuine and sincere responses. It should not take more than 10 minutes of your time.

Thank you in advance for your cooperation and giving your time for this purpose.

Note: no need to mention name. Code: 049

Section A: Socio-Economic Characteristics

1. **Sex:** ☐ Male ☐ Female
2. **Household Head: Are you the Head of your house**? ☐ Yes ☐ No
3. **Age (years)**: _____
4. **Marriage:** ☐ Single ☐ Married ☐ Divorced ☐ Widowed
5. **Education (EDU)**: Education Level/Grade:_____
6. **Household Size (HHS)**: How many members in your Household? _____
7. **Growing more than One crop (GMOC):**
   Do you grow crops other than Maize? ☐ Yes ☐ No
8. **Effectiveness of Substitutes (ES):** Access to Borrowings and Saving and other sources of income: Do you have access to credit/savings services? ☐ Yes ☐ No
9. **Risk aversion or Trust in the management of the scheme (TMS):**
   Do you trust institutions like insurance companies, microfinances, providing such services? ☐ Yes ☐ No
10. **Awareness/understanding of insurance (Product Literacy) (PLT):**
    Do you know what insurance mean, purpose? ☐ Yes ☐ No

(Tick Yes or No based on the respondent's answer for the question)

11. **SHG/MFI Member (SHG):** Are you member of any Self Help Groups or Microfinance or Rural Saving and Credit Organization? ☐ Yes ☐ No
12. **Land Holding:** The land you farm ☐ Own ☐ Rented
13. **Planted Land Size and Land Holdings:** taking average land holding/Planted land size per holder of the study area as median. Tick (√) in the appropriate box.

In Hectare	**Category 1**	**Category 2**	**Category 3 Average[4]**	**Category 4**	**Category 5**
	< 1.0	1.0 - 1.5	1.5 – 2.0	2.0 - 2.5	> 2.5
Land Holdings, How many Hectares?					
In Hectare	Category 1	Category 2	Category 3 Average	Category 4	Category 5
	< 0.5	0.5 - 1.0	1.0 - 1.5	1.6 - 2.0	> 2.0
Planted Land, How many Hectares?					

Note: one Hectare of Land = 4 'Timad; (Locally Translated)

Section B
Hypothetical Product- Microinsurance for Maize

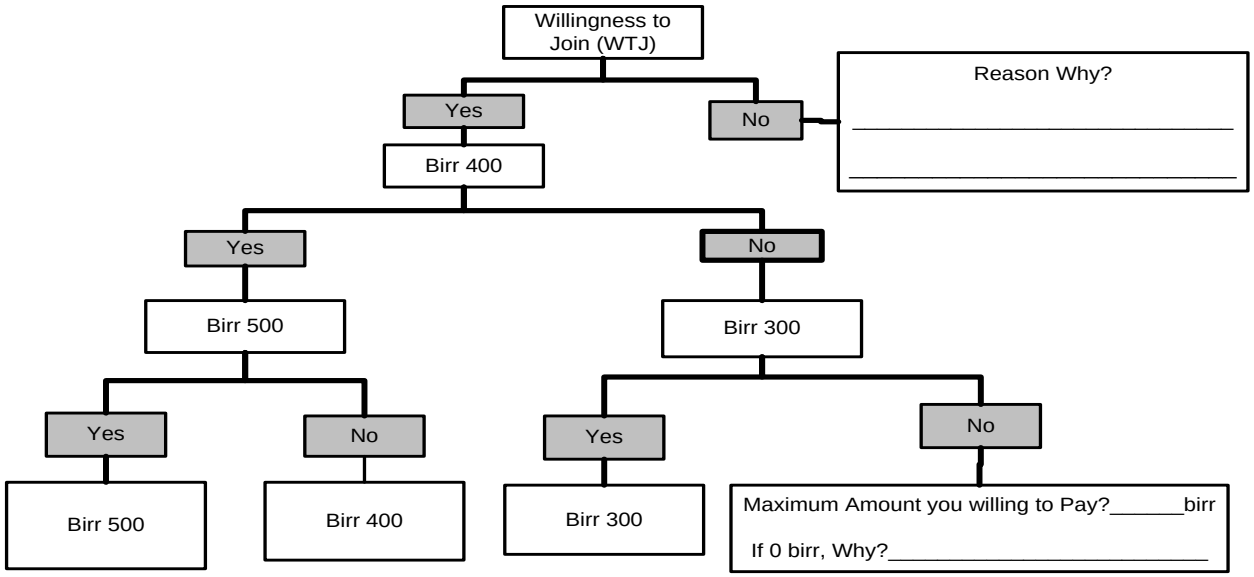
Drought is common in your area where crop like maize is the predominant product. For this reason, insurance providers, companies, are interested to deliver the service in your area. The basic objective is to secure you and your family when you face drought that damages your product-maize beyond business objective. The companies will have branch nearby to you at

