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Willingness to Pay for Weather-Indexed Insurance: Evidence from Cambodian Rice Farmers

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Abstract: This study examines Cambodian rice farmers' willingness to pay for the weather-indexed insurance (WII) proposed to manage the financial impact of shifting monsoon rainfall patterns in Battambang Province in north-western Cambodia. Detailed interviews are conducted in the districts of Bavel and Thma Koul. We first analyse farmer respondents' socioeconomic and demographic characteristics, climate change perceptions and experience, risk attitudes, and awareness of insurance. The binary logistic model is used to identify factors that significantly impact farmers' willingness to pay (WTP) for WII. Our results show that farmers in general had lower awareness of how to use innovative financial products to adapt to extreme weather. The results also demonstrate that farmer respondents' marital status, the number of off-farm labourers, and the farm size have a positive effect, whereas the number of children in the household has a negative effect on farmers' WTP for WII. Specifically, being married, an increase of one off-farm labourer, and an increase of one hectare (ha) of farmland increase the probability of demand for WII by 38.6%, 21.4%, and 5.1%, respectively. In contrast, an increase of one child reduces the probability of WII demand by 9.7%. We also identify challenges confronted by Cambodian farmers for participating in the proposed WII scheme and provide relevant recommendations to overcome these challenges.

Keywords: climate change; willingness to pay (WTP); weather-indexed insurance (WII); crop insurance; risk transfer

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1. Introduction

Agriculture is a fundamental sector of the Cambodian economy. The sector employed about 35% of the Cambodian workforce (https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=KH) (accessed on 21 July 2022) and accounted for more than 20% of the country's gross domestic product (GDP) in 2019 (https://www.adb.org/sites/default/files/publication/718806/cambodia-agriculture-rural-development-road-map.pdf) (accessed on 22 July 2022). However, farmers are vulnerable to climate change. With increasingly extreme weather, such as drought, heavy monsoon rainfall, extreme temperatures, and floods, cropping systems have been severely impacted [1,2].

According to the United Nations Development Programme (United Nations Development Programme (UNDP), 2014. CamDi: Cambodia disaster loss and damage information system, Phnom Penh: UNDP. https://www.undp.org/cambodia/publications/cambodia-disaster-loss-and-damage-analysis-report-1996-2013) (accessed on 12 September 2022), floods damaged 67% of all rice paddy fields throughout the country between 1996 and 2013, followed by droughts that affected 31% of crop losses during the same period, threatening the livelihoods of many. The production of rice might decrease by 10% for every 1 °C rise in temperature, and coffee and rubber production might decline considerably as well

(Ministry of Economy and Finance and National Council for Sustainable Development, 2019. Addressing climate change impacts on economic growth in Cambodia, Phnom Penh: Ministry of Economy and Finance. https://www.undp.org/cambodia/publications/addressing-climate-change-impacts-economic-growth-cambodia) (accessed on 12 September 2022). Cambodia lost USD 1.5 billion—10% of its GDP in 2015 from the negative effect of climate change (https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_Cambodia%20CRP.pdf) (accessed on 12 September 2022). Drought devastated 71,474 hectares of rice fields in Cambodia in 2019, resulting in a USD 37 million economic loss (https://www.khmertimeskh.com/50943617/droughts-caused-about-100-million-in-rice-production-losses/#:~:text=In%202019%2C%20the%20drought%20in,(FAO)%20report%20in%202018) (accessed on 12 September 2022). According to the assessment of the Food and Agriculture Organization (FAO) (Food and Agriculture Organization (FAO), 2021. The impact of disasters and crises on agriculture and food security. https://www.fao.org/3/cb3673en/cb3673en.pdf) (accessed on 12 September 2022), from 2008 to 2018, drought was the most significant climate-related disaster, accounting for up to 82% of overall agricultural damage and losses.

To adapt to climate change and transfer corresponding climate risk, weather-indexed insurance (WII) provides potential support and protection for farmers [3]. It is becoming one of the important climate risk mitigation and adaptation strategies in tackling adverse climate impacts. In contrast to traditional indemnity-based insurance, in which the claim can be only made when the loss happens, WII is based on the pre-specified threshold of weather parameters, such as rainfall and temperature. Payout of WII is triggered if the weather parameter moves beyond this threshold regardless of crop yield losses. Therefore, WII significantly reduces information asymmetry and moral hazard [4–6], making coverage more transparent and claims quicker. However, prior literature shows that the uptake of WII is still low [4,7–9].

This study aims to investigate Cambodian rice farmers' willingness to purchase WII products. Specifically, we conduct interview surveys in the districts of Battambang Province, in north-western Cambodia. The survey collects farmers' socioeconomic and demographic information, and their experience suffering from extreme weather events. The WTP studies often focus on two important stages. The first stage is about whether farmers are willing to participate in the WII scheme (or demand WII products). If the answer is affirmative in the first stage, the second stage will be about investigating how much farmers are willing to pay for WII. This study mainly focuses on the first stage to examine farmers' willingness to participate in the WII program. We further identify potential challenges and possible solutions.

Our study contributes to the growing literature on the research topic of WTP for WII. It is based in Cambodia, one of the developing countries in which the WII scheme is in its preliminary stage. The findings of this study are crucial to exploring how to use financial products to help small household farmers to mitigate and adapt to climate change. The results of farmers' perspectives of and preferences for WII provide empirical evidence that some features of the insurance products should be refined, e.g., the covered period in the year, in consultation with insurance and crop experts. At the same, this study sheds light on governments and regulators in developing risk management strategies and policies, and in particular in setting up a national framework for climate service.

The rest of our study proceeds as follows. In Section 2, a literature review is conducted. Section 3 presents the methodology and data collection. Section 4 describes the econometric models. Section 5 reports descriptive statistics, discusses empirical results, and shows the limitations of this study. Challenges and relevant recommendations are presented in Section 6. Section 7 concludes.

2. Literature Review

WII schemes have been increasingly developed in some developing countries to transfer weather risk [10]. India has been one of the world's largest WII markets [11,12] (at the

beginning of the 2000s, India introduced rainfall index insurance, while index-based agriculture insurance became attractive after nearly a decade [8,12]). Giné et al. [6] investigate a particular rainfall insurance product in the southern India region, showing that credit constraints and a lack of knowledge about the insurance products were two main factors that prevent farmers from purchasing rainfall insurance. Consistent with Giné et al. [6], Cole et al. [4] further document several key factors that limit farmers' demand for insurance, including a lack of trust and understanding of insurance products, product salience, and liquidity constraints.

Moreover, Cole et al. [4] demonstrate that insurance demand is price sensitive. Consistently, Aditya et al. [13] also show that farmers are willing to pay for crop insurance, but would pay less than the required premium based on existing rates. This is because the premium only insures 75% of the threshold value of farmers' crops. In contrast, Budhathoki et al. [9] suggest that the premium price might not be the main reason for the low uptake of index-based crop insurance, but improving knowledge and communication regarding the threat arising from climate variability should be facilitated. Similarly, Matsuda and Kurosaki [14] state that the although insurance premium does not significantly affect the purchase decision, it influences the quantity of purchased insurance.

