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Reducing the Vulnerability in Tikapur Municipality: A Role of Index Based Flood Insurance

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Abstract
The Terai region of Nepal experiences significant economic losses every year as a result of flooding. The poor and indigenous farmers, whose houses are made up of mud, are already vulnerable to flood hazards. Tikapur municipality is situated along the banks of the Karnali River, where the majority of small-scale farmers sustain their livelihoods from agriculture. Various structural and non-structural measures have been implemented in this area to mitigate the risk of flood hazards. The various risk transfer tools are studied, and index-based flood insurance, as a non-structural tool, is found to be suitable. But the uptake of index-based insurance is very low. To identify the factors contributing to low uptake, a closed-ended questionnaire survey was conducted among 85 households in the most flood-affected wards 2, 5, 6, 7, and 8 of the municipality, and the results were validated by triangulating with key informant techniques and field observations. Out of 85 respondents, only 37.65% expressed their interest and showed their willingness to participate. A chi-square test and a logistic regression test were performed to identify the factors that influence the WTP of the respondent. Insurance awareness and farm income are found to be significant factors. The awareness about the insurance, by the selection of appropriate medium to the local famers can be done by the stakeholders. The local government can allocate the amount for premiums for the most vulnerable farmers from the disaster management fund, as in the case of a flood disaster or other disaster, the government has to spend a huge sum of money for relief and reconstruction work.

Keywords
Risk transfer tools, Index based flood insurance, Vulnerability, Willingness to pay (WTP)

1. Introduction

Major disasters like floods, landslides, earthquakes, fires, lighting, etc. are the major causes of economic loss in Nepal. The character of flood disasters has undergone a significant change, making people and communities residing in Nepal's Terai belt more vulnerable [1]. Vulnerability involves not just the exposure to risks, but also the capacity of communities to effectively cope with and mitigate the impacts of those risks [2]. The productive agricultural fields are inundated every year by flood hazards in the Terai region. The inundation depth is increasing as the effect of sedimentation from Chure range in conjunction with climate change [3]. As the climate changes, these floods become more intense, destroying thousands of hectares of crops. As a result, farmers, who rely heavily on agriculture as their main source of income, become even more vulnerable to the impacts of floods and other hazards. Non-structural measures like flood insurance might be the solution to reducing vulnerability. Flood insurance can help reduce the burden of losses caused by floods. Index-based flood insurance stands as an inventive strategy to swiftly establish efficient payout systems, targeting low-income communities that are vulnerable to floods [4].

Nepal has limited resources and a poor disaster risk financing mechanism to minimize disaster risk. The country largely relies on external funds and humanitarian aid for any disaster, big or small. Despite the financial burden of relying on external assistance, governments still attempt to mitigate flood risk by implementing structural measures like dams, reservoirs, and river training works [5]. The various structural and non-structural measures have been practiced in Tikapur municipality to prevent flood hazards. The construction of embankments along the Rani Jamara Kulariya irrigation project is aimed at mitigating the risk of flooding in this region. But the problem of flooding persists despite these interventions. The river bank of Karnali is fertile, and facilities for irrigation are also easily available. Numerous vulnerable individuals sustain their livelihoods by farming on riverbanks that are prone to flooding and inundation [1].

The people residing in Tikapur municipality, whose major source of income is agriculture, are highly affected by water-induced disasters every year. The crops, both harvested and unharvested, have been significantly impacted by flooding in previous years, leading to a lack of confidence in farming in these areas. The cultivable agricultural fields have been left barren due to the past year's experience with flooding. The increasing amount of barren agricultural land poses a threat to global food security [6]. To support their livelihoods, the people are going to India and other nations in search of employment. To resolve the problem of the increasing number of vulnerable farmers to natural hazards in Nepal, insurance should be promoted [7].

The Sendai Framework for Disaster Risk Reduction (DRR) 2015–2030 prioritizes the mechanisms of disaster risk transfer and insurance and advocates for their promotion by state and local authorities [8]. The 15th periodic plan (2019/20 – 2023/24) of Nepal has developed strategies and working policies for promoting resilience in both society and the economy by effectively managing risks through the strengthening and expansion of insurance services. The 2018

National Policy on Disaster Risk Reduction emphasizes the promotion and enhanced accessibility of insurance for agriculture, livestock, and businesses. This aims to facilitate risk sharing and transfer among vulnerable communities.

The United Nations Office for Disaster Risk Reduction (UNDRR) advocates for the use of risk transfer tools and their promotion by local as well as state governments. Some of the major risk transfer tools given by UNDRR are insurance and reinsurance, catastrophe (CAT) bonds, contingent credit facilities, and reserve funds [9].

In insurance and reinsurance, the cost is covered by the premium. Life insurance and non-life insurance are two types of insurance available on the market. Under non- life insurance, property insurance, engineering insurance, and agriculture insurance are commonly practiced insurances in the context of Nepal. In property insurance, disaster risk properties are insured. The under construction projects are insured by engineering insurance, whereas crops and livestock are insured under agriculture insurance. The premium is decided as per the guidelines of the Beema Samiti Act in Nepal. In a CAT bond, the cost is covered by the investor's contribution. The government and companies transfer part of their natural disaster risk to the international capital market. An example of a CAT bond is the World Bank's Multi-CAT Program. The parametric, modeled loss index, and indemnity are the commonly used trigger factors for such insurance. In a contingent credit facility, the cost is covered by the interest rate. It is designed to assist nations in addressing their urgent financial requirements that may emerge immediately following a natural catastrophe. The prior agreement was done before the natural disaster for contingent credit facilities. For example, the JICA program SECURE (Standby Emergency Credit for Urgent Recovery) finances up to JPY 10 billion or 0.25% of GDP, whichever is less under this scheme. In the case of the reserve fund, the cost is covered by past savings. The government disaster fund is used in different countries to cope with natural disasters. The Prime Minister's Disaster Relief Fund is one example of Nepal. The money allocated for the disaster management fund could not be used for other purposes.

In traditional (indemnity based) agricultural insurance, the insurance payment is made on the basis of a direct measurement of the loss or damage suffered by the farmer. It requires manpower to access the damage, and is time consuming. The administrative work is tedious, and the high transaction cost is highly undesirable for the farmer. The problem of moral hazard also prevails in traditional indemnity based insurance. In index-based insurance, losses are correlated to a predefined threshold, excluding independent damages [10]. While in index based flood insurance, the predetermined threshold is based on historical flood events and economic loss, which are developed on the basis of flood depth and duration [4]. The pilot project of index based flood insurance was done in India and Bangladesh in 2015. In the index-based flood insurance projects implemented in India and Bangladesh, remote sensing technology was used to help overcome the challenge of missing hydro-meteorological data. In both the index-based flood insurance projects in India and Bangladesh, farmers were actively involved, and multiple local partners were engaged to ensure the smooth implementation of program activities[4].

The formal practice of disaster risk insurance was introduced in Nepal through the implementation of the Crops and Livestock Insurance Directives in 2013. After the introduction of the Crops and Livestock Insurance Directives in 2013, specific insurance products were developed for different food grains, horticultural crops, and livestock. These products are now subsidized with an 80% subsidy on the total premium. Weather index insurance, index-based agriculture insurance, index-based flood insurance (IBFI), and parametric earthquake insurance (for under construction projects) are the index-based insurance products available in Nepal. In the approach to risk transfer for flood-vulnerable communities in the lower Karnali region of western Nepal that are engaged in paddy cultivation, index-based flood insurance is practiced. The IBFI project is supported by the InsuResilience Solutions Fund and the Zurich Flood Resilience Alliance and implemented by Practical Action in partnership with Stone Step, Global Parametric, and Shikhar Insurance Company Limited. The project target is an area near the Karnali River basin in Lumbini and Sudurpaschim provinces. The policies were issued through local cooperatives in groups. Index-based insurance suffers from basis risk, which is an additional risk over indemnity-based insurance.

