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Willingness to Pay of Rice Farmers in Lao PDR on Agriculture Insurance

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ABSTRACT

Agricultural production is under the constant threat of disasters such as droughts, floods, and storms and from diseases and pests. The increasing incidence of crop-damaging events is likely to drive a demand for insurance coverage. Agricultural insurance has been repeatedly discussed in Lao PDR but has only been converted into a premium subsidy scheme. This study offers some 'first options' for agricultural insurance and focuses on rice farmers as examples. The objectives of this research were to evaluate the level of willingness of farmers to pay for agricultural insurance, to analyse insurance premiums and indemnity and to assess the determinants of farmers' decisions to buy agricultural insurance. Data was collected via stakeholder interviews, field surveys, and scenario planning. The results of the 'Willingness to Pay' surveys suggest that rice farmers would pay premiums 17% of indemnity. This result is consistent with previous studies and the insurance policies of neighbouring countries. The results also showed that farmers impacted by disasters are more willing to pay than those who have not been affected. Access to bank loan affect rice farmers' decisions to buy insurance.

Keywords: Agriculture Insurance, Willingness to Pay, Insurance Premium, Discrete Choice experiment and Indemnity

JEL Classification: G520

1. Introduction

Agricultural production is under constant threat of natural and man-made disasters, diseases, and pests. Farmers often bear losses that threaten their ability to produce crops and livestock in the next season. Lao PDR face the disasters that caused losses in products, production equipment, infrastructure, and life valued at LAK 1,560 billion in 2019. Twenty-seven people died, seven were missing, and 800,449 people were affected in some way. Flooding is a common disaster and accounts for the highest share accounting for 93.5% of total loss. The government mainly subsidizes living expenses for the people affected but there is no subsidy for lost production.

Insurance is one risk-mitigating mechanism that could reduce risk and losses for people and the government. Agricultural insurance has been introduced in both developed and developing countries and can be purchased by agricultural producers and subsidized by the government to protect against the loss of product disaster or revenue due to the collapse of agricultural commodity prices.

Agricultural insurance has been repeatedly discussed in Lao PDR but has only been converted into the current premium subsidy scheme. Another possibility could be for private insurance companies to offer insurance products to farmers. However, private insurance companies show little to no interest in agricultural insurance because of the high risks. Still, there is a strong need for the government to think seriously about insurance, either through subsidizing insurance companies or by setting up an insurance department under the Ministry of Agriculture and Forestry. This study aims to offer options for agricultural insurance in the Lao PDR.

The lack of information makes it difficult for the government of Lao PDR to initiate insurance. Therefore, the

objectives of this research were to i) evaluate the level of willingness of farmers to pay for agricultural insurance, ii) to analyze insurance premiums and indemnity, and iii) to assess the determinants of farmers' decisions to buy agricultural insurance.

2. Literature Review

Farmers face risks that can be classified as disasters, diseases and pests, and social and economic fluctuation. The disasters include drought, flood, storms, hail, disease, and wildfires; the diseases and pests contain contagious animal diseases and pest infestations; and the social-economic fluctuation is the strikes, labor shortages, theft, arson, price change, interest rates, and exchange rates. Farmers could lower the risk by preparing for pre and post-disaster events. The pre-disaster includes purchasing agricultural insurance, or invest in irrigation, construction of dams to prevent flooding, using modern seeds, etc. The risk coping strategies are new credit, sale of assets, temporary off-farm employment, support from the community, building reserves or stocks, etc. The risk coping strategies can be costly, new credit can lead to indebtedness, and selling assets reduces the household's ability to produce (Hazell, 1992).

Insurance is, "one of the financial tools that agricultural producers can use to mitigate the risks associated with adverse natural events" (Mahul & Stutley, 2010). The policyholder (the farmer) pays a premium to an insurer to transfer his risk of income loss to the insurer according to the conditions agreed by both parties. The unexpected occurrence of negative events is likely to impact the production, income, and consumption levels of smallholder farmers who have few options to mitigate risks. The main stakeholders in the supply of agricultural insurance include policyholder or insured: The

person or business entity covered by an insurance policy. The policyholder pays a premium to the insurer. Most agricultural insurance is group insurance because of the low premiums. Insurer: The company which issues the insurance policy and is named in the policy as responsible for paying a claim should a loss event result in damage to the insured property. The insurer can be a private or a state-owned company. Reinsurer: In the case of a disaster affecting many people, insurers may not have enough funds to pay indemnities to everyone. In this case, insurers can transfer their risk to a reinsurer. In a normal situation, insurers have sufficient reserves to compensate policyholders for their losses and do not use the services of a reinsurer. Delivery channel: The person or company selling insurance products to policyholders. Most delivery channels are microfinance institutes, traders, retailers, and the post office.

A number of researchers conduct an empirical analysis to value the insurance level. The two common methods to measure willingness to pay (WTP) for the insurance are the contingent valuation method (CVM) and the choice experiment analysis (CE). Budiasa et al. (2020) evaluated the WTP for rice farm insurance in Bali by using CVM and found that the level of WTP for one hectare was IDR 61,000 (USD 4.13) per hectare approximately 34% of premiums. Ngoc Que Anh et al. (2019) measured the level of WTP for agricultural flood insurance in the Mekong River Delta using the CE analysis and concluded that WTP for one hectare was between USD 8.8 to USD 22.2 with the share of premium as 10% to 25% respectively. Mutaqin and Usami (2019) evaluated WTP for agricultural production costs using CVM in Indonesia. They suggested that farmers would pay USD 2.25 per hectare. And finally, Danso-Abbeam et al. (2014) analyzed insurance for cocoa in Ghana using CVM. They found that farmers' WTP was between 9.3% to 10% of the premium.

Furthermore, the empirical research also suggests the determinants of agricultural insurance. Several studies suggest the positive influence of farm and household size on WTP (Donso-Abbeam et al., 2014; Kouame & Komenan, 2012; Nimo, Baah & Tham-Agyekum, 2011; Afroz et al., 2017). Income level also contributes to farmers' WTP for crop insurance (Budiasa et al., 2020; Botzen and Bergh, 2012; Donso-Abbeam et al., 2014: Akter et al., 2009; and Fuks & Chatterjee, 2008). In contrast, Arshad et al. (2016), Fahad et al. (2018), and Afroz et al, (2017) found no relationship between farmer income and WTP. Education level and occupation are also commonly used in many studies. Most confirm a positive and statistically significant effect of education level on WTP (Mutaqin & Usami, 2019; Donso-Abbeam et al., 2014; Budiasa et al., 2020; Dohmen et al., 2011; Fahad et al., 2018). However, other studies show a negative effect (Arshad et al., 2016; Botzen and Bergh, 2012). Nimo, Baah and Tham-Agyekum (2011) analyzed how occupation affects WTP and factors such as age and gender are also used in many studies. Dohmen et al. (2011) found that a farmer's age had significant positive effect on WTP for crop insurance, while other studies (show that age can reduce farmers' WTP for the crop insurance (Arshad et al, 2016; Botzen and Bergh, 2012; Afroz et al., 2017. Botzen and Bergh, 2012) showed that women's WTP is more likely to decrease.

3. Methodology

This study employs a discrete choice experiment analysis to measure the level of willingness to pay for the insurance and assess the effect of insurance and respondent's characteristics on the level of insurance. The analysis includes four steps which are (1) developing attributes and level of

alternative, (2) designing the alternative sets, (3) conducting an experiment with farmers, and (4) estimating the econometric equation and calculating the willingness to pay. To develop the attributes and their levels, let us denote the equation below as:

$$P(take) = f(\mathbf{x\beta} + \mathbf{z\theta}) \quad (1)$$

where take shows the respondent's willingness to take the hypothetical insurance, **x** is a vector of alternative characteristics, and **z** is a vector of farmer's characteristics. **β** and **θ** are vector of coefficient. The attributes and their level of alternative are developed based on number of studies in literatures. The attributes and levels are shown in Table 1. It has four attributes which are the insurance premium, the indemnity when disaster occurred, specific type of rice that resistance to insects and diseases but not local type of rice, and ability to access to bank loan. The insurance premium has six levels that start from LAK 30,000 to LAK 130,000. The indemnity has five levels which start from LAK 500,000 to LAK 900,000. The specific type of rice and access to bank loan are binary variables. The attributes of return and access to bank loan are expected to have a positive sign whereas the premium and specific type of rice are expected to have a negative sign.

Table 1. Attribute and level

Attributes	Definition	Levels
Premium	Premium in a million LAK	0.03, 0.05, 0.07, 0.09, 0.11, and 0.13
Indemnity	Indemnity in a million LAK	0.5, 0.7, and 0.9
Specific type of rice	Apply specific type of rice that resistance to insects and diseases	1 = yes, 0 = no

	but not local type of rice	
Access to bank loan	Advantage of access to bank loan	1 = yes, 0 = no

In constructing the alternative set, the total combination of attributes for one alternative is 72 which requires a number of respondents. To limit the number of respondents, the alternative set is constructed by using the D-optimality, which helps to reduce the overall variance of estimated coefficients (Atkinson & Donev, 1992). The alternative set includes three alternatives which include two alternatives with levels of attributes and one alternative of not taking the insurance.

Next, the alternative sets are used to conduct the experiment with farmers. In this step, the participated farmers are interviewed related to their farming activity before being shown the table of the alternative set. The enumerators explain the details of the set and ask farmers to select the best alternative. The farming activity is also used in the estimation. Table 2 shows the farmers' characteristics that are used to estimate the impact on the level of insurance. In using respondent's characteristics to estimate by DCE, the alternative specific constant is used to interact with other variables. It equals one for not selecting the insurance and zero for otherwise. The characteristics include an experience of disaster, income from a farm, an experience of buying another type of insurance, preparation activity to cope with disaster, education level, and resident location. The estimation proceeds by the conditional logit model.

Table 2. Respondent characteristics

Variable	Definition	Measurement
Asc	Alternative specific constant (Asc)	1 = not select insurance, 0 = otherwise
Disaster	5-years of experience in disaster	1 = yes, 0 = otherwise
Agricultural income	Farm income	Million LAK per month
Other insurances	Purchase another kind of insurance	1 = yes, 0 = otherwise
Prepare for disaster	Preparing for disaster	1 = yes, 0 = otherwise
Education	Education level of respondent	Year
Xiengkhuang	A resident of Xiengkuang province	1 = yes, 0 = otherwise
Savannakhet	A resident of Savannakhet province	1 = yes, 0 = otherwise
Champasack	A resident of Champasack province	1 = yes, 0 = otherwise

After conducting the experiment, the data obtaining from farmers is used in the econometric estimation. As the dependent variable is a choice selection variable, the econometric equation applies the conditional logit estimation. After that, the coefficients from the equation are used to calculate the level of willingness to pay (WTP) for each factor (j) by:

$$WTP_j = -\frac{\beta_j}{\beta_{fee}} \quad (2)$$

The results show the WTP which is approximately the insurance premium that respondents are willing to take.

4. Data

This study conducted the discrete choice experiment to estimate the impact of the alternative's attributes and farmers' characteristics on the value of willingness to take the insurance in Vientiane, Xhiengkhuang, Savannakhet, and Champasack provinces. After data cleaning, there were 339 famers from Xiengkhouang by 21%, Vientiane by 24%, Savannakhet by 30%, Champasack by 25%. It has 53% male respondents and 47% female respondents. The age of respondents ranges from 18 to 79 years old where the average is 48 years old. 93% of the sample are rice farmers, followed by the government officials as only 5.25%. Approximately 4.06% of rice farmers had no education, while 35.08% had primary education and 40.33% had attained lower secondary school. Rice farmers have the highest income from agriculture activities at LAK 152 million per year while the lowest is LAK 500,000 per year. Most rice farmers have income from agriculture activities lower than LAK 30 million per year which accounts for 80.29% of the total sample.

5. Results

The result from the conditional logit model is shown in Table 3. Column (1) shows the result of using only the alternative specific characters, and Column (2) includes both the alternative and the respondent specific characteristics, both columns show a consistent sign and statistically significant level of the attributes of alternative. The insurance premium variable shows the negative effect on the willingness to take the insurance and is statistically significant at 1%, and the return variable illustrates the positive effect and is statistically significant at 1%. Unsurprisingly, the higher insurance premium would reduce the willingness to take, and the higher indemnity would increase the willingness to take.

The specific type of rice has a positive sign; however, it is not statistically significant. This potentially shows that some farmers could accept the specific type of rice that resistance to insects and diseases to get the insurance, but other farmers would not be likely to change their rice seed to get the insurance. Finally, the ability to access to bank loan increase the willingness to take the insurance, and it is statistically significant at 1% in both columns.