In Bangladesh, both Akter et al. [15] and Akter et al. [16] show farmers' aversion to insurance. Akter et al. [15] argue that the gender differences in the trust of insurance providers and financial literacy play a significant role in influencing farmers' preferences for WII. Women are more risk-averse and have a lower capability to understand WII products. Akter et al. [16] further document that farmers' demand for WII depends on their climate risk understanding and their interest in adaptation to the risk. Considering the weather index system, Al-Maruf et al. [10] suggest that it could be well-developed by combining other facilities such as online business and automated weather monitoring systems. A properly designed weather index is essential to improve farmers' confidence in WII. In addition, Hossain et al. [17] explore farmers' WTP for flood insurance and show that both social-economic characteristics and risk attitudes have significant impacts on farmers' demand for insurance.

Consistent with Akter et al. [15], Jin et al. [18] find that male and female farmers demonstrate a different preference for climate change-related adaptation products and strategies in China. Jin et al. [19] also document the influence of social-economic and risk perceptions on Chinese farmers' WTP for WII, in line with the findings of Hossain et al. [17] for the Bangladesh setting. Tang et al. [20] examine WTP for WII in two provinces of China and find that influencing factors for insurance demand are different in the two provinces. These studies indicate that preference heterogeneity is related to not only social-economic features [15,18,21] but also geographical location [20]. Moreover, Aizaki et al. [22] further show the heterogeneity in preference for insurance packages in Myanmar. They find that farmers are more likely to buy insurance covering extreme weather than other disasters (e.g., salt damage), suggesting that the preference for insurance varies with crop types and geographical conditions. Furuya et al. [23] investigate the optimum payment of WII in Myanmar's coastal regions and show that the optimum premium of index insurance is about 5% of rice income. They further conclude that insurance premium varies with crop types, countries, and disaster type.

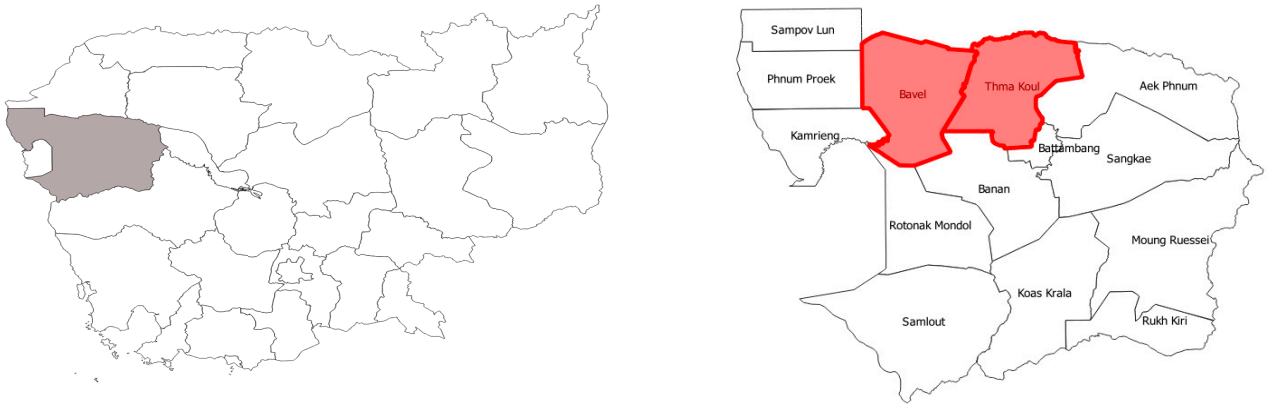
In African countries, agriculture insurance has also become an effective option to protect farmers' welfare as weather shocks significantly impact farmers' crops. Literature has extensively explored the effectiveness and determinants of WII. Leblois et al. [24] show that insurance could not cover an insured farmer's risk in Niger, which results in a lower insurance demand, in line with the findings of Aditya et al. [13] in India. Abugri et al. [25] and Dougherty et al. [26] suggest that the low uptake rate is because farmers underestimate weather risk in Ghana and Tanzania, respectively, whereas Maganga et al. [27] argue that it largely depends on the associated premiums in Malawi. Moreover, Abugri et al. [25] argue that women have lower insurance adoption because of restrictive cultural norms in agricultural investment decision-making [28]. Belissa et al. [29] provide empirical evidence

from Ethiopia that farmers with previous insurance experience are more informed and more likely to continue to purchase an insurance product. To facilitate farmers' preference to purchase insurance, Carter et al. [30] and Ahmed et al. [31] propose incorporating other services (e.g., credit) into insurance. As such, both farmers and insurance providers could benefit from multiple services without increasing extra costs.

We propose that Cambodian farmers' socioeconomic and demographic features and their risk attitudes have import effect on their preferences for WII. However, prior literature documents inconclusive results for the determining factors. For example, Abebe and Bogale [32] document a negative effect of a farmer's age on WTP but Belissa et al. [29] show a positive effect. For education, Jin et al. [19] argue that the level of education improves farmers' preferences for WII whereas Dougherty et al. [26] find that it reduces the demand for WII. Other conflicting results are found in Abebe and Bogale [32] and Hossain et al. [17] for off-farm income, and Giné et al. [6] and Jin et al. [19] for risk aversion. Overall, these inconclusive results may arise from many factors, such as country, sample size, and research design.

3. Methodology and Data Collection

Al-Maruf et al. [10] argue that a case study may be an appropriate approach when lacking detailed comparative information on WII. In this study, we conducted interview surveys in two districts (Bavel and Thma Koul) of Battambang Province, in north-western Cambodia (Figure 1). In these two districts, rice is the predominant crop and its production is significantly impacted by extreme weather, such as, droughts, excess rainfall, and floods. Therefore, rice household farmers were interviewed (interview questionnaires are provided as Supplementary Materials).



(**a**) (**b**)

Figure 1. Map showing the study areas. (**a**) The map of Cambodia. The part highlighted in gray is Battambang Province. (**b**) The map of Battambang Province. The parts highlighted in red are the study areas (i.e., districts of Bavel and Thma Koul).

Primary data were collected through individual interviews with rice farmers, key informant interviews with agricultural cooperative (AC) leaders and commune authorities, and group discussion meetings. Technical staff from the Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF) conducted individual surveys. A total of 96 rice household farmers were interviewed face-to-face between the 1st and 10th of April 2022. During this survey period, some rice farmers were starting to cultivate. At the same time, there were no major weather warnings or historical events that could impact farmers' responses. In general, this period was slightly drier than normal, and as a result, some farmers experienced drought-like conditions. Furthermore, there were no other major climatic events (such as floods) that caught media attention in neighbouring districts. Drought was the condition that affected the farmers who started the early rice cultivation.

