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RESEARCH ARTICLE

ASSESSING FARMER'S UNDERSTANDING TO WEATHER INDEX INSURANCE IN TIGRAY REGION

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ABSTRACT

Climate change is the main challenge for farm households in the world and it becomes a special treat for underdeveloped country's farmers whose income depends on whether condition. And Ethiopia is one of the few countries in the world that has been ravaged by extreme drought. While its economy depends on agriculture, Farmers face a variety of climatic risks that make their incomes unstable and unpredictable from year to year (Hazell *et al.,* 2010). In order to minimize such agricultural problems index insurance program is being developed in Ethiopia. Hence the study aimed to assess farmer's understanding to weather index insurance by using panel data of 2010/11 household survey in Tigray region. To achieve the objectives of the study descriptive technique was used. Result showed that 10.85% of the index insurance purchasers do not understand the index insurance well but most of the purchasers i.e. 83.72% of them reported that they have well understanding about insurance and purchase it based on their awareness. We have also found that 43.61% of the respondent reports that insurance could cover part of their loss while 20.30% of them reports that insurance covers full lost of crop as a result of rain fall problem. As it was explained in the previous section payout is possible only when rainfall was below the pre determined level in the area (the agreed threshold) but only 24.06% of the respondents know this fact. Based on the result, the study recommends that; repeated training program should be given to the society about index insurance and expanding awareness until they really understand it especially about the loss coverage and rain full problem. Then after, expanding weather index insurance program, in all the drought prone areas of this region. Households could increase purchasing the weather index insurance, through this production or economic capacity of households and living standard of the rural society in general could improve over time. Finally, this study is left open for further research as index insurance is at its early stage in the study area, so there should be continuous follow up and research on this area.

1. INTRODUCTION

1.1. Background of the study

Ethiopia is one of the few countries in the world that has been ravaged by extreme drought, resulted in dramatic decrease in economic development and an increase in poverty. 44 percent of Ethiopia's population lives below the poverty line. And Agriculture is the dominant economic activity, accounting for about 47 per cent of GDP. Almost four fifths of the people live in rural areas, and the majority works in the agriculture sector (Hazell *et al.,* 2010). Grains are the most important field crops and the chief element in the diet of most Ethiopians. The principal grains are teff[1], wheat, barley, corn, sorghum and millet. However, Agricultural activities in Ethiopia generally have low productivity. The agricultural sector is affected by a high level of poverty, underdeveloped infrastructure and poor entrepreneurial development.

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Agricultural production is also a risky business. Farmers face a variety of price, yield and resource risks that make their incomes unstable and unpredictable from year to year. The direct results are dramatic decrease in economic development and an increase in poverty. In order to cope, some farmers have diversified crops in the case of drought or have sold cattle to repay loans or buy food (Hazell *et al.,* 2010).

In order to solve such agricultural problems index insurance pilot is being developed in Ethiopia by Oxfam America (OA) and Swiss Re, in collaboration with IRI, the Relief Society of Tigray (REST) and other partners. Still at a relatively early stage, this project is taking a farmer-centric approach, and is working to integrate index insurance with other risk reduction activities such as improved agronomic practices, conservation measures, and seasonal and daily weather forecasting. Project innovations include the extension of weather insurance to communities that are technically challenging to serve, and methods that allow cash-constrained farmers to pay for premiums with their labor.

[1] Teff –is a type of cereal crop which is stable food crop for Ethiopians.

The project, which is called Horn of Africa Risk Transfer for Adaptation (HARITA), is initially targeting teff farmers in the village of Adi Ha, during 2009. In 2010 the program was expanded to additional four (Awet-bikalci, Gente, Hade-alga and Hadush-adi) treated villages found in different zones of the region. Lack of delivery channels for reaching remote and inaccessible rural customers is often a major obstacle to offering Micro insurance. To overcome this challenge, the financial institutions involved in the pilot will employ a partner–agent model. Dedebit Credit and Savings Institution (DECSI), the second largest microfinance institution in Ethiopia, will act as the insurance agent. DECSI has very extensive operations throughout Tigray, and will harness its strong community relationships and reputation to market and deliver insurance on behalf of Nyala Insurance, the primary insurance supplier.

The project is also working on ways of overcoming weather data limitations. IRI has led the exploration of new techniques to enhance sparse local datasets through a combination of satellite data, rainfall simulators and statistical tools that interpolate data from stations nearby. Satellite data will also be used to improve understanding of the correlation between rain gauge data and actual losses on farms. With this information, the project may be able to reduce basis risk by answering the difficult question of what is the maximum distance between farm and rain gauge for which the rain gauge measurement of precipitation is valid.

The HARITA project complements Ethiopia's innovative social protection scheme, the PSNP. This reaches approximately 8 million vulnerable people, about 11% of Ethiopia's total population. The PSNP provides payments to participating households in exchange for labor to build community assets such as water harvesting structures. Such households tend to be chronically food and resource-insecure, and are likely to be unable or unwilling to pay cash for insurance premiums, despite finding risk management highly relevant to their livelihood strategies. HARITA is exploring ways to build upon the PSNP model by enabling farmers to pay insurance premiums in kind rather than in cash. Under the scheme, farmers will have the option of working a few additional days in exchange for an insurance voucher that protects them against drought (Hellmuth *et al.,* 2009).

Through this insurance with PSNP labor, farmers demand for modern agricultural inputs will be increased because the insurance creates some confidence about the compensation for expected loss from future weather condition problems. Thus they will be motivated to take risk and apply the modern inputs.

1.2. Statement of the problem

According to a variety of scientific studies, climate change in Ethiopia could lead to extreme temperatures, extraordinary rainfall events, and more intense and prolonged droughts and floods. These projections come as particularly bad news considering the fact that more than 85 percent of Ethiopians are engaged in smallholder, rain fed agriculture, and farms already find themselves under significant climate stress (HARITA, 2009). The Government of Ethiopia's agriculture policy aims to achieve rapid agricultural growth through adoption of modern inputs and commercializing smallholder agriculture. To realize this Ethiopian government introduces weather index insurance.

In 2009 index insurance contract was designed risk management package for farmers in the village of Adi-Ha. Farmers were creating a scalable in-kind premium payment model whereby farmers obtain insurance through PSNP (HARITA, 2009).

Payouts occur when the amount of rainfall over an agreed range of period is below a pre determined threshold. Unlike with traditional crop insurance, the insurance company does not need to visit farmers' fields to assess losses and determine payouts. Instead, it uses data from rain gauges near the farmer's field. If these data show the rainfall amount is below the threshold, the insurance has to be paid. This means that payouts can be made on time so that to reduces or avoids farmers' distress sales of assets. This process also removes moral hazards such as the 'perverse incentives' of crop insurance, where under certain conditions farmers may actually prefer their crops to fail so that they receive a payout. With index insurance, the payout is not linked to the crop's survival or failure, so the farmer still has an incentive to work hard and get better harvest given that the minimum amount of rain fall (Hellmuth *et al.,* 2009).

In the last few years, weather index insurance has gained increasing attention as a useful tool to manage risk. Much has been said about its advantages over other traditional agricultural insurance arrangements (contracts) especially in its role to reduce transaction costs and information asymmetry. Nonetheless, there is still little empirical evidence of its effects on risk taking behavior and farmers' decision making (Fuchs, and Wolff, 2010). Thus, this study assesses knowledge of farmers on weather index insurance.

To the best of my knowledge studies conducted so far in this field were based on experiment, but such an experimental assessment could not exactly reflect the exact understanding level of farmers on index insurance. This research is therefore, an attempt to fill the existing gaps on the assessment about understanding of farmers to index insurance.

1.3. Objective of the study

- To assess and describe knowledge of households about index insurance and the contract design.
- To recommend directions in how to implementation the weather index insurance program

1.4. Significance of the study

Maximizing agricultural production in Ethiopia and particularly in the study region is essential to reduce poverty and ensure sustainable development. Such concerns call to investigate the underlying root causes contributing to the farmer's risk aversion behavior, which leads them to invest on less risky inputs with less return in the study area.

A possible solution to this problem may be providing these poor farmers with index insurance. Thus it is necessary to study whether this program is really understood by farmers.

Hence, such studies are important for the success of huge efforts made in the area to ensure food security. Policy makers and planners can also draw lessons on designing effective strategies for further efforts in addressing food insecurity and poverty alleviation. This study will also contribute to fill a gap of knowledge in the subject. Furthermore the output of the study could be informative for development practitioners, donors and nongovernmental organizations.

1.5. Scope of the Study

The study is conducted in five treated villages of three woredas (Raya -Azobo, Kola-Temben, and Sas'e tsaeda-Emba) of Tigray Regional State, Ethiopia. The research design employed household survey panel data of 2010 and 2011, i.e. household base line survey which was collected in 2010 and one follow up survey data that was collected during 2011.

