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Research article

Willingness to pay for crop insurance in Tolon District of Ghana: Application of an endogenous treatment effect model

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Abstract: The purpose of this study was to assess the factors affecting farmers' awareness of and willingness to pay for crop insurance in Tolon District of Ghana. The study was guided by the following objectives: (1) to determine farmers' level of awareness of crop insurance, (2) to analyse the factors affecting awareness of crop insurance and (3) to identify the factors that affect willingness to pay for crop insurance. Data was collected from 150 respondents from three farming communities in the Tolon District. Questionnaires were used as instruments for data collection. The computer software package STATA version 15 was used to analyse the quantitative data. Farmers' level of awareness of crop insurance was described descriptively while an endogenous treatment effect model was used to analyse the factors affecting awareness and willingness to pay. The result indicated that 48% of the respondents were aware of crop insurance. The results showed that sex of the farmer, extension training and adoption of good agriculture practices were significant factors affecting awareness of crop insurance. Also, willingness to pay for crop insurance was influenced by household size, years of farming experience, farm size and respondent's awareness of crop insurance. The study concluded that increasing awareness of crop insurance is an effective way to enhance farmers' willingness to pay. Hence, any intervention to promote adoption of crop insurance should target awareness campaign in order to increase the level of awareness especially among male farmers.

Keywords: awareness; willingness to pay; crop insurance; small-scale maize farmers; Ghana

1. Introduction

Agriculture is characterized by high exposure to risk [1]. Vagaries of nature like drought, floods, as well as pest and disease infestation can cause risk in farming [2]. Droughts and other natural calamities have become serious threats to agricultural production. For this reason, there is the need for a mechanism which can help reduce risks and uncertainties by employing risk management tools such as crop insurance [3]. However, farmers have less access to risk management options needed to cope with natural calamities and uncertain events when they occur [4].

Crop insurance is acknowledged to be a fundamental tool for stabilising farm income by facilitating farm investment, technology adoption and flow of credit in agriculture [2]. Crop insurance is defined as an instrument that provides financial compensation to farmers for production or revenue losses [5]. Crop insurance enables individuals who face production and other risks to turn a future and unforeseen loss, which is usually high, into an anticipated, certain and lower premium [1]. The fundamental principle underpinning crop insurance is that the loss incurred by few farmers is shared among other producers in the same locality who are involved in similar activity. Crop insurance provides the most promising means to overcome threats to agricultural production and improve rural welfare [6].

Crop insurance is a risk management control, structured to equal out agriculture risks and reduce the consequence of natural disasters, especially to small-scale farmers [7]. The common risks associated with agriculture include natural disasters such as droughts, floods, pests and diseases. Susceptibility of agriculture to these disasters is compounded by the outbreak of epidemics and man-made disasters such as fire, sale of spurious seeds, fertilizers and pesticides, price crashes, scrupulous middlemen, etc. All these events, which are beyond the control of farmers, severely affect production and farm income.

The closer that a community's livelihood is tied to the weather, the greater its exposure to risk of climatic variability and extremes. For example, many rural communities in sub-Saharan Africa rely largely on rain-fed agriculture or pastoralism and struggle to cope with climatic variability [8]. These vulnerable populations face immense challenges to adapt to climate change. This means that there is a need for an instrument that focuses on developing flexible, long-term strategies for reducing vulnerability, improving resilience, and enabling adaptation to natural catastrophes and climate change if food security is to be attained.

In absolute terms, economic losses due to natural catastrophes are greatest in developed countries, as a percentage of gross domestic product (GDP); however, catastrophes inflict higher proportional losses in developing countries. For example, Hurricane Katrina in 2005 resulted in a 1.1% GDP loss in the United States while at the other extreme, small island nations can incur damages representing several times their annual GDP [9].

High fatality rates and high proportional GDP losses are two indicators of the destruction caused by natural catastrophes in developing countries. Natural catastrophes prohibit economic development and exacerbate cyclical poverty; in the event of a natural catastrophe, the poor may have to sell assets (e.g., livestock), spend savings or default on loans, and cope with concurrent shocks such as illness [10]. Many rely on family networks for support, but families are often geographically concentrated and have highly covariant exposures to natural catastrophes. Furthermore, foreign investment in developing countries remains low partially because investors are

averse to taking on the risk of losing infrastructure investments, and small firms and farms are unable to access credit to invest in higher risk, higher-yield activities [10].

