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RESEARCH PAPER

Risk Management Strategies and Insurance Preference for Apiculturist: Evidence from the Bono Region of Ghana

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ABSTRACT

PURPOSE: This paper examines the risk management strategies and insurance preferences for apiculturists in the Bono region of Ghana.

DESIGN/METHODOLOGY/APPROACH: One hundred apiculturists were selected for this study. A probit and heteroscedasticity linear regression was employed to analyse the factors that influenced the willingness to pay and willingness to pay amount for apiculture insurance respectively. A contingent valuation method and Kendall's coefficient of concordance were used to examine the mean amount apiculturists were willing to pay for apiculture insurance, as well as their risk management strategies respectively.

FINDINGS: The pressing farm risk management strategies were regular visits and close watch of the apiary. Farmers preferred a combined policy comprising of all-risk and whole-farm public liability and loss of farm income apiculture insurance. Factors such as awareness, farm age, number of beehives, and farming experience had a positive and significant influence on both willingness to pay and amount for apiculture insurance. The mean willingness to pay (WTP) amount was GH¢ 7.259 (US$1.234) per beehive/quarterly for apiculture insurance, which translates to a premium rate of 5% of the market value of apiculture.

ORIGINALITY: The paper provides insights on apiculturist residual risk, mean amount they are willing to pay, as well as factors influencing willingness to pay for apiculture insurance. This could aid Ghana Agricultural Insurance Pool (GAIP), World Cover, and other interested practitioners to design apiculture insurance for the apiarist.

KEYWORDS: *Apiculture; Insurance; Double-Bound CVM; Ghana*

INTRODUCTION

Poverty reduction is a global concern, particularly for Ghanaian societies and apiculturists. In 2010 European, apiculture employed 600,000 individuals worldwide (Moreno-Opo *et al*., 2018). According to Peter (2015), apiculture could be an avenue for generating income for the rural poor, especially in Africa and Ghana, as it contributes to 48.9% of bee-keepers' income (Duah *et al*., 2019). This makes apiculture important for socio-economic development (Vaziritabar and Esmaeilzade, 2016). Consequently, due to low start-up costs, low labour intensiveness, and simple inputs, apiculture is more attractive to women, youths, and disadvantaged groups (Peter, 2015).

Despite the benefits of apiculture, apiculturists are faced with numerous risks that must be managed *ex ante* and *ex post*. Therefore, underwriting apiculture insurance is indispensable to aid mitigation of apiculturists' residual risk that may be biological or climatic related risk.

Notwithstanding, there has been a growing interest in agricultural insurance research globally (see, Olubiyo *et al*., 2009; Smith and Glauber, 2012; Falola *et al*., 2013; Nosov *et al*., 2014; Oppong Mensah *et al*., 2017). However, in Africa and specifically Ghana, studies on apiculturist risk management and insurance preference appears to be non-existent. This paper therefore attempts to bridge the research gap in the global agricultural insurance discourse, and tries to provide a sense of direction and technical guidance to the National Insurance Commission (NIC) of Ghana, Ghana Agricultural Insurance Pool (GAIP), World Cover, and agricultural insurance product designers and policy-makers globally.

In this study, we rank identified apiculturist residual risk, and rank their on-farm risk management strategies in addition to their apiculture insurance products.

MATERIALS AND METHODS

Study Area

In Ghana, the Dormaa municipality lies on the western part of the Ahafo Region. It falls within latitudes 7^o North and 7^{o}30' North, and longitudes 3^o West and 3^{o}30' West (Ghana Statistical Service, 2014). The capital for the municipality is Dormaa Ahenkro that is 80km from Sunyani (regional capital). Land within the municipality measures 1,210.28 square kilometres (Ghana Statistical Service, 2014). The major agricultural activities are poultry and crop production. However, apiculture also appears to be a thriving enterprise. Further details of the study area are shown in Figure 1.

