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Research Paper

Households' Willingness to Pay for Livestock Insurance in Karrayyu Pastoralist Community: An Attempt for Risk Reduction

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Abstract

The study aim to investigate pastoralist community's willingness to pay (WTP) and factors that determine their willingness to pay for index based livestock insurance scheme. Using survey data collected by systematic sampling method, the study adopted an interval data logit model and estimated households' WTP for index based livestock insurance for camels, cattle and goats & sheep's separately. The study finding reveals that there is huge demand for livestock insurance scheme following recurrent drought and increased chance of losing their livestock. The estimated result shows that total WTP for camel, cattle and goat and sheep is about 2.7, 4.27, and 4.4 million birr per year respectively. Age of household head, family size, number of camel size and value of household asset have significant positive effect; where as non-farm income and distance from local market have negative effect on households' probability of joining Camel insurance. The cattle model shows that value of household assets have negative effect and size of the cattle has positive effect on the probability of households' willingness to join cattle insurance and their WTP. The goat and sheep model shows that number of goat and sheep has positive effect; income from livestock and age of household head has negative effect on households' probability of joining livestock insurance and WTP. In all models, the starting bid price has negative significant effect on the demand for livestock insurance, confirming the law of demand. Policy suggestion is that public or private insurance company can intervene through supply of livestock insurance for commercial purposes as well as to mitigate the side effect of covariate shocks leading to smooth consumption and stable income stream of households. Preferential policy intervention for camel insurance may yield better outcome as the community gives more value to the camel.

1. Introduction

In developing countries, poor households are often faced with unpredictable income streams and unpredictable expenditure needs. Literatures investigate strategies that these households employ so as to cope up with the shocks to smooth consumption. The consequences of these shocks may be both short term and long term on the welfare of households depending on how households cope with such shocks. Especially, if covariate shocks like drought are hard felt and affect households' welfare for long time after the shock, households may opt for less risky technologies so as to avoid permanent damage leading to lower returns on average (Ali et al., 2014).

The understanding of the shocks, household vulnerabilities, risk management strategies, and coping

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strategies to mitigate the effect of these shocks is very crucial in order to prioritize and design appropriate policy. Understanding the effect of shocks like drought and health on household consumption, income, labor supply and input application is area of concern recently. Specifically, the effect of past shocks on current consumption and input application in rural areas is very crucial to design appropriate policies for the coping strategies since the effect of these shocks has its role in explaining perpetuating poverty (Fletschner et al., 2010).The livelihood and wellbeing of rain fed households in developing countries are greatly influenced by the climate change. Such supply side shocks have big impact on prices, influencing production and consumption patterns.

Households in poor rural areas of developing countries respond using different mitigating strategies to such production shock and livestock death that are related to weather changes like rainfall failure. Asset accumulation, diversification of income sources, risk sharing network participation, and adoption of less risky activities are some of risk management strategies. Sales of asset, reducing nonessential expenditures, migrating from drought affected areas, drawing on social networks, and relying on formal and informal borrowing are used as coping strategies to such covariate shocks (Caeyers and Dercon, 2008).

The findings of literatures shows households cope with different shocks at the expense of long-term cost in the absence of credits or formal insurance. Accordingly, households in different socio economic settings cope to both idiosyncratic and covariate shocks using different coping strategies like reducing investment in education, increasing child labor, reducing farm and livestock investment and reallocating resources across sector indicating that these shocks may contribute for explaining persistent poverty in poor countries in general and that of rural households in particular (Wheeler, 2011). Ethiopia experiences recurrent weather and drought related shock, absence of formal insurance for rural households and very limited access to finance for the poor rural households (Pan, 2009).

Index insurance has gained widespread interest in recent years as an instrument for reducing uninsured risk in poor rural areas that typically lack access to commercial insurance products. These financial instruments make indemnity payments based on realizations of an underlying index – based on some objectively measured random variable – relative to a pre-specified threshold (Barnett et al. 2008). Index insurance offers significant potential advantages over traditional insurance. Because indemnity payments are not based on individual claims, insurance companies and insured clients need only monitor the index to know when payments are due. This sharply reduces the transaction costs of monitoring and verifying losses, while also eliminating the asymmetric information problems (i.e., adverse selection and moral hazard) that bedevil conventional insurance. These advantages have sparked considerable interest in index insurance for poor regions otherwise lacking formal insurance access (Barnett and Mahul, 2007). Hence, such kinds of insurance can also be applicable to pastoralist community whose livelihood mainly depends on livestock rearing in areas like Fantale and Boset woredas of karrayyu community.

Livestock insurance for pastoral community like Karrayyu is unquestionably important as the people lead their livelihood from animal husbandry. The predominant agricultural practice in this woreda is pastoralism. Camels, goats and cattle are the most common livestock (CSA 2005) and many of these livestock die because of drought/ disease yearly.

The Karrayyu are attempting to cope with the changing circumstances as a result of land dispossession and climate change by combining farming with livestock management, petty trading and wage employment. However, these responses at the moment are not adequate to cope with the pressures, as changes are taking place too quickly to allow for adequate adaptation. Therefore, we found that risk management practices through livestock insurance, are perhaps, one innovative policy to overcome food insecurity and loss of livestock.