The households were randomly selected from the villages in the study areas. Each farmer participant in the interview was considered the person who could make important farming and other decisions in the household. The interview included questions about socio-demographic and farming characteristics, extreme weather risk perception and experience, production impact of extreme weather, insurance awareness, and willingness to purchase WII.

4. Econometric Model

As mentioned in the introduction section, our WTP focused on the first stage. When farmer respondents chose to pay or not to pay for WII, the relevant variable of WTP took a value of 1 (if yes) or zero (if no). Thus, we used the binary logistic model to conduct empirical analysis and examine the factors influencing respondents' insurance purchase decisions [18,33]. The logistic model can be written as:

$$y_i = \alpha + \sum_{j=1}^{m} \beta_j X_j + \varepsilon_i \quad (1)$$

where y_i is the dependent variable, relating to the probability of WTP of the farmer respondent i. α is the intercept. X represents a set of explanatory (independent) variables, including respondents' socioeconomic and demographic characteristics [27,34,35], as illustrated in Table 1 (as yield is highly correlated to other variables (e.g., farm size, total income, and rice income), we do not include yield in our regression analysis). Haile et al. [34] also argue that changes in risk aversion might work as a major channel through which the uptake of weather-indexed crop insurance impacts farmers' innovative investment decisions [36]. m is the number of explanatory (independent) variables. β_j is a set of estimated coefficients on the independent variables, and ε_i is the error term.

Table 1. Descriptive statistics of socioeconomic and demographic characteristics.

Variable	Description	Mean	SD	Min	Max	Obs
Age	Age of a respondent in years	48.59	12.62	24	78	96
Gender	Male = 1, female = 0	0.57	0.50	0	1	96
MaritalStatus	Married = 1, otherwise (single/divorced/widowed) = 0	0.88	0.33	0	1	96
Edu	Education level in years (No schooling = 0, Primary school = 6, Secondary school = 9, High school = 12, University and above = 16)	7.29	2.94	0	16	96
HHSize	Number of persons in the household	4.57	1.65	2	9	96
Adult	Number of adults	3.26	1.45	1	8	96
Child	Number of children (<15 years old)	1.31	1.19	0	5	96
TotalLabour	Number of total labourers in the household	2.58	1.36	1	8	96
FarmLabour	Number of labourers working on the farm	2.09	1.20	1	8	96
OffFarmLabour	Number of labourers working outside the farm	0.49	1.01	0	5	96
FarmSize	Total farm area (ha)	4.19	2.82	0.48	15	96
Yield	Yearly rice production (kg)	12,610.42	10,572.42	1500	56,000	96
SalePrice	Rice sales price (KHR/kg)	835.78	105.03	550	1200	96
TotalIncome	Total yearly income (KHR '000)	13,268.09	11,393.17	1400	74,800	96
RiceIncome	Yearly income from rice farming (KHR '000)	10,620.78	8988.97	1125	44,800	96
NonRiceIncome	Yearly income rather from rice farming (KHR '000)	2647.31	5285.01	0	30,000	96

5. Results and Discussion

5.1. Descriptive Statistics

5.1.1. Socioeconomic and Demographic Characteristics

Table 1 presents the descriptive statistics of farmer respondents' socioeconomic and demographic characteristics. The first column lists the main variables and their descriptions are presented in the second column. Each variable's mean value (Mean), standard deviation (SD), maximum value (Max), minimum value (Min), and the number of farmer respondents (Obs) are shown in columns 3 to 7, respectively.

The average age of the respondents is around 49 years old, with a wide variety from 24 to 78 years old. More than half of the respondents (57%) are male and 88% of the respondents are married. The average household size is 4.6 people, with an average of 3.3 adults and 1.3 children. The average length of education is 7 years, indicating that most of the respondents' education level is a primary school (6 years) or a secondary school (9 years in total). Each household has average labour of 2.6 persons, and the majority of labourers undertake rice farming.

Regarding the total cultivated farmland, the average area is 4.2 ha, mainly used for planting rice. For rice production, the average yearly rice yield over the past five years is 12,610 kg, with an average sales price of 835.78 KHR/kg, which generates an average income from rice farming of KHR 10.6 million. Including other income of KHR 2.7 million from activities outside rice farming, the households' yearly total income reaches KHR 13.3 million. There is a significant variation in both total income and income from rice farming, indicating an inequality in households' earning capacity. For example, some farmers' total income is only KHR 1.4 million, whereas others can earn up to KHR 74.8 million.

5.1.2. Climate Change Experience and Perception

Farmer respondents' climate change experiences and perceptions are presented in Table 2. Column (1) shows the percentage of respondents who are affected by extreme weather conditions. Columns (2) and (3) present the percentages of losses in crop production and household income in case of extreme weather, respectively. Column (4) demonstrates the percentage of respondents who take potential measures to deal with extreme weather and reduce losses. The results show that the impacts of climate change in Cambodia arise mainly from drought, excess rainfall, extreme temperature (heat), and floods.

Table 2. Climate change perception.

Type of Extreme Weather	Average Percentage of Respondents Impacted (%) (1)	Average Percentage of Production Loss (%) (2)	Average Percentage of Income Loss (%) (3)	Average Percentage of Respondents Adopting Possible Mitigation/Adaptation Measures (%) (4)
Drought	97.9	61.2	61.2	5.2
Excess rainfall	81.3	43.4	44.6	1.0
Extreme temperature (heat)	81.3	30.7	30.7	7.3
Floods	81.3	58.8	58.8	0.0

Rice farmers are the most sensitive to drying trends in the monsoon phase. On average, 98% of respondents were affected by drought, which results in a 61% loss in both production and income. However, farmers did not proactively adopt strategic measures in tackling drought. Only a small percentage of 5% of them took some actions (e.g., pumping water) to reduce losses caused by drought.

Producers who have shown the strongest declines may be the most sensitive to excess rainfall/flood events from higher rainfall during the monsoon phase. Nearly equally, 82% of respondents stated that they are affected by excess rainfall, extreme temperature, and floods. The losses in production and income from these three types of weather were around

43%, 31%, and 59%, respectively. Similarly, a low percentage of farmers adopted potential mitigation measures. Floods resulted in the largest loss among these three types of worse weather conditions. Apparently, no farmer can do anything against it.

5.1.3. Risk Attitude and Awareness of Crop Insurance

Risk aversion is an important determinant of smaller households' decisions in using innovative technology to mitigate climate risk [34]. Normally, experimental settings (e.g., [e.g., 19,34]) are employed to elicit risk behaviour. However, in our study, we used farmers' subjective assessment to drive risk attitude/behaviour. A subjective risk rating between 0–10, where a value of 0 means the farmer is highly risk-averse and a value of 10 is a risktaker, was developed.

