Willingness to Pay for Farm Insurance by Smallholder Cocoa Farmers in Ghana

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Abstract

This study analyzes the willingness to pay for cocoa price insurance in the Ghanaian cocoa industry using contingent valuation (CV) method to collect primary data from 201 cocoa farmers in Bibiani-Anhiawso-Bekwai district, Ghana. The study employed descriptive statistics to analyze the demographic characteristics of the sampled farmers in the study area. 57.71 percent of the sampled cocoa farmers were found to respond positively to cocoa price insurance. Independent double-hurdle model was used to determine factors influencing farmer's adoption of cocoa price insurance and the premium farmers are willing to pay. Empirical results from the study revealed that farmers interest in cocoa price insurance was affected by range of explanatory variables such as marital status, number of years in cocoa farming, educational attainment, household size, farm size, ownership of farm land for farming, age of cocoa farm, age squared of cocoa farm, farmers being aware of the insurance scheme and income from cocoa farm. On the other hand, the premium farmers were willing to pay was significantly influence by marital status, educational attainment, ownership of farm land for farming, farmer's awareness of insurance scheme and income from cocoa farm. Cocoa farmers are on average willing to pay between 9.3% and 10.5% of the option value they intend to receive as premium depending on the value. The study recommends that particular attention be given to education of farmers on the significance of insuring their cocoa farms.

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1.0 Introduction

The importance of agriculture in every developing country like Ghana cannot be overemphasized, in that it employs about two-thirds of the Ghanaian labour force (both formal and informal sector). On the average, agriculture accounts for about 30 percent of Ghana's GDP and contributes about 60 percent of export earnings (Government of Ghana, 2009; ISSER, 2010). In spite of the fact that the share of agriculture in Ghana's GDP has decline over the years, it still remains a very strong force in the economy (ISSER, 2011).

The main driving force of the growth of agriculture is the crop sector of which cocoa is the largest subsector, accounting for about 30 percent of the agricultural sector. Krishna (2007) noted that, Ghana was the principal exporter of cocoa since 1911 and held this position until late 1970s when it lost it to Cote d'Ivoire. Historically, cocoa has been reported as a key economic sector and a major sources of fiscal and exports earnings in Ghana. The Ghana COCOBOD in 2008 attributed the general growth in Agriculture to the impressive growth in the cocoa sector. Briesinger, Daio, Thurlow & Al-Hassan (2009) indicated that the share of cocoa in agricultural GDP increase from 13.7 percent in 2000 – 2004 to 18.9 percent in 2005/2006.

The tremendous contribution of cocoa to Ghana's revenue coupled with the fact it serves as a major source of livelihood for most Ghanaian farmers simply means that its future against any unforeseen circumstances must be safeguarded. This is because any major failure in this sector will have an adverse effect on both the macroeconomic and the microeconomic sector of the economy. Even though risk in agricultural sector (including cocoa) is unavoidable, it is manageable. Cocoa production can vary widely from year to year due to unforeseen weather conditions, pest and disease infestations and sometimes market conditions causing yields and prices to sway extensively. Again, cocoa production in Ghana is rain-fed dependent; that is, the output of cocoa beans produce per cocoa season is highly correlated with rainfall pattern. Cocoa production should therefore receive more attention not only to add to Ghana's revenue but to help to resolve the food security challenges in some parts of the country.

The fact that the business of cocoa production depends on unpredictable weather variations such as rainfall pattern and drought makes it inherently a risky venture. Poor rural farmer who depend on small-scale (on the average 1.4 acres) cocoa farm land for the livelihood of himself and the family face yield risk and for that matter income risk as a result of weather variations. These poor farm households lack the resources to withstand some of these shocks resulting from natural and manmade disasters. Some rural poor farmers try to avoid risk by adopting self-insurance and informal measures such as growing other cash crops like palm trees, coffee, cashew nuts etc and diversification strategies such as engaging in some off-farm businesses.

In the various independent studies of Barret, Readon & Webb (2001); Brown & Churchill (1999) and Rozenwieg & Binswanger (1993) maintained that self-insurance or traditional coping strategies do not only serve as a barrier to poverty alleviation but also serve as a re-enforcement to poverty. Thus, farmers relying on traditional risk coping strategies have the potential of trapping themselves in a perpetual poverty (Diaz-Nieto, Cook, Lundy, Fisher, Sanchez & Guevara, 2006). Kwadzo, Korwunor & Amadu (2013) established that, rural farmers anticipating risk of farm loss resulting from drought, bush fires, pest infestations, windstorms and other natural and manmade disasters tend to reduce their investment in factor resources like fertilizer application and pesticides application since investments in these inputs would increase their loss should their crop fail. This simply means that traditional risk coping strategies cannot be an efficient risk management tool since it can only survive the farmer to a limited extend.

Quagranie (2006) proposed that insurance can be used to minimize financial consequences of many adverse events such as loss of life, motor accidents, loss of property and weather damages. Adam (1995) define insurance as a contract signed between two parties where one party called the insurer undertakes an exchange called premium to pay the other party a fixed amount of money on the occurrence of an unforeseen event. Insurance is an economic device whereby the individual substitutes a small certain cost (the premium) for a large uncertain financial loss (the contingency insured against) that would exist if it were not for the insurance. The basic function of insurance is the creation of risk counterpart, which is risk.

Insurance does not decrease the uncertainty for the individual farmer as to whether the event would occur nor does it alter the probability of occurrence, but it does reduce the probability of financial loss connected with the event. The purchase of insurance policy on a farm would eliminate the uncertainty regarding the financial loss in the event of bush fire, flood etc.

Ghana's agriculture has seen two major natural disasters which are agricultural drought (slow onset) and flash flooding (rapid onset) with adverse conditions that led to extensive damage of farmlands and loss of life (Agyemang 2010). Again, in 1983, cocoa farmers lost most value of their entire investment resulting from mass destruction of cocoa farms due to outbreak of swollen shoot virus and bush fires in the country.

Kwadzo *et al* (2013) contended that market-based crop insurance is the most effective management tool farmers can use in today's agriculture industry where the degree of uncertainty is highly associated with high loss. Hess (2003) suggested that crop insurance can serve as an important alternative ex-ante risk management tool for rural farmers in the developing economies to cope with production risk resulting from variations in weather conditions.

Generally, there are numerous socio-economic (such as income, education, farm size etc) and natural occurrence factor (drought, bush fire and flood) that could induce a farmer to insure his or her farm. Farmer's perception towards insurance policies could stem from how frequent natural disasters such as flood, drought or bush fires do occur in and around his farming territories. Because cocoa trees are susceptible to natural disasters, farmers closer to disaster prone areas would desire to insure their farms than their counterparts who are far from those areas. Sarris (2002) also contended that farm specific variables such as size of cultivated area and socio-economic variables such as age and household size have positive significance influence on the demand for insurance.

Kouame & Komenan (2012) uses Heckman method to modeled farmers willingness to pay for minimum price insurance in Cote d'Iviore's cocoa industry. Their study revealed that variables such as age of cocoa farmers, farming experience, farm size, household size and the share of cocoa in farmer's total income exert significant effects on farmers demand for cocoa insurance.

Nimo, Baah & Tham-Agyekum (2011) in analyzing the demand for insurance of cocoa farmers in Ghana using Probit model indicated that farmers with other occupation, farm size and owner of land for farming have significant influence on farmers willingness to pay for insurance. Similarly, Falola, Ayinde & Agboola (2013) in assessing cocoa farmer's willingness to pay for insurance showed that age of household head, educational level, access to extension services and farm income affect farmers willingness to pay for agricultural insurance. Thus, farmers can be motivated or deterred by these factors as well as the prevailing insurance policies.

According to Annaman (1988), crop insurance is not widely use in developing continent like Africa. For the past decades, very little has been done to secure the future of the Ghana's cocoa industry against uncertainties. Recently, Ghana COCOBOD has started a pilot insurance project to ensure cocoa farmers are protected against production uncertainties. However, whether farmers are willing to participate in this scheme and how much they are willing to pay as well as the determinants of their willingness to pay for minimum price insurance remains an open question. Hence, the objectives of this study is three fold: (1) to assess the factors influencing cocoa farmers adoption of cocoa price insurance scheme, (2) to find out the average willingness to pay for cocoa insurance and (3) to investigate the effect of the determinants of the premium willingness to pay for cocoa insurance.

2.0 Methodology of the Study

2.1 The study Area

Bibiani- Anhwiaso-Bekwai (BAB) is located in the North-eastern part of the Western region of Ghana. The district is located between latitude 6° N, 3° N and longitude 2° W, 3° W. with a total land area of 873 kilometers square representing about 8.6% of the total land area of the region. The district is located in the equatorial climate with the annual rainfall average between 1200mm and 1500mm.The pattern is bimodal, falling between March – August and September- October. The dry season is noticeable between November- January and the peak periods are June and October. The average temperature throughout the year is about 26°C.

The Agricultural sector is the single most important sector of the district's economy of which crop farming (particularly cocoa farming) has been identified as the major agriculture activity undertaken in the district. The climatic conditions of the district is favourable for the production of food crops such as cassava, cocoyam, plantain and tropical cash crops like cocoa, coffee, oil palm and cashew. Total population is estimated to be about 120,869 with 47.5% male and 52.5% female (www.ghanadistrict.com). The district has three urban centers; Bibiani, Bekwai and Awaso. These towns account for 37% of the total population, with the district capital alone constituting 22.1% of the total population in the district.

2.2 Theoretical and Analytical Techniques

Empirical literature on willingness to pay for agricultural insurance indicated that there are three ways of estimating farmer's willingness to pay for insurance. The first relates to the contingent valuation approach. With contingent valuation method (CVM), the farmer is directly ask, what he or she would be willing to pay for an insurance scheme described in details to him. The second is the revealed preference theory or approach where inferences with regards to farmer's willingness to pay are made from the analysis of the pattern of production and other behavior of the farmers. The third approach combines the use of theory along with microeconomic household variables and market variables to estimate indirectly the appropriate market premium. The notion behind this approach is to estimate farmers willingness to pay by comparing their level of utility with and without insurance and determine what they would be willing to pay to be indifferent in moving from a world without to a world with insurance (indirect approach).

According to Sarris (2002), insurance guarantees a minimum price for a specific quantity over a predetermined period of time for which the insurer has to pay an upfront premium. The data set on farmer's willingness to pay was elicited from farm household survey. Using the dichotomous contingent valuation method, farmers were made to answer a variety of questions relating to cocoa price insurance of which a detail description of how cocoa insurance contract works was presented to them. After this description, farmers were asked if they are interested in such a contract. Then a follow up questions on farmers WTP various amounts for a given price contract only to farmers who declared their interest in price insurance.

To receive information on a wider range of values, different amounts for the bids were assigned randomly between farmers. Three hypothetical insurance contracts were designed, each of which offers a higher premium for a corresponding higher price. Thus, farmers were asked if they would be willing to pay a premium for contract offering a minimum sum of GH¢200/bag/season, GH¢300/bag/season and GH¢400/bag/season. For each contract, three different bid values or price to pay were selected and each farmer was asked whether he or she would be willing to pay a certain amount for each contract. Thus, the bid values 10, 15 and 25 were for the contract that offers a minimum price of GH¢200; 15, 25 and 35 were for contract that offers a minimum price of GH¢300; and 30, 35 and 45 were for contract that offers a minimum price of GH¢400.

Stratified sampling procedure was employed to divide each community into three strata namely Zones A, Zone B and Zone C. Each farmer was randomly selected from each stratum to answer whether he/she would be willing to pay one of these minimum values for each contract. This is to minimize the influence of bargain effects on farmer's willingness to pay. The table below shows the bid values for the price insurance contracts.

Table 1: Cocoa Price Insurance Contract

Community Zones	Price Insurance Contract (Ghana cedis)		
	Minimum price Gh¢ 200	Minimum Price Gh¢ 300	Minimum Price Gh¢ 400
Zone A	10	15	30
Zone B	15	25	35
Zone B	25	35	45

Thus, farmers in Zone A were asked whether they would be willing to pay a premium of GH¢ 10 for GH¢ 200, GH¢ 15 for GH¢300 and GH¢ 30 for GH¢ 400. Farmers in Zone B were asked whether they were willing to pay a premium of GH¢ 15 for a minimum price of GH¢ 200, GH¢ 25 for GH¢ 300 and GH¢35 for GH¢ 400 and farmers in Zone C were asked whether they were willing to pay GH¢ 25, GH¢ 35 and GH¢ 45 for each of the cocoa price insurance contract.

Farmer's willingness to pay for minimum cocoa price insurance in this study can be modeled using discrete choice framework.

The study employed the independent double- hurdle model with the assumption that farmer's interest to take up cocoa price insurance and the actual amount (insurance premium) they are willing to pay are two distinct or independent decisions. The double-hurdle model formulated by Craig (1971), assumes that cocoa farmers make two sequential decisions with regards to their interest in insuring their cocoa farms and actual amount they are willing to pay for such insurance contract. The likelihood ratio test reveals the double-hurdle as the appropriate procedure in modeling farmer's interest in taking up insurance policies and the actual amount they are willing to pay. In this model, a different latent variable is used to model each decision making process, with a binary choice probit model determining farmers interest in the insurance policy and a censored truncated regression model determining the actual amount farmers are willing to pay.

Following Cragg (1971), farmer's decision to adopt insurance policy and the minimum price they are willing to pay can be modeled as;

$$A_{1i}^* = X_{1i}^/ \alpha_2 + u_i \quad U_i \approx N(0,1) \tag{1}$$

$$A_1 = 1, if \ A_{1i}^* > 0, and \ is \ 0 \ if \ A_{1i}^* \leq 0 \qquad \text{Insurance taking decision}$$

$$A_{2i}^* = X_{2i}^/ \alpha_2 + v_i \quad V_i \approx N(0, \delta^2) \tag{2}$$

$A_{2i} = A_{2i}^* \ if \ A_{1i} = 1 \ and \ A_{2i}^* > 0, and \ is \ 0 \ if \ A_{1i} \leq 1 \ and \ A_{2i}^* \leq 0$ Minimum price to pay

A_{1i}^* is a discrete latent variable describing farmers interest in taking up insurance policy, A_{2i}^* is the latent minimum price farmers are willing to pay for insurance contract;

$X_{1i}^/$ is a vector of independent variables hypothesized to influence farmers decision to take up   insurance policies.

$X_{2i}^/$ is a vector of independent variables hypothesized to influence the minimum price farmers are willing to pay for insurance policy.

$u_i \ and \ v_i$ are respective error terms assumed to be independent and normally distributed.

The independent error term of the double-hurdle model can be estimated by the following log-likelihood equation:

$$LogL = \sum_0 In\left[1 - \alpha(X_{1i}^{/}\beta_1)\phi(\frac{X_{2i}^{/}\beta_2}{\sigma}) \right] + \sum In\left[\alpha(X_{1i}^{/}\beta_1)\frac{1}{\sigma}\phi(\frac{A_2 - X_{1i}^{/}\beta_2}{\sigma}) \right]$$

[3]

The first term in the equation above corresponds to the contribution of all the observations with an observed zero values (McDowell, 2003). This indicates that zero observations are not coming from only farmers who express their interest in insurance policy contract but also from the amount they are willing to pay (premium) for the insurance contract. The second term in the equation accounts for all the observations with non-zero interest in the insurance policy contract. Furthermore, under the assumption of the log-likelihood function of the double-hurdle is equivalent to the sum of the truncated regression model and a univariate probit model (Aristei & Pieroni, 2007; McDowell, 2003). Thus, the log-likelihood functions of the double-hurdle model allows for maximization without loss of information by the separate maximization of the two components, thus; the probit model followed by a truncated regression model on the non-zero observations (Jones, 1989; McDowell, 2003).

2.3 Empirical Model

Cocoa farmer's willingness to take up minimum cocoa price insurance can be specified as;

$$WTI = \alpha + \sum_{j=1}^{N}\beta_j X_j + \varepsilon_i$$

[4]

Where *WTI* is a dichotomous dependent variable expressing individual willingness to take cocoa price insurance,

WTI = 1 (for insurance takers),
WTI = 0 (for non-insurance takers)

X_j ………………..X_N represents socio-economic factors and ε is the random variable accounting for unobserved factors, α *and* β are parameters to be estimated.

The empirical model for cocoa farmer's interest in insurance policy can finally be formulated as;

$$WTI = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10}$$
$$+ \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} \qquad\qquad [5]$$

Where X_1 denotes age of farmer, X_2 denotes the age squared of the farmer, X_3 denotes gender, X_4 denotes marital status of the farmer, X_5 educational attainment of the farmer, X_6 denotes household size, X_7 denotes the number of years farmer has been engaging in cocoa farming, X_8 denotes farmer belonging to any farmer-based organization, X_9 denotes farm size, X_{10} denotes ownership of farm land for farming, X_{11} denotes the average age of the cocoa farm, X_{12} denotes the average age squared of the cocoa farm, X_{13} denotes income from cocoa farm and X_{14} denotes whether farmers are aware of cocoa insurance policy.

The truncated regression model used to estimate the amount (premium) farmers in the study area are willing to pay can be formulated as;

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11}$$
$$+ \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} \qquad\qquad [6]$$

Where Y_i is the last bid value offered to farmers in the study area and $X_1 \ldots \ldots X_{14}$ denotes the explanatory variables explained in equation [5] above.

Table 1 below presents variable description, measurement and a priori expectations of the explanatory variables used in the probit and truncated regression model.

Table 1: Variable description, Measurement and a priori expectation

Variable	Measurement	a priori expectation
Age	Years	+
Age squared	Years	-
Gender	1 if male, 0 otherwise	-/+
Marital status	1 if married, 0 otherwise	-/+
Education status	0 = no education, 1= Primary, 2= Junior high, 3 =Senior high, 4= Tertiary	+
Household size	Numbers	+
Farm size	Acres	+
Farmer-based organization	1 if farmer belongs to FBO, 0 otherwise	+
Own land	1 if farmer owns the farmland, 0 otherwise	+
Farm age	Years	+
Farm age squared	Years	-
Awareness	1 if farmer is aware of cocoa insurance, 0 otherwise	+
Income	Ghana cedis	+

3.0 Empirical Results

3.1 Demographic Characteristics of Respondents

From the descriptive statistics, age distribution of farmers in the study area range from 27 years to 82 years with active population (27 – 60) representing 89.55% and the mean age is 48 years. The male household headed constitutes about 80% while the female headed household was just 20% implying that cocoa farming in the study area is male dominated. Majority (86%) of cocoa farmers in the study area were married while only 14% were single. The household size distribution of cocoa farmers in the study area indicates that farmers have household sizes ranging between two (2) and fourteen (14) with mean household size of six (6). This is greater than the national mean household size of 4.0 (GSS, 2008).

In terms of education, 35.82% of farmers in the study area had no formal education, 19.9% had primary education, majority (40%) had education up to junior high school or middle school, 2.48% had secondary education and only 1.49% had tertiary education.

Moreover, the study reveals that farmer population in the study area are quite experience in the cocoa farming business with a mean of 19 years of experience in cocoa farming. Again, data from the study indicates that farmers in the study area had an average farm size 3.65 hectares with an average output level of about 17bags (1,088kg, thus 64kg/bag) of cocoa per cocoa season. This result somehow supports a recent study by Danso-Abbeam (2014) who reported that about 70% of cocoa farmers in Ghana had farm sizes measured between 1 – 5 hectares of cocoa farm lands. Furthermore, a study by Ghana COCOBOD (2002) indicated that cocoa farms in Ghana are relatively small ranging from 0.4 to 4 hectares.

3.2 Factors Influencing Cocoa Farmers Interest in Cocoa Price Insurance Contract

The estimated results for Probit regression model used to analyze cocoa farmers decision to adopt cocoa insurance policy are presented in Table 2 below. Analytical statistic test revealed that the estimated model had a good fit with chi-square statistic significance at 1% level of significance. This indicates that the farmers socio-economic and farm specific factors used in the model are relevant in explaining the adoption decision of farmers in the study area. The Pseudo R^2 value of 0.5885 indicates that about 58.85% of variations in farmer's decision to take up cocoa price insurance contract are explained by the explanatory variables used in the model. This is quite reasonable considering that the data were cross-sectional obtain from selected individual cocoa farmers in the study area. The Log-likelihood statistic ratio (LR) of 42.400 is significant, indicating that the explanatory factors included in the model jointly explain the probability of farmer's decision to adopt cocoa insurance policy.

The explanatory variables included in the model are; age, age squared, gender, marital status, educational status, household size, membership of farmer-based organization, farm size, farm age, farm age squared, awareness of cocoa insurance policy and annual income from cocoa farm.

The explanatory variables that were significant and satisfied the a priori expectations are marital status, educational status, experience in cocoa farming, farm size, ownership of land for cocoa farming, farm age, farm age squared, awareness of cocoa insurance policy and income from cocoa farm. However, household size was significant at 1% significance level but negatively signed which was contrary to the a priori expectation.

Marital status was found to be significant at 1% significance level and positively correlated to the desirability of farmers to participate in cocoa insurance policy. This might simply indicate how married farmers consider the survival of their family should any uncertainty strikes, hence; influence their decision to adopt the cocoa insurance policy.

Farmers level of education was significant at 1% significance level and has a positive effect on the probability of farmers desire to partake in cocoa insurance policy suggesting that better educated farmers are more likely to understand the policy and are therefore likely to buy the insurance policy than their counterparts with less educational level. This result is in conformity with the earlier study by Falola, Ayinde & Agboola (2013) in the Nigerian cocoa industry but contrary to that of Kwadzo *et al* (2013) in the Ghanaian agricultural crop sector who reported a negative relationship between farmer's willingness to take market-based crop insurance and educational attainment. The study is also invariance with that of Black & Dorfman (2000), who suggested that better educated farmers have the ability to manage their farms very well and are exposed to various risk management practice and are therefore less likely to engage in crop insurance.

Farming experience was found to be significant at 10% significance level and positively related to the probability of farmers being interested in cocoa insurance policy. Thus, farmers with greater number of years in cocoa farming might understand the impact of farm perils on their economic life better than their colleagues with less experience in cocoa farming and are therefore more likely to be interested in cocoa insurance policy. The result is consistent with that of Kouame & Koumenan (2012) who estimated a positive coefficient for farmers experience in cocoa farming up to a certain level of threshold after which the effect becomes negative.

Table 2 Probit Regression Estimates of Farmers Interest in Cocoa Price Insurance

Variable	Coefficient	Robust Std Error	P-Value
Constant	-4.614892	2.545832	0.070
Age	0.0136839	0.1035789	0.895
Age Squared	0.0001631	0.0009848	0.868
Gender	-0.56434	0.3431974	0.100
Marital Status	0.861995	0.4045597	0.033**
Education	0.8843539	0.2035104	0.000***
Household Size	-0.184952	0.0547766	0.001***
Experience	0.0068194	0.0041883	0.099*
Farmer-base Organization	0.0784893	0.3238575	0.324
Farm size	0.1204205	0.0417299	0.004***
Own land	1.086122	0.3707946	0.003***
Farm age	0.1521667	0.0806389	0.059*
Farm age squared	0.0046866	0.0025569	0.067*
Income	0.0006157	0.0001484	0.000***
Awareness	0.8933354	0.4591458	0.052*
Log Pseudolikelihood	*-42.400*		
Wald Chi²	*50.100*		
Pseudo R²	*0.5885*		

***, ** and * indicate significance level at 1%, 5% and 10% level respectively

Another important factor that significantly and positively influences farmer's cocoa insurance adoption decision is farm size. Thus, as farmers own larger farm lands, they are more likely to engage in cocoa minimum price insurance policy. This is because farmers with larger farm lands are likely to experience greater impact if peril such as drought, flood, fire outbreak occur than farmers with relatively small farm lands. This is in line with a recent study in Ghana's cocoa sector by Nimoh *et al* (2011). Kwadzo *et al* (2013) and Mohammed & Orthman (2005) in their studies in Ghana and Eritrea respectively suggested positive relationship between farm size and farmers involvement in crop insurance policy.

The ownership of land for cocoa farming variable was significant and consistent with the expected positive effect.

That is, as farmers have their own land to farm on and not go into share-cropping or have land inherited from family, they are more likely to show interest in

insurance policy. The result somehow supports the argument of Nimoh *et al* (2011) who suggested that farmers who go into share-cropping contract or farm on family lands are less likely to participate in cocoa insurance. However, it contradicts the findings of Kwadzo *et al* (2013) and Sherick, Barry, Ellinger & Schnitkey (2000) who estimated a negative coefficient for land tenure suggesting that farmers who have their own land are less likely to show interest in crop insurance policy.

With regards to age of cocoa farms, the study observed significantly positive correlation between age of cocoa farms and insurance take-up decision but significantly negative correlation between age-squared of cocoa farms and insurance take-up decision. This can be explained by the fact that output from cocoa increases as cocoa trees ages up to a certain age after which output begins to decline with age. A study by Kazianga (2002) reveals three main stages of cocoa productivity over time; yield increases with increasing rate in the first stage (0 – 10 years), increases at a decreasing rate in the second stage (11 – 30 years) and then declines after 30 years. The study partly supports the results from Kouame & Koemenan (2012) who reported a decline in output growth as cocoa farm ages. The study therefore suggest that cocoa farmers are more willing to take up insurance policy when their farms are relatively younger but as farm ages they become vulnerable to output fluctuations and hence, their interest in insurance policy wane down. Awareness variable was significant and positively signed. Thus, farmers with fair knowledge of cocoa insurance policy are more likely to show interest in the policy than their counterparts with little or no knowledge in insurance policy.

From the results, income generated from cocoa farm was a significant factor influencing farmer's decision to take up insurance policy. Thus, farmers who obtain higher income from their farms have a higher probability of insuring their farms than their colleagues with less farm income. This contradicts the findings of Nimoh *et al* (2011) who found negative correlation between income from cocoa and farmers participation in insurance policy contract.

3.3 Evaluation of Mean Willingness – to – pay for Minimum Price Cocoa Insurance

One of the objectives of this study is to provide a summary statistics of WTP of individual farmers in the study area. Table 3 and 4 give a summary statistics of farmers WTP values. The results in table 3 indicate that out of 201 farmers sampled from the study area, 116 indicated their interest in cocoa insurance policy while 85 farmers were unwilling to participate in the insurance policy programme representing 57.71% and 42.29% respectively.

Table 3 Interest in Cocoa Price Insurance among Cocoa Farmers

	Sample size (N) = 116 Yes		Sample size (N) = 85 No		Total (%)		
Zone	Frequency	Percentage	Frequency	Percentage	Yes	No	Total share
Zone A	53	45.69	27	31.76	26.36	13.43	39.79
Zone B	38	32.76	39	45.88	18.91	19.41	38.32
Zone C	25	21.55	19	22.36	12.44	9.45	21.89
Total	116	100	85	100	57.71	42.29	100

Considering the sampled farmers who declared their interest in cocoa insurance, 45.69% were willing to pay a premium of GH¢10, GH¢15 and GH¢25 for a contract sum of GH¢200, GH¢300 and GH¢400 respectively; 32.76% were willing to pay a premium of GH¢15, GH¢25 and GH¢35 for a price insurance at GH¢200, GH¢300 and GH¢400 respectively; and at the respective insurance price of GH¢200, GH¢300 and GH¢400, 21.55% of the sampled farmers are willing to offer bid value of GH¢25, GH¢35 and GH¢45.

Moreover, the results of Table 4 indicated that cocoa farmers who were interested in cocoa price insurance were willing to pay 9.8%, 7.80% and 10.52% of the underlying contract value as premium for minimum price insurance at Gh¢200, Gh¢300 and Gh¢400 respectively. Thus, on the average, farmers in the study area were willing to pay GH¢28.03 representing 9.21% of the average price insurance of GH¢300 per bag of cocoa. This is relatively low compared with the study by Kouame & Koumenan (2013) in Cote d'Ivoire where cocoa farmers were willing to pay 8.5%, 10.48% and 13.42% for option values of 400FCFA, 600FCFA and 800FCFA respectively. In another study by Sarris *et al* (2006) in Tanzania, farmers were willing to pay between 13% and 30% of the insurance contract value.

Table 4 Average WTP for each Cocoa Price Insurance Contract (Ghana cedis)

	Minimum Contract			
	200	300	400	Mean Total
Mean WTP	18.59	23.48	42.01	28.03
Share (%)	9.295	7.827	10.503	9.208

3.4 Factors Influencing the Amount (Premium) Farmers are willing to Pay

The study also sought to analyze factors determining the amount (premium) farmers are willing to pay for the underlying option values. However, in discrete choice framework, the premium farmers are willing to pay cannot be observed directly. This difficulty was overcome by asking open questions with regards to farmers WTP for each insurance price contract. The truncated regression model was used to determine factors influencing the amount farmers were willing to pay. The estimated results from the truncated regression model revealed that seven out of fourteen variables included in the model statistically influence farmers decisions with regards to the bid values: marital status, level of education, own land, farm age, farm age squared, income from cocoa farm and awareness of cocoa price insurance scheme.

Education plays a significant role on farmers WTP decisions. Farmers with higher educational level may have the ability to access, assimilate information and have a better understanding about how cocoa insurance works and its advantages. Thus, farmers with higher educational level will have higher probabilities of paying higher premium for higher contract value. The finding is in line with a study in Cote D'Ivoire by Kouame & Koumenan (2012) who observed positive relationship between farmer's level of education and amounts they were willing to pay.

Like the probit regression model, the study observed a significant increasing function of marital status, own land and income level with the amount (premium) farmers were willing to pay at 5%, 1% and 10% significance level respectively. However, though significant, farm age, farm age squared and awareness level did not meet their a priori expectations. Unlike the probit regression model, household size, number of years farmers have worked in cocoa farms and farm size have no influence on the premium farmers were willing to pay.

Table 4 Truncated Regression Estimates of the Premium Farmers are Willing-to-pay

Variable	Coefficient	Robust Std Err	P-Value
Constant	14.60769	12.90833	0.258
Age	-0.0588785	0.5318177	0.912
Age Squared	-0.0010001	0.0051951	0.847
Gender	2.558566	1.819035	0.160
Marital Status	-6.791784	2.000094	0.001***
Education	1.250506	0.576841	0.030**
Household Size	0.0329753	0.2605004	0.899
Experience	0.1232487	0.09417	0.191
Member of Farmer-base Organization	0.0332332	1.309305	0.980
Farm size	0.1084288	0.1130427	0.337
Tenure	9.724818	2.560929	0.000***
Farm age	-0.847902	0.4599888	0.065*
Farm age squared	0.0284713	0.0139666	0.041**
Income level	0.1014219	0.05772	0.079*
Awareness level	-4.856362	2.498083	0.052*
Log pseudolikehood	*-250.01877*		
Wald Chi2	*54.14*		
Prob > Chi2	*0.000*		

***, **, * represents 1%, 5% and 10% significance level respectively

4.0 Conclusions and Recommendations

This study sought to contribute to the ongoing debate on the possibility of crop insurance in developing economies, particularly cocoa insurance in Ghana by providing empirical evidence on demand for cocoa price insurance in the Ghanaian cocoa industry. Using CV methods, 57.71% of the sampled farmers express their willingness to take up cocoa price insurance scheme while 42.29% were non-takers of the insurance scheme. Probit regression model was used to analyze farmer's adoption decision of cocoa price insurance while truncated regression model was used in analyzing the premium farmers are willing to pay. Moreover, farmers years of experience, household size, marital status, education, own farm land, farm size age of cocoa farm, age squared of farm, awareness level and income from cocoa farm have significance influence on farmers WTP adoption decision.

With regards to the premium farmers are willing to pay; sampled farmers in the study area are willing to pay about 9.23% of the value of the option contract. Factors influencing how much farmers are willing to pay with regards to the option contract are: marital status, education, own farm land, age of cocoa farm, age of cocoa farm squared, awareness level and income from cocoa farm.

The study therefore recommends that the design to implement cocoa insurance scheme by Ghana COCOBOD or government of Ghana should take into consideration factors influencing farmers WTP for cocoa insurance. Also, farmers should be well educated on the cocoa insurance scheme and its advantages. It is imperative that government of Ghana and other stakeholders collaborate with insurance providers to come out with a strategic policy to convince farmers of the credibility and reliability of insurance scheme. The study should be replicated in other cocoa growing areas in Ghana since this may not be a representative of the whole cocoa industry in Ghana.

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