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Farmers' Willingness to Purchase Weather Index Crop Insurance: Evidence from Battambang, Cambodia

Bungchay Lay [1,2], Isriya Bunyasiri [2,*] and Ravissa Suchato [2]

[1] Graduate School, Kasetsart University, Bangkok 10900, Thailand; bungchay.l@ku.th
[2] Department of Agricultural and Resource Economics, Faculty of Economics, Kasetsart University, Bangkok 10900, Thailand; ravissa.s@ku.th
* Correspondence: isriya.b@ku.th

Abstract: The weather index crop insurance (WICI) scheme was introduced under a pilot project for rice in Cambodia in 2021. The adoption rate was low and the loss ratio was higher than 200%. The increase in farmers' participation would help reduce the loss ratio, which can sustain the WICI scheme. This study, therefore, examines Cambodian rice farmers' willingness to purchase WICI in Cambodia. The hypothesis is that the low adoption rate is due to a lack of awareness, lack of understanding of WICI, lack of trust in weather stations, and the problem of basis risk. This study would like to test the influence of those factors on the willingness to purchase in Cambodia. Battambang Province was chosen as the study area as it is the largest area for rice production and has the largest take-up rate of farmers buying WICI. Detailed interviews of 232 farmers were conducted in the districts of Bavel and Moung Ruessei. The probit regression model was used to identify factors that significantly impact farmers' willingness to purchase WICI. The results indicate that land size, level of trust in weather stations, level of farmers' understanding of WICI, and joining the WICI awareness program have positive effects on the probability of farmers' willingness to buy WICI, whereas the number of household laborers and expectation of floods have negative influences. The probability of willingness to purchase by farmers who attended the awareness program on WICI was 38% higher than those who did not. The size of farmland, level of trust in weather stations, and level of understanding of WICI increase in one unit affecting the probability of willingness to purchase WICI by 4%, 16%, and 25%, respectively. On the other hand, the increase in the number of household laborers in the rice field by one person and the increase in the probability of expected flood increase by 0.1 drag back the probability of farmers' willingness to purchase by 16% and 5%, respectively. The results suggest the government to raise the insurance awareness and understanding of WICI. Development of weather station infrastructure, as well as maintenance of weather stations, is needed to guarantee the accuracy of data generated from the weather station.

Keywords: rice; weather index crop insurance (WICI); probit regression; willingness to purchase

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1. Introduction

Cambodia's agricultural sector contributes 32% of the GDP, and rice accounts for over 90% of the cropped area Asian Development Bank (2014). A total of 70% of the loss is caused by floods and 20% by droughts, which impact rice farmers' income Chan (2020). By 2025, the rainfall will rapidly increase and cause a significant impact on Cambodia's rice production, with a decrease of 30 kg yield per hectare Bairagi et al. (2020). Crop insurance provides the ex-post financing option for them to mitigate the risk Connor et al. (2022); Fahad et al. (2018). The excessive rainfalls and dry spells are serious issues impacting farmers and affecting food security and exports, and usually, this severely impacts agricultural production from May to August Sony (2021). Therefore, WICI can be one of the solutions for rice farmers to deal with climate uncertainty as it is a risk-sharing

institutional mechanism that helps farmers against climate risk with the insured cost for the next phase of production, secure their livelihood, and speed up the recovery process.

In 2021, the weather index crop insurance (WICI) scheme was introduced under the pilot project, which was separated into two phases, the first 60-day phase and the remaining phase of rice cultivation. WICI is a voluntary program and serves as a risk mitigation strategy for rice farmers in the wet rice season (from May to December). As a parametric insurance, WICI uses historical rainfall verifiable data from two sources: (1) Ministry of Water Resources and Meteorology (MOWRAM) weather stations and (2) Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) rainfall data from satellite Asian Development Bank (2021). The rainfall data can examine the lack of rainfall and excessive rainfall in three main rice-producing provinces in Cambodia. The WICI has a premium of USD 10 per hectare with a USD 100 compensation at maximum while 50% of the premium is a government subsidy and farmers actually pay only USD 5 per hectare. In Cambodia, the net profit obtained by rice cultivation is between USD 50.89 and USD 140.02 per hectare Bunthan and Takahashi (2018). This proves that rice farmers are able to pay the premium with the profit generated from the cultivation.

However, the farmers' participation in this pilot project was still very low. In 2022, Cambodia's insurance penetration rate was 1.17% Insurance Regulator of Cambodia (2023), which is still one of the low penetration rates among ASEAN countries. Although there was an increase in participant farmers, from 675 farmers in 2021 to 1521 farmers in 2022, in the provinces of Battambang, Kampong Thom, and Prey Veng, it was far below the target of 100,000 farmers for the WICI scheme's plan Asian Development Bank (2021). In Battambang, the company also points out that the loss ratio is 248% with the amount of USD 8492.59 compared to the receivable premium amount of USD 3430 in 2021. The increase in farmers' participation in the scheme will increase the amount of the company's receivable premium and reduce the loss ratio, which can sustain the WICI scheme.

The adoption rate is quite low even though farmers have the ability to pay. This can be caused by a lack of awareness related to the WICI scheme, a lack of trust in crop insurance, a lack of trust in weather stations, the complexity of WICI, and the problem of basis risk, which is the mismatch between the weather index and farmers' loss. This paper would like to test how farmers' awareness, trust, understanding, and perception of basis risk influence their willingness to purchase WICI.

The aim of this study is to examine factors determining farmers' willingness to buy WICI in Battambang, Cambodia. Battambang Province is chosen as a study area as it is a major rice production area and one of the major pilot provinces for WICI. The study contributes to the literature on crop insurance in Cambodia by testing the influence on crop insurance awareness, level of understanding, trust in the accuracy of weather stations, farmers' perception of basis risk, and risk attitude on the willingness to purchase WICI.

2. Literature Review

Several studies have identified factors influencing crop insurance demand or willingness to pay for crop insurance. Fahad et al. (2018) evaluate the factors influencing crop insurance demand in flood-prone areas in Pakistan by using probit model. Their finding reveals several factors such as age, farming experience, landholding size, access to information sources, risk perception of floods, risk-averse perspective, and access to credit positively correlated with farmers' willingness to purchase crop insurance. Conversely, family size and off-farm income are negatively associated with take-up decisions. Similar findings are made by Danso-Abbeam et al. (2014), who study Ghanaian smallholder cocoa farmers' willingness to pay for farm insurance. Their results indicate that household size has a negative significant impact on farmers' willingness to purchase cocoa insurance, whereas farming experience and farm size have positive influences on farmers' decision to adopt cocoa insurance. Ellis (2017) also finds that access to credit has a positive influence on the willingness to purchase crop insurance. In addition, Yakubu et al. (2016) indicate that off-farm income causes farmers to decide not to pay for crop insurance. Conversely,

Aidoo et al. (2014) reveal that farm size, land tenure system, and age have negative influences on farmers' willingness to adopt crop insurance for Ghanaian maize and cassava farmers. Regarding the education of farmers, Ellis (2017) finds that education level has a positive influence whereas Aidoo et al. (2014) find a negative influence on the willingness to purchase.

Most studies such as Danso-Abbeam et al. (2014), Ghazanfar et al. (2015), and Ellis (2017) find that crop insurance awareness has a positive influence on the willingness to purchase. Ghazanfar et al. (2015) stress that low literacy rates negatively affect farmers' adoption rate of crop insurance. Moreover, farmers with more loss experience were more interested in purchasing crop insurance to avoid losses from future climatic risks.