The extant literature attests to the positive impact of crop insurance in reducing yield and income volatility among farmers. A study by Fu et al. indicated that weather index insurance helps to stabilize farmer income by transferring weather risks from the production chain [11]. Reduction in income and yield volatility as a result of weather derivatives has been observed among soybean farmers in Brazil [12]. It is also reported that farmers in Canada used weather derivatives as complementary to insurance, with participation costs, particularly lack of awareness, being the most serious challenge to adopting weather derivatives in weather risk management [13]. Empirical studies further indicate that systemic weather risks in low income African and Asian countries provide opportunity to expand weather derivatives in these countries [14].

In Ghana, the crop insurance market is still in its developmental stages, despite the critical need for crop insurance in the light of inherent risks associated with small-scale farming which relies on rainfall for production. In response to the threat of climate change to agriculture, the German International Cooperation (GTZ) initiated a project in Ghana in 2009 to develop an insurance product for farmers. Currently, Ghana Agricultural Insurance Program (GAIP) provides crop insurance to farmers in Ghana. The insurance is provided by a pool of Ghanaian insurance companies. The array of insurance products includes weather index insurance, specifically drought index insurance for maize, soybean, sorghum and millet farmers, as well as a multi-peril crop insurance for commercial farmers and plantations. Farmers pay one-tenth of the cost of their farm production to GAIP at the start of the cropping season and receive payments when rainfall is less than 2.5 mm for 12 consecutive dry days. Farmers receive their claims within 30 days after the cropping season. GAIP has provided crop insurance to Ghanaian farmers since 2011.

Most smallholder farmers in the country use crop diversification as a means of spreading risks. However, even where farmers use crop diversification to spread risks, the introduction of area yield insurance has the potential to reduce production risks and enhance the welfare of agricultural households [15]. Issaka et al. identified micro-credit and micro-insurance as complementary products and therefore concluded that improving access to micro-credit can play a key role in improving micro-insurance uptake by farmers in northern Ghana [16]. A study to investigate the willingness of farmers to pay for crop insurance in eastern Ghana revealed that 52.9% of the respondents expressed interest in insuring their farms and were willing to pay a premium of approximately $18.36 per cropping season [17]. The study also indicated that crop insurance is a normal good since the demand for insurance had a negative correlation with the market premium. An interval regression analysis of the factors affecting the premium amount indicated that age, income, crop type, farm size, farming experience, weather variation, savings and access to extension were influential factors.

Several studies have been conducted to shed light on the factors affecting farmers' awareness of crop insurance and willingness to pay. Studies on crop insurance decisions and willingness to pay include [18–20]. Coble et al. observed that as farm size increases, participation in crop insurance increases [21]. Diversification also reduces participation while output variability and income risk increase participation. Moreover, crop insurance programs are likely to be more successfully in ecosystems where output are more volatile, farmers are better educated and debt is a concern [22]. Factors such as farm size, diversity of products, age of beneficiaries, insurance level and prior records of outcomes (risks) have been identified to have negative influence on the tendency and

adaptability of soya farmers to insurance uptake in Golestan Province, Iran [19]. An investigation of corn insurance markets in Iowa, United States found that risk characteristics of producers, income level, and the cost of insurance were the factors influencing farmers' choice of yield and revenue insurance products [20]. Other authors have argued that producers with higher insurable risk are anticipated to have higher demand for crop insurance and greater use of more comprehensive insurance products [18].

A study by Danso-Abbeam et al. indicated that marital status, education, tenure, farm age, income level and level of awareness of farm insurance were significantly related to the amount or premium Ghanaian cocoa farmers were willing to pay [23]. Also, marital status, educational level, and awareness of crop insurance were found to be positively associated with Ghanaian farmers' willingness to pay for crop insurance [17]. Another study by Falola et al. identified age, education, access to extension services, and farm income to be significant factors that influence willingness to take agricultural insurance in Nigeria [24].