A pre-tested questionnaire was administered by the experienced project staff. The questionnaire was converted into the local language to ensure respondents understand the questions. More importantly, before asking questions, the interviewers first explained the question to the respondents. To obtain a subjective risk rating, farmers were asked the question, for example, "Are you generally a risk-taking person, or do you try to avoid risks?" We present farmer respondents' risk attitude (level of risk-taking) and awareness of crop insurance in Table 3. Risk attitude has an average of 5.1, with a standard deviation of 2.3. More than 50% (51 out of 96) of respondents ranked their risk attitude between 4 and 6. Most of these 51 respondents obtained a primary and secondary education and the average size of their farmland is less than that of the whole sample. Overall, these results show that most of the respondents are almost risk-neutral, although the prior literature assumes that farmers are risk-averse, especially in developing countries [34].

Table 3. Risk attitude and awareness of crop insurance.

Variable	Description	Value	Obs
Risk attitude (Risk preference) (0: high risk aversion to 10: high risk-seeking)	Average value (standard deviation)	5.1(2.3)	96
	Ranking range		
	0–3	24.0%	23
	4–6	53.1%	51
	7–10	22.9%	22
Crop insurance awareness	% of respondents who are aware of crop insurance	12.5	12
Crop insurance purchase	% of respondents who purchased crop insurance	1.0	1
Reason for purchasing insurance	% of respondents	-	-
Information sources about insurance	% of respondents	-	-
Reason for not purchasing insurance	% of respondents		
- Suitable insurance products are not available		2.1	2
- Lack of exposure to major production risks		6.3	6
- Lack of government assistant		2.1	2
- Excessive complexity of insurance		2.1	2
- Lack of trust that insurers will pay valid claims		3.1	3
- Not aware of insurance benefits		8.3	8
- Others		2.1	2
Insurance knowledge rank (0: not knowledgeable at all to 10: very knowledgeable)	Average value (standard deviation)	4.4 (2.2)	11
Insurance importance rank (0: not important at all to 10: very important)	Average value (standard deviation)	6.8 (2.8)	12

Concerning crop insurance, the response rate was low. Only 12 of 96 respondents were aware of insurance products, and one of them had experience in purchasing crop insurance. When investigating the reasons why they did not purchase crop insurance,

the response rate was also low. For each main reason listed in the table, the response rate was lower than 10%. Furthermore, the evidence shows that the average rank of respondents' insurance knowledge was 4.4, with a standard deviation of 2.2, consistent with the argument of the low education level and a lack of skills in financial literacy in developing countries (e.g., [6,15,37]). However, in ranking the importance of crop insurance, the average value of the respondents' ranking was 6.8, indicating that respondents still valued insurance products.

5.1.4. Preference for WII and Period of Coverage

In this study, two types of WII schemes, low rainfall (drought) and excess rainfall index insurance, were investigated. Before we allowed respondents to choose the type of insurance, we explored their experience with the period of the year in which extreme weather probably occurs. Accordingly, WII should cover these months. Table 4 reports the results.

Table 4. Farmers' preference for WII and period of coverage.

Weather Risk	Potential Period to Be Covered	Percentage of Responses to Period Coverage of Particular Weather Risk (%)
Drought (87 respondents)	April–May	28.7
	May–June	39.1
	June–July	57.5
	July–August	34..5
Excess rainfall (29 respondents)	July–August	24.1
	August–September	44.8
	September–October	69.0
Extreme temperature (2 respondents)	June–July	50.0
	July–August	50.0
Floods (40 respondents)	September–October	82.5
	October–November	40.0

Among the four types of extreme weather, 87 out of 96 respondents stated that drought should be covered. More than half of these 87 respondents (58%) considered that drought is more severe from June to July. For the other three types of extreme weather, the number of respondents was 29 for excess rainfall, 2 for excess temperature, and 40 for floods. Most of the respondents who care about heavy rainfall (69%) and floods (83%) stated that WII should cover September and October.

Next, we examined which type of WII was preferred by corresponding respondents (Table 5). We found that 56 out of 96 respondents were willing to pay for WII. Among these 56 respondents, 21 of them preferred low rainfall index insurance, 8 of them preferred excess rainfall index insurance, and 26 of them wanted to buy both (one of the 56 respondents did not give an answer about which type of WII insurance to purchase). While more respondents cared about these two types of insurance, we propose that the percentage of them who prefer low rainfall index insurance is high, as the response rate to drought is high.

Table 5. Willingness to participate in insurance schemes.

WII Schemes	Number of Respondents
Low rainfall index insurance	21
Excess rainfall index insurance	8
Both	26
N/A	1
Total	56

5.2. Regression Results and Discussions

We now report the empirical results of the binary logistic regression of Equation (1). (Conducting face-to-face interviews during the COVID-19 period may constrain our sample size. To overcome the concern about the sample size, we also applied the linear probability model (LPM) with white-robust standard errors. We obtained qualitatively similar results. The LPM results are not reported but are available from the authors upon request.) Multicollinearity among independent variables is a common problem in logistic regression models. We first calculated the correlations among variables of interest. The correlation matrix is presented in Table A1 in the Appendix A. We observed that *Yield* has a high correlation with several variables, such as farm size (*FarmSize*), and income (*TotalIncome* or *RiceIncome*), so it was excluded from our further analyses. We further checked possible multicollinearity problems using the variance inflation factor (VIF). Our results show that all independent variables' VIF values in our models are 3 or less than 3, without severe multicollinearity. A cut-off value of 10 for VIF indicates an issue of multicollinearity [19,27,38] (the VIF values are not reported but are available from the authors upon request).

Table 6 reports the results of the coefficients and the marginal effects of the determinant factors of WTP. Two models are estimated. The first model (Model (1)) focuses on the total measures of several variables—for example, household size, total labour, and total income. To further investigate the effect of the corresponding components of these variables, we include them in Model (2). For example, the household size examined in Model (1) is separated into the number of adults and the number of children, which are investigated in Model (2).

We first interpreted the regression results of Model (1). The estimated coefficient on *Age* is positive but not statistically significant. This indicates that elder farmers are more likely to uptake WII than younger farmers, but it is not significantly different [27,34]. Similarly, the gender of respondents, with a negative and insignificant estimate, does not make a difference to WTP for WII [34]. In contrast, Maganga et al. [27] document a significantly negative effect of gender on WTP, suggesting that male farmers have less willingness to purchase WII for maize crops. The literature has also shown that women are more concerned about food crop production, whereas men are concentrated on cash crop production [39].

For *MaritalStatus*, both the estimated coefficient and the marginal effect are positive and statistically significant at the 10% level. We argue that if a farmer is married, he (she) may get his/her partner's financial and other support and can be more confident in the insurance products. Our results suggest that a farmer in a marriage is more willing to purchase WII.

Education level (*Edu*) has a positive effect on the uptake decision of WII, although surprisingly this effect is not statistically significant [6,34]. It is expected that farmers with a high education level have a good ability to understand risk and relevant risk management strategies. For example, one can use financial products (e.g., insurance) to transfer risk [40]. However, the complexity of WII is beyond most farmers' capacity, which has been demonstrated in the survey process. More respondents reflected that it is difficult for them to understand the payout policy of WII. Therefore, to facilitate the WII uptake, better education and communication for farmers in understanding WII contracts and policy may be one effective measure.

Household size (*HHSize*) is negatively but insignificantly correlated with respondents' WII decisions, in line with the result of Liu et al. [41]. This indicates a larger household may have financial constraints and is less likely to purchase WII.

The number of total labourers (*TotalLabour*) is positively and significantly associated with the probability of WTP. If the households have more active labourers, they should have more income capacity and thus are willing to participate in the insurance scheme [34]. Our results show that an increase in household labourers increases the probability of WTP by 11.2%.

Table 6. Regression results of the binary logistic model.

Variable	Model (1)		Model (2)	
	Coefficient	**Marginal Effect**	**Coefficient**	**Marginal Effect**
Age	0.012	0.003	−0.008	−0.002
	(0.021)	(0.022)	(0.024)	(0.004)
Gender	−0.490	−0.100	−0.615	−0.113
	(0.517)	(0.104)	(0.556)	(0.100)
MaritalStatus	1.266 *	0.259 *	2.099 **	0.386 **
	(0.764)	(0.148)	(0.976)	(0.164)
Edu	0.109	0.022	0.103	0.019
	(0.091)	(0.018)	(0.093)	(0.017)
HHSize	−0.268	−0.055		
	(0.177)	(0.035)		
Adult			−0.068	−0.013
			(0.267)	(0.049)
Child			−0.525 **	−0.097 **
			(0.234)	(0.039)
TotalLabour	0.547 **	0.112 **		
	(0.258)	(0.048)		
FarmLabour			0.152	0.028
			(0.306)	(0.027)
OffFarmLabour			1.165 **	0.214 **
			(0.526)	(0.088)
FarmSize	0.146	0.030	0.277 *	0.051 *
	(0.135)	(0.027)	(0.158)	(0.027)
SalePrice	−0.004	−0.001	−0.004	−0.001
	(0.002)	(0.001)	(0.003)	(0.001)
log(TotalIncome)	−0.136	−0.000		
	(0.450)	(0.000)		
log(RiceIncome)			−0.341	−0.000
			(0.504)	(−0.000)
log(1 + NonRiceIncome)			0.023	0.000
			(0.033)	(0.000)
Risk Averse	−0.112	−0.023	−0.137	−0.025
	(0.110)	(0.022)	(0.120)	(0.022)
Constant	3.068		6.599	
	(6.925)		(7.688)	
Observations	96		96	
Log Likelihood	−57.027		−52.011	
Akaike Inf. Crit.	136.053		132.022	
Pseudo R2	0.125		0.202	

Numbers in parentheses are standard errors. ***, **, and * indicate significance level of 1%, 5%, and 10%, respectively.

In line with prior literature, the estimated coefficient and marginal effect on *FarmSize* are positive (e.g., [9,27]), but are not statistically significant [9], suggesting that farmers' WTP for WII is not associated with their farmland size. The estimate on *SalePrice* is negative and statistically insignificant. This might indicate that if rice could be sold at a high price, it would offset the product loss, leading to low demand for WII.

Farmers' total household income (*TotalIncome*) is negatively related to the insurance purchase decision [41]. It is in contrast to our intuition as we consider that richer farmers have a good financial situation and thus have a higher demand for WII. This negative effect may be because richer farmers could manage climate risk by allocating their wealth through other investments, which weakens their incentives to purchase WII.

Regarding the respondent's risk aversion (*RiskAverse*) (to easily explain the regression result, we use 10 minus the ranking of risk attitude (risk preference) in Table 3 (0 for high risk aversion to 10 for high risk-seeking) to get this Risk Averse variable; after conversion,

a higher number represents a higher level of risk aversion), we find that while its effect is statistically insignificant, the estimated sign is negative. (A caveat on our findings is that there might be endogeneity between risk aversion and WTP. However, due to the low correlation (−0.16) between WTP and Risk Averse, and an insignificant estimated coefficient on Risk Averse in the regression, we argue that the possibility of endogeneity is low in our study. Moreover, the data collection was conducted face-to-face during the COVID-19 period, which constrains our sample size. Future research may cover a larger sample of villages or districts, and then we can identify and test the differences in farmers' risk attitudes on their demand for WII.) This suggests that respondents who are more risk-averse are less likely to purchase insurance. Intuitively, risk-averse people are more likely to purchase insurance, but their willingness decreases if people lack trust and confidence in the insurance products and providers [42]). Haile et al. [34] investigate the relationship between risk aversion and demand for WII. They show that the WII uptake reduces farmers' risk aversion, which facilitates farmers to purchase insurance in the future. Prior literature also shows that the effect of risk aversion on the WTP decision is inconclusive. For example, Giné et al. [6] and Hill et al. [42] document that risk aversion negatively impacts the WTP decision, whereas Jin et al. [19] demonstrate a positive relationship. As such, our result is consistent with the findings of Giné et al. [6] and Hill et al. [42], but in contrast to the result of Jin et al. [19]. Tang et al. [20] further show that even in one country (China), risk preferences display different impacts on the demand for WII in two different provinces. Overall, these studies provide evidence that the effect of risk aversion on the WTP decision varies with different settings (e.g., country, district) and its measures.

Next, we discuss the regression results of Model (2), which investigates the effect of the components of several variables (*HHSize*, *TotalLabour*, *TotalIncome*). Although the estimates on most variables in Model (1) continue to retain their signs and significance in Model (2), others do not. For example, *MaritalStatus* continue to hold a significantly positive estimate, and its marginal effect is still significant. Being married increases the probability of WTP for WII by 38.6%. However, we find that the relationship between respondents' age and WTP changes from a positive sign to a negative one. The negative estimate value is in our expectation, showing that younger farmers are more interested in innovation and were willing to purchase WII products. This may also imply that elder farmers might have more farming experience in tackling climate change [25,32,43], which reduced their incentives to participate in the WII scheme.

The estimate on *FarmSize* becomes statistically significant at the 10% level in Model (2). This indicates that a farmer with larger farmland is more likely to purchase WII [19], with a one-hectare increase associated with a 5.1% increase in the probability of WTP. This can be explained from two aspects. First, larger farmland would create more wealth, which improves farmers' affordability for WII. Second, farmers who have larger farmland are concerned about climate risks arising from the change in weather. As such, both considerations facilitate farmers' WTP for WII.

After the household size is split into the number of adults and the number of children, we observe that the effect of *HHSize* in Model (1) is mostly attributed to the number of children. This is demonstrated by the negative and statistically significant estimate on *Child*, suggesting that the household with more children has a lower probability to purchase WII. Specifically, an increase of one child in the household is related to a decrease in the probability of WTP by 9.7%. The reason would be that more spending is required to support children's studies and other needs, which significantly reduces the household capacity to pay for WII.