For the specific studies relating to factors influencing willingness to pay for WICI, in Wang et al. (2023), rice farmers' willingness to purchase weather-indexed insurance are investigated in the Bavel district and Thma Koul district, Battambang Province, Cambodia. The finding has demonstrated that marital factor, off-farm laborer factor, and farm size factor have a positive effect on WICI purchase decisions. In India, Giné et al. (2018) and Cole et al. (2013) interpret that trust in insurance vendors and understanding of WICI have a positive impact on farmers' take-up of WICI. Basis risk is also a possible explanation for why the demand for WICI is low Clement et al. (2018); Shin et al. (2022).

From the literature review, the factors influencing farmers' willingness to purchase are (1) socio-economic factors such as age, gender, household labor, income, and access to credit; (2) farm characteristic factors such as farm size; (3) risk-coping strategies such as off-farm income and non-farm income; (4) awareness of crop insurance; and (5) risk attitude such as risk aversion index and the expected chance of flood and drought in next year. In this study, we also add factors influencing the willingness to purchase from the previous literature, which are the distance from farm locations to the nearest weather station, farmer's level of trust in accuracy of data from the weather station, understanding of WICI, and farmer's perception about basis risk.

3. Methodology and Data Collection

Primary data were collected from the WICI pilot program covered area and with the installation of weather (rainfall) station gauges, namely, the districts of Moung Ruessei and Bavel (Figure 1). The targeted villages were intentionally selected, as they had a high participation rate, and the well-structured questionnaire was applied while conducting face-to-face interviews with farmers who either did or did not purchase WICI.

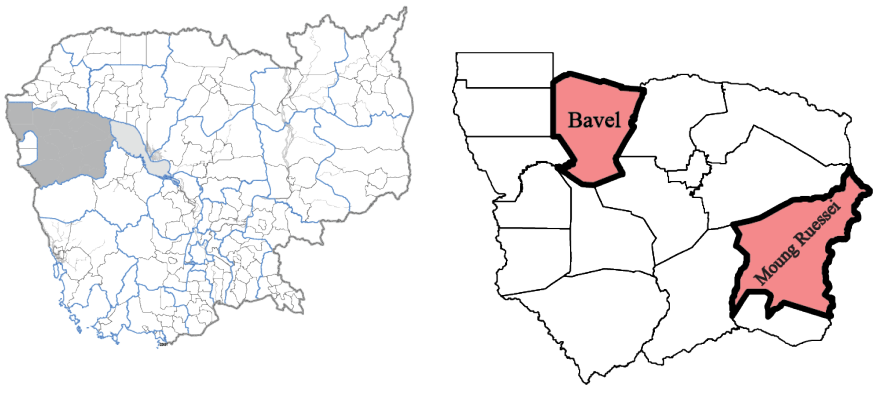

Figure 1. Map showing the study area. (**a**) The map of Cambodia. The part highlighted in gray is Battambang Province. (**b**) The map of Battambang Province. The parts highlighted in red are the study areas (districts of Bavel and Moung Ruessei).

Individual interviews were conducted with rice farmers during May–June 2023. Sampling rice farmers were divided into 2 groups: those who have experienced buying WICI and those who have not. Those who have experienced buying WICI were randomly se-

lected from the Forte company's WICI sale report. Those who have not experienced buying WICI were randomly selected from the lists of village heads. The number of surveyed farmers in the target area is described in Table 1.

Table 1. The number of surveyed farmers in the target area.

Battambang Province				Total Samples
Moung Ruessei District		Bavel District		
Farmers bought WICI	Farmers did not buy WICI	Farmers bought WICI	Farmers did not buy WICI	
51 respondents	56 respondents	55 respondents	70 respondents	
107 respondents		125 respondents		232

4. Econometric Model

The probit model was used to explore the likelihood of farmers' willingness to purchase WICI.