A study in Ethiopia indicated that income level and ownership of radio are positively related to the willingness to pay for crop insurance while off-farm income and age are negatively associated with the willingness to pay for insurance [25]. In addition, the choice to purchase insurance is positively correlated with previous amount of insurance claims [25]. Studies show that insurance appears to be too expensive for smaller farms, hence more likely to be patronised by larger farms [27]. This finding is supported by Enjolras and Sentis [26] in their study on crop insurance policies and purchase in France. The result has implications for Ghanaian farmers where majority are smallholders operating less than 2 hectares of land.

Diverse challenges restrain the improvement of crop insurance [28], and these include planned risk [29], determination of the premium rate and absence of long-term data on agricultural output. According to Just et al., three ways that usually attract farmers for purchasing crop insurance include subsidy effect from the government, motivation in risk aversion and adverse selection among farmers [30]. The risk aversion is the best option to indemnify small scale farmers against climate related risks.

The policy challenge is therefore how to protect farmers from catastrophic losses and increase productivity by minimizing such losses. For some farmers, farm input subsidies provide a measure of income stability but do not necessarily prevent food insecurity. There are other mechanisms like contract farming and futures trading which can provide some security against price fluctuations directly or indirectly. While contract farming is gaining some popularity among smallholders in developing countries [31,32], the same cannot be said of crop insurance. It is against this background that we propose this study to investigate farmers' awareness of crop insurance and willingness to insure their farms. The purpose of this study is therefore to assess the factors affecting farmers' awareness of crop insurance in Tolon District of Ghana as well as the factors influencing willingness to pay for insurance.

2. Materials and methods

2.1. Study area

The study was conducted in Tolon District which is found in the Northern Region of Ghana. The District shares boundaries with Kumbungu to the North, North Gonja to the West, Central

Gonja to the South, and Sagnarigu District to the East. More than 92 percent of households in the District are engaged in agriculture with crop farming as the main agricultural activity practiced by almost 97.5 percent of households. Livestock rearing is practiced by 74.1 percent of the population. The district is characterized by a single rainy season, which starts in late April, rising to a peak in July–August and declining sharply and coming to an end in October–November. The main vegetation is grassland, interspersed with guinea savanna woodland, characterised by drought-resistant trees such as acacia (*Acacia longifolia*), baobab (*Adansoniadigitata* Linn), and neem (*Azadirachta indica*). Major economic tree species which form an integral part of livelihood of the people in the area include shea nut (*Vitellaria paradoxa*), dawadawa (*Parkia biglobosa*), and mango (*Mangifera indica*). The soil is commonly of the sandy loam type and highly susceptible to erosion due to perennial burning of the natural vegetation, which leaves the top soil exposed to high temperatures and run-off. The continuous erosion over a long period of time has resulted in soils with low organic matter content which barely supports the survival of soil fauna, culminating in low agricultural yields [33].

2.2. Sampling and data collection

The study used a cross-sectional research design to solicit information pertaining to individual, farm and household characteristics, as well as institutional factors that affect awareness of crop insurance and willingness to pay for insurance. A total of 150 farmers were randomly selected from three farming communities in the Tolon District for the study. The communities included Nyankpala, Dundo and Gbushalagu. Equal number of farmers (i.e., 50) was sampled from each community. A semi-structured questionnaire containing both open- and close-ended questions was used as the data collection tool. This instrument was used in order to generate both qualitative and quantitative data, which were analysed using Stata version 15.

2.3. The linear regression with endogenous treatment effects model

The linear regression with endogenous treatment effects model (also known as endogenous treatment effect model or endogenous treatment-regression model) can be used to estimate the impact of a treatment on an outcome of interest. The model allows the estimation of average treatment effect (ATE) as well as average treatment effect on the treated (ATET or ATT). Besides the impact parameter, the linear regression endogenous treatment effect model also estimates other parameters (or coefficients) of a linear regression model augmented with an endogenous binary-treatment variable. The ATET (or ATT) estimated by the endogenous treatment effect model (ETEM) is the same as the ATE when the treatment indicator variable is not interacted with any of the independent variables in the outcome model.