2. Methodology of the Study

Description of the Study Area

Tigrai is located in the northern most of Ethiopia. It covers an area of approximately 54,572 square km. The altitude of the region varies from about 500 meters above sea level (masl) in the. North-east to almost 4000 masl in the South-west. The agro-ecology of the region is broadly categorized into lowland (Kola – less than 1500 masl), midland (Woina-degua – 1500 to 2300 masl), and highland (degua – above 2300). About 53 percent of the region is lowland, 39 percent Medium highland and 8 percent upper highland (BoFED, 2008 in K/mariam, 2010).

The study was conducted on three drought prone woredas[2]. Sample of purchasers and non-purchasers were taken from five treated villages (Adi-ha, Awet-bkalci, Gente, Hadealga, and Hadush-adi) found in these drought pron woredas'. The first woreda is Kola-Temben which is found on central zone of Tigray region where, the dominant crops are teff and wheat. In this woreda there are two treated tabias [3]Adi-ha and Awet-bikalsi. In late May 2009, 20% of households in Adi-Ha signed up for a weather index insurance product for *teff,* a staple cereal crop. Of these households, 65% were participants of the Productive Safety Net Program (PSNP).

The second is Woreda Raya-Azebo found in southern zone of Tigray, where the dominant crops in this woreda are sorghum[4] and teff, here there are two treated tabias (Gentea and Hade-alga).The other is wereda Sasea-tsaedaemba found in western zone of Tigray, where the dominant crops are barley and teff. Hadush-adi is the treated tabia that is found in this woreda. Households participate in index insurance either through PSNP or by cash. Farmers that participate in PSNP purchased insurance for their dominant crop with labor, that is they have the option to work *extra* days beyond those required for their normal payments, but instead of earning cash or food for this additional labor, they earn an insurance certificate protecting them against rainfall risk. On the other hand richer farmers who do not participate in PSNP are encouraged to purchase insurance with their own cash.

Data Sources and Sampling Method

House hold level primary data collected during 2010 and 2011 in Tigray region, Northern Ethiopia using structured survey instrument was used in this study. Besides, secondary sources about the weather index insurance and related materials were consulted. The project employed a mix of different sampling techniques. The study area and the target population were selected by purposive sampling method (i.e. drought prone woredas and PSNP participant individuals are selected purposefully), then proportional sampling method employed to determine the sample size for each tabia. Finally respondents or households are selected by applying systematic random sampling from the sample frame of purchasers and non-purchasers.

Based on these processes 300 treated households out of 6891 treated households from five treated (Adi-ha, Hadush-adi, Gentae, Hadealga, Awet-bkalci) tabias. And 100 control households from three control (Menji,Werabay and Agazi) tabias were selected.

For the purpose of this study three hundred households (purchasers and Non-Purchasers) from five treated villages (i.e. from Adi-ha, Hadush-adi, Gentae, Hadealga, Awet-bkalci) were taken. After some cleaning of the data 245 households were left, these were distributed among the villages (tabias) on the following Table 2.1.and Table 2.2.

Table 2.1. Sample of all Treated Tabias

S.No.	Tabia	Sample size	Program
1	Adi-ha	65	Participant
2	Awet-bikalci	49	Participant
3	Gente	55	Participant
4	Hade-alga	58	Participant
5	Hadush-adi	70	Participant
	Total	297	

Source: household survey 2010.

Table 2.2. Sample of Purchasers and Non-Purchasers from the Treated Tabias

Village (Tabia)	Genet	Hade-alga	Hadush-adi	Awet bikalci	Adi-ha	Total
Non-purchaser	35	27	20	14	20	116
Purchaser	13	23	36	22	35	129
Total	48	50	56	36	55	245

Source: household survey 2010.

The survey data contain detailed information on household characteristics (such as age and sex of the household head, schooling level of household members etc), asset ownership, credit, non-agricultural activities, land holding, inputs, crop outputs, rented land, sharecrop land, livestock ownership,

[2] Woreda-refers to district
[3] Tabia- this is small administrative unit in Tigray region
[4] Sorghum –type of cereal crop

adoption of modern inputs, purchasing weather index insurance and reasons for purchasing it, etc.

Methods of Data Analysis

For the analysis of this study descriptive techniques were used. Their respective ways of analysis are explained in detail in the next section as follows.

Descriptive Analysis

In the descriptive analysis part, descriptive statics about the demographic characteristics of the sampled households and summery statistics of their modern input demand and their level of understanding about the insurance contract design were presented.

3. RESULTS AND DISCUSSION

This part presents the descriptive statistics.

Descriptive evidences

In this section descriptive analysis about household characteristics, households' understanding about index insurance and their level of input demand were discussed by implementing tables.

Household head characteristics

Household characteristics of the weather index insurance purchasers and non-purchasers are presented in Table 3.1.