The Probit model can be expressed as follows:

$$(Y_i^* = \beta_0 + \sum_{i=1}^{n} \beta_n X_i + \mu_i)$$

where Y_i^* can be defined as an expected utility that farmers received from purchasing WICI which is a latent variable that is not observed. Y_i is the dichotomous dependent variable expressed as follows: $Y_i = 1$ when a farmer is willing to purchase the current WICI scheme in the 2023 crop production year given the sum insured of USD 100 per hectare maximum and the premium costs that farmers actually pay is USD 5 (with the 50% of government subsidy); $Y_i = 0$ when a farmer is not willing to purchase WICI. X_i is a vector of factors influencing farmers' willingness to purchase. X_i include (1) socio-economic factors: age, gender, household labor, and total income; (2) farm characteristic factors: farm size, distance from farm locations to nearest weather station; (3) risk-coping strategies: non-farm income, access to credit; (4) awareness and understanding of crop insurance: farmer joining the awareness program (0 = not joining and 1 = joining), level of understanding of crop insurance; (5) risk attitude such as risk aversion index, the likelihood that severe flood will occur, the likelihood that severe drought will occur; and (6) farmer's perception relating to WICI, farmer's level of trust in accuracy data of weather station, based on scale of 1–5 (1 = least trust, 5 = most trust), level of understanding of WICI, and farmer's perception of the discrepancy between the weather index and farmer's loss (1 = least discrepancy, 5 = most discrepancy).

For the risk aversion index, This study employed a modified version of Binswanger's game Binswanger (1980) where respondents were presented with a choice among various types of rice seeds, each associated with different yields that could vary based on uncertainty. Each choice indicated the respondent's degree of risk aversion, and the risk aversion parameter was based on the payoff of each choice. In essence, this parameter provided a quantifiable measure of each respondent's willingness to take risks in the context of their agricultural investment decisions, with higher values indicating greater risk aversion Dohmen et al. (2011). Table A1 indicates the parameter was constructed as an ordinal index ranging from 1 (least averse) to 5 (most averse) Binswanger (1980). For the level of understanding of WICI, this study asks a series of 6 questions providing a scenario of receiving compensation based on rainfall levels. The questions are divided into two sections: (1) questions testing farmers' comprehensive understanding of the compensation criteria due to lack of rainfall during the first 60-day phase; and (2) questions testing farmers' comprehensive understanding of the compensation criteria due to both lack of rainfall and excessive rainfall in the subsequent phase. The level of understanding is based on the score of 1–6 from the correct answers to 6 questions.

5. Result and Discussion

5.1. Descriptive Statistics

Table 2 indicates the descriptive statistics of dependent and independent variables used in this study. A total of 45.7% of rice farming respondents are willing to purchase WICI. A total of 66.4% of the whole sample is male, and the average age of farmers is around 51 years old. Moreover, the average number of household laborers is around two people, ranging from one to six laborers working in the rice field. The average total income of respondents is KHR 10.3 million.

For farming characteristics, farmers have a farm size of around 3 hectares on average, with a range from 0.2 to 12 hectares. The average farm distance from the station is 6 km, the furthest one is 11 km and the nearest one is 1 km. For the risk coping strategies, 91% of farmers engage in non-farm activities. Very few farmers have access to credit services, and there is only 0.09% access to credit among the whole sample. For awareness and understanding of crop insurance, 81% of respondents joined the awareness program. The level of understanding of crop insurance is average at 3.54 out of 6. The average risk aversion index is 1.789, representing a relatively less risk-averse sample. The average likelihood that severe flood and severe drought will occur are 0.51 and 0.48, respectively. The farmer's level of trust in the accuracy of data from weather stations is average at 3.54 out of 5. The level of understanding of WICI is average at 4.6 out of 6. The farmer's perception of the basis risk, which refers to the discrepancy between the weather index and the farmer's loss, is average at 3.13 out of 5.

Table 2. Descriptive statistics.