Given climate change a serious issue, it is vital, therefore, to find a means through which we can optimize our return from livestock population. Livestock insurance can be taken a good example to avoid the risky investments for livestock owners. When it comes to the case of Fantale and Boset, our case study, to the best of our reference, there is no study under taken concerning the subject matter so far. Therefore, this

study will fill the gap between insurance demand (pastoralist community) and insurance providers through answering question like whether potential demand for livestock insurance is available and then recommend for potential insurance provider companies for intervention and thereby open a way for livestock insurance commercialization (for insurance companies).

2. Data and Methodology

2.1. Study area

The study is designed for the pastoralist community of Fantale and Boset woreda i.e karrayyu community in the eastern Shewa zone of Oromia regional state. The two woredas are mainly known by pastoralist livelihood; and the major livestock produced are camel, cattle, goat and sheep. Both woredas are located in the Great Rift Valley. The administrative center of Fentale woreda is Metehara town and that of Boset is wolenciti town. Both Metehara and Wolenciti are located east of Addis Ababa on the main high way that connects Ethiopia and Djibouti at the distance of 193 km and 135 km, respectively. Kareyu community commonly resides in central rift valley of eastern Showa zones of Oromia regional state. The figure below portrays residential woredas of Karayu community and the two darken encircled areas; Boset and Fentale woredas are chosen for this study. Boset woreda is adjacent to Adama and Fantale is also adjacent to Boset woreda to the eastern part of the country respectively.

2.2. Sample size and sampling methods

The study is based on household survey using structured survey instruments (questionnaires) to collect data and information at woreda, kebele and household levels. The selected kebele from each woreda and selected household respondent from each kebele are summarized in Table 1.

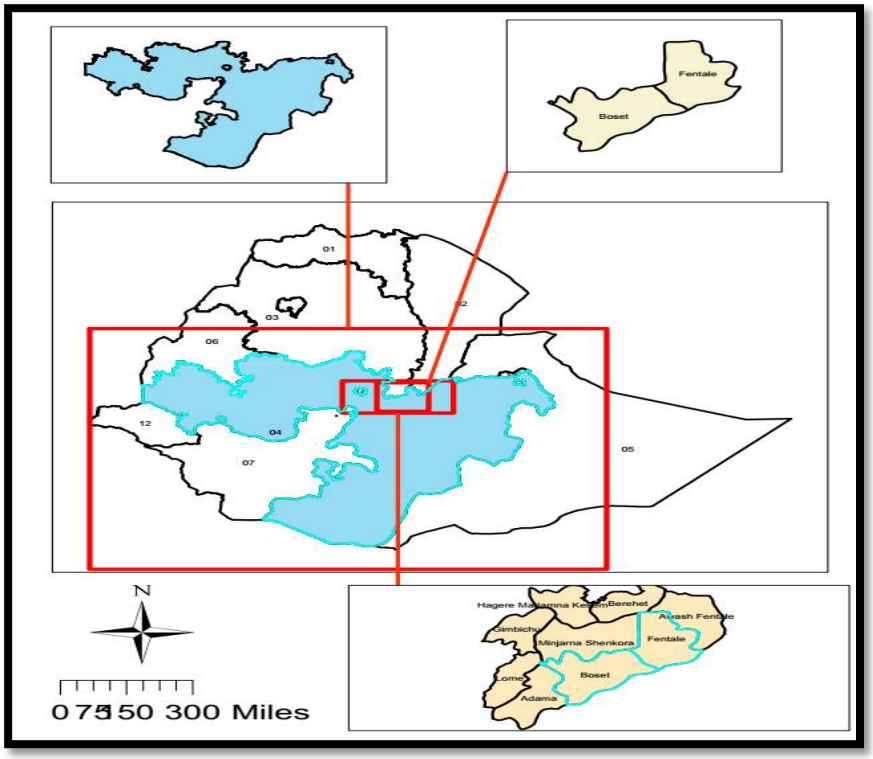

Figure 1: Map of study area (Boset and Fantale woreda)

Table 1: Summary of sample size

Woreda	Total kebele	Selected kebele	Sample respondent	Planned respondent	Actual data
Fantale	18	3	60	180	165
Boset	20	2	60	120	

Mixed sampling of, purposive and systematic sampling methods are used to select sample respondents for the study. Given the administrative structure of Ethiopia, sample zone and woredas are selected on purposive basis. This paper was primarily targeted pastoralist community of east Showa zone where Karayyu communities are living. Although Karayyu communities are living sparsely in different woredas of north east Shoa, Boset and Fantale woredas were among the selected areas on purposive as large proportion of pastorals are living in arid rift valley of those areas. The kebeles were selected purposively based on the number of livestock dwellers are holding and based on the kebeles vulnerability to livestock shock due to different reasons. However, from each kebeles the household head respondents were systematically drawn from the total kebele population. Given kebele is the smallest official administrative structure in Ethiopian geo-politics, a representative sample size should have to make at least 10% of its total population and accordingly, this paper estimated to draw 60 individual household heads from each kebele's of selected woredas. The target individual household heads were drawn from each kebeles using systematic sampling technique. The systematic lottery method was implemented to the list document (kebele level sampling frame) in cooperation with kebele administrator. Hence about 165 households were selected and used for analysis.

2.3. Model and analytical framework

Arrow et al. (1993) studied the applications of contingent valuation (CV) and provides insightful recommendations to maximize the reliability of CV estimates, among those relevant to our study are: (1) use of representative sample, (2) phasing CV questions in the form of hypothetical referenda in which respondents are told how much they would have to pay for each product or scenario choice before asking them to cast a simple yes or no answer, (3) reminding respondents of their actual budget constraint when considering their willingness to pay, (4) providing some sort of a "would not choose" option in addition to the "yes" and "no" option on the referendum, and (5) breaking down willingness to pay by a variety of respondent's characteristics.