[4] As indicated on Physical and Socio Economic Profile of Oromia (2009), Bureau of Finance and Economic Development of The National Regional government of Oromia, regional average of land holding and cultivate land is 1.6 and 1.2 hectare respectively.

Shashemene town and payment for you will be made there at the branch. Payment will be made in cash for the insured land size on which maize crop is growing.

Cover: it covers short of rainfall[5] that results in confirmed failure of the Crop-maize in the specific area, a payment would be made to the farmer.
Pay out: Birr 4,500 per half hectare of land insured [6][7].
The respondents are informed that the rainfall would be recorded in a weather station that is approximately in a radius of 20 km from the station and crop failure will be confirmed, when happens
Starting bid: Birr 400, 500, 600, 700 and 800. The starting bid varied per 30 schedules (to avoid starting point's bias) and is distributed equally among the enumerators to ensure that each enumerator has schedule with each of the starting bid values.
The subsequent bids in the bidding game vary by birr 100.

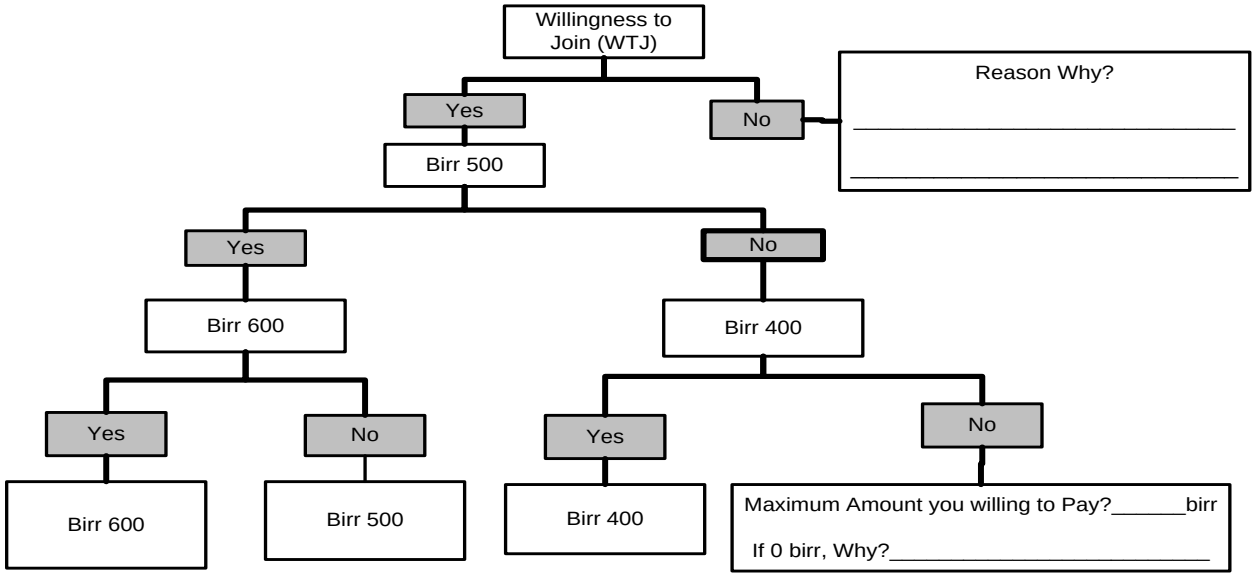
Tick (√) in the appropriate box and/or describe the reason