The mean age of the insurance purchasers and non-purchasers is found to be 40.9 years and 43.1 years respectively. And, the t- test shows that there is significant difference (at 10% level) between insurance purchaser and non-purchaser households on the basis of the age of household head. Thus it indicates that non-purchaser households were more aged than purchasers.

Based on Table 3.1. average fertilizer demand of insurance purchasers was 43 kilo gram while that of non-purchasers was 26.8 kilo gram. The difference in fertilizer demand is significant at less than 1% level. This indicates that insurance purchaser's fertilizer demand was more than non-purchasers. When we see demand of other modern inputs such as high yielding variety seeds and Pesticides by sample households, it was 6.24 kilo gram and 0.24 litters respectively. As Table 3.2 reveals 32.35 percent of the total sample households can read and write, while the remaining, which are more than half of the sample household were illiterate. When we compare educational background of insurance purchasers and non-purchasers, we found that 40.91% of the literate household heads purchase insurance, while 22.34% literate households were non-purchasers. This difference in educational background of insurance purchasers and non-purchasers is significant at less than 1% level. So this shows that more of the literate households purchases insurance relative to the non-purchasers. The study identified that 60.78% of the sample households were headed by males, while the remaining 39.22% were female headed households. When we compare purchasers and non-purchasers, 62.73% male headed households and 37.27% female headed households were insurance purchasers. While, 58.51% male headed and 41.49% female headed households were non insurance purchasers.

Table 3.1. Summary of descriptive statistics (continuous variables) Comparison of Index Insurance Purchasers and Non-purchasers

	Total		Insurance-purchasers		Non-purchasers		Significance of difference
Variable description	Observation	Mean	Observation	Mean	observation	Mean	t-test
Age of household head	446	42.340	220	40.909	188	43.127	1.715*
Fertilizer demand	446	35.991	220	43.363	188	26.803	2.569***
High yielding variety seeds	446	6.247	220	7.238	188	5.436	1.185
Pesticide	444	.243	218	.121	188	.433	-0.868
Yield (output)	446	11.318	220	9.801	188	11.224	-0.288

Difference = Mean (purchasers) – Mean (Non-purchasers). *** Significance at 1% level, *Significance at 10% level
Source: Own computation based on survey data, 2010 and 2011, *(NB. Missed observations are excluded from this computation.)*

Table 3.2. Summary of descriptive statistics (discrete variables) Comparison of Index Insurance Purchasers and Non-purchasers

		Total		Non-purchasers		Insurance purchaser		Significance of difference
Variable description		Frequency	percent	Frequency	percent	Frequency	Percent	chi^2 test*
	Male	248	60.78	138	62.73	110	58.51	
Gender	female	160	39.22	82	37.27	78	41.49	0.75
Marital status	Un Married	130	31.86	60	31.91	70	31.82	
	Married	278	68.14	128	68.09	150	68.18	0.00
Education	illiterate	138	67.65	73	77.66	65	59.09	7.98***
	literate	66	32.35	21	22.34	45	40.91	
Religion	Christian	362	88.93	152	80.85	210	95.45	
	Muslim	46	11.27	36	19.15	10	4.55	21.61***
wealth perception	Not Wealthy	228	62.47	86	52.76	142	70.30	
	Wealthy	137	37.53	77	47.24	60	29.70	11.83***
Credit access	No credit	228	62.47	114	69.94	114	56.44	
	Credit	137	37.53	49	30.06	88	43.56	7.01***
PSNP	None participant	133	32.60	95	50.53	38	17.27	51.03***
	Participant	275	67.40	93	49.47	182	82.73	

*** Significance at 1% level, *Significance at 10% level
Source: Own computation based on survey data, 2010 and 2011, *(NB. Missed observations are excluded from this computation.)*

The chi 2-test result shows that there is no significant difference between purchasers and non-purchasers in regard to gender.

Religion may also influence credit and fertilizer demand of households. Accordingly we found that 95.45% of the insurance purchaser households were Christians (mainly orthodox) while, Muslim community accounts the remaining percentage. On the other hand 80.8% of the non-purchasers were Christians (mainly orthodox) while; Muslim community accounts the remaining percentage. From this it is clear that most of the sample households were Christian. But there is significant difference in religion of purchasers and non-purchasers. That is most of insurance purchasers were Christians (mainly orthodox).

We identified also that about 82.7% of the index insurance purchasers were PSNP participants while 17.3% of the purchasers were non PSNP participants. On the other hand 49.4% of the non purchasers were PSNP participants while 50.5% were none PSNP participants (Table 3.2). This indicates that almost all the insurance purchasers were PSNP participants. Who are poor and risk-averse households and needs more security in their agricultural activity relative to the rich households, this result matches with different theories regarding insurance and behavior of risk-averse households.