A small literature applies CV methods to study willingness to pay (WTP) for agricultural insurance. Patrick (1988) and Vandeveer and Loehman (1994) used a single dichotomous (yes/no) choice question to study producers' demand for a multiple peril crop insurance, rainfall insurance and other modifications of crop insurance. McCarthy (2003) and Sarris et al. (2006) used similar single CV question to study pattern of demand for rainfall insurance in Morocco and Tanzania, respectively.

Our approach deviates from others in three interesting ways. First, we model household's demand for index based livestock insurance (IBLI) as a sequential decision. Households will be first asked pastoralists to choose a proportion of their herd (among 0%, 25%, 50%, 75% and 100%) that they wish to insure. And so conditional on their chosen proportion, they will be then asked a series of dichotomous WTP questions. This is contrastable with the standard joint decision approach widely used in the literature, in which respondent are asked to consider insurance contracts with pre-specified combinations of coverage and price (e.g., full coverage contract in which pastoralists are required to insure all their herd). As in reality, we cannot observe households' total herd sizes prior to their insurance decision – but rather the herd sizes households are willing to insure – and various literatures related to agricultural insurance provide evidence that the insured acreages vary across producers and far from full coverage (Barnett et al. 2004, Miranda and Venedov 2001, among others), the standard, pre-specified coverage insurance question may not well replicate the actual insurance decision.

Second, we have used double-bounded CV method, in which pastoralists were asked a sequence of dichotomous insurance questions that progressively narrows down the range of their unobserved WTP. Specifically, pastoralists were first asked to consider a specific insurance and if they are willing to pay at a specific price. A follow-up question with higher (lower) price are then asked if they response "yes" ("no") to the first question, and the process continues until we can classify their willingness to pay into different intervals classified using prices. This is based on the assumption that the individuals compare their utility from the proposed livestock insurance scheme with the current situation and decide whether to accept or reject the offered bid levels. This implies that the probability that households to buy the proposed livestock insurance policy can be expressed as the difference of their utility functions with and without

the proposed livestock insurance. Then, assume that the true willingness to pay of household i for the livestock insurance product is given by equation 1.

$$WTP_i^{*} = X_i'\beta + \varepsilon_i \ldots\ldots\ldots 1$$

Where, X is a vector of explanatory variables, β is a vector of coefficients to be estimated, ε is a random error term assumed to be randomly and independently distributed with mean zero and constant variance, σ^2. In dichotomous choice specification, the WTP* value is not directly observed. However, we observe a range of WTP values from the survey response. As we have shown above, we use double bounded dichotomous choice elicitation method[1]. Under this method, each respondent is given two bids, the first bid (P^f) and the second higher (P^H) or the second lower (P^L) bids, depending whether the individual responds 'yes' or 'no' to the first bid. This means that we have the following four possible outcomes for each respondent.

$D_i^{11} = 1$, if respondent i says 'yes' and 'yes' to the 1st and 2nd higher bids, respectively

D_i^{10} = 1, if respondent i says 'yes' and 'no' to the 1st and 2nd higher bids, respectively

D_i^{01} = 1, if respondent i says 'no' and 'yes' to the 1st and 2nd lower bids, respectively and

D_i^{00} = 1, if respondent i says 'no' and 'no' to the 1st and 2nd lower bids, respectively. Then, the mean WTP is estimated by maximizing the following log likelihood function (Cameron and Quiggin, 1994; Haab, 1998)[2].

$$\ln L = \left\{ \begin{array}{l} \sum_{i=1}^{N} D_i^{11} \ln\left[1 - \Phi\left(\frac{P_i^H - X_i'\beta}{\lambda}\right)\right] \\ + D_i^{10} \ln\left[\left(\frac{P_i^H - X_i'\beta}{\lambda}\right) - \Phi\left(\frac{P_i - X_i'\beta}{\lambda}\right)\right] \\ + D_i^{01} \ln\left[\Phi\left(\frac{P_i - X_i'\beta}{\lambda}\right) - \Phi\left(\frac{P_i^L - X_i'\beta}{\lambda}\right)\right] \\ + D_i^{00} \ln\left[\Phi\left(\frac{P_i^L - X_i'\beta}{\lambda}\right)\right] \end{array} \right\} \ldots 2$$

Where, *Φ(.)* is the standard normal cumulative distribution function and β and λ are parameters to be estimated.

If the response of individuals to the second bid is independent of their response to the first bid, each response can be estimated independently. However, various studies have shown that the second response is more likely to be dependent on the first response (Cameron and Quiggin, 1994; An and Ayala, 1996; Asfaw and von Braun, 2005). Therefore, in a double bounded dichotomous choice approach, the bivariate normal probability density function is the appropriate specification to estimate consistent mean values[3]. The mean WTP can then be computed based on the method suggested by Hanneman and Kanninen (1999) and Kriström (1990). So at the beginning of each year *t* when state of the world is unknown, household *i* first chooses the optimal livestock investment and insurance to maximize the standard intertemporal discounted utility. The state of the world is realized at the end of the year and so IBLI makes indemnity payment to compensate for livestock loss, which then adds to the livestock accumulation dynamics in.

In this setting where household is considering a hypothetical IBLI, we consider a sequential insurance decision, in which household first chooses the optimal proportion of herd to insure, without prior knowledge of the actual IBLI premium. Conditional on their optimal insurance decision and beliefs – which also govern their expectation of the IBLI premium – the household's equilibrium conditions to imply an optimal insurance decision.

Evaluating the insurance decision at the self-insurance equilibrium (without IBLI), an equilibrium premium rate, which makes household indifferent between purchasing or not purchasing IBLI and so representing household's maximum willingness to pay for IBLI conditional on their chosen insuring proportion, will also be considered. Preferences, subjective beliefs, wealth and other household-specific characteristics thus serve as the key determinants of household's insurance decision in our setting. And theoretical predictions can be made regarding insurance demand determinants according to a standard neoclassical model.

[1] We use double-bounded elicitation method instead of triple or quadruple methods because the additional efficiency gain from adding third or fourth follow up question is relatively small and it can increase the chance of inducing response effects (Hanemann and Kanninen, 1999; Cooper and Hanemann, 1995; Yoo and Yang, 2001).

[2] This model can be estimated using standard econometrics packaged bivariate probit algorithms such as those offered in the LIMDEP software.

[3] In special cases where the correlation coefficient between the error terms of the first and the second response equations is zero, the two responses are independent and if the correlation is 1, the two responses are essentially the same. In both cases the bivariate probit specification is not appropriate.

First, with respect to household's preference, WTP will be increasing in risk aversion and decreasing in household's discount rate in a setting without asymmetric information (e.g., households fully understand the insurance contract). Second, with respect to their subjective expectation and beliefs, WTP will be increasing in household's perceived livestock mortality risk and in household's expected insurance payout taking into account the perceived basis risk associated with IBLI product (e.g., the correlations between individual mortality losses and the predicted mortality index that governs IBLI indemnity payout).

Third, by the standard wealth effect, household's income and assets represent the extent of financial resource to afford IBLI, which have positive impact on insurance decision. As the welfare impact of a formal risk management instrument like IBLI depends largely on the effectiveness of the existing risk-coping mechanisms (Morduch, 1995), household's wealth could also reflect availability of existing self-insurance capacity and so could have negative impact on insurance decision.

Theoretically, wealth thus could have ambiguous impact on insurance decision. By similar token, degree of credit constraint also plays key but ambiguous role in household's WTP for insurance. On one hand, credit constrained households may value reduction in asset risk provided by IBLI more highly because they have lesser ability to smooth consumption ex post by other means. On the other hand, the shadow value of their needy liquid asset may be too high to make IBLI attractive.

Table 2: The descriptions of variables used in the model

S. No.	List of variables used in the model	Description of the variable	Expected sign w.r.t. dependent variable
1	Age	age of household head in years	Positive
2	Education	Years of schooling completed by household head	Positive
3	Dead camel	The number of camels lost by death from household in a year	Positive
4	Crop income	Total revenue generated from crop sale in a year	Positive
5	Non-farm income	Total income generated from non-farming activities in a year	Positive
6	Family size	The number of families living together with the household head since the last six months	Negative
7	Value of asset	The estimated total market value of household assets	Positive
8	Total land holding	The total land size of household head in hectare	Positive
9	Distance from market	The distance between home and market place in kilometer (time)	Negative
10	Number of trainings	The number of times that the household head took trainings on farming in a year	Positive
11	Livestock income	The total income of households from the sale of livestock and its products in a year	Positive
12	Starting bid	The minimum starting bid price of camel, cattle and goats & sheep that the household head is willing to pay for insurance	Negative
13	The insurance coverage	The proportion of livestock (camel, cattle and goats and sheep) that the insured household head is willing to purchase for it	Negative
14	Occupation	The type of occupation of household head (dummy variables; 1 if pastoral, 0 if mixed)	Positive
15	Shock severity	Severity index (calculated based on rank level) level for different shocks that the pastoral community faces	Positive
16	Mitigation practice	The type of mitigation strategy followed by household head (in most preferred orders)	Negative
17	Adaptation strategies	The types of adaptation strategies followed during shock period in most preferred orders	Negative
18	Access to information	The accessibility of information to household level through different alternatives (and in its preferential sequences)	Positive
19	Gender	Dummy variable for the gender of household head (1 for male and 0 for female)	

Many of these predictions have been empirically verified especially in the insurance markets in developed countries. However, factors that deviate the economic setting away from full information – e.g., household's awareness, ability to understand the product and trust that condition their perceived cost and benefit of IBLI – are shown theoretically and empirically to influence demand for insurance and other financial instruments (Cole et al., 2009). These factors are expected to serve as important demand determinants for a new product like IBLI among the targeted pastoralist clients in Karrayyu with very limited knowledge of insurance.

2.4. List of variables used in the model

The study has formulated three different analytical frame works (econometrics models) such as camel model, cattle model and goats & sheep model for estimating respective household willingness to pay for the respective livestock type (Table 2). The models are separately analyzed in order to accurately estimate household willingness to pay for livestock insurance. The only thing that makes the three models similar is the personal information (household characteristics) that, which do not vary across livestock model (cattle, camel and goats and sheeps) such as age, education, gender, occupation and the like. The hypothetical relationships between the dependent variable and the interest variable are constructed based on the review of literature. The hypothesized relationship could be subjected to change for the study area, right after hypothesis testing and analytical regression model result.