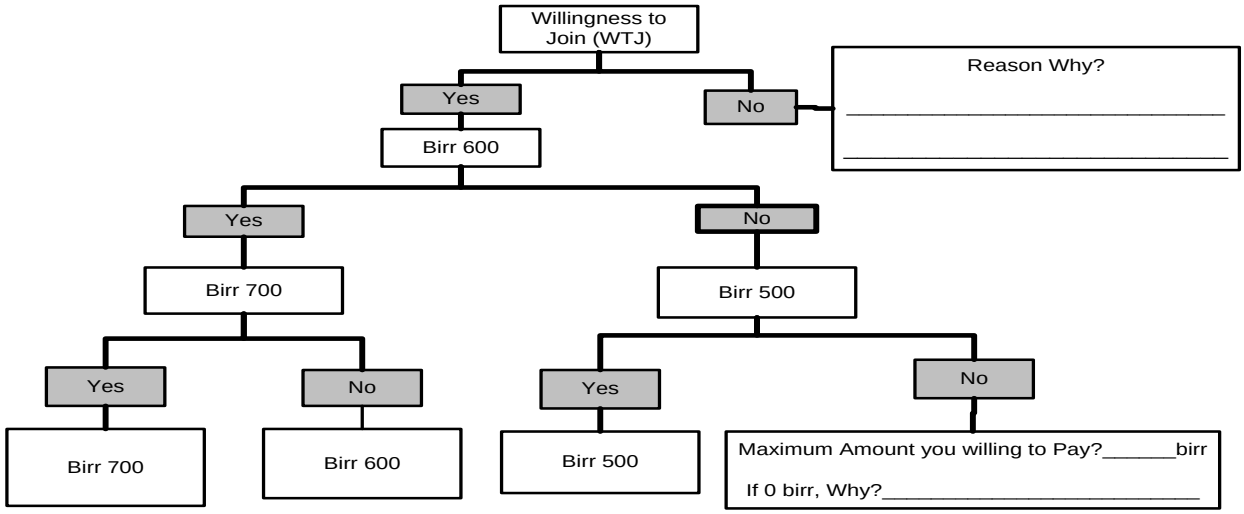


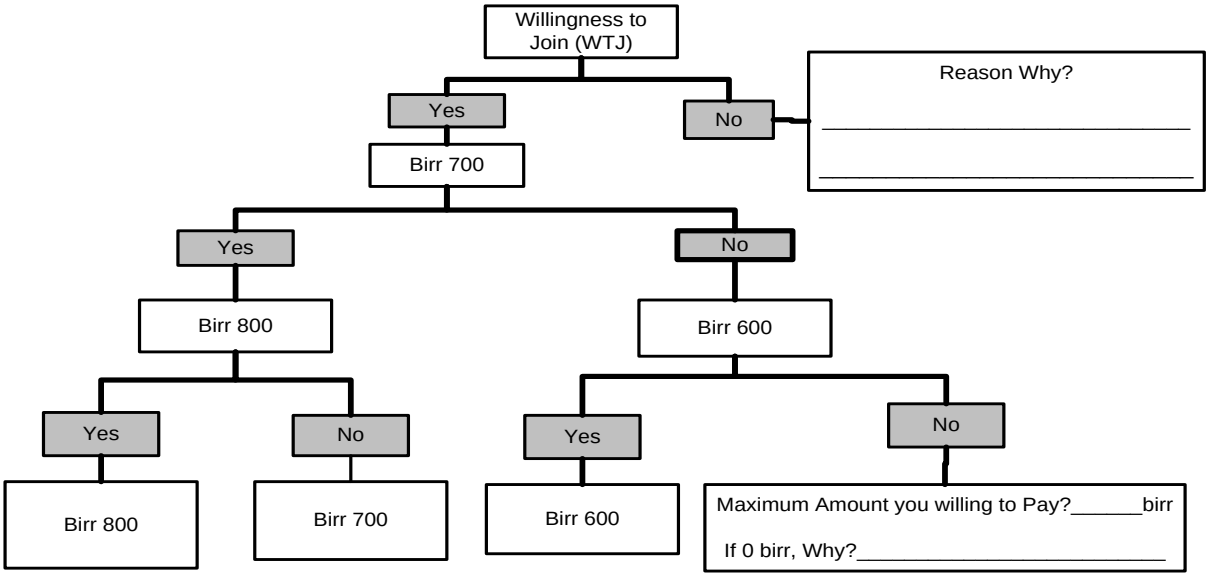
[5] For maximum production a medium maturity maize crop requires 500 to 800 mm of water depending on climate per its total growing period, that is 180 days, on average (FAO, 2013)