Similarly, when we split *TotalLabour* into *FarmLabour* and *OffFarmLabour*, we observe that the positive and significant relationship between *TotalLabour* and farmers' WTP is dominated by the number of off-farm labourers. The household with more off-farm labourers is more willing to purchase WII products. With an increase of one off-farm labourer, the probability of WTP increases by 21.4%. While the number of farm labourers is positively associated with a household's WTP, its estimated coefficient is statistically insignificant.

In line with the total income, income from rice farming (*RiceIncome*) has a negative effect on farmers' WTP. However, income from practices outside rice farming (*NonRiceIncome*) generates a positive effect on farmers' insurance purchase decisions. This suggests that when the households could earn more money besides rice income, they might be in a good financial position and would pay for WII to avoid the impact of the extreme weather on their rice farming. However, this positive effect is much smaller than the negative effect imposed by rice income, demonstrated by a small estimated coefficient. The marginal effects of rice income and non-rice income demonstrate that their impacts on the WTP decision are weak because of small and statistically insignificant regression coefficients. Nevertheless, our results for the two components of the total income are consistent with the findings of Hossain et al. [17], which show that farm income and off-farm income are negatively and positively associated with WTP for flood insurance, respectively. However, our results are in contrast to those of Abebe and Bogale [32]. Abebe and Bogale [32] present a positive effect of farm income and a negative effect of off-farm income on the WTP decision. The inconsistent results might arise from many aspects, such as different study areas, question designs, and/or measures of variables.

5.3. Limitations

We have analysed Cambodian farmers' willingness to participate in the WII program. From our survey experience, we show some limitations in our study. First, the survey data is one-time data. The information from the collected data may not be adequate as some variables could vary from time to time. Second, the designs of interview questionnaires need to be improved and well-structured, especially for some critical measures (e.g., farmers' risk awareness and perspectives). Finally, the response rates for some questions are very low. Some effective measures and actions may be required to motivate farmers to respond to the questions. At least, we need to understand the possible reasons why some farmers are not willing to provide their answers. For example, this can be because of their privacy, limited financial literacy, or any other considerations.

6. Challenges and Recommendations

Prior literature has documented that more WII initiatives have been developed, whereas the uptake rate is still low, especially among smallholder farmers. This suggests that there exist some barriers and challenges in implementing WII programs [10,44,45]. Similarly, in our study, the interview survey and empirical results provide evidence that there are also some challenges for Cambodian farmers.

First, farmers lack knowledge about the innovative insurance product, WII, because this insurance product is new to them, and meetings to enhance farmers' awareness of the insurance are limited. While a few meetings are organized to introduce the insurance concept, only AC leaders participate. As such, the information about the WII scheme does not effectively reach the farmers. With this, it is highly suggested that high-quality and effective insurance literacy training or seminars should be organized for farmers. Moreover, experiential games may be useful in increasing farmers' insurance knowledge [35].

Second, farmers lack confidence in the insurance products and lack trust in the insurance providers. As Platteau et al. [46] state, "The core concept of insurance—spending money in return for an uncertain payout covering a hypothetical event—is, indeed, not straightforward," so some farmers are concerned that the insurance company would not pay the compensation or payouts. Farmer respondents also express the importance of accessible tools in measuring rainfall to give them accurate and transparent information that they can trust. A certain degree of flexibility should be built into the index insurance design so that the product can meet the requirements and be aligned with farmers' preferences. Moreover, local farmers highly rely on ACs and local governments, so insurance providers should work closely with these local community parties and government organizations to establish effective cooperation to improve farmers' insurance awareness and trust to facilitate the implementation of the WII program.

Third, there is no successful crop insurance model that farmers can observe and learn from. This may be another reason that farmers have low confidence in the success of the program. One of the most critical issues with WII is how to establish a reasonable weather index and determine the index threshold. In some instances, various basis risks may be induced [47,48]. For example, if weather station systems are used, the distance from a farm to a certain weather station is ignored, which affects the evaluation of a weather parameter (e.g., rainfall). The consequence is that a potential mismatch arises between the weather parameter index and actual farm losses.

Finally, the minimal support provided by the government is another problem to tackle. The government does not have a legal structure in place that would facilitate crop insurance. At the same time, the government does not provide a significant amount of assistance in the form of an extension service for crop insurance. The private sector has carried out a few pilot projects, but these projects remain relatively modest in size. Furthermore, private companies typically carry out such projects on their own initiative, which indicates a lack of coordination and integration into already existing programs and policies that could contribute to a more significant outcome. With the strong presence of agricultural cooperatives in the province, they should be a potential local farmer organization that can aid in the dissemination of crop insurance knowledge and also have the potential to be a part of the crop insurance program to implement it alongside the private sector, government, and other stakeholders.

7. Conclusions

Climate change has imposed a significant threat to the agriculture sector. Especially in developing countries, farmers are more vulnerable to extreme weather. How to adapt to climate change and transfer climate-related risk is becoming an impending task for a variety of parties, including governments, policy regulation agencies, relevant industries, and researchers.

In general, the WTP scheme includes two stages. The first stage involves farmers' willingness to participate in the scheme and the second stage focuses on the amount that farmers are willing to pay for the insurance. This study mainly focuses on the first stage of the WTP scheme by employing interview surveys to investigate whether and to what extent Cambodian rice farmers are willing to participate in the WII scheme in adaptation to climate change. The interview results indicate that most farmers have limited education and have no previous insurance experience. Furthermore, the practice of the WII program is still in its preliminary stage in Cambodia and the concept of WII is novel, so farmers' understanding of insurance products is significantly constrained. Our empirical results show that in the study areas of Cambodia, farmer respondents' marital status, the number of children in the household, the farm size, and the number of laborers who work outside their farm play important roles in influencing the purchase decision of WII.

WII is becoming an important risk management option for farmers to adapt to climate change, although the low uptake rate is still a critical problem. Farmers' WTP for WII varies with insurance design, geography, and crop types. The WII scheme in Cambodia will provide Cambodian smallholder farmers an option to transfer climate risk.

This study provides important implications for policymakers and regulators to facilitate the uptake and implementation of the WII scheme. First, a structured government subsidy scheme should be developed to improve farmers' incentives for adaptation to climate change. These subsidies would make WII more affordable to farmers. Second, government post-event support might also help farmers to participate in insurance schemes. Due to the nature of WII, farmers who have purchased WII and suffered losses from extreme weather may not be guaranteed to get indemnity. With government post-event assistance, these farmers might become confident and trust the insurance products, leading to a high uptake rate. Finally, a clear framework and an effective operational plan from policymakers, financial institutions, and regulators are crucial. Only through supportive

regulation can the insurance industry provide sustainable insurance products to their clients (e.g., farmers).

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/su142114558/s1: File S1: Individual interview questionnaire.

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Appendix A

Table A1. Correlation matrix for variables of interest.