3. Result and Discussion

3.1. Descriptive Analysis

Because of the fact that respondents' livelihood depends on livestock and livestock products income, for instance the average income obtained from camel is 3077 birr, from goat and sheep is 2914 and from cattle is 9478 birr per year. Some households have also off farm income generating activities and hence on average about 1650 birr non-farm income earned per year. The average education level attained in the study area is 1.22 years schooling ranging from 0 schooling to 9th grade complete. In general the respondent's descriptive statistics is summarized and categorized in to camels, cattle and goats and sheep (Table 3).

Of the total 165 sampled household, about 47 respondents have camels. The maximum average willingness to pay for the proposed insurance for camels is about 107.23 birr per year and the minimum average willingness to pay is 67.34 birr per year. The average population of camels per head is about 13.85 and the mean age of sampled households for this model is 36.85 years. In Fantale woreda, crop cultivation, though rare,

Table 3: Statistical summary for camels' model

Variable	Obs	Mean	Std.de.	Min	Max
Starting bidl	47	50	0	50	50
MaWTPH_yes	47	107.23	18.53	50	135
MiWTPH_No	47	67.34	29.79	20	100
Number of camel	47	13.64	9.58	2	45
age	47	36.85	5.49	26	49
education	47	.28	1.17	0	9
Number of dead camel	47	.34	.59	0	3
Crop income	47	22697.39	27304.26	0	108150
non_farm_i~e	47	1067.66	3938.15	0	21600
family size	47	5.77	1.84	3	14
Value of HH asset	47	21249.64	16423.86	2245	70850
total land hold	47	5.44	5.87	0	21
Distance market	47	21.29	7.17	10	30
Number training	47	3.74	1.37	1	6
Livestock income	47	27464.47	24589.1	1000	99755

is also practiced using irrigation and the estimated average income from crop cultivation, from non-farm income and from aggregate livestock income are 22697.39, 1067.66 and 27464.47 birr per year, respectively. In addition to this, the average total land hold, average distance of their home from local market, average of their value of household asset are 5.44 km, 21.29km, and 21249.64 birr respectively. Finally the average family sizes of sampled household are 5.76. The same explanation holds for cattle, and goat and sheep (Table 4 and 5).

Of the total 165 sampled households, only 137 of them have cattle in Fantale woreda. The maximum average willingness to pay for the proposed insurance for cattle is about 56.8 birr per year and the minimum average willingness to pay is 27.40 birr per year. The average population of cattle per head is about 12.2 and the mean age of sampled households for this study is 40 years.

Table 4: statistical summary for cattle

Variable	Obs	Mean	Std.de.	Min	Max
Starting bid ~l	137	30	0	30	30
MiWTPcattle1	137	27.41	12.17	5	60
MaWTPcattle1	137	56.79	29.77	15	100
Number of cattle l	137	12.16	8.25	2	45
age	137	40.04	8.55	25	69
education	137	1.11	2.16	0	9
Number of dead cattle	137	.8	.99	0	5
Crop income	137	23559.72	23555.47	0	120000
non_farm_i~e	137	1591.89	4015.57	0	21600
family size	137	5.61	1.76	1	14
Value of HH asset	137	36483.88	120653.5	0	132510
total land hold	137	3.83	9.33	0	100
Distance from market	137	19.42	7.55	7	30
Number training	137	3.21	1.42	0	6
Livestock income	137	16210.47	19132.61	0	99755

Table 5: S Statistical Summary of goat and sheep from the survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Starting bid~t	139	10	0	10	10
MiWTPgoat	139	12.42	6.60	0	20
MaWTPgoat	139	21.80	10.67	5	50
Number of goat and sheep	139	18.32	12.13	2	62
Age	139	40.17	8.64	25	6
Education	139	1.08	2.22	0	9
Number of dead goat	139	.39	.70	0	5
Crop income	139	23363.39	23132.78	0	120000
Non_farm_i~e	139	1409.28	3747.66	0	21600
Family size	139	5.61	1.75	1	14
Value of HH asset~t	139	37762.68	123832.4	0	1325100
Total land hold~*e*	139	3.80	9.26	0	100
Distance from market	139	19.59	7.75	7	32
Number training	139	3.25	1.44	0	7
Livestock income~e	139	16797.94	18929.35	0	99755

Of the total 165 sampled households, only 139 of them have goat and sheep in Fantale woreda. The maximum average willingness to pay for the proposed insurance for goat and sheep is about 21.79 birr per year and the minimum average willingness to pay is 12.41 birr per year. The average population of goat and sheep per head is about 18.32 and the mean age of sampled households for this model is 40.17 years. Out of the 165 respondents, majority of the households are farmers followed by pastoralist and some are practicing mixed agriculture.

The major livestock population in this Karrayyu community are goat and sheep, cattle, camels and other pack animals summarized as in Figure 2.

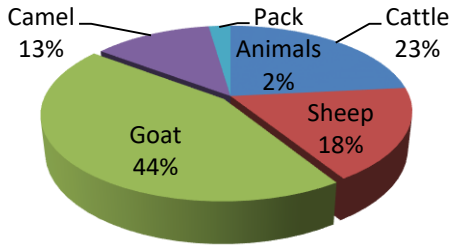

Figure 2: Share of livestock distribution by study area

3.2. Severity of shock and mitigation mechanism for both woreda

One purpose of the study is to propose livestock insurance scheme for the community in order to be able to cop up with different shocks which pull them into poverty, otherwise. Hence, by assessing the type of shock frequently happening in the study area, the severity of this shock is categorized as displayed in Figure 3.