The ETEM is estimated by specifying an equation for the endogenous treatment, Z_i (in this case, a model of farmers awareness of crop insurance) followed by specification of an outcome equation, Y_i (in this case the amount that farmers are willing to pay for crop insurance).

Given an outcome Y_i, which measures the amount that farmers are willing to pay for crop insurance, and the endogenous treatment variable, Z_i, which measures farmers awareness of crop insurance, we can specify the endogenous treatment-regression model as follows:

$$Y_i = X_i\beta + \delta Z_i + v_i \quad (1)$$

$$Z_i = w_i\gamma + u_i \tag{2}$$

$$where\ Z_i = \begin{cases} 1, & if\ w_i\gamma + u_i > 0 \\ 0, & if\ w_i\gamma + u_i \leq 0 \end{cases} \tag{3}$$

Z_i is a dichotomous variable with a value of 1 for farmers who are aware of crop insurance, and 0 otherwise. X_i is a vector of outcome covariates, w_i is a vector of endogenous treatment covariates, β and γ are unknown parameters, while v_i and u_i are the error terms with the following covariance matrix:

$$\begin{bmatrix} \delta^2 & \rho\sigma \\ \rho\sigma & 1 \end{bmatrix} \tag{4}$$

The covariates X_i and w_i are exogenous because they are unrelated to the error terms.

The empirical model for the outcome equation is specified as follows:

$$Y_i = \beta_0 + \beta_1 sex_i + \beta_2 edu_i + \beta_3 exp_i + \beta_4 hsize_i + \beta_5 fmsize_i + \beta_6 gap_i + \beta_6 ofw_i + u_i \tag{5}$$

Where the variables are as defined in Table 1.

The empirical model for the treatment equation is similarly specified as follows:

$$Z_i = \gamma_0 + \gamma_1 sex_i + \gamma_2 edu_i + \gamma_3 exp_i + \gamma_4 fmsize_i + \gamma_5 \text{ext} + \gamma_6 agro_i + u_i \tag{6}$$

Where the variables are as defined in Table 1.

3. Results and discussions

3.1. Socio-economic characteristics of the respondents

The summary statistics of the respondents is presented in Table 1. Majority of the respondents are female (representing 58%) with the rest being male. The age of the respondents ranged between 19 and 72 years, with a mean of 38 years. Furthermore, the respondents had average farm size of 2 hectares implying that they are small-scale producers. The respondents also had a mean maize output of 2301 kg. On average, farmers received one (1) extension visit during the cropping season, with a range of 0 and 4 visits. The low level of extension visits is a likely drawback to farmers' level of awareness of crop insurance since extension agents play an important role in information dissemination to smallholder farmers.

The study shows that farmer's awareness of crop insurance is low. Majority of the farmers representing 52 percent were not aware of crop insurance as at the time of the study. The respondents who were aware of crop insurance viewed it as a basic tool for risk mitigation. Close to 25% of the respondents made contact with agro-sellers during the cropping season. Hence, minority of the respondents took steps to control pests and diseases using agrochemicals. The respondents also had an average of 16 years of farming experience and 9 household members. Majority of the respondents (73%) adopted good agricultural practices such as reduction of erosion, avoidance of soil compaction, drainage and fertilizer run-off, among others. Finally, the study revealed that farmers were willing to pay an insurance premium of GH¢59 to insure an acre of maize farm (equivalent to GH¢147 per hectare).

Table 1. Descriptive characteristics of the respondents.

Variable	Definition	Mean	S. D.	Min.	Max.
Z	Awareness of crop insurance (1 = aware)	0.480	0.501	0	1
Y	Amount willing to pay in GH¢ [†]	59.27	66.55	0	400
sex	Sex of respondent (1 = male)	0.580	0.495	0	1
edu	Education	6.473	6.911	0	25
fmsize	Maize farm size in hectares	2.017	2.121	0.4	17
ext	Number of extension contacts	1.133	1.053	0	4
agro	Contact with agrochemical seller (1 = yes)	0.247	0.433	0	1
hsize	Household size	9.287	4.400	2	22
exp	Years of farming experience	15.87	10.70	1	50
ofw	Off-farm work (1 = participant)	0.427	0.496	0	1
gap	Adopt good agricultural practices (1 = yes)	0.733	0.444	0	1

*Note: [†] 1.0 US$ equals 4.7 Ghana Cedis (GH¢).