Sampling and Data

There were a total of 150 farmers registered with the Apiculture Farmers Association in the study area at the time of the data collection. Applying Yamane's (1967) sample size formula $n = \frac{N}{1+N(e)^2}$ (where, n = Sample size, N = Population size, e = Margin of error) with a significance level of 10%, the sample size for the study was 60. Although this satisfies the central limit theorem (Mensah *et al*., 2020), a sample size of 100 was used in the study. A multi-stage sampling technique was used to select a total of 100 apiculture farmers for the study. First, a purposive sampling technique was applied in selecting the Bono Region because it had relatively more apiculture farmers. Similarly, in the second stage, the purposive sampling procedure was employed in selecting two communities: Dormaa municipality and Dormaa East district of Ghana. Finally, a simple random sampling technique was used to select apiculturists from eight towns

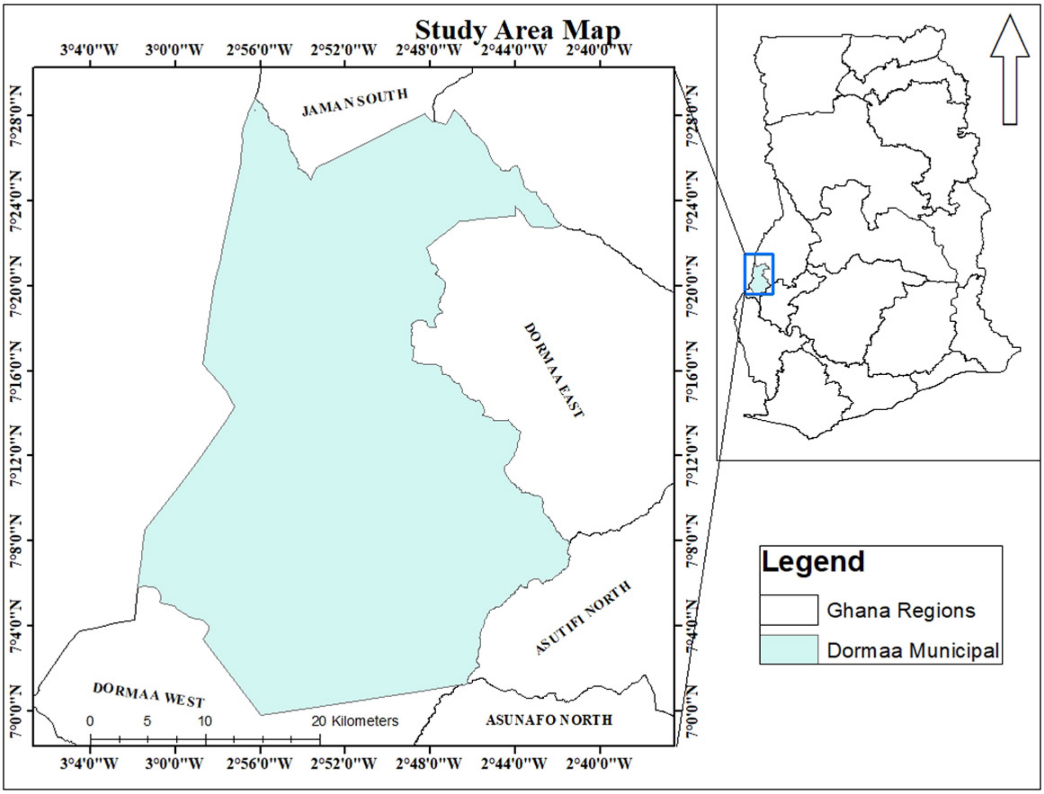

Figure 1: Map of Dormaa Municipality

Source: Produced by authors with ArcMap

from the Dormaa and Dormaa East municipalities. These were Benekrom, Bebianeha, Aboabo, and Kofiasua from Dormaa municipality, and Wamfie, Wamanafo, Dormaa Akwamu, and Amaasu from Dormaa East. Employing a simple random sampling technique, 15 apiculturists were randomly selected from Kofiasua, while 10 were randomly selected from each of the remaining 3 communities in the Dormaa Municipality. In Dormaa East, 20 apiculturists were randomly selected from Dormaa Akwamu, 15 from both Amaasu and Wamfie, and 5 from Wamanafo.

Contingency Valuation Method (C.V.M)

A contingency valuation method was used in eliciting responses on the willingness to pay (WTP) among the apiculturists. This method is an effective approach for WTP studies (Woldegiorgis, 2014). The four approaches in estimating WTP are payment card, dichotomous choice technique, bidding game, and open-ended (Venkatachalam, 2004). The dichotomous choice procedure as proposed by Hanemann *et al*. (1991) could be a single bounded dichotomous choice (SBDC) or double bounded dichotomous choice (DBDC). However, SBDC is not robustly efficient because it needs a larger sample size for a given threshold of precision (Hanemann *et al*., 1991). Therefore, as Amfo and Ali (2021) argued, DBDC is appropriate in addressing the drawbacks of SBDC. The study therefore adopted DBDC to estimate the mean WTP for apiculture insurance for the apiculturists. In this approach (DBDC), an apiculturist was presented with a first bid on the dichotomous decision "yes or no". If an affirmative or negative response was given a second higher bid was then presented. This process results in four possible outcomes: "yes-yes", "yes-no", "no-yes" and "no-no". For likelihoods of these outcomes, refer to Kikulwe and Asindu (2020). Following Zheng *et al*. (2018), the mean WTP is estimated as follows: $Mean\ WTP = \alpha / \rho$

Where α is the coefficient of the intercept term and ρ is the price of the bid or ultimate bid.

Apiculture Insurance WTP Elicitation

Key informants' interviews revealed that farmer's average WTP amount was GH¢ 5.00/beehive/quarterly. Given the expensive nature of apiculture insurance, a 10% increase in the amount was employed as the lowest bid. An interval of 10% to 100% was used as the procedure for the amount increment (see Table 1). During the survey, farmers were presented with a 50% price increment of the average WTP amount. This was supported with detailed elucidations on the advantages of the hypothetical apiculture insurance. Therefore, the 50% amount served as the price start-up for WTP elicitation. Farmers willing to pay 50% more were randomly assigned a second bid amount of 60%, 70%, 80%, 90%, or 100%. Concerning WTP below 50%, farmers were randomly assigned 40%, 30%, 20%, and 10% as the second bid. It must be noted that to prevent starting bias, second bids were randomly assigned.

Table 1: Average Price and Bids for WTP Elicitation

WTP Elicitation (GH¢)												
Average price (GH¢)	<10%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	>100%
5.0	<5.5	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	>10.0

NB: 1 GH¢ = US$ 0.17% = Percentage increases in average WTP price for apiculture insurance

Source: Constructed by authors

Method of Data Analysis

In this study, it is argued that apiculturists have two choices: willingness to pay for apiculture insurance or not. The two choices of apiculture insurance are contingent on mutually exclusive alternatives (Amrago and Mensah, 2023). As a result, probit and heteroscedasticity linear regression models were used to model the factors influencing apiculturists' willingness to pay and willingness to pay amount for apiculture insurance (see Table 2). The expected utility to be obtained from the willingness to pay for apiculture insurance is influenced by factors such as awareness of apiculture insurance, education, age, and farm income. In the probit model, the error term has a normal distribution. Given the assumption of normality, the probability that $I_i^* \leq I_i$ can be computed from the standard normal cumulative distribution function (CDF) as:

$$P_i = Pr(Y = 1|X) = Pr(I_i^* \leq I_i) = Pr(Z_i \leq BX) = F(BX) \quad (1)$$

Where $Pr = (Y|X)$ means the probability that an event occurs (i.e., apiculture insurance participation) given the values of the X variables and where Z is the standard normal variable (i.e., a normal variable with zero mean and unit variance). F is the standard normal CDF; in the present context, this can be expressed as:

$$F(BX) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{BX} e^{-z^2/2} dz \quad (2)$$

Since P represents the probability that an apiculturist is willing to pay apiculture insurance, it is measured by the area of the standard CDF curve from $-\infty$ to I_i. In the present context, $F(I_i)$ is called the probit function.

Although the estimation of the utility index of BX and the Bs is rather complicated in the probit model, the method of maximum likelihood (ML) can be used to estimate them. In this study, the ML estimates of the probit model and that of heteroscedasticity linear regression model are shown below in Tables 7 and 8 respectively. Refer to Bannor *et al*. (2020) on the heteroscedasticity model.

Table 2: Description of Regressors in the Probit and Heteroscedastic Linear Regression Model

Variable	Description	Measurement	Model 1	Model 2	Supporting Literature
Dependent variable					
Willingness to pay for apiculture insurance	Apiculturist pays apiculture insurance	Discrete decision (1 = Yes, 0 = No)			
Amount	Amount paid by each apiculturist	Amount in Ghana Cedis (GH¢)			
Independent variables					
Awareness	Awareness of apiculture insurance	Dummy (1 = Yes 0 = No)	+	+	**(1)** Danso-Abbeam *et al.* (2014)
Education	Had formal education	Continuous (In years)	+	+	Okoffo *et al.* (2016)
Extension service access	Access to extension service	Dummy (1 = Yes 0 = No)	+	–	**(2)** Ellis (2017a)

(continued)

Table 2: Description of Regressors in the Probit and Heteroscedastic Linear Regression Model *(continued)*

Variable	Description	Measurement	Model 1	Model 2	Supporting Literature
Age	Number of years from birth	Continuous (In years)	–	–	**(3)** Falola *et al.* (2013)
Farm income	Income from farm	Continuous (In Gh cedis)	+	+	Gulseven (2014)
Household size	Size of household	Continuous (In numbers)	–	–	**(1)**
Farm size	Size of farm	Continuous (In Acres)	+	–	Nyaaba *et al.* (2019)
Experience	Experience in apiculture	Continuous (In years)		+	**(3)**
Marital status	Marital status of the respondent	Dummy (1 = Married 0 = Unmarried)	+	–	**(2)**
Gender	Gender of apiculturist	Dummy (1 = Male 0 = Female)	–	+	Khan *et al.* (2013)
Farm age	Number of years of the farm from the start of apiculture	Continuous (In years)	+	–	**(1)**

Notes: Model 1 is the willingness to pay for apiculture insurance. Model 2 is the apiculture insurance amount model

Source: Author's construct based on literature review, 2020

Kendall's coefficient of concordance was used in the analysis of risk management strategies. The Kendall coefficient of concordance is specified as:

$$W = \frac{12\left[\Sigma_{T^2} - \frac{\Sigma_{T^2}}{n}\right]}{nm^2(n^2-1)} \tag{3}$$

Where T = Total weight score, W = Kendall's coefficient of concordance, n = Number of risk management strategies to being ranked, m = Number of respondents.

The coefficient of concordance significance was tested with the F-distribution. The F-ratio is specified below:

$$\text{F-ratio} = \frac{[(m-1)\,Wc]}{(1-Wc)}$$ Where Wc = Calculated Kendall's Coefficient of Concordance

Decision rule: If $F_{Cal} > F_{Cri}$ from the Fisher's F-distribution table, the null hypothesis is rejected in favour of the alternative hypothesis.

RESULTS AND DISCUSSION

Table 3: Ranks for On-farm Risk Management Strategies

Strategies	Mean Rank	Ranks
Regular visits and close watch of the apiary	1.62	1st
Greasing or Oiling the stands of the hive	1.97	2nd
During cold weather relocate or weed control	3.06	3rd
During hot weather; the apiary is covered with shade	3.55	4th
Applying less hazardous chemicals	4.80	5th
N	100	
Kendall's W	0.653	
Chi-square (X^2)	261.240	
Degree of freedom (df)	4	
Asymptotic significance	0.000	

Source: Field Survey, 2020

Using a rank strategy, the on-farm risk management strategies deployed by apiculturists in the study area were examined. Five strategies were established and ranked from the most pressing strategy to the least pressing strategy. In consequence, the strategy with the least mean score is the most pressing. From the results in Table 3, it can be seen that the highest risk management strategy employed by apiculturists was regular visits and close watch of the apiary. The next risk mitigation strategy was greasing or oiling the stands of the hive to prevent ants and lizards from killing the bees, with a mean score of 1.97. During cold weather, apiculturists weed around or relocate the apiary to prevent further aggression by predators; this had a mean score of 3.06. The fourth strategy used by apiculturists was the provision of shade during hot weather. The use of shade could be attributed to the high radiation from the sun that consequently increases the mortality risk of the honeybees. Applying less hazardous chemicals was the lowest strategy ranked, with a mean rank of 4.80. This is because apiculturists revealed that honeybees are susceptible to less toxic chemicals and so was ranked as the least on-farm risk management strategy. The results show that approximately 65% of the apiculturists were in agreement with the on-farm risk management strategies.

Table 4: Residual Perils

S/No	Out of Control Risk Factors
1	Bush fire
2	Theft
3	Adverse weather

Source: Field Survey, 2020

Table 4 shows that the residual perils or uncontrollable risks encountered by apiculturists were, bush fire, theft, and adverse weather. Therefore, the majority (81.2%) of the apiculturists were willing to pay for apiculture insurance.

Table 5: Mean WTP for Apiculture Insurance

Variable	Per Beehive/Quarterly
Constant (α)	17.631***(4.30)
Bid (ρ)	2.429***(4.50)
Mean WTP $\left(\frac{\alpha}{\rho}\right)$	7.259 (US$1.234)
N = 100	
LR chi2(1) = 71.76	
Prob>chi2 = 0.000	
Pseudo R^2 = 0.688	
Log likelihood = -16.298	

NB: 1 GH¢ = US$ 0.17 Figures in parenthesis are z-values; *** 1% significance level
Source: Field Survey, 2020

The apiculturists' mean WTP for apiculture insurance per beehive per quarter is presented in Table 5. The majority of apiculturists (81.2%) were willing to pay for apiculture insurance while 18.8% were not willing to pay. This suggests that apiculturists were awareness of the relevance of apiculture insurance in the protection of their investment against risk and unforeseen losses resulting from their residual dangers. Their explanations denote the need for apiculture insurance to indemnify their farm investments against uncontrollable risk and dangers, such as bush fire, theft and adverse weather.

The mean WTP for apiculture insurance was estimated as GH¢7.259 (US$1.234) per beehive per quarter, which is equivalent to a premium rate of 5% on the market value of apiculture.

Table 6 presents the summary statistics for insurance preferred by apiculturists. According to Hatch (2008), insurance is fundamental for risk mitigation. Surprisingly, the majority of apiculturists (65.4%) showed interest in a combined policy entailing both all-risk and whole farm apiculture insurance products. This implies that these products can be underwritten by agricultural insurance underwriters including Ghana Agricultural Insurance Pool (GAIP). Also, 64.4% of the apiculturists

Table 6: Insurance Preferred by the Apiculturist

Variable	Frequency (N)	Percentage (%)
Insurance cover required		
All risk (Bush fire, Theft and Adverse Weather)	16	15.8
Whole farm (All risk, public liability, and loss of farm income) insurance	19	18.8
Combine Policy (All risk and Whole farm)	65	65.4
Total	**100**	**100.0**
Mode of participation		
Individual	36	35.6
Group	64	64.4
Total	**100**	**100.0**
Basis of indemnity		
Market value	63	62.4
Cost of production	37	37.6
Total	**100**	**100.0**
Time of payment		
Quarterly	64	63.4
Semi-annually	20	19.8
Annually	16	16.8
Total	**100**	**100.0**

Source: Field Survey, 2020

were willing to participate in a group insurance, while 35.6% of apiculturists wanted individual participation in apiculture insurance. Virtually all the apiculturists were members of the beekeeper's association in the area; this provides them with education as well as a ready market for sales. Consequently, they prefer to participate in apiculture insurance through the association due to the high level of trust vested in the association. With regards to claims payment options, 62.4% of the apiculturists chose the market value of their product as the basis for indemnity for the sum assured or insurance cover. A total of 37.6% indicated that the cost of production of their investment was their base for indemnity. The results indicated that the number of premium deductions preferred by apiculturists on the market value of their honey, which is the sum assured to be paid to the apiculturist in times of loss, should be on the market value of honey that is relatively higher than the amount to be paid on the cost of production as a basis of indemnity. Further, the results show that the majority of the apiculturists (63.4%) preferred quarterly payments for their apiculture insurance. The factors influencing their willingness to pay for apiculture insurance and the insurance amount are shown in Tables 7 and 8 below:

Table 7: Probit Model Estimates of the Factors Influencing the Willingness to Pay for Apiculture Insurance

Variables	Coefficient	Robust Std. Err.	Marginal Effect	P-Value
Awareness	1.105	0.469	0.069	0.019**
Farm age	1.015	0.442	0.063	0.022**
Education	-0.027	0.061	-0.002	0.664
Extension	0.467	0.458	0.029	0.308
Farmer age	0.019	0.016	0.001	0.232
Farm income	0.000	0.000	0.000	0.151
Household size	-0.012	0.081	-0.001	0.883
Number of beehives	0.091	0.036	0.006	0.012***
Experience in beekeeping	0.142	0.086	0.009	0.098*
Marital status	0.748	0.497	0.047	0.133
Gender	0.563	0.417	0.035	0.177
Constant	-3.984	1.670	0.017	
Prob>chi	0.0140			
Pseudo R^2	0.3372			
Wald chi2 (11)	26.11			
Log pseudo-likelihood	-24.321			

Notes: 1%=***, 5%=**, 10%=*
Source: Field Survey, 2020

The factors influencing the willingness to pay for apiculture insurance are presented in Table 7. Farm age was positive and statistically significant ($p<0.05$). The result is consistent with Danso-Abbeam *et al*. (2014) who observed a positive relationship between cocoa insurance and farm age. Awareness of apiculture insurance has a significant, positive influence on the willingness to pay for apiculture insurance ($p<0.05$). Apiculturists who are aware of apiculture insurance are 6.9% more likely to pay for apiculture insurance. The result is consistent with observations made by Ellis (2017b) who revealed a positive association between crop insurance and awareness of crop insurance. In consonance with this, should they be aware of apiculture insurance, apiculturists may be willing to pay for apiculture insurance so they are indemnified from insurance contracts against their legal liabilities. The proliferation of crop insurance awareness is an efficient procedure to facilitate willingness to pay among farmers (Nyaaba *et al*., 2019).

It is interesting to note that the number of beehives was positive and significantly different from zero ($p<0.012$). Generally, as the number of beehives increases, apiculturists are more likely to pay for apiculture insurance. The result is suggestive that an apiculturist with more beehives would be willing to pay for apiculture insurance as there is the likelihood of the honeybees not transferring from their wild nest to all the beehives, meaning the apiculturist may lose some potential of their capital outlay.

Our findings also reveal that experience was positive and significant ($p<0.1$). The findings are in congruence with Nyaaba *et al*. (2019) and Khan *et al*. (2013) who revealed that experience was statistically significant in influencing crop insurance. However, the finding was at odds with Mohammed and Ortmann (2005). A possible reason for the positive relationship between experience and apiculture insurance is that the unforeseen circumstances attached to apiculture, such as the widely dispersed nature of the apiary and not being their full-time occupation, renders the apiary vulnerable to attack. Therefore, as a means of transferring risk, experienced apiculturists are willing to pay for apiculture insurance to indemnify their business against unforeseen circumstances. As a consequence, an apiculturist is more likely to pay for apiculture insurance as experience increases.

Table 8: Heteroscedasticity Linear Regression Model Estimates of the Factors Influencing the Amount of Apiculture Insurance

Variable	Coefficient	Robust Std. Err	P-Value
Awareness	3.559	1.431	0.013***
Farm age	3.315	0.984	0.001***
Education	-0.128	0.256	0.617
Extension	-2.319	1.867	0.214
Farmer age	0.062	0.060	0.300
Farm income	0.002	0.000	0.000***
Household size	0.479	0.228	0.036**
Number of beehives	0.343	0.130	0.009***
Experience in beekeeping	1.015	0.227	0.000***
Marital status	-2.550	1.266	0.044**
Gender	-1.434	0.975	0.141
Insigma2			
Extension service access	-2.428	0.417	0.000
Constant	4.862	0.362	0.000
Prob>chi2 = 0.0000			
Wald chi2(11) = 387.11			
Log pseudo likelihood = -332.779			
Wald test of Insigma2 = 0: chi2(1) = 33.92			

Notes: 1%=***, 5%=**, 10%=*
Source: Field Survey, 2020

Table 8 presents the factors influencing the amount of apiculture insurance. The test for the variance function was done with the Wald test of Insigma2; this is significant and indicates a probable heteroscedasticity in the model. Extension service access was significantly different from zero ($p<0.001$), suggesting that there is a multiplicative factor of the variance related to the amount of apiculture insurance; therefore, the model was correctly specified. The Prob>chi2 is significant (0.0000), suggesting that the regressors significantly influence the regress and in the model. Awareness has a positive influence on the amount of contribution for apiculture insurance. In detail, awareness increases the amount of contribution by 1.3%. At the same time, farm age is 0.1% more likely to increase the amount of contribution for apiculture insurance. Similarly, farm income is positive and statistically significant at the 1% level, suggesting that farm income is more likely to increase the amount of premium payment to insurers. The coefficient of household size and the number of beehives is positive, indicating their positive influence on the amount of contribution for apiculture insurance. A plausible explanation for this could be that an apiculturist with a large household has many dependents to fend for them. As a result, they are circumspect of their business collapsing from accidents and unforeseen circumstances leading to losses; therefore, they are more likely to increase the amount of contribution with recourse to apiculture insurance. Okoffo *et al*. (2016), has a similar observation in their studies in which household size was positive and significantly influenced the cocoa farmer's willingness to pay crop insurance premiums. Marital status coefficient is negative and significantly different from 0 ($p<0.05$), implying that married apiculturists are less likely to increase their amount of premium payment relative to others. Okoffo *et al*. (2016) also observed a negative association between marital status and crop insurance. The positive coefficient of experience from the results shows that an increase increases the willingness to pay amount for apiculture insurance (Table A1).

CONCLUSIONS AND RECOMMENDATIONS

This paper examined the factors that influenced honeybee farmers to pay apiculture insurance in the Dormaa Municipality and Dormaa East of Ghana. The study analysed the mean amount of apiculture insurance the apiculture farmers are willing to pay and risk management strategies. Interestingly, regular visits and close watch of the apiary were the on-farm risk management strategies. The residual dangers confronting farmers were bush fire, theft, and adverse weather. The mean WTP amount of apiculture insurance was GH¢7.259 (US$1.234) per beehive/quarterly; this is equivalent to a premium rate of 5% of the market value of apiculture. On the insurance preference, the majority (65.4%) preferred both all-risk and whole farm, including farm income apiculture insurance. The empirical results indicate a significant and positive relationship between willingness to pay for apiculture insurance and awareness, farm age, number of beehives, and experience. Estimates on the heteroscedasticity linear model revealed that awareness, farm age, farm income, household size, number of beehives, and experience in beekeeping positively influenced the amount of apiculture insurance.

It is therefore recommended that the Ghana Agricultural Insurance Pool (GAIP) and World Cover could design insurance for apiculturists based on an all risk and whole farm basis. They should ensure farmers in groups and the basis of indemnity should be provided based on market value. GAIP, World Cover, and other practitioners interested in designing pilot apiculture insurance in the study area should consider the estimated mean WTP premium for apiculture insurance for optimal impact. The different set of factors influencing the WTP of apiculture insurance should, however, not be undermined by stakeholders as they have robust implications for the development of apiculture insurance and apiculture as a whole.

Future studies should consider replicating the study in other honey production areas in Ghana as the study may not be representative of the whole apiculture industry in Ghana. Additionally, the absence of a research grant has limited the study as more apiculturists could be sampled for the study.

NOTES

1. In this study, honeybee farmers and apiculturists are used interchangeably.
2. The market value of apiculture at the time of the study was GH¢15,452.00 (US$2,626.84).

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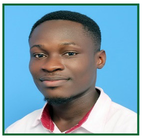
BIOGRAPHY

Dr Nicholas Oppong Mensah is a senior lecturer at the Department of Agribusiness and Consumer Studies. He holds a PhD in Agribusiness Management, an MPhil in Agribusiness, MBA Marketing and Corporate Strategy, MA in international Development Studies, Diploma in Education and Diploma in Applied Insurance Studies. Dr Oppong Mensah has also acted as a consultant for a number of organisations and industries, both agricultural and non-agricultural; these include the FAO's (Food and Agriculture Organization) Farmer Field Schools. His research interests include insurance, agricultural insurance, risk management, agricultural tax, marketing, food banking and marketing, corporate social responsibility and agribusiness value and supply chains.



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APPENDIX

Table A1: Multicollinearity Test

Regressors	Variance Inflation Factor (VIF)	Tolerance = 1/VIF
Awareness	1.06	0.941
Farm age	1.27	0.786
Education	1.58	0.634
Extension service access	1.51	0.664
Farmer age	1.73	0.577
Farm income	1.82	0.549
Household size	1.67	0.598
Number of beehives	2.10	0.477
Experience in beekeeping	1.99	0.502
Marital status	1.14	0.873
Gender	1.05	0.955
Mean VIF	1.54	