From Figure 3, about 59% of shock is suffered because of drought followed by communicable disease (20.5%) and excess rain (10.5%). The farmers, since long time, have been victim of these shocks and were given that these households are usually victim of drought, over flooding and other are not able to cop up with these shocks. Hence this study, for the first time, proposes livestock insurance to safe guard livestock owners against this shock. To recover from problems associated with these shocks, they have been using different mitigation mechanism such as selling their own asset, home furniture; depend on NGO aids and government aids and etc. The mitigation practices are summarized in Figure 4.

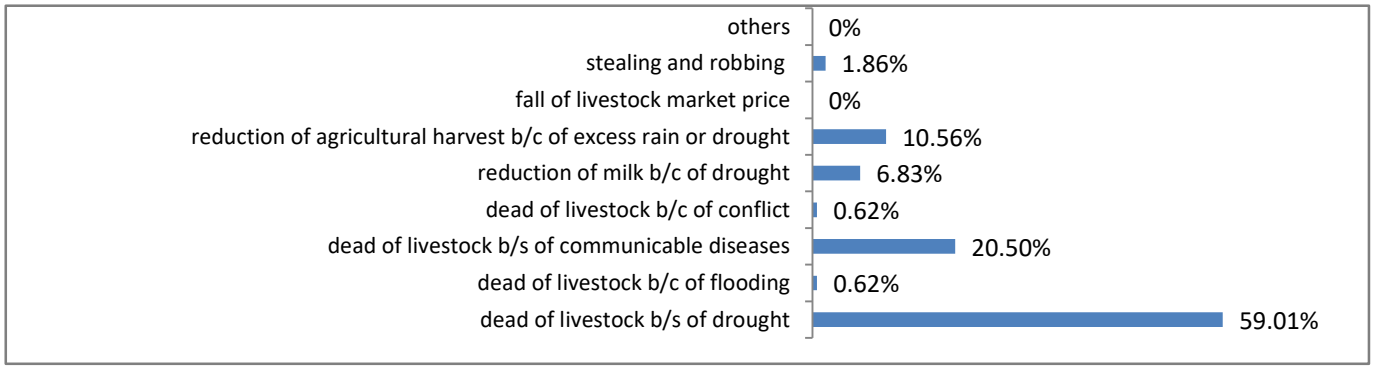

Figure 3: Severity of shocks by percent

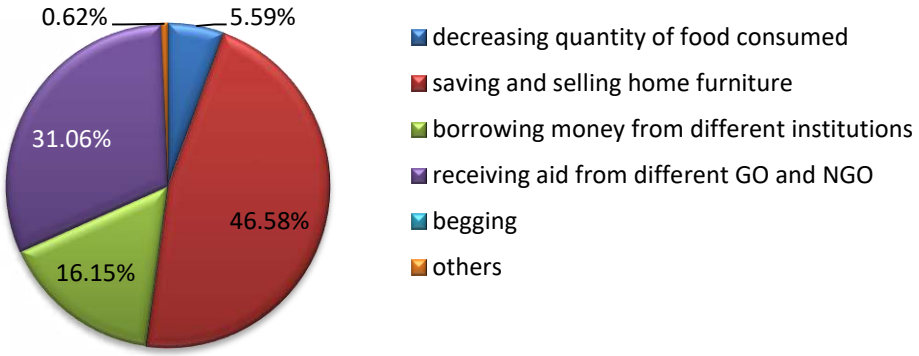

Figure 4: Mitigation practices in the study area

Majority of the respondents were selling their home furniture to overcome the problem followed by receiving aid from different governmental and non-governmental organizations. However, this is to be recognized that it cannot be sustainable way of coping up with the problem. Therefore, during the study of this work, we have asked the respondents' means of mitigating the effect of future shocks against their livelihood and the response is summarized in Figure 5.

As shown in Figure 5, farmers mainly wish to save more money and crops to prevent and resist shock respectively. About 36.8% of the respondents wish to reduce risk of their livelihood by saving money followed by increasing crop storage as safe guard during shock (20.6%), and then followed by storing foods of livestock for during drought (19.3%) since major cause of shock is drought as earlier explained.

Furthermore, we have conducted perception index just to understand farmers' attitude towards risk. Perceptions of risk attitude level across sampled households are different as follows: majority of sampled respondents are risk adverse people.

3.3. Information access of farmers and pastoralist

The farmers and pastoralist need to get information to sell their livestock in the market. However, the information asymmetry is a big problem in rural community of Ethiopia. The Karrayyu community mainly get information about their livestock market from local peoples and local market source.

The majority of respondent's source of information about livestock marketing is from local people or neighbour followed by from local market.

3.4. Reasons for no –no response (protest)

The major reason of the respondents to reject the proposed insurance bid is because they believe that government should pay the insurance bid; while having no money is the second major reason.

3.5. Percentage of livestock willing to be insured

Percentage of camel, cattle and goat and sheep respondents are willing to insure, on average, are given by each kebeles in Table 6.

Majority of the respondents have willingness to insure large share of their cattle followed by goat and sheep. Therefore, we can say from the above table that, on average, pastoral community of Karayu people are willing to insure more than 40% of their livestock population on very reasonable prices.