3.2. Farmers' perception of losses due to catastrophic events

The study assessed farmers' perceptions of losses due to catastrophic events. Majority of the farmers indicated that losses due to catastrophic events are high (Figure 1). This is consistent with the extant literature and a priori expectation. Smallholder farmers face several production risks which call for measures to reduce crop losses due to catastrophic events which lower farm income.

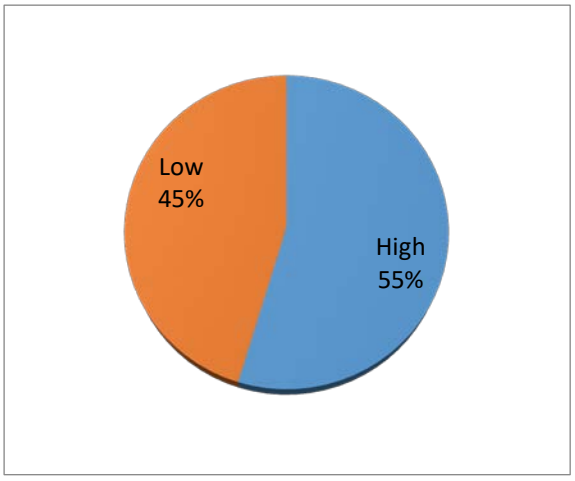

Figure 1. Farmers' perception of losses due to catastrophic events.

Asked whether crop insurance could help reduce agricultural risk, 94 percent of the respondents responded in the affirmative. This indicates that farmers recognize the value of crop insurance. Considering that 52 percent of the respondents did not know about crop insurance prior to the interview, stepping up awareness campaign about crop insurance is likely to motivate farmers to take up insurance. Understanding the barriers to crop insurance adoption is therefore an important step to promoting adoption.

3.3. Threat to crop production

The study further investigated the factors identified by farmers as threats to food production. Farmers were asked to identify their biggest threat to crop production. These threats included pest and disease infestation, erratic rainfall, drought, excessive rainfall, and fire outbreak. The ranking of these threats is presented in Table 2. Farmers identified pests and diseases as the most important threat, representing 69% of the responses. From the results, pest and diseases had the most destructive effect on maize production which is attributed to the fall army worm infestation which plagued maize crops in the West African sub-region during the time of the study.

Table 2. Threat to crop production.

Threat	Response	Percent	Rank
Pests and diseases	104	69	1st
Erratic rainfall	25	17	2nd
Drought	11	7	3rd
Excessive rainfall	8	5	4th
Fire outbreak	2	1	5th
Total	150	100	-

3.4. Maximum amount farmers are willing to pay to insure one acre of maize farm

Respondents were asked to indicate the highest amount they would be willing to pay to insure one acre of maize farm (Table 3). The mean premium farmers were willing to pay was GH¢59.3, approximately US$13. The figure is very low and suggests that farmers are adamant to insure their crops. Less than 3% of the respondents were willing to pay more than GH¢200 (US$43.0) to insure an acre of maize farm.

Table 3. Maximum amount farmers are willing to pay to insure an acre of maize farm.

Amount (GH¢) $^{\Psi}$	Frequency	Percent
0	13	8.7
1–100	123	82
101–200	10	6.7
201–300	2	1.3
301–400	2	1.3
Total	150	100

*Note: $^{\Psi}$ 1.0 US dollars is equivalent to GH¢4.7.

A study by Kwadzo et al. showed that farmers in Kintampo North municipality in Ghana were willing to pay a mean of GH¢24.00 and a maximum of GH¢80.00 to insure their farms against an income loss of GH¢1,000 [34]. On their part, Okoffo et al. observed that cocoa farmers in Ghana were willing to pay a mean of GH¢49.32 and a maximum of GH¢128.40 to insure an acre of cocoa farm [35]. The finding of our study calls for farmer education on the usefulness of crop insurance. Most subsistence farmers do not carry out farm budgeting and therefore are not adequately informed about the input-output relationships of their farm businesses and the resultant profitability. Ensuring

that farmers acquire basic farm management techniques will improve farm operation, profitability and the willingness to pay for crop insurance.