The factors affecting farmers' WTP for index based flood insurance for crops need to be identified in two stages. In the WTP scheme, the first stage is to determine the farmer's willingness to participate, and in the second stage, the amount that the farmers are willing to pay for insurance is determined [11]. The study conducted by [12] determined family size, accessibility to credit, annual income, access to information, awareness about the crop insurance schemes, and extent of irrigation to be the major factors for low uptake of the Pradhan Mantri Fasal Bima Yojana (PMFBY) and Revised Weather Based Crop Insurance Scheme (RWBCIS) in India. [13] found lack of knowledge, trust in institutions, beliefs, and perceptions about climate change to influence WTP for index based crop insurance. [14] and [11] suggest that farmers with larger landholdings are willing to pay more for insurance compared to farmers with smaller farms.

The objective of the study is to identify the factors that influence the WTP for index based flood insurance in Tikapur municipality.

2. Study Area

Tikapur municipality is situated on the bank of the Karnali River in the Kailali district of Sudurpaschim province. The municipality is divided into a total of 9 wards.

It is surrounded by Janaki Rural Municipality in the north, India in the south, the Karnali River in the east, and Bhajani Municipality in the west. Tikapur Municipality covers an area of 122.12 sq. km. The municipality lies at the coordinates 28.5099° in the north and 81.1066° in the east. The municipality consists of 20930 households. The total population of Tikapur is 89835, out of which 47.1% are male and 52.9% are female. The maximum number of people are dependent on agriculture as a primary source of income in Tikapur Municipality.

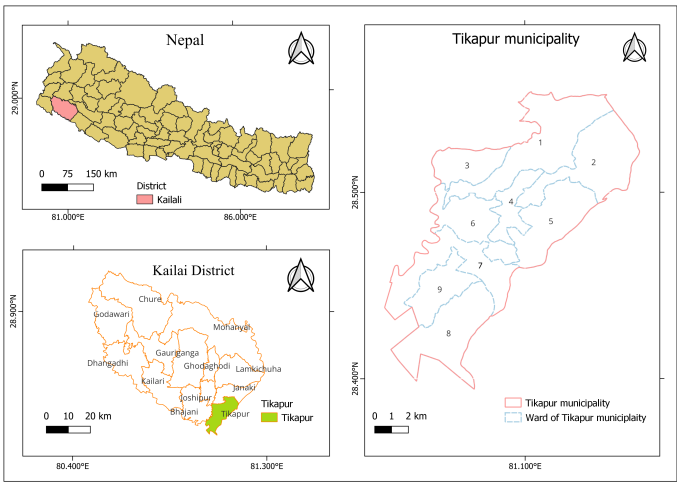

Figure 1: Study area

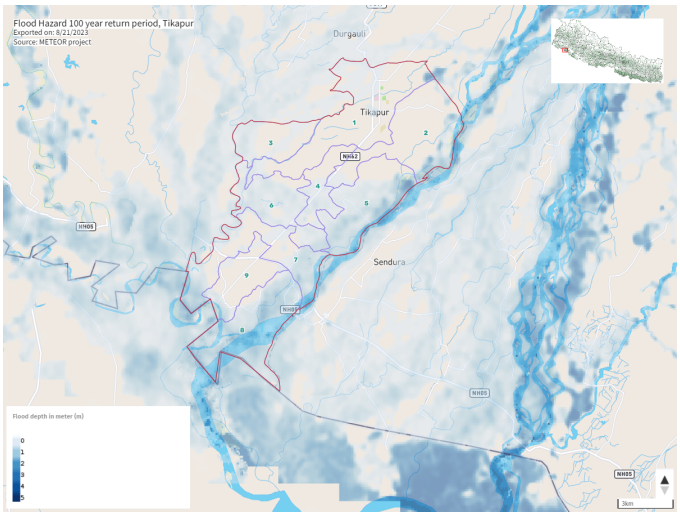

Figure 2: Flood hazard map of study area (Source: bipadportal)

3. Methods

The given research used a mixed method that used both quantitative and qualitative data. The primary data for this study was collected from Tikapur municipality, where 85 households were selected in the area. In the key informant interview (KII) with the Local Emergency Operating Center (LEOC) head, local authorities, and the Nepal Red Cross Society Tikapur branch, the most flood-prone wards 2, 5, 6, 7, and 8 were identified. The household survey was conducted in these wards with the further identification of people involved in agriculture for more than 5 years and cultivation fields for more than half a kattha. With the KII and the Ward Chairperson, the most flood-prone areas in that ward were further identified, and people residing in that ward were selected for a household survey.