Table 3.3 shows, 10.85% of the index insurance purchasers reported that they do not understand the index insurance well but most of the purchasers i.e. 83.72% have good understanding about insurance and purchase it based on their awareness. On the other hand 23.3% of the non-purchasers have some understanding about insurance but not purchase it. The remaining purchasers and non-purchasers do not know certainly whether they understand index insurance or not.

Table 3.3. Understanding and purchase of weather index insurance

Understand WII	Non-Purchaser	Percent	Purchaser	Percent
No	33	28.45	14	10.85
Yes	27	23.3	108	83.72

Source: Own computation based on survey data, 2010,
(NB. households that respond do not know for this question is excluded from this computation.)

Understanding of the index insurance contract was measured by assessing participant's understanding about the contract design described in the training. A weather index insurance contract was described and questions on the contract asked during the training. Households with a higher and lower understanding of the contract were participated in the program. That is those more able to understand the contract were more likely to increase fertilizer purchases. This means farmers that correctly answer for questions such as; when does insurance give you pay -out? , does it compensate your full cost or not? etc were recorded as having a high understanding and those who not answer correctly were recorded as having a low understanding.

Table 3.4 shows understanding of households about cost coverage of weather index insurance as result of rainfall failure. Therefore, we have found that 43.61% of the respondent reports that insurance could cover part of their loss and the remaining 20.30% reports that insurance covers full lost of crop as result of rain fall problem. As it is explained in the previous section payout is possible only when rainfall was below the pre determined level in the area (the agreed threshold) but only 24.06% of the respondents know this fact.

As it was explained in Table 3.3 and 3.4, households consider themselves as they have good knowledge about insurance and purchase it based on their awareness. But they do not understand the contract design that is in relation to cost coverage and rain fall problem of the insurance program.

Table 3.4. knowledge of households about the contract design of index insurance

Coverage and condition of payout	Answer	Frequency	Percent
➢ All cost covered	No	116	43.61
	Yes	54	20.30
➢ Part of cost covered	No	99	37.22
	Yes	71	26.69
➢ Will you Get payout when RF below some level?	No	119	44.74
	Yes	64	24.06
➢ Will you Get payout When rainfall below level on field?	No	178	66.92
	Yes	5	1.88
➢ Will you receive payout every time yields are poor?	No	50	21.01
	Yes	93	39.08

Source: Own computation based on survey data, 2010,
(NB. households that respond do not know for these questions are excluded from this computation.)

4. Conclusion and recommendation

4.1.1.Conclusion

Descriptive method of analysis was used. We assess understanding of farmers to index insurance in five treated villages of Tigray, Northern Ethiopia. The result shows that 10.85% of the index insurance purchasers do not understand the index insurance well but most of the purchasers i.e. 83.72% of them reported that they have well understanding about insurance and purchase it based on their awareness. We have also found that 43.61% of the respondent reports that insurance could cover part of their loss while 20.30% of them reports that insurance covers full lost of crop as a result of rain fall problem. As it was explained in the previous section payout is possible only when rainfall was below the pre determined level in the area (the agreed threshold) but only 24.06% of the respondents know this fact.

In table 3.3 most of the purchasers respond as they understand index insurance, but in table 3.4 their answer about the contract design is inconsistent and this shows that they still did not understand about the contract design even though they have knowledge about weather index insurance. And this can have effect on the impact of index insurance in changing behavior of households to adopt modern agricultural technology and then reducing poverty. Thus provision of Weather index insurance

can achieve the intended objective when households get detail training on the contract design.

Previous studies on weather index insurance reveals that the program was introduced in most developing countries and its impact on modern agricultural inputs was positive. In Malawi the impact of index insurance on consumption, investment and on welfare was studied by Nicola (2010) and he found that Weather insurance can allow developing countries for the adoption of riskier but more-productive improved seeds such as hybrid seeds. And this leads them to increase investment on modern inputs over time because of the increase in farmers' income.

4.1.2. Recommendation

Based on the result of the study, we are going to recommend the following things:

The first thing to be done is; expanding awareness and giving repeated training program to the society about index insurance until they really understand it. Then after expanding weather index insurance program in all the drought prone areas of this region, households could increase demand to index insurance, through this production or economic capacity of households and living standard of the rural society in general could improve over time.

Finally, this study is left open for further research as index insurance is at its early stage, so there should be continuous follow up and research.

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