3.5. Factors affecting awareness of crop insurance and the amount farmers are willing to pay

Maximum likelihood estimates of the regression with endogenous treatment effect model are presented in Table 4. The 2nd and 3rd columns present the results of the determinants of awareness while the 4th and 5th columns indicate farmers' willingness to pay for crop insurance.

Table 4. Maximum likelihood estimates of the endogenous treatment effect model.

Variables	Determinants of awareness		Willingness to pay	
	Coefficient	Std. Error	Coefficient	Std. Error
Awareness of crop insurance			110.2***	16.55
Sex	−0.228	0.230	−5.483	12.88
Educational status	0.010	0.018	−0.559	1.054
Farming experience	−0.014	0.012	1.824**	0.716
Farm size	0.118	0.074	−7.379**	3.594
Household size			−2.196*	1.221
Extension contact	0.293***	0.096		
Good agricultural practices			−33.73***	12.96
Contact with agrochemical seller	0.946***	0.218		
Off-farm work			5.152	11.08
Constant	−0.570*	0.291	42.03*	21.55
/athrho	−1.035***	0.189		
/lnsigma	4.297***	0.079		
Lambda	−56.99***	9.181		

*Note: ***, ** and * indicate statistical significance at 1, 5 and 10 per cent level, respectively. Note: LR test of indep. eqns. (rho = 0): chi2(1) = 13.37, Prob > chi2 = 0.0003.

The results indicate a significant effect of extension visits on farmers' awareness of crop insurance at 1% level. Hence, access to extension services increases framers' awareness of crop insurance. The result is plausible because extension agents are the main source of information to most small-scale farmers in rural communities.

Many small-scale farmers rely on agrochemical sellers for information on their farming activities, hence the inclusion of contact with agrochemical sellers as an explanatory variable in the awareness model. The result indicates that contact with agrochemical sellers is positively related to farmers' awareness of crop insurance and significant at 5% level. This means that farmers who purchase farm inputs from agrochemical sellers are more likely to have knowledge of crop insurance.

On the factors influencing willingness to pay for crop insurance, the results indicate that farmers with previous knowledge of crop insurance are willing to pay more for crop insurance, which is consistent with a priori expectations. The coefficient of the variable for awareness measures the average treatment effect of awareness on the amount to pay for crop insurance. Thus, being aware of crop insurance increases the amount that the farmer is willing to pay for crop

insurance by GH¢110. Being aware of crop insurance enables farmers to carefully assess the benefits of insuring their farms, which is expected to increase willingness to pay. Farmers who only became aware of crop insurance during the interview process therefore showed less willingness to insure their crops because they lacked previous knowledge of insurance and thus did not have much understanding of its benefits. The result is at variance with the finding of Danso-Abbeam et al. which showed that awareness of crop insurance decreased the premium that farmers were willing to pay to insure their crops in Ghana [23]. The authors pointed out that the result did not meet a priori expectation. As observed by Okoffo et al., lack of knowledge of crop insurance was cited by farmers as the reason for their unwillingness to pay a premium to insure their cocoa farms in Ghana [35].

The study also revealed that smaller households are willing to pay more for crop insurance as shown by the negative and significant coefficient of the household size variable. Intuitively, the result is consistent with a priori expectation because an increase in household size raises the household's financial burden which is expected to have a negative effect on poor household's ability to purchase insurance. The result agrees with Okoffo et al. in their study on willingness to pay for crop insurance in Ghana [35].

Farming experience on the other hand increases the willingness to pay for crop insurance; experienced farmers are willing to pay more to insure their farms. This is because experience in farming enhances human capital so that information accumulated through years of farming experience is channelled into decision making about farming. It is expected that experienced farmers will have more knowledge about the benefits of insurance and therefore willing to pay higher insurance premium. The result agrees with Abdullah et al. [36] in a study involving paddy farmers in Malaysia but at variance with Ellis [17] who studied willingness to pay for crop insurance in Eastern Ghana.