The convenience sampling method was employed during data collection in the field, which is used when the respondent is available when needed or willing to take part in the research. The secondary data is collected from different sources, like insurance companies, LEOC, the Nepal Red Cross Society's Tikapur branch, and the Bipad portal. A household questionnaire, which included sociodemographic information, farming characteristics, extreme weather risk perception and experience, and insurance awareness of the household, was used to collect information for the study.

Contingent valuation method (CVM) is a survey-based method to assess preferences for goods and services whose market prices are not well defined. The contingent valuation approach employs four frequently used methods for gathering information: open-ended, dichotomous choice, payment card, and bidding game [15]. The payment card method was used to identify the value that represents the maximum willingness to pay of a household during a field survey. The payment card with six altered premium prices (Nrs. 30, 60, 76, 152, 228, and 304) was prepared, and the household was requested to select one that best represented their WTP. A pilot test was conducted in ward no. 1 of Tikapur municipality with 10 individuals. The test result questionnaire is reliable for the desired objectives. The statistical software JASP v17.3 was used to analyze the data obtained from the questionnaire survey.

When farmer respondents chose to pay or not to pay for index based flood insurance, the relevant variable, WTP, took a value of 1 (if yes) or zero (if no). The chi-square test was used to determine the relationship between variables. In addition, a logistic regression model was used to determine factors influencing household WTP for index based flood insurance.

4. Results and Discussion

4.1 Univariate analysis of Variables and WTP for Index based flood insurance (IBFI)

The univariate analysis of dependent and independent variables of WTP for IBFI shows that sex, education level, household size, monthly household income, farm size, monthly farm income, and insurance awareness are the significant factors ($p<0.05$), which is shown table 1.

Table 1: Univariate analysis of independent variables

Variables	Standard error	Odd Ratio	P-value
Sex	0.477	4.845	<0.001
Education level	0.212	0.490	<0.001
Household size	0.350	0.449	0.022
Monthly household income	0.462	0.307	0.011
Farm size	0.416	0.552	<0.001
Monthly farm income	0.309	0.258	<0.001
Insurance awareness	0.692	25.846	<0.001

4.2 Logistic regression model analysis

The logistic regression model shows that monthly farm income and insurance awareness are the most significant factors that affect farmers' willingness to participate in index-based flood insurance. A similar study indicated that farm income has a significant effect on the WTP of households, which can be increased through training and extension agriculture services [14]. Also, the monthly farm income increases the household's ability to pay insurance premiums. The monthly farm income can be increased through integrated farming practices [16].

Table 2: Logistic regression model analysis

Variables	Standard error	Odd Ratio	P-value
Sex	0.853	1.813	0.486
Education level	0.314	0.870	0.656
Household size	0.545	0.767	0.627
Monthly household income	0.906	0.409	0.324
Farm size	0.279	0.792	0.402
Monthly farm income	0.610	0.300	0.049
Insurance awareness	1.040	45.598	<0.001

4.3 Insurance awareness

Out of 85 respondents, only 28% knew about crop insurance, and the rest, 72%, were not aware of it.

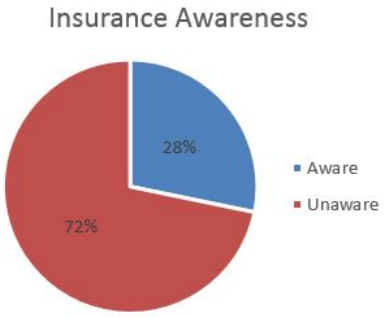

Figure 3: Insurance awareness

Farmers had limited awareness of index based flood insurance [4]. They were uncertain about their ability to afford it and also unsure about where to seek information regarding this kind of insurance. Awareness about the insurance was found to be the main factor in the low uptake of index-based insurance in this municipality, which is also found in the study conducted by [12] and [11]. The respondent, who was aware of crop insurance, was further asked about the source from which they obtained information about it. 75% of respondents obtained the information from their coworkers, 9% from social sites, and the other 4% from banks and family members, respectively. No respondent answered that they obtain information from the newspaper, which is outdated due to the digitalization of technology, and many of the respondents were illiterate.