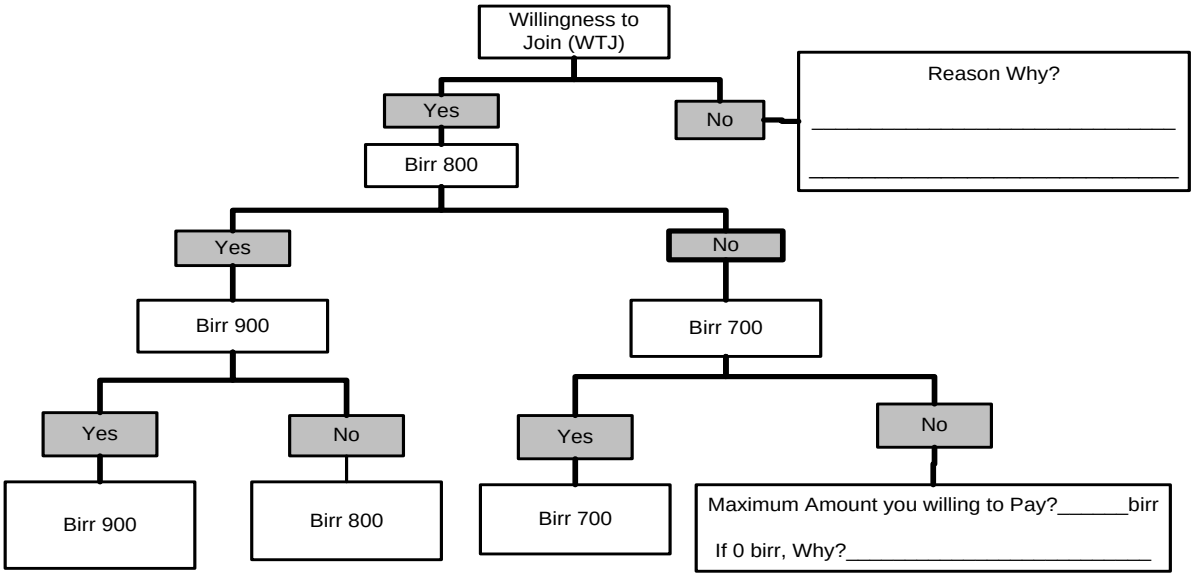
[6] Per CSA (2005), average yield of maize was 30 quintal per hectare. In the area, average price of maize at harvest is about birr 300.00.

[7] Drought insurance might be an attractive proposition in drought-prone agricultural areas. Studies in drought-prone areas have demonstrated that farmers are often willing to pay 12-20 percent (WFP, 2010). In Ethiopia, Nyala Insurance Company was providing crop micro insurance for Barley and Maize with premium rate of 19.96% which is same to birr 200 per half hectare (Nahu Senay, 2011). Furthermore, an insurance product offered to Adi Ha 'teff' growing farmers by Nyala insurance company with support from Oxfam America was charging premium rate of 24% (IRI, 2009). Additionally, recently, Oromia Insurance Company charges between 10-20 Percent depending on risk severity of the area, which is 20 percent in the study area, regardless of crop type which suggests premium rate of , on average, birr 600 for the payout of the hypothetical product.


Willingness to Join (WTJ)
Yes
No
Reason Why?
_____
_____
Birr 500
Yes
No
Birr 600
Birr 400
Yes
No
Yes
No
Birr 600
Birr 500
Birr 400
Maximum Amount you willing to Pay?_____birr
If 0 birr, Why?_____


Willingness to Join (WTJ)
Yes
No
Reason Why?
_____
_____
Birr 600
Yes
No
Birr 700
Birr 500
Yes
No
Yes
No
Birr 700
Birr 600
Birr 500
Maximum Amount you willing to Pay?_____birr
If 0 birr, Why?_____


Willingness to Join (WTJ)
Yes
No
Reason Why?
_____
_____
Birr 700
Yes
No
Birr 800
Birr 600
Yes
No
Yes
Birr 800
Birr 700
Birr 600
No
Maximum Amount you willing to Pay?_____birr
If 0 birr, Why?_____


Willingness to Join (WTJ)
Yes
No
Reason Why?
_____
_____
Birr 800
Yes
No
Birr 900
Birr 700
Yes
No
Yes
Birr 900
Birr 800
Birr 700
No
Maximum Amount you willing to Pay?_____birr
If 0 birr, Why?_____