Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no8.0465

An Economic Valuation of Forest Ecosystem Services: A Choice Modeling Application to the Mekong Delta Project in Vietnam*

Huynh Viet KHAI[1], Nguyen Phi VAN[2], Vo Thanh DANH[3]

Received: April 20, 2021 Revised: July 04, 2021 Accepted: July 15, 2021

Abstract

This study is the application of a choice experiment to assess Mekong Delta urban households' preferences and motivations for ecosystem conservation in the U Minh forest. The study applied a choice modeling approach to estimate the economic values of the proposed ecosystem conservation program in the U Minh forest by accessing urban consumer preferences and their willingness to pay for the project. Discrete choice experimental data was collected from 450 residents in the cities of the Vietnamese Mekong Delta. The multinomial logit model was employed to identify consumer's stated preferences for the environmental and sustainability attributes of the conservation project. The results showed that Mekong Delta urban residents paid much attention to the proposed project to protect and develop the U Minh forest. In addition, the results showed that higher education, income, and knowledge of the U Minh forest revealed a higher likelihood of selecting the project, while the older residents would select the status quo more than the younger ones. The study also proved that the effect of participation had a strong impact on the willingness to pay for the project. The findings could be useful for policymakers to take action to raise resident's awareness and willingness to pay for the U Minh forest project.

Keywords: Choice Experiment, Ecosystem Conservation, Marginal Willingness to Pay, Vietnam

JEL Classification Code: Q01, Q51, Q56, Q57, Q58

1. Introduction

Vietnam has been acknowledged as a country with high biodiversity, and as one of the prioritized nations for global conservation. In the country's terrestrial ecosystems, more than 13,200 floral species and about 10,000 faunal species have been identified. More than 3,000 aquatic creatures have been identified in the interior wetlands. The tropical marine with more than 20 typical ecosystems is also home to more than 11,000 sea creatures. For the past two decades, many new floral and faunal species have been discovered and described. Many of them belong to new genera and species. New creatures continue to be discovered and announced in Vietnam (MONRE, 2008).

The country's ecosystems and biological resources are an integral part of its economy and culture, as reflected in the value they impart in terms of environmental protection (ecological function value), direct use (economic value), and socio-cultural activities. Biodiversity resources have contributed to sustainable livelihoods over many generations through the provision of food security and health care, especially for local people living in remote areas who are directly dependent on resource exploitation (MONRE, 2015).

By 2006, forest cover in Vietnam, including natural and planted forests, increased by 38.2%, including 2 million ha of special-use forests, 5 million ha of protection forests, and 8 million ha of production forests. In addition, a system of 45 interior protected wetlands was approved late in 2008. Plans for another system consisting of 15 marine protected areas have been designed and submitted for Government

***Acknowledgements:**
This study is funded in part by the Can Tho University Improvement Project VN14-P6, supported by a Japanese ODA loan.

[1]First Author. Associate Professor, Department of Environmental and Resource Economics, School of Economics, Can Tho University, Vietnam [Postal Address: Campus II, 3/2 Street, Xuan Khanh, Ninh Kieu, Can Tho, Vietnam] Email: hvkhai@ctu.edu.vn
[2]School of Economics, Can Tho University, Vietnam.
[3]Corresponding Author. Associate professor, Department of Environmental and Resource Economics, School of Economics, Can Tho University, Vietnam [Postal Address: Campus II, 3/2 Street, Xuan Khanh, Ninh Kieu, Can Tho, Vietnam] Email: vtdanh@ctu.edu.vn

approval. In addition to the national protected areas system, 2 Natural World Heritage Sites, 4 ASEAN Natural Heritage Parks, 2 Ramsar Wetlands and 6 Biosphere Reserves have been internationally recognized (MONRE, 2008). Nevertheless, many threats to biodiversity in Vietnam exist. Population growth and consