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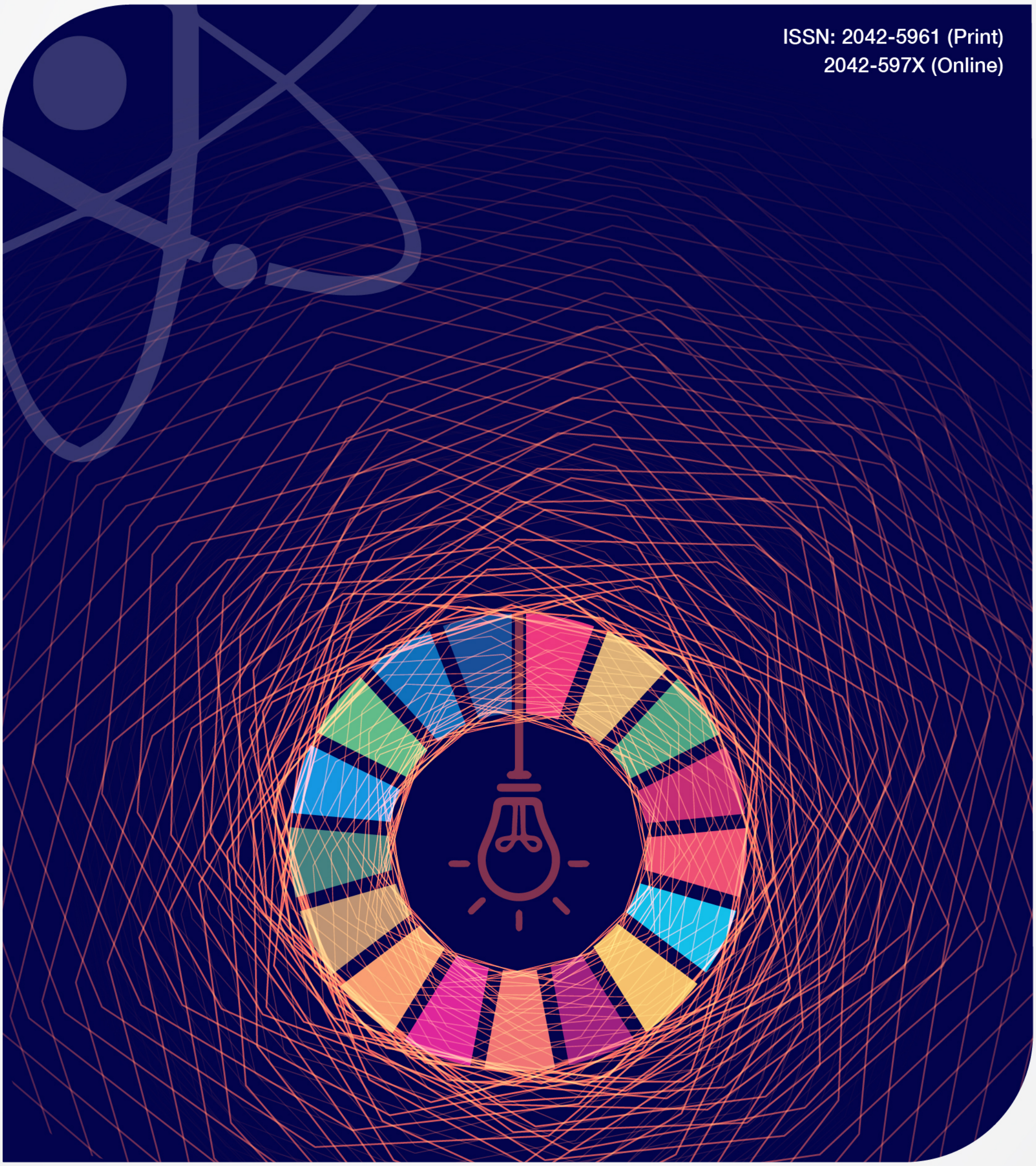
World Journal of Science, Technology and Sustainable Development

VOL 19 | NO 1 | 2022



ISSN: 2042-5961 (Print)
2042-597X (Online)

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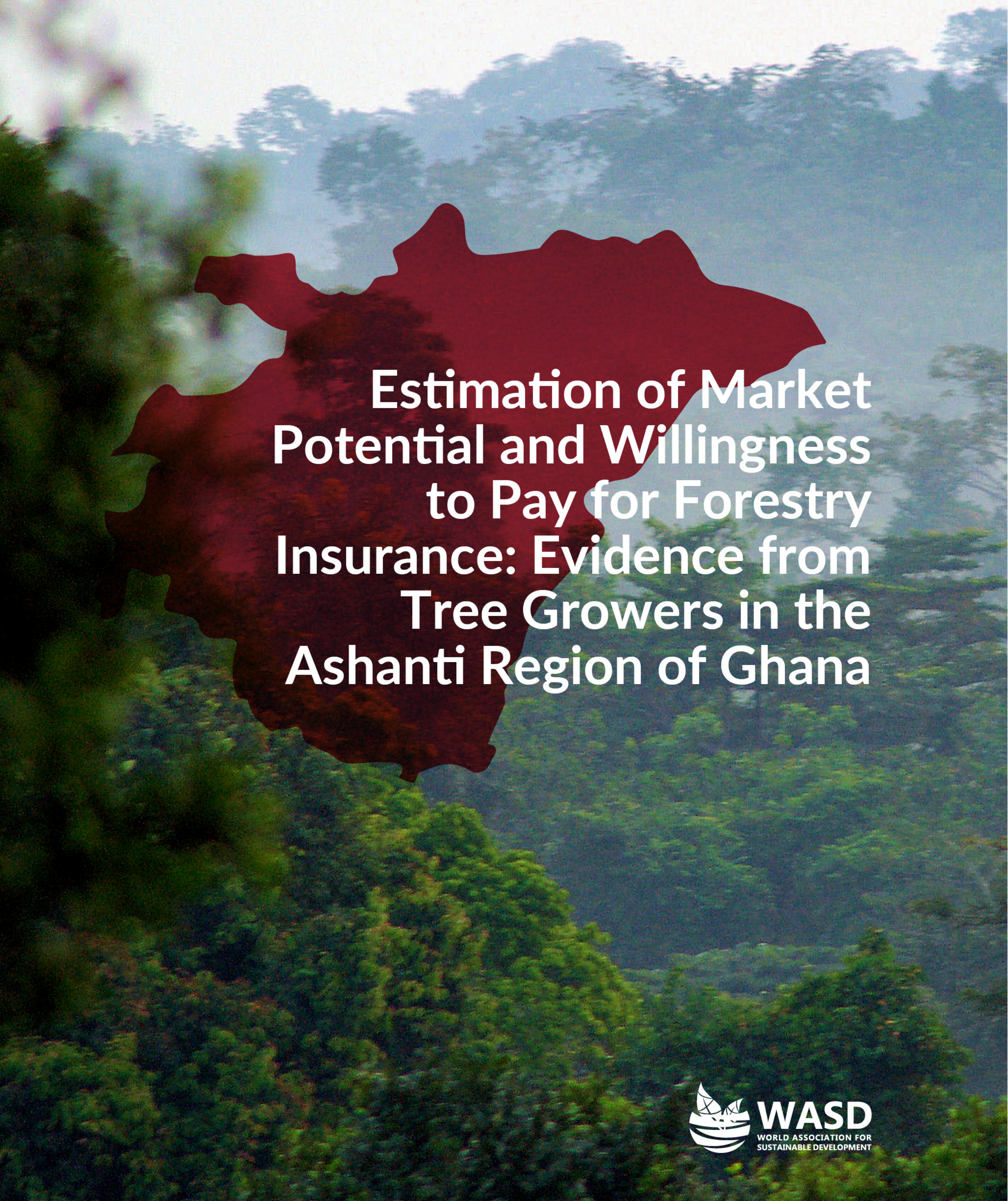

Estimation of Market Potential and Willingness to Pay for Forestry Insurance: Evidence from Tree Growers in the Ashanti Region of Ghana

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World Journal of Science, Technology and Sustainable Development

ISSN: 2042-5945 (Print) | 2042-5953 (Online)
WJSTSD V19 N1 2022

OPEN ACCESS
DOI: 10.47556/J.WJSTSD.19.1.2022.1

RESEARCH PAPER

Estimation of Market Potential and Willingness to Pay for Forestry Insurance: Evidence from Tree Growers in the Ashanti Region of Ghana

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ABSTRACT

PURPOSE: In this study, we estimate the market potential and willingness to pay (WTP) for forestry insurance in the Ashanti Region of Ghana. The study examines the factors influencing the expenditure on premiums for forestry insurance across varying quantiles of expenditure and mean WTP premium for forest insurance products.

CITATION: Mensah, N.O., Amrago, E.C., Twintoh, J.J., Donkor, A. and Anang, S.A. (2022): Estimation of Market Potential and Willingness to Pay for Forestry Insurance: Evidence from Tree Growers in the Ashanti Region of Ghana. *World Journal of Science, Technology and Sustainable Development (WJSTSD)*, Vol. 19, No. 1, pp. 1–15.

RECEIVED: 21 February 2021 / **REVISED:** 1 April 2022 / **ACCEPTED:** 7 April 2022 / **PUBLISHED:** 3 May 2022

DESIGN/METHODOLOGY/APPROACH: A total of 170 tree growers/foresters were sampled for the study. The quantile regression was employed to analyse the factors influencing the expenditure on premiums for forestry insurance and the double-bound contingent valuation method for the mean WTP.

FINDINGS: The market potential was high for Cedrela and low for Emeri. Varying factors affect the expenditure on premiums for forestry insurance at different quantiles. The mean WTP for Teak, Cedrela, African Mahogany, Emeri and Oframo was respectively Ghc 7.989 (US$1.38), Ghc 112.747 (US$19.44), Ghc 58.069 (US$10.00), Ghc 29.092 (US$5.00) and Ghc 28.292 (US$4.88).

ORIGINALITY/VALUE: The study adds to the body of literature by estimating the market potential and willingness to pay for forestry insurance, particularly in Ghana.

KEYWORDS: *Market potential; forestry insurance; quantile regression; double-bound; Ghana*

INTRODUCTION

Forestry is a significant catalyst for the economic development (Ke *et al.,* 2019) of emerging economies such as Ghana. In effect, it stands to provide aesthetic, economic, ecological, and social services to human beings and natural systems (Dai *et al.,* 2015; Ma *et al.,* 2015). Major forest productivity is enhanced by solar radiation, rainfall, temperature, and atmospheric concentration of CO_2 (Brunette *et al.,* 2017). Practices such as management of tree density, rotational density, planting of the plant as pure (monoculture) or mixed stands, farm sanitation, and good forest management practices are also key for the forest's productivity. A skim through the literature on the perils that affect forests include biotic factors such as pests, disease, and damage caused by mammals, and abiotic factors, such as wind storms, fire, snow, and drought, resulting in financial loss if not properly managed (Brunette *et al.,* 2017). If unattended, these perils will bring about economic loss that decreases the future value and marketability of forest products and non-timber forest products (NTFPs) such as black pepper, the grace of paradise, and beeswax. The use of natural resources, such as timber and NTFPs, as an alternative livelihood is often characterised by communities close to these resources. However, the economic success of planting trees as a livelihood strategy still faces natural disasters such as fire (Hasan *et al.,* 2019) and storms (Sauter *et al.,* 2016; Brunette *et al.,* 2020). In Ghana, for instance, bushfires have negatively affected the ecosystem and forest production levels (Appiah *et al.,* 2010). The incidence of fire and most of the residual risk enumerated pose an enormous threat to the forest sector by reducing the potentiality of the forest serving as a livelihood strategy (Appiah *et al.,* 2010); it also augments the levels of carbon emissions in the atmosphere (Tienhaara, 2012; Dwomoh *et al.,* 2019).

Subsequently, the global warming threshold increases. In consonance with this, forestry insurance has become one of the most important means of addressing these key perils while maintaining forestry production levels (Ma *et al.,* 2019). More so, one of the important strategies to reduce or transfer forest risk has been the use of forest insurance (Holecy and Hanewinkel, 2006; Brunette *et al.,* 2015; Deng *et al.,* 2015). This paper also considers forest risk as a natural disturbance that scales down the value of wood or forest stands (Schelhaas *et al.,* 2003). Forestry insurance also has the prospects of increasing wood value or forest stands, increasing credit access, and providing peace of mind. Undoubtedly, it is interesting to note that when the last tree dies, the last human dies, because of the forest's ability to influence rainfall patterns, as well as purifying the atmosphere through the utilisation of carbon dioxide (Co_2). Therefore, using forestry insurance is of utmost importance to indemnify the Ghanaian forest against perils such as fire, storm, and drought.

As a result, to spur the high use of forestry insurance, various stakeholders must recognise the need for developing forestry insurance against unforeseen circumstances in the forestry sub-sector of Ghana. Therefore, while other aspects of agricultural insurance are being championed and popularised amongst academics, researchers, and practitioners, forestry insurance remains a grey area in the Ghanaian agricultural insurance discourse, despite forestry's contribution to agricultural GDP of 6% and export earnings of approximately 11% (Eshun *et al.,* 2012). Despite the increasing relevance of forestry to economic development, studies on the market potential of forestry products (such as Teak and African Mahogany), the factors influencing the expenditure on premiums for forestry insurance, and the mean premium willing to pay for forest products appears to be non-existent in Ghana. If forestry insurance is accepted as an important driver of economic development and an indispensable component of national development, then understanding the factors influencing premium expenditures in forestry insurance is key and cannot be abandoned. Further, the paper provides relevant information to underwriters, policy-makers, and researchers. Notwithstanding, should forestry insurance materialise in Ghana, then an added advantage of increasing agricultural insurance penetration as a whole is achieved.

In the proceeding section, we presented our objectives in three ways: (1) to investigate the market potential for forest insurance products, (2) to estimate the mean WTP premium for forest insurance products, and (3) to analyse the factors influencing the expenditure on premiums for forestry insurance.

MATERIALS AND METHODS

Study Area

The Ashanti Region is located in the southern part of Ghana and occupies 24,389 square kilometres, representing 10.2% of Ghana's total land area (Ghana Statistical Service, 2013). The region is considered the third largest in Ghana after the Northern, Bono East, and Ahafo region. The Ashanti Region has 27 administrative districts and shares boundaries with Bono East and Ahafo Region in the North, on the east is Eastern Region, on the south, is Central Region and on the southwest with Western Region (Hussey and Malczewski, 2018). The region has a total population of 4,780,380 (Ghana Statistical Service, 2012), see Figure 1.

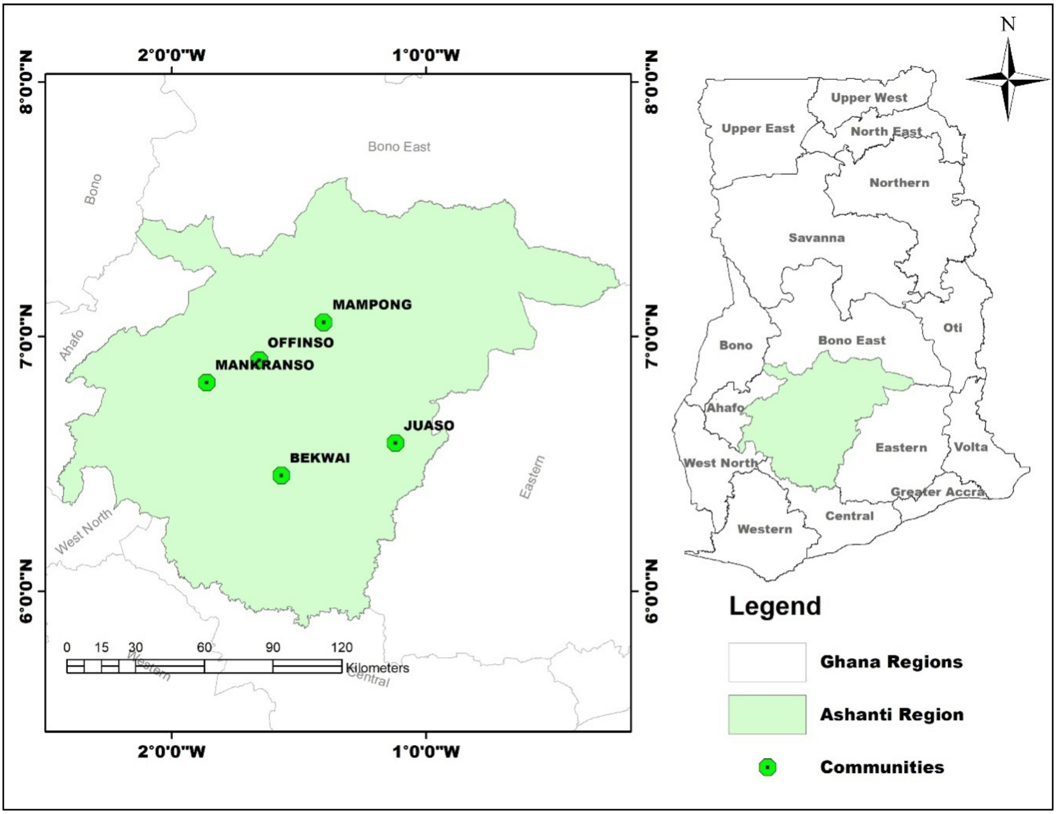

Figure 1: Map of the Study Area

Source: Framed by Authors based on ArcGIS

Sampling and Data

Questionnaires were administered to tree growers as a source of primary data. The survey questionnaire was pre-tested and the responses used for the modified version. The questionnaire had the following sub-headings: factors influencing expenditure premiums, willingness to pay for forestry insurance, key perils affecting forest quality, and market potential estimation. A multi-stage sampling method was used to sample tree growers. In the first stage, the Ashanti region was selected because there was a predominance of tree growers. Second, five communities were selected in the region, Mampong, Offinso, Juaso, Bekwai, and Mankraso; the population for a study could be finite or infinite (Kozak, 2008). After constructing a list of all tree growers in the study area from the Forestry Commission, the total population for tree growers was found to be infinite. In detail, the central limit theorem indicates that a sample size ≥30 is sufficient for a standard normal deviation (Mensah *et al*., 2021; Amrago and Mensah, 2022). As a consequence, following the empirical work of Qin *et al.* (2016) who used a sample size of 165, the sample size for this study was 170, indicating that the sample size of 170 was appropriate. Finally, 50 tree growers were sampled from Mampong, 40 from Offinso, 30 from Juaso, 40 from Bekwai, and 10 from Mankraso. The secondary information used in the study was sourced from the Forestry Commission. The period for data collection was 15 June-20 August 2020.

Estimation of Market Potential for Forest Insurance Products

The market potential of a new trade or trade expansion is reliable enough to ascertain the economic viability of a business (Wolfe, 2006). Estimating the market potential provides an understanding as to whether the market is large enough to sustain the new trade or trade expansion and sustain an additional competitor in the market environment. Estimating the market potential for wood products requires information such as the number of possible buyers, average selling price, and average annual consumption. In this study, the formula proposed by Wolfe (2006) for estimating market potential was adopted.

The formula is specified as follows: $MP = N \times P \times A$

Where, MP = Market potential, N = Number of possible buyers, P = Average selling price or mean willingness to pay, A = Average quantity purchased annually.

Empirical Estimation of Mean Willingness to Pay (WTP)

Several methods were used to evaluate the value of a product or service that is not in the market. Notable amongst them are the travel cost method, hedonic pricing, and the contingent valuation method (Mensah, 2016; Mensah, 2017; Kikulwe and Asindu, 2020). In this study, the double-bounded Contingent Valuation method was employed because forestry insurance was new and had not been recognised amongst tree growers. Two bids were given to the tree growers, an initial bid and a second bid. Tree growers were faced with two dichotomous choices, a 'yes' or a 'no' response to an initial bid. The decision of the second bid was contingent on the first bid. A higher bid was presented as a second bid to the tree grower if they responded 'yes' to the first bid, but a lower bid was presented as a second bid if the tree grower responded 'no' to the first bid. As a consequence, there are four possible outcomes for this decision: a 'yes-yes' outcome, a 'yes-no' outcome, a 'no-no' outcome, and a 'no-yes' outcome (Owuwu, 2009). Following Kikulwe and Asindu (2020), the four possible outcomes are expressed as:

$$\begin{aligned} Pryy(B,B^{u}) &= \Pr\left[B \leq WTP, B^{u} \leq WTP\right] \\ &= \Pr[B \leq WTP | B^{U} \leq WTP] \Pr[B^{u} \leq WTP] \\ &= \Pr[B^{U} \leq WTP] = 1 - F(B^{u}) \end{aligned} \tag{1}$$

$$\begin{aligned} Pryn(B,B^{u}) &= \Pr\left[B \leq WTP < B^{u}\right] \\ &= F(B^{U}) - F(B) \end{aligned} \tag{2}$$

$$Prny(B,B^d) = \Pr\left[B^d \le WTP < B\right] \\ = F(B) - (B^d) \tag{3}$$

$$Prnn(B,B^d) = \Pr\left[B > WTP, B^d > WTP\right] \\ = F(B^d) \tag{4}$$

where *Pryy* is the probability of a 'yes-yes' outcome, *Pryn* is the probability of a 'yes-no' outcome, *Prny* is the probability of a 'no-yes' outcome, and *Prnn* is the probability of 'no-no' outcome. In addition, B *and* B^u denotes the price for the first question and a higher price for the second question. WTP represents the willingness to pay and F connotes the Cumulative Distribution Function.

Combining the probabilities of the four outcomes, the log-likelihood function for a sample takes the form:

$$InL = \sum_{1}^{N}\{yy_i InPr_{yy}(B_i, B_i^U) + yn_i InPr_{yn}(B_i, B_i^U) + ny_i InPr_{ny}(B_i, B_i^d) + nn_i InPr_{nn}(B_i, B_i^d)\} \tag{5}$$

where *yy, yn, ny*, and *nn* are dichotomous variables representing 1 if the forester is willing to pay for the forestry insurance and 0 otherwise. The likelihood function is maximised to provide an estimate for the parameters. Adopting the equation of Owuwu (2009), 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.

Quantile Regression

The quantile regression model was used to analyse the factors influencing the expenditure on premiums for forestry insurance. The model was advanced by Koenker and Bassett Jr (1978) and focuses on underscoring socio-economic factors that influence the maximum values in the conditional distribution of the regressand. Unlike the ordinary least squares (OLS) that estimates the conditional means, $E(y|x)$ the quantile regression goes beyond conditional means by estimating the conditional quantiles $Q(\beta_q)$. Following Uematsu and Mishra (2011), the estimator of the qth quantile regression minimises the objective function below:

$$Q(\beta_q) = \min_{\beta \in R^P} \sum_{i \in \{i: y_i \ge x_i\beta\}}^{N} \left[q\left|y_i - x_i'\beta_q\right| + \sum_{i \in \{i: y_i < x_i\beta\}}^{N} (1-q)\left|y_i - x_i'\beta_q\right| \right], q \in (0,1) \tag{6}$$

where q is the quantile chosen by chance, p is the number of estimated parameters, y_i is the ith observation of the regressand, x_i is a $k \times 1$ vector wherein each element is the ith observation of k regressors, β_q is a $k \times 1$ vector of quantile regression parameters to be estimated. N signifies the observations' number (Koenker and Bassett Jr, 1978). Unlike OLS that minimises the sum of squared errors, quantile regression absolutely minimises the sum of errors. The robustness to outliers and heteroscedasticity makes quantile regression superior to the OLS (Uematsu and Mishra, 2011). Employing the *hettest* command in STATA 15, the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was estimated. Heteroscedasticity was present in the dataset ($X^2(1) = 26.08$, Prob > $X^2 = 0.0000$), hence the use of Quantile regression. For reasons of comparison, OLS is estimated. Refer to Table 1, on regressors for the quantile regression.

Table 1: Description of Regressors for the Quantile Regression Model

Variable	Description	Measurement	Expected Sign (OLS)	Reference Literature
Dependent variable	Forest insurance premium expenditure	Continuous variable (in Ghc)		
Socio-economic variables				
Age	Forester	Continuous variable (in years)	+	Parajuli *et al.* (2019)
Education	Years spent in school	Number	+	Gan *et al.* (2014)
Income	Forester income	Continuous variable (in Ghc)	–	Brunette *et al.* (2020)
Gender	Forester gender	Dummy variable (1 = Male 0 = Female)	–	Apipoonyanon *et al.* (2020)
Forest level variables				
Experience in forest management	Foresters years of experience in managing the forest	Continuous variable	+	Deng *et al.* (2015)
Land ownership	Forester own land	Dummy variable (1 = Yes 0 = No)	+	Parajuli *et al.* (2019)
Forest size	Size of forest	Continuous variable (in acres)	–	Deng *et al.* (2015)
Forest quality	Quality of the forest	Dummy variable (1 = Good quality 0 = Otherwise)	+	Zhi *et al.* (2020)
The previous occurrence of fire	The previous occurrence of fire in the forest	Dummy variable (1 = Yes 0 = No)	+	Brunette *et al.* (2020)
Risk aversion	Forester is risk averse	Dummy variable (1 = Yes 0 = No)	+	Deng *et al.* (2015)
Risk perception	Forester perceives risk incidence	Dummy variable (1 = Yes 0 = No)	+	Deng *et al.* (2015)
Insurance variables				
Awareness of forest insurance	Forester is aware of forest insurance	Dummy variable (1 = Yes 0 = No)	+	Zhi *et al.* (2020)

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

RESULTS AND DISCUSSION

Table 2: Market Potential for Forest Insurance Products

Communities	Products	Number of Possible Buyers	Mean WTP (Ghc)	Average Quantity Purchased Annually	Estimated Market Potential (Ghc)	Estimated Market Potential (USD)
Mampong	Teak (*Tectonagrandis*)	42,037	7.99	80.13	26,913,714.23	4,640,295.56
Offinso		138,190	7.99	93.22	102,927,753.68	17,746,164.43
Juaso		117,245	7.99	55.24	87,327,335.41	15,056,437.14
Bekwai		7,267	7.99	63.01	51,748,144.26	8,922,093.84
Mankraso		26,909	7.99	78.66	16,912,128.90	2,915,884.29
Total					**285,829,076.48**	**49,280,875.26**
Mampong	Cedrela (*Cedrelaodorata*)	42,037	112.75	23.00	109,012,450.25	18,795,250.04
Offinso		138,190	112.75	35.23	548,915,899.68	94,640,672.36
Juaso		117,245	112.75	13.44	177,668,383.20	30,632,479.86
Bekwai		7,267	112.75	18.66	15,289,150.31	2,636,060.39
Mankraso		26,909	112.75	5.15	15,625,047.21	2,693,973.66
Total					**866,510,930.65**	**149,398,436.31**
Mampong	African Mahogany (*Khayaivorensis*)	42,037	58.07	55.44	135,333,951.43	23,333,439.90
Offinso		138,190	58.07	20.70	444,888,996.55	76,704,999.41
Juaso		117,245	58.07	25.65	174,635,899.89	30,109,637.91
Bekwai		7,267	58.07	10.35	4,367,645.04	753,042.25
Mankraso		26,909	58.07	16.22	25,345,463.32	4,369,907.47
Total					**784,571,956.23**	**135,271,026.94**
Mampong	Emeri (*Terminalia ivorensis*)	42,037	29.09	5.50	6,725,709.82	1,159,605.14
Offinso		138,190	29.09	10.26	41,244,657.25	7,111,147.80
Juaso		117,245	29.09	3.44	11,732,660.25	2,022,872.46
Bekwai		7,267	29.09	42.68	9,022,425.24	1,555,590.56
Mankraso		26,909	29.09	15.28	11,960,921.34	2,062,227.82
Total					**80,686,373.90**	**13,911,443.78**
Mampong	Oframo (*Terminalia superba*)	42,037	28.29	25.88	30,777,187.77	5,306,411.68
Offinso		138,190	28.29	28.40	111,026,820.84	19,142,555.32
Juaso		117,245	28.29	3.74	12,405,060.33	2,138,803.51
Bekwai		7,267	28.29	9.39	1,930,428.41	332,832.48
Mankraso		26,909	28.29	6.77	5,153,700.48	888,569.05
Total					**161,293,197.83**	**27,809,172.04**

NB: 1 US$ = Ghc 5.80

Source: Author's computation based on field data, 2020

The market potential for forest insurance products is presented in Table 2. We find a high potential for the market of Cedrela (*Cedrela Odorata*), Ghc 866,510,930.65 (US$149,398,436.31). This is attributed to the high dependence on Cedrela as a fast-growing forest product for re-afforestation programmes in Ghana (Brobbey, 2017). In the same vein, Jones (1969) professed the use of *Cedrela odorata* (Cedrela) as a paramount plantation crop for the development of Ghana's forest industry. Although Cedrela has impressive market potential, African Mahogany closely competes with Cedrela, with an estimated market potential of Ghc 784,571,956.23 (US$135,271,026.94). The high out-turn of African Mahogany is partly due to an average contribution of 15-30% to the total export of Ghana's timber (Opuni-Frimpong *et al.,* 2008). Undoubtedly, the overuse of African Mahogany has reduced its availability. However, until recently the decline in the supply of African Mahogany from South America and Southeast Asia had necessitated the exigency for the demand of African Mahogany (Opuni-Frimpong *et al.,* 2008). Moreover, the potential market for Teak (*Tectona grandis*) was Ghc 285,829,076.48 (US$49,280,875.26), objectively because of the rapid economic returns and the variability in use (Watanabe *et al.,* 2010). In Ghana, plantation crops (Teak) could be used for telephone poles, furniture, and fencing, amongst others. Notwithstanding, Oframo and Emeri respectively had a market of Ghc 161,293,197.83 (US$27,809,172.04) and Ghc 80,686,373.90 (US$13,911,443.78).

We empirically estimate the mean WTP for each forest insurance product per tree, Teak (*Tectona grandis*), Cedrela (*Cedrela odorata*), African Mahogany (*Khaya ivorensis*), Emeri (*Terminalia ivorensis*), and Oframo (*Terminalia superba*), via the Logit model with no control of socio-economic variables, forest level variables, and insurance variables. The mean WTP was obtained by dividing the α by ρ, Where α is the co-efficient of the intercept term and ρ is the price of the bid. Table 3 presents the mean WTP for several forest insurance products.

Table 3: Estimation of the Mean WTP for Forest Insurance Products

Variable	Teak	Cedrela	African Mahogany	Emeri	Oframo
Constant (α)	8.612*** (5.19)	8.456*** (3.91)	27.467*** (4.26)	20.248*** (3.82)	8.346*** (6.04)
Bid (ρ)	1.078*** (5.22)	0.075*** (4.11)	0.473*** (4.23)	0.696*** (3.77)	0.295*** (5.95)
Mean WTP $\left(\frac{\alpha}{\rho}\right)$	**7.989**	**112.747**	**58.069**	**29.092**	**28.292**
N	170	170	170	170	170
Log likelihood	-47.777	-75.695	-44.147	-44.334	-37.972
LR Chi2 (1)	85.86	28.00	92.39	92.32	102.76
Pseudo R^2	0.4733	0.1561	0.5113	0.5101	0.5750

NB: 1 US$ = Ghc 5.80 *** = 1% Figures in parenthesis are z values

Source: Field data, 2020

The mean WTP for a Teak was Ghc 7.989 (US$1.38) and Cedrela had an average WTP of Ghc 112.747 (US$19.44). The estimated average WTP for African Mahogany was Ghc 58.069 (US$10), while the mean WTP for Emeri and Oframo was Ghc 29.092 (US$5) and Ghc 28.292 (US$4.88) respectively.

Table 4: Quantile Regression Estimates for Factors Influencing the Expenditure on Premiums for Forestry Insurance

Dependent variable = Expenditure on Forest Insurance Premium				
Variables	**0.25Q**	**0.50Q**	**0.75Q**	**OLS**
Socio-economic variables				
Age	-27.272 (29.384)	-72.837 (44.406)	-28.142 (150.659)	-40.996 (64.279)
Education	-24.861 (84.769)	-100.416 (128.107)	-68.334 (434.638)	-103.507 (185.441)
Income	1.391*** (0.361)	1.716*** (0.545)	3.250* (1.849)	2.098*** (0.789)
Gender	-1322.399* (697.168)	-10.038 (1053.585)	311.674 (3574.569)	-132.035 (1525.108)
Forest level variables				
Experience in forest management	-59.597 (38.293)	-3.789 (57.869)	-286.481 (196.338)	-218.973*** (83.769)
Land ownership	-276.166 (712.009)	-1513.624 (1076.016)	-4547.489 (3650.669)	-1700.544 (1557.577)
Forest size	-91.585 (60.587)	-105.777 (91.562)	93.440 (310.678)	-74.637 (132.539)
Forest quality	-379.717 (602.810)	-748.146 (910.989)	-992.395 (3090.773)	-1036.923 (1318.694)
The previous occurrence of fire	-236.115 (661.359)	-47.785 (999.471)	827.3917 (3390.97)	2453.050* (1446.775)
Risk aversion	-1440.836 (1206.469)	-2710.768 (1823.261)	-2600.016 (6185.899)	-2728.436 (2639.246)
Risk perception	1181.362 (773.209)	817.0054 (1168.502)	3176.028 (3964.455)	3487.889** (1691.455)
Insurance variables				
Awareness of forest insurance	4951.669*** (1761.519)	5009.221* (2662.073)	6279.92 (9031.792)	4276.566 (3853.460)
Constant	3548.790 (2337.88)	8846.577*** (3533.091)	11814.64 (11986.95)	10399.59** (5114.296)
Prob>F				0.0004
R^2				0.2802
Pseudo R^2	0.2153	0.1692	0.1432	

Notes: *** = 1%, ** = 5%, * = 10% The dependent variable is the expenditure on forest insurance premium. Figures in parenthesis are standard errors

Source: Field data, 2020

The quantile regression (QR) model was employed to analyse the factors influencing the expenditure on premiums for forestry insurance. Table 4 demonstrates the estimators for the QR of the factors influencing the expenditure on premiums for forestry insurance at the 0.25, 0.50, and 0.75 quantiles, with controls for socio-economic variables, forest level variables, and an insurance variable. The estimated co-efficient for each quantile was different from each other and different from the OLS regression estimates, indicating the presence of heterogeneity for which the OLS fails to account.

Inferring from Table 4, income significantly influenced the expenditure on premiums for forestry insurance across all quantiles of expenditure, and was significantly different from zero ($p<0.01$) for the OLS estimate. A one Ghana Cedis (Ghc) increase in income increases the expenditure on premiums for forestry insurance by Ghc 1.391 (US$0.239) at the 0.25 quantile, Ghc 1.716 (US$0.296) at the median quantile, and Ghc 3.250 (US$0.560) at the 0.75 quantiles. Succinctly, for the OLS estimate, one Ghc increase in income would increase the premium expenditure for forestry insurance by Ghc 2.098 (US$0.362). It is worth noting that the result validates the findings of Qin *et al.* (2016) who found a positive association between forest income and forest insurance.

The co-efficient of gender was negative at the 0.25 quantile but statistically significant at the 10% level of significance. This implies that, with an added female, there is a reduction in the expenditure on premiums for forestry insurance by Ghc 1322.399 (US$228.00). Across all the quantiles, experience in forest management was not significant; however, estimates from the OLS equation reveals that a year increase in experience would reduce the expenditure on premiums for forestry insurance by Ghc 218.973 (US$38.00). The result is in line with Deng *et al.* (2015) who reported a positive association between forest management experience and timber insurance.

In addition, the previous occurrence of fire was statistically significant at a 10% level of significance for the OLS estimate. The positive coefficient of the OLS reveals that an added occurrence of fire would increase the premium expenditure of forestry insurance by Ghc 2453.050 (US$423.00). Likewise, risk perception was significantly different from zero ($P<0.05$) for the OLS equation. Should the perception of risk increase by one point, respondents would increase their expenditure on premiums for forestry insurance by Ghc 3487.889 (US$601.00). The result reflects that of Deng *et al.* (2015) who indicated that risk perception positively influenced wildfire insurance. Surprisingly, awareness of forest insurance was 1% and 10% significant at the 0.25 quantile and 0.50 quantile. Therefore, a one-point increase in the awareness of forest insurance would increase the expenditure on premiums for forestry insurance by Ghc 4951.669 (US$853.74; 0.25 quantile) and Ghc 5009.221 (US$863.66; 0.50 quantile). The result confirms the study of Zhi *et al.* (2020) who acknowledged a positive relationship between the awareness of forest insurance and forest insurance purchase.

CONCLUSIONS AND RECOMMENDATIONS

The study examined the market potential and willingness to pay for forestry insurance in the Ashanti Region of Ghana. The result suggests that income, gender, experience in forest management, the previous occurrence of fire, risk perception, and the awareness of forest insurance significantly influences the expenditure on premiums for forestry insurance. Interestingly, income increases the expenditure on premiums across all quantiles of expenditure. The quantile estimates would therefore serve as a guide in the drafting of a pilot forestry insurance scheme for the tree planters by Ghana Agricultural Insurance Pool (GAIP) and World cover.

The market potential for Cedrela was high, followed by African Mahogany, Teak, Oframo, and Emeri. The Forestry Commission should increase the education of tree growers to siphon their investment from Oframo, and Emeri as Cedrela, African Mahogany, and Teak demonstrates high market potential. The mean WTP for Teak, Cedrela, African Mahogany, Emeri and Oframo was respectively Ghc 7.989 (US$1.38), Ghc 112.747 (US$19.44), Ghc 58.069 (US$10.00), Ghc 29.092 (US$5.00) and Ghc 28.292 (US$4.88). Future studies should consider similar estimation procedures as they have proved to be robust.

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