The coefficient of the variable for adoption of good agricultural practices is negative and significant at 1% level, indicating that adopters of good agricultural practices are less willing to pay for crop insurance. Good agricultural practices adopted by the respondents include erosion control, application of inorganic fertilizers at recommended rates, and maintaining soil organic matter.

Finally, farm size is negatively related to the amount farmers are willing to pay to insure their farms. The result implies that an increase in farm size decreases the amount farmers are willing to pay for crop insurance. The result agrees with Okoffo et al. [35] in their assessment of cocoa farmers' willingness to pay for crop insurance in Ghana as well as Kumar et al. [2] in their study on crop insurance as a tool for risk management in Tamil Nadu. As farm size increases, the premium payment also increases which places a higher financial burden on the household which negatively affects the ability to pay for insurance.

3.6. Preference for crop insurance types

One way to promote crop insurance among smallholders is to understand the insurance types they are more likely to patronize. Table 5 presents the results of farmers' responses regarding their preferred form of crop insurance. It was revealed that the most popular form of crop insurance that farmers are willing to patronize is the crop insurance type where the premium is paid in cash prior to the commencement of the farming season. In other words, farmers are willing to purchase up-front their crop insurance in cash. This category represented 36% of the respondents. The next preferred insurance type is where the premium is paid in cash immediately after harvest. This

category represented 28% of the respondents. The results indicate that farmers prefer to pay for their crop insurance in cash. The insurance type where the premium is paid after harvest using harvested crop as payment is the next preferred form of insurance representing 25% of the respondents. Only 4% of farmers preferred to pay the insurance premium upfront from the previous year's harvest. The rest of the respondents (6.7%) gave other suggestions such as paying with livestock, government compensating farmers for their losses, etc., while some failed to respond.

Table 5. What type of insurance would you prefer?

Type of insurance preferred	Frequency	Percent	Cum.
Premium paid in cash after harvest	42	28	28
Premium paid after harvest using harvested crop	38	25.3	53.3
Premium paid in cash before farming	54	36	89.3
Premium paid upfront from previous year's harvest	6.0	4.0	93.3
Other	10	6.7	100

4. Conclusions

The study revealed that factors such as sex, age, contact with agrochemical dealers, and extension visits significantly affect farmer's awareness of crop insurance. Awareness was higher among younger farmers and female respondents. In addition, awareness of crop insurance was higher among farmers who purchased farm inputs from agro-dealers as well as those who had contact with extension agents. The study further showed that the premium farmers are willing to pay to insure an acre of maize farm is GH¢ 59, which is very low. Hence, even though majority of the respondents agreed that crop insurance is important to protect against catastrophic losses, they were willing to pay only a little amount to insure their crops. Thus, either farmers perceive themselves too poor to pay for insurance or they do not fully understand the benefits of crop insurance. The study further revealed that the significant factors influencing willingness to pay for crop insurance were sex and farming experience of the farmer, household size, farm size and awareness of crop insurance. Insurance premium paid upfront in cash prior to production was most preferred by the farmers. The next preferred insurance option is where the premium is paid in cash after harvest. Thus, the payment of insurance premium in cash was preferred to payment with harvested crop. We draw from these findings that farmers prefer insurance premium payment in cash and not with harvested crop, even though the use of harvested crop is perceived as an easier option for premium payment. Also, farmers prefer to pay premiums at the onset of production, not at the end of the cropping season. This is because for smallholders, linking premium payments to their harvest seems like double risk, since they are uncertain about their output level and ability to pay from the harvested crop. These findings are important contributions to the existing literature on crop insurance.

From the findings of the study, we make the following recommendations to enhance uptake of crop insurance by farmers in Ghana. Efforts are needed to enhance awareness of crop insurance among small-scale farmers. This can be done through meetings and durbars with farmers to educate them on the importance of crop insurance. Farmers associations and groups can serve as important conduit for the dissemination of information on crop insurance to farmers. Awareness creation can also be carried out through extension education by agricultural extension officers. This will go a

long way to increase farmers' level of awareness and subsequently promote uptake of crop insurance by farmers.

Conflict of interest

The authors declare no conflict of interest.

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