Variables	Description	Mean	Std. Dev.
Willingness	Willingness to purchase WICI = 1, otherwise 0	0.457	0.499
Gender	Male = 1, otherwise 0	0.664	0.473
Age	Age of farmers (years)	50.987	11.248
HHlabor	The number of household laborers in farm	2.138	0.975
Distance	Distance of weather station (Km)	5.864	2.505
FarmSize	Area of growing rice (Ha)	3.174	2.307
CreditAccess	Access to credit = 1, otherwise 0	0.086	0.281
TotalIncome	Total income (in million KHR)	10.368	7.648
NonFarm	Non-farm income = 1, otherwise 0	0.909	0.288
WICIBasis	Farmer's perception about the basis risk, the discrepancy between the weather index and farmer's loss (1 = least similar; 5 = most similar)	3.134	1.03
Trust	Level of trust on weather station (1 = least trust; 5 = most trust)	3.543	0.957
WICIUnderstand	Level of understanding on WICI (1 = least understanding 6 = most understanding)	4.616	1.33
AwareProgram	WICI awareness program = 1, otherwise 0	0.806	0.396
RiskAverse	Level of farmer's reluctance to take risk (1 = least averse 5 = most averse)	1.789	1.246
ExpectFlood	The probability that farmers expect severe flood	0.515	0.195
ExpectDrought	The probability that farmers expect severe drought	0.484	0.190

5.2. Regression Results and Discussion

The binary probit model was used to determine the factors influencing farmers' willingness to purchase WICI. From the correlation matrix among independent variables shown in Table 3, farm size is highly correlated with total income. Two models were developed. Model 1 tests the influence of farm size on the probability that a farmer is willing to purchase WICI. Model 2 tests the influence of total income on the probability. The problem of multicollinearity was also tested. The mean value of the variance inflation factor (VIF) of all the independent variables in both models is 1.27, which suggests that multicollinearity is not a major issue among the independent variables used in our model.

Table 3. Correlation matrix among independent variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) *HHlabor*	1.000														
(2) *Distance*	0.185	1.000													
(3) *FarmSize*	−0.006	0.055	1.000												
(4) *CreditAccess*	0.162	0.127	0.030	1.000											
(5) *NonFarm*	0.106	0.253	−0.198	−0.010	1.000										
(6) *WICIBasis*	0.085	0.160	0.065	−0.040	0.041	1.000									
(7) *Trust*	−0.067	−0.236	0.039	−0.062	0.022	0.150	1.000								
(8) *WICIUnderstand*	0.141	0.091	−0.028	−0.015	0.237	0.332	0.270	1.000							
(9) *AwareProgram*	0.002	−0.044	−0.047	−0.160	0.187	0.170	0.176	0.589	1.000						
(10) *RiskAverse*	−0.033	0.108	0.035	0.225	−0.042	−0.049	−0.110	−0.088	−0.101	1.000					
(11) *ExpectFlood*	−0.093	0.064	0.077	0.047	0.009	0.033	0.076	0.136	0.032	0.077	1.000				
(12) *ExpectDrought*	0.159	0.059	−0.036	−0.007	0.236	0.057	−0.092	0.108	0.086	−0.142	0.015	1.000			
(13) *TotalIncome*	0.058	0.095	0.862	0.082	−0.101	0.077	0.025	−0.038	−0.042	0.054	0.043	−0.010	1.000		
(14) *Gender*	0.045	0.084	0.015	−0.009	0.030	0.039	−0.149	0.062	−0.003	−0.025	−0.053	−0.015	0.041	1.000	
(15) *Age*	0.024	−0.109	−0.086	−0.054	−0.065	−0.010	0.126	0.156	0.066	−0.094	0.164	−0.030	−0.033	0.202	1.000

Overall, both estimated models can explain the willingness to purchase as the Wald Chi-Square statistics in both models are significant at the 99% level of confidence. The value of Pseudo R^2 is about 0.43, showing that these explanatory factors explained 43% of the probability that farmers would be willing to purchase WICI.