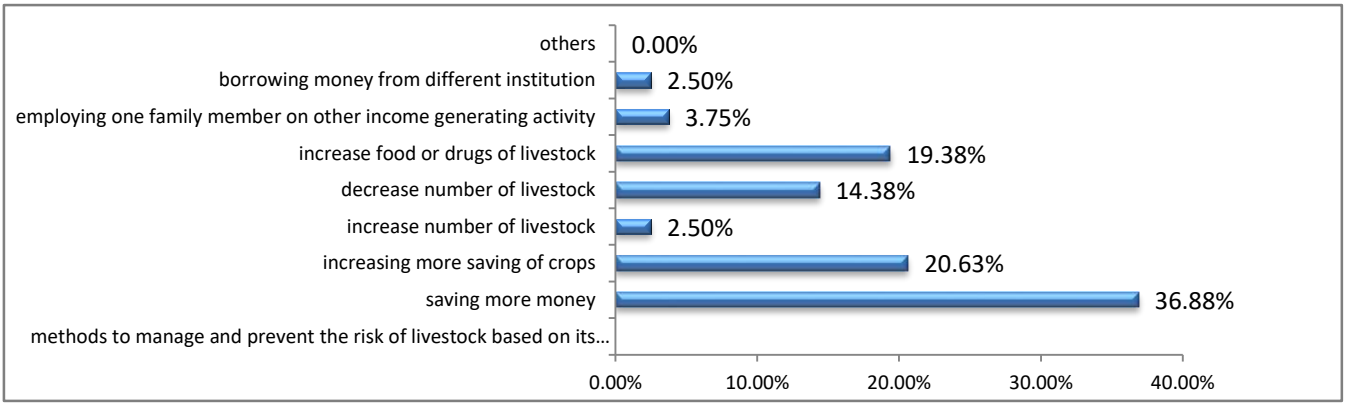

Figure 5: Future method to reduce risk of livelihood during shock

Table 6: Percentage of livestock to be insured

By kebele	Laga Banti	Godo Faafatee	Dire Saden	Borokot	Gari Nura Dhera	Total
	Mean	Mean	Mean	Mean	Mean	Mean
how much percentage of goat and sheep you have WT insure	26.00	59.63	31.20	60.17	51.95	45.79.
how much percentage of camel you have WT insure	22.18	39.18	27.27	.	.	29.54.
how much percentage of cattle you have WT insure	23.00	57.50	28.88	54.43	70.74	46.91.

3.6. Econometrics Analysis

Interval data logit estimation techniques were used to estimate the model of this study i.e to identify determinant factors which affect household WTP and to know how much they are willing to pay to join the proposed livestock insurance. Using interval data logit model we have estimated three models i.e. for camel, for cattle and for goat and sheep. In the case of bivariate logit, fixed effect panel and interval logit models (models with two variables as dependent variable), the appropriate estimated parameters used for the interpretations is the marginal effect one, instead of incidental effects and odd ratios. Therefore, the below tables are the estimated marginal effect results for each models.

The result of camel model (Table 7) shows that age of household head, family size, and number of camel size and value of household asset have positive effect on probability to join livestock insurance and more willingness to pay. Education has an expected result which implies the more educated the less willing to join insurance but this is because of data problem. We find that educated people are not even living there as a pastoralist or farmers rather they join urban economic activities where there is relatively higher wage rate. The non-farm income and distance from local market has negative impact on willingness to join livestock insurance. This could be because of the fact that the more household earn non- farm income the more they may perceive to overcome any shock when happened; and hence the more reluctant they are to join livestock

Table 7: Marginal effect result for willingness to pay model for camel insurance

Variables	Marginal effects after intreg: dy/dx	Mean value X
Starting bid	-1.576261***	50
	(.3177338)	
Camels owned	.8899253***	13.6383
	(.30587)	
Age	.5933122*	36.8511
	(.34489)	
Education	-6.167751***	.276596
	(1.44266)	
Crop income	.0001123	22697.4
	(.0001)	
Nonfarm income	-.0011565**	1067.66
	(.00058)	
Family size	3.050541***	5.76596
	(.85905)	
Value of household asset	.0006384***	21249.6
	(.00011)	
Total land hold	-1.747564***	21.2979
	(.34872)	
Distance to market	-3.76045***	3.74468
	(1.42229)	
No. of training taken	-.0000377	27464.5
	(.00016)	
Livestock income	-.5275333	5.44362
	(.62076)	
Lnsigma	1.9253***	
	(.2062)	
Sigma	6.8569	
	(1.4141)	
Log likelihood = -18.00532; LR chi2(11) = 60.37; Prob > chi2 = 0.0000; No. of observation=47		

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: Marginal effect result for willingness to pay model for cattle insurance

Variables	Marginal effects after intreg: dy/dx	Mean of X
Starting bid	-1.401491***	30
	(.3039682)	
Number of cattle owned	.4574891*	12.1606
	(.26913)	
Age	-.2785723	40.0438
	(.1926)	
Education	1.121682	1.10949
	(.75266)	
Income from crop	-.000043	23559.7
	(.00007)	
Nonfarm and off farm income	-.0004382	1591.9
	(.00038)	
Family size	.4678694	5.60584
	(.93423)	
Value of household asset	-.0000208*	36483.9
	(.00001)	
Total land hold	-.1791323	3.82883
	(.17077)	
Distance to market	-.0470991	19.4161
	(.22909)	
Number of training taken	.9741571	3.21168
	(1.21301)	
Livestock income	-3.11e-06	16210.5
	(.00012)	
Lnsigma	2.6561***	
	(.0749)	
sigma	14.2401	
	(1.0666)	
Log likelihood = -139.3593; LR chi2(11) = 16.69; Prob > chi2 = 0.1175; No. of obser.=137		

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

insurance. The more the distance of market from the household, the less household has money in the pocket; and hence the more reluctant he is willing to pay for livestock health insurance. Concerning the number of training they have been attending on livestock management, the negative sign may be attributed deviation of the training to the real situation of that community.