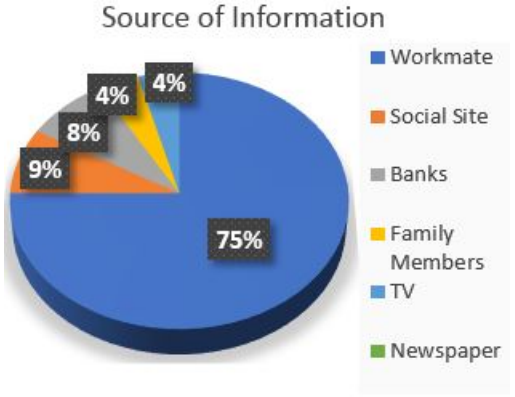

Figure 4: Source of information

The farmer was further asked to rank (1-6) the important sources of information, and the rank score was calculated. The most important source of information was ranked on a scale of 1–6.

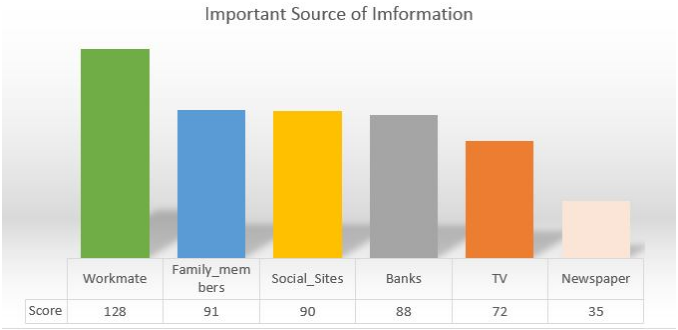

Figure 5: Important sources of information

The majority of respondents rank workmates, family members, social sites, banks, TV, and newspapers, respectively, as the most important sources of information. Information about insurance from colleagues, family members, and social sites scored higher. Thus, the information could be effectively conveyed through the farmer groups formed in the different wards of the municipality. The majority of farmer groups are registered in the agriculture center of Tikapur municipality, where they obtain necessary extension agriculture services, training, and other sorts of services that are provided by the government. The women's groups are formed in the different communities of the municipality, from where they collect funds as micro-cooperatives, and the funds are mobilized to the required individual women with a minimum interest rate. These groups could be an important source for conveying information about index-based insurance. The social media platform, where the maximum number of people could be reached now, might be an effective way to inform people about the importance of insurance.

4.4 WTP for index based flood insurance

Out of 85 respondents, only 37.65% expressed their interest and showed their willingness to participate. The respondent who expressed their interest in participating was shown a payment card and asked to select the maximum amount that they were willing to pay. Approximately 44% and 28% of respondents reported that they will pay NRs. 30 and NRs. 60 as a premium. This is the same amount that the farmer would have to pay if the government subsidized the premium by 90% and 80%, respectively. The 6.25% respondents were willing to pay NRs. 152 and NRs. 304 as premium, kattha, or season. Overall, the average WTP is Nrs. 75.13/kattha/season. The farmers are willing to pay the maximum subsidized amount per kattha per season as a premium. The poor and marginalized farmer, who is already vulnerable due to various factors, could not afford the higher premium, although they were willing to participate in this type of insurance scheme [4]. The local government could subsidize the premium amount by 100% to transfer the flood risk by making vulnerable farmers resilient to preserve their assets.

5. Conclusion

The study depicts that only 37.65% were willing to participate, although the respondents were vulnerable due to various factors. Monthly farm income and insurance awareness are found to be the significant factors behind the low uptake of index based flood insurance in Tikapur municipality. The flood-vulnerable communities in Tikapur Municipality were willing to pay the maximum subsidized amount per katha per season as a premium. Furthermore, the farmer's awareness about such a scheme should be communicated and implemented before we face any disaster, big or small. The development of cost-effective and appropriate insurance schemes for earthquakes and other hazards should consequently be promoted in the far west region, as these hazards are prominent here.

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