Table 4 reports the results of the coefficients and the marginal effects of determinants of farmers' willingness to purchase WICI. The estimated model results in several independent variables with significant impact on farmers' uptake, such as the number of household laborers (*HHLabor*) and the probability that farmers expected flood (*ExpectFloood*) with negative influence, and the farm size (*FarmSize*), the trust in weather station (*Trust*), the level of understanding (*WICIUnderstand*), and WICI awareness program (*AwareProgram*) with positive correlation.

Participating in the awareness program on WICI had the highest significant effect on the probability that farmers are willing to purchase. The probability of willingness to purchase by farmers who attended the awareness program on WICI was 37% higher than those who did not attend. The probability of farmers having the willingness to purchase increases by 25% and by 16% as the level of understanding of WICI increases and the level of trust in weather station increases, respectively. The trust in the accuracy of the weather station can reduce farmers' worries about not receiving compensation, increasing the willingness to purchase WICI.

On the other hand, the likelihood of willingness to purchase WICI declines by 16% as the number of household laborers increases by one person. This is consistent with Danso-Abbeam et al. (2014), in which farmers with more family members participating in cultivation are more likely to practice other risk management. Contrary to previous documents, when farmers believe higher possibility of floods, they are more likely to pay for crop insurance Fahad et al. (2018); Liu et al. (2019). The result indicates that *ExpectFlood* has a negative estimate at a 5% significant level. The probability of buying WICI decreases by 5% if the expected chance of flood increases by one unit. The results also showed that the probability of willingness to purchase increases by 3.7% with a one-hectare increase in farm size. In line with previous studies, farmers with more cultivation land are more likely to buy crop insurance Abbas et al. (2014); Wang et al. (2023). Farmers with larger farm sizes are wealthier, so they can afford crop insurance.

The risk aversion attitude is found to be negative and insignificant in this study, while other studies found that the likelihood of purchasing insurance is significantly higher for

risk-averse farmers Fahad et al. (2018); Liu et al. (2019). One possible explanation of the negative coefficient is that a very risk-averse farmer will choose to purchase less index insurance compared to their worst case scenario of having basis risk, in which they realize a bad event and that the index data realized a good event Clarke (2016).

Farmers' perception relating to basis risk, the discrepancy between weather index and actual loss, is found to be insignificant, representing that rice farmers in Cambodia are not concerned much over the problem of basis risk. Moreover, unlike in the study of Wang et al. (2023), gender and age are not significant factors in influencing willingness.

Table 4. Estimated result of the binary probit model on farmers' willingness to purchase.

Variables	Model (1) Coefficient	Marginal Effect	Model (2) Coefficient	Marginal Effect
HHLabor	−0.416 ***	−0.154 ***	−0.431 ***	−0.159 ***
	(0.129)	(0.0472)	(0.130)	(0.0473)
Distance	−0.0363	−0.0134	−0.0339	−0.0125
	(0.0498)	(0.0185)	(0.0492)	(0.0182)
FarmSize	0.100 *	0.0372 *		
	(0.0518)	(0.0193)		
CreditAccess	−0.438	−0.148	−0.473	−0.158
	(0.379)	(0.114)	(0.384)	(0.112)
NonFarm	0.649	0.207	0.547	0.179
	(0.505)	(0.132)	(0.481)	(0.134)
WICIBasis	−0.00662	−0.00245	−0.00726	−0.00268
	(0.119)	(0.0442)	(0.119)	(0.0439)
Trust	0.442 ***	0.164 ***	0.446 ***	0.164 ***
	(0.135)	(0.0497)	(0.134)	(0.0490)
WICIUnderstand	0.689 ***	0.255 ***	0.675 ***	0.249 ***
	(0.112)	(0.0406)	(0.112)	(0.0406)
AwareProgram	1.327 ***	0.376 ***	1.368 ***	0.381 ***
	(0.509)	(0.0842)	(0.526)	(0.0822)
RiskAverse	−0.127	−0.0470	−0.128	−0.0470
	(0.0823)	(0.0304)	(0.0829)	(0.0306)
ExpectFlood	−1.387 **	−0.514 **	−1.266 *	−0.467 *
	(0.680)	(0.252)	(0.651)	(0.240)
ExpectDrought	0.697	0.258	0.683	0.252
	(0.655)	(0.242)	(0.635)	(0.234)
Gender	−0.312	−0.117	−0.302	−0.113
	(0.232)	(0.0888)	(0.230)	(0.0873)
Age	−0.0134	−0.00497	−0.0151	−0.00557
	(0.0100)	(0.00369)	(0.0101)	(0.00369)
TotalIncome			0.0130	0.00478
			(0.0155)	(0.00574)
Constant	−4.459 ***		−4.120 ***	
	(1.154)		(1.102)	
Observations	232	232	232	232
Pseudo R2	0.4114		0.4028	
Wald chi2(14)	86.71		80.71	
Prob > chi2	0		0	

Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6. Conclusions and Recommendations

This study aimed to empirically explore the factors affecting farmers' willingness to purchase WICI in Battambang Province, Cambodia. This study used survey data from 232 rice farmers. The results of the survey indicate that 45.7% of respondents are willing to purchase WICI under the premium rate of USD 5 per hectare with the USD 100 compensation at maximum. A binary probit model was used to estimate factors affecting farmers' willingness to purchase WICI. The results show that household labor, flood expectation, farm size, trust in weather station, knowledge of WICI, and participation in WICI awareness program are statistically significant. Rice farmers in the study area are more willing to purchase WICI if they have more trust in weather station, have more level of understanding of WICI, have larger farm size, have fewer household laborers, and expect less chance of flood. The probability of willingness to purchase by farmers who

attended the awareness program on WICI was higher than those who did not participate. Among these factors, participating in the awareness program on WICI had the highest significant effect on the probability that farmers are willing to purchase. This suggests that the government should increase insurance awareness by extending the awareness program to cover rice farmers throughout the country. This will also help increase the understanding of WICI. Moreover, trust in the accuracy of the weather station is also a significant factor affecting the willingness to purchase. Therefore, the development of weather station infrastructure as well as maintenance of weather stations is needed to guarantee the accuracy of data generated from weather stations. Furthermore, rice farmers with marginal farm size are less likely to have willingness to purchase WICI. A full subsidy support may be needed for marginal rice farmers.

7. Limitations and Recommendations of Future Research

The survey was conducted in Battambang Province, the pilot area of WICI. However, future research should cover other parts of the rice production area in Cambodia as farmers in different areas may face different risk exposures and have different risk perceptions. Moreover, this study explores farmers' willingness to purchase WICI under the current scheme wherein the government subsidizes 50% of insurance premium. In addition, insurance is a new concept in Cambodia, so farmers might not understand the concept of WICI. Hence, the survey results may be optimistic. In addition, due to the limited data of the historical records of loss events, the actual problem of the basis risk from WICI cannot be studied. Future work can explore the willingness to pay for WICI as well as the problem of basis risk.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Summary of risk aversion parameter in this study adopted from Binswanger (1980).

Option	Low Payoff (Pr = 0.5)	High Payoff (Pr = 0.5)	Expected Payoff	S.D. Payoff	CRRA Interval	Geometric Means	Risk Class	The Risk Aversion Parameters
1	1.6	1.6	1.6	0.00	>7.51	7.51	extreme	5
2	1.5	1.8	1.65	0.21	7.51 > R > 1.74	3.615	severe	4
3	1.4	2	1.7	0.42	1.74 > 0.812	1.189	intermediate	3
4	1.2	2.4	1.8	0.85	0.812 > R > 0.316	0.507	moderate	2
5	0.8	2.8	1.8	1.41	inconsistent	inconsistent	inconsistent	-
6	0.6	3.2	1.9	1.84	0.316 > R > 0	0.158	slightly to neutral	1
7	0	4	2	2.83	0<		neutral to negative	0

Payoff is ,000 Kilograms per hectare.

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