The result for the cattle model (Table 8) is not as such significant in influencing willingness to pay for livestock insurance. However, the value of household asset has negative impact on willingness to pay for livestock insurance which may imply that as household asset increases people have less willingness to accept new ideas and hence less willingness to join the program. The number of cattle owned has positive impact on willingness to pay and the starting bid has negative impact on households' willingness to pay for livestock insurance in the study area.

The model for goat and sheep is as below Table 9. The result of this model shows that as number of goat and sheep increases households willingness to join livestock insurance increases and significant. The higher livestock income leads to the less willingness to pay for goat and sheep insurance. As age of the household increase, their willingness to pay for livestock insurance decreases, which imply aged people, has less tendency to accept new products. In all the three models, the starting bid price has negative significant effect on the demand for livestock insurance, which confirms the law of demand.

Table 9: Marginal effect result for willingness to pay for goat and sheep insurance

Variables	Marginal effects after intreg: dy/dx	Mean of X
Starting bid	-2.157819***	10
	(.4416049)	
Number of goat and sheep owned	.1375738**	18.3333
	(.06405)	
Age	-.1534964*	40.1812
	(.08452)	
Education	-.2314444	1.08696
	(.31806)	
Income from crop	-.0000199	23307.7
	(.00003)	
Nonfarm and off farm income	-.000058	1419.49
	(.00018)	
Family size	.1606583	5.6087
	(.39725)	
Value of household asset	2.41e-06	37902.3
	(.00001)	
Total land hold	-.0358934	3.80797
	(.07617)	
Distance to market	-.0334112	19.6812
	(.10176)	
Number of training taken	.2823072	3.25362
	(.51282)	
Livestock income	-.0001254***	16809.5
	(.00004)	
Lnsigma	1.9063***	
	(.0709)	
Sigma	6.7279	
	(.4769)	
Log likelihood = -187.61759; LR chi2(11) = 21.12; Prob > chi2 = 0.0322; No. of obser. = 138		

3.7. Total willingness to pay

One of the objectives of this study is to know how much of birr households are willing to pay for their livestock insurance. Hence to answer for this question, we need to calculate total willingness to pay. To obtain the total willingness to pay for each insurance model for sampled area, we need to know the median or mean willingness to pay per livestock. The mean and median willingness to pay is obtained using Krinsky and Robb procedure.

The total willingness to pay for sampled survey area is calculated as multiplying the percentage of livestock willing to be insured by the estimated median willingness to pay.

If the sampled households do represent the entire woreda, then out of the total size of livestock 29.54 %, 46.91% and 45.79 % of camel, cattle and goat and sheep's will be insured, respectively (Tabel 10). Hence the total willingness to pay for camel, cattle and goat and sheep are 2.7million, 4.27 million, and 4.4 million birr[4] per year respectively. This amount of birr implies, as there is huge demand for livestock insurance in this Karrayyu community and can call for potential intervention.

[4] The currency exchange rate during study period was USD 1= 20 birr.

Table 10: Total willingness to pay

Type of insurance	Median WTP per each livestock per year in birr	Total number of livestock in Fantale and Boset woreda in 2015	Percentage of livestock willing to be insured	Total WTP per year birr
Camel	73.70	124,236	29.54	2.7 million
Cattle	39.24	232,192	46.91	4.27 million
Goat and sheep	15.73	612,486	45.79	4.4 million

4. CONCLUSION AND RECOMMENDATION

Karrayyu communities living in Boset and Fentale experience recurrent weather related shocks like drought and rainfall failure. Given that these communities are largely pastoralists, covariate shocks like drought have paramount effect on the livelihood of these communities. Given this condition, the study-analyzed households' willingness to pay for index based livestock insurance and the determinants of livestock insurance.

The finding of the study shows the presence of huge potential demand for livestock insurance among the Karrayyu community. The camel model reveals that age of household, family size, number of camel size and value of household asset have positive effect; non-farm income and distance from local market have negative effect on the households' probability of joining livestock insurance and their WTP. The cattle model shows that age of household head has negative impact on livestock insurance. The result of goat and sheep model shows number of goat and sheep has positive and significant effect while income from livestock has negative effect on households' willingness to join livestock insurance. In all models, the starting bid price has negative significant effect on the demand for livestock insurance, confirming the law of demand. Based on the study results, the author recommends the following main points;

- The fact that there is willingness to pay for livestock insurance implies that policy intervention through supply of livestock insurance can mitigate the side effect of covariate shocks leading to smooth consumption and stable income stream of households.
- The fact that the median WTP for a single camel is greater than other livestock implies that preferential policy intervention, through camel insurance, may yield better outcome as community give more value to the camel.
- Majority of the households who reject to pay for the proposed new insurance scheme perceive that government should pay premium for them and hence may partly imply lack of awareness and hence awareness creation is need to be done.
- The fact that the finding shows households' source of market information is from local people, implies that their access to information is very limited. Therefore, working for households' better access to information through radio and other forms of communication is crucial.

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