	WTP	Age	Gender	MaritalStatus	Edu	HHSize	Adult	Child	TotalLabour	FarmLabour	OffFarmLabour	FarmSize	Yield	SalePrice	TotalIncome	RiceIncome	NonRiceIncome	RiskAverse
WTP	1.00																	
Age	0.07	1.00																
Gender	0.04	0.12	1.00															
Marital Status	0.13	−0.12	0.25	1.00														
Edu	0.13	−0.30	0.23	0.03	1.00													
HH Size	−0.01	0.21	−0.06	−0.02	−0.12	1.00												
Adult	0.15	0.46	0.05	−0.08	−0.18	0.71	1.00											
Child	−0.21	−0.27	−0.15	0.07	0.06	0.52	−0.23	1.00										
TotalLabour	0.18	0.39	0.19	−0.07	−0.09	0.55	0.75	−0.15	1.00									
FarmLabour	0.03	0.20	0.19	0.06	−0.02	0.41	0.53	−0.07	0.70	1.00								
OffFarmLabour	0.20	0.29	0.02	−0.16	−0.10	0.25	0.38	−0.12	0.52	−0.25	1.00							
FarmSize	0.19	−0.05	0.12	−0.08	0.28	0.22	0.13	0.14	0.28	0.31	0.01	1.00						
Yield	0.14	−0.22	0.03	−0.04	0.31	0.12	−0.05	0.23	0.07	0.20	−0.14	0.82	1.00					
SalePrice	−0.11	0.04	0.14	−0.04	0.10	0.06	−0.04	0.13	0.20	0.07	0.19	0.04	0.07	1.00				
TotalIncome	0.20	−0.18	0.11	0.01	0.33	0.21	0.04	0.24	0.15	0.16	0.02	0.73	0.88	0.14	1.00			
RiceIncome	0.12	−0.23	0.05	−0.03	0.33	0.11	−0.07	0.25	0.07	0.19	−0.12	0.81	0.98	0.20	0.89	1.00		
NonRiceIncome	0.22	0.00	0.16	0.07	0.15	0.26	0.21	0.11	0.20	0.02	0.24	0.18	0.22	−0.03	0.64	0.22	1.00	
RiskAverse	−0.16	−0.04	0.02	−0.08	−0.18	0.06	0.01	0.08	0.03	0.04	−0.01	−0.18	−0.10	0.04	−0.11	−0.11	−0.04	1.00

References

1. Touch, V.; Martin, R.J.; Scott, J.F.; Cowie, A.; Liu, D.L. Climate change adaptation options in rainfed upland cropping systems in the wet tropics: A case study of smallholder farms in North-West Cambodia. *J. Environ. Manag.* **2016**, *182*, 238–246. [CrossRef] [PubMed]
2. Touch, V.; Martin, R.J.; Scott, J.F.; Cowie, A.; Liu, D.L. Climate change impacts on rainfed cropping production systems in the tropics and the case of smallholder farms in North-west Cambodia. *Environ. Dev. Sustain.* **2017**, *19*, 1631–1647. [CrossRef]
3. Barnett, B.J.; Mahul, O. Weather index insurance for agriculture and rural areas in lower-income countries. *Am. J. Agric. Econ.* **2007**, *89*, 1241–1247. [CrossRef]
4. Cole, S.; Giné, X.; Tobacman, J.; Topalova, P.; Townsend, R.; Vickery, J. Barriers to household risk management: Evidence from India. *Am. Econ. J. Appl. Econ.* **2013**, *5*, 104–135. [CrossRef]
5. Chiappori, P.-A.; Salanié, B. Testing for asymmetric information in insurance markets. *J. Polit. Economy* **2000**, *108*, 56–78. [CrossRef]
6. Giné, X.; Townsend, R.; Vickery, J. Patterns of rainfall insurance participation in rural India. *World Bank Econ. Rev.* **2008**, *22*, 539–566. [CrossRef]
7. Sibiko, K.W.; Veettil, P.C.; Qaim, M. Small farmers' preferences for weather index insurance: Insights from Kenya. *Agric. Food Secur.* **2018**, *7*, 53. [CrossRef]
8. Binswanger-Mkhize, H.P. Is there too much hype about index-based agricultural insurance? *J. Devel. Stud.* **2012**, *48*, 187–200. [CrossRef]
9. Budhathoki, N.K.; Lassa, J.A.; Pun, S.; Zander, K.K. Farmers' interest and willingness-to-pay for index-based crop insurance in the lowlands of Nepal. *Land Use Policy* **2019**, *85*, 1–10. [CrossRef]
10. Al-Maruf, A.; Mira, S.A.; Rida, T.N.; Rahman, M.S.; Sarker, P.K.; Jenkins, J.C. Piloting a weather-index-based crop insurance system in Bangladesh: Understanding the challenges of financial instruments for tackling climate risks. *Sustainability* **2021**, *13*, 8616. [CrossRef]
11. Cole, S.A.; Xiong, W. Agricultural insurance and economic development. *Annu. Rev. Econom.* **2017**, *9*, 235–262. [CrossRef]
12. Stein, D. Dynamics of demand for rainfall index insurance: Evidence from a commercial product in India. *World Bank Econ. Rev.* **2018**, *32*, 692–708.
13. Aditya, K.; Kishore, A.; Khan, M.T. Exploring farmers' willingness to pay for crop insurance products: A case of weather-based crop insurance in Punjab India. *Agr. Econ. Res. Rev.* **2020**, *33*, 135–146. [CrossRef]
14. Matsuda, A.; Kurosaki, T. Demand for temperature and rainfall index insurance in India. *Agr. Econ.* **2019**, *50*, 353–366. [CrossRef]
15. Akter, S.; Krupnik, T.J.; Rossi, F.; Khanam, F. The influence of gender and product design on farmers' preferences for weather-indexed crop insurance. *Glob. Environ. Chang.* **2016**, *38*, 217–229. [CrossRef]
16. Akter, S.; Krupnik, T.J.; Khanam, F. Climate change skepticism and index versus standard crop insurance demand in coastal Bangladesh. *Reg. Environ. Chang.* **2017**, *17*, 2455–2466. [CrossRef]
17. Hossain, M.S.; Alam, G.M.; Fahad, S.; Sarker, T.; Moniruzzaman, M.; Rabbany, M.G. Farmers' willingness to pay for flood insurance as climate change adaptation strategy in northern Bangladesh. *J. Clean. Prod.* **2022**, 130584. [CrossRef]
18. Jin, J.; Wang, X.; Gao, Y. Gender differences in farmers' responses to climate change adaptation in Yongqiao District, China. *Sci. Total Environ.* **2015**, *538*, 942–948. [CrossRef]
19. Jin, J.; Wang, W.; Wang, X. Farmers' risk preferences and agricultural weather index insurance uptake in rural China. *Int. J. Disaster Risk Sci.* **2016**, *7*, 366–373. [CrossRef]
20. Tang, Y.; Cai, H.; Liu, R. Farmers' demand for informal risk management strategy and weather index insurance: Evidence from china. *Int. J. Disaster Risk Sci.* **2021**, *12*, 281–297. [CrossRef]
21. Tang, Y.; Cai, H.; Liu, R. Will marketing strategies affect farmers' preferences and willingness to pay for catastrophe insurance? Evidence from a choice experiment in China. *Environ. Dev. Sustain.* **2022**, *24*, 1376–1389. [CrossRef]
22. Aizaki, H.; Furuya, J.; Sakurai, T.; Mar, S.S. Measuring farmers' preferences for weather index insurance in the Ayeyarwady Delta, Myanmar: A discrete choice experiment approach. *Paddy Water Environ.* **2021**, *19*, 307–317. [CrossRef]
23. Furuya, J.; Mar, S.S.; Hirano, A.; Sakurai, T. Optimum insurance contract of flood damage index insurance for rice farmers in Myanmar. *Paddy Water Environ.* **2021**, *19*, 319–330. [CrossRef]
24. Leblois, A.; Quirion, P.; Alhassane, A.; Traoré, S. Weather index drought insurance: An ex ante evaluation for millet growers in Niger. *Environ. Resource Econ.* **2014**, *57*, 527–551. [CrossRef]
25. Abugri, S.A.; Amikuzuno, J.; Daadi, E.B. Looking out for a better mitigation strategy: Smallholder farmers' willingness to pay for drought-index crop insurance premium in the Northern Region of Ghana. *Agric. Food Secur.* **2017**, *6*, 71. [CrossRef]
26. Dougherty, J.P.; Flatnes, J.E.; Gallenstein, R.A.; Miranda, M.J.; Sam, A.G. Climate change and index insurance demand: Evidence from a framed field experiment in Tanzania. *J. Econ. Behav. Organ.* **2020**, *175*, 155–184. [CrossRef]
27. Maganga, A.M.; Chiwaula, L.S.; Kambewa, P. Parametric and non-parametric estimates of willingness to pay for weather index insurance in Malawi. *Int. J. Disaster Risk Reduct.* **2021**, *62*, 102406. [CrossRef]
28. Fisher, M.; Carr, E.R. The influence of gendered roles and responsibilities on the adoption of technologies that mitigate drought risk: The case of drought-tolerant maize seed in eastern Uganda. *Glob. Environ. Chang.* **2015**, *35*, 82–92. [CrossRef]
29. Belissa, T.K.; Lensink, R.; Van Asseldonk, M. Risk and ambiguity aversion behavior in index-based insurance uptake decisions: Experimental evidence from Ethiopia. *J. Econ. Behav. Organ.* **2020**, *180*, 718–730. [CrossRef]