Column (2) shows the variable of asc and its interaction with the number of respondents' characteristics. Since the asc equals 1 for the selection of not taking the insurance, the sign of the interaction is the opposite of taking the insurance. The interaction with disaster shows a negative sign and is statistically significant at 1%, which means that farmers with an experience of disaster would be more likely to take the insurance. This result is as expected that farmers who understand the loss from the disaster would want to reduce the risk by taking the insurance. The interaction of Asc with agricultural income, purchase of any insurance, and preparation for disaster show a positive sign which means that higher income, brought any insurance, and prepared for the disaster would reduce the potential to take the insurance. The effect is expected; however, they are statistically insignificant. In addition, the interaction of Asc with education shows a negative sign and is statistically significant at the 1% level. This means that individual with higher education level is more likely to take the insurance. Finally, the interaction of Asc with Xiengkhuang and Savannakhet illustrates a negative sign, while the interaction with Champasack shows a positive sign, and they are all statistically significant. It shows that farmers in Xiengkhuang and Savannakhet provinces are more likely to take the insurance compared to farmers in Vientiane province, and vice versa for the farmers from Champasack province.

Table 3. Conditional logit estimation results

	(1)	(2)
Insurance premium	-13.454***	-11.393***
	(1.657)	(2.253)
Indemnity	0.732***	1.907***
	(0.211)	(0.419)
Specific type of rice	-0.154	-0.166
	(0.150)	(0.157)
Access to bank loan	0.387***	0.580***
	(0.083)	(0.104)
Alternative specific constant (asc)		1.924***
		(0.464)
Disaster*asc		-0.511***
		(0.229)
Agricultural income*asc		0.004
		(0.002)
Other insurances*asc		0.042
		(0.193)
Prepare for disaster*asc		0.089
		(0.192)
Education*asc		-0.086***
		(0.024)
Xiengkhuang*asc		-0.950***
		(0.279)
Savannakhet*asc		-0.290*
		(0.176)
Champasack*asc		0.739***

		(0.186)
Observation	3,231	3,075
Pseudo R-squares	0.046	0.077

Source: Authors based on a survey in 2020. Note: Standard error is in parentheses; and *, **, *** indicate the statistically significant at 10%, 5%, and 1% respectively.

Table 4 shows the value of willingness to pay for the insurance by characteristics. Not all variables are statistically significant, thus we interpret the value of willingness to pay for the significant factors. The results show that the return increases LAK 1 million would increase the willingness to pay by LAK 167,338, or approximately 17%. The farmers are willing to pay LAK 50,928 for the insurance with access to bank loan. the experience of disaster increases the willingness to pay by LAK 44,860. Furthermore, if education increases by 1 year, the willingness to pay increases by 7,558 LAK. The farmers from Xiengkhuang and Savannakhet provinces are willing to pay for the insurance higher than farmers in Vientiane province by LAK 83,419 and LAK 25,425 respectively, while the farmers from Champasack province want to pay less than the farmers in Vientiane province by LAK 64,839.

Table 4.1 Measurement of willingness to pay for the insurance

	Value
Return (1 million LAK)	167,338
Specific type of rice	-14,600

Access to bank loan	50,928
asc	168,898
Disaster*asc	-44,860
Agricultural income*asc	322
Other insurances*asc	3,671
Prepare for disaster*asc	7,836
Education*asc	-7,558
Xiengkhuang*asc	-83,419
Savannakhet*asc	-25,425
Champasack*asc	64,839

Source: Author's survey, 2020. Note: 1 USD = 10,310 LAK in November 1st, 2021.

6. Conclusion

Agriculture insurance could be a tool to transfer risk from farmers to insurance companies. The result of the willingness to pay analysis suggests that rice farmers will pay for a premium with an indemnity of 17%. This result is consistent with the results of previous studies and the insurance schemes of neighboring countries. Farmers who have been affected by a disaster in the past are more willing to pay for insurance than those who were not. Access to bank loan is a bigger factor in rice farmers' decision to buy insurance. The government must

subsidize the loss although there is agriculture insurance, at least it spends less than without insurance.

This study had some limitations as the country was locked down due to the Covid-19 pandemic and the survey schedule was postponed to the rainy season. The survey did not meet the target, especially for rice farmers in Xiengkhuang Province due to poor transportation. To address this issue, the research team rearranged the schedule to meet farmers when they were available.

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