30. Carter, M.R.; Cheng, L.; Sarris, A. Where and how index insurance can boost the adoption of improved agricultural technologies. *J. Dev. Econ.* **2016**, *118*, 59–71. [CrossRef]
31. Ahmed, S.; McIntosh, C.; Sarris, A. The impact of commercial rainfall index insurance: Experimental evidence from Ethiopia. *Am. J. Agric. Econ.* **2020**, *102*, 1154–1176. [CrossRef]
32. Abebe, H.T.; Bogale, A. Willingness to pay for rainfall based insurance by smallholder farmers in Central Rift Valley of Ethiopia: The case of Dugda and Mieso Woredas. *Asia Pac. J. Energy Environ.* **2014**, *1*, 117–152. [CrossRef]
33. Kleinbaum, D.G.; Dietz, K.; Gail, M.; Klein, M.; Klein, M. *Logistic regression*; Springer: Berlin, Germany, 2002.
34. Haile, K.K.; Nillesen, E.; Tirivayi, N. Impact of formal climate risk transfer mechanisms on risk-aversion: Empirical evidence from rural Ethiopia. *World Devel.* **2020**, *130*, 104930. [CrossRef]
35. Janzen, S.; Magnan, N.; Mullally, C.; Shin, S.; Palmer, I.B.; Oduol, J.; Hughes, K. Can experiential games and improved risk coverage raise demand for index insurance? evidence from kenya. *Am. J. Agric. Econ.* **2021**, *103*, 338–361. [CrossRef]
36. Falco, C.; Rotondi, V.; Kong, D.; Spelta, V. Investment, insurance and weather shocks: Evidence from Cambodia. *Ecol. Econ.* **2021**, *188*, 107115. [CrossRef]
37. Adjabui, J.A.; Tozer, P.R.; Gray, D.I. Willingness to participate and pay for index-based crop insurance in Ghana. *Agric. Financ. Rev.* **2019**, *79*, 491–507. [CrossRef]
38. Menard, S. *Applied Logistic Regression Analysis*, 2nd ed.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 2002.
39. Hill, R.V.; Vigneri, M. Mainstreaming gender sensitivity in cash crop market supply chains. In *Gender in Agriculture*; Quisumbing, A., Meinzen-Dick, R., Raney, T., Croppenstedt, A., Behrman, J., Peterman, A., Eds.; Springer: Berlin, Germany, 2014; pp. 315–341.
40. Enjolras, G.; Sentis, P. Crop insurance policies and purchases in France. *Agr. Econ.* **2011**, *42*, 475–486. [CrossRef]
41. Liu, X.; Tang, Y.; Ge, J.; Miranda, M.J. Does experience with natural disasters affect willingness-to-pay for weather index insurance? Evidence from China. *Int. J. Disaster Risk Reduct.* **2019**, *33*, 33–43. [CrossRef]
42. Hill, R.V.; Hoddinott, J.; Kumar, N. Adoption of weather-index insurance: Learning from willingness to pay among a panel of households in rural Ethiopia. *Agric. Econ.* **2013**, *44*, 385–398. [CrossRef]
43. Fonta, W.M.; Sanfo, S.; Kedir, A.M.; Thiam, D.R. Estimating farmers' willingness to pay for weather index-based crop insurance uptake in West Africa: Insight from a pilot initiative in Southwestern Burkina Faso. *Agric. Food Econ.* **2018**, *6*, 11. [CrossRef]
44. Clarke, D.J.; Grenham, D. Microinsurance and natural disasters: Challenges and options. *Environ. Sci. Policy* **2013**, *27*, S89–S98. [CrossRef]
45. Johnson, L.; Wandera, B.; Jensen, N.; Banerjee, R. Competing expectations in an index-based livestock insurance project. *J. Devel. Stud.* **2019**, *55*, 1221–1239. [CrossRef]
46. Platteau, J.-P.; De Bock, O.; Gelade, W. The demand for microinsurance: A literature review. *World Devel.* **2017**, *94*, 139–156. [CrossRef]
47. Clement, K.Y.; Botzen, W.W.; Brouwer, R.; Aerts, J.C. A global review of the impact of basis risk on the functioning of and demand for index insurance. *Int. J. Disaster Risk Reduct.* **2018**, *28*, 845–853. [CrossRef]
48. Ward, P.; Spielman, D.J.; Ortega, D.; Kumar, N.; Minocha, S. Demand for complementary financial and technological tools for managing drought risk. *Econ. Devel. Cult. Chang.* **2020**, *68*, 607–653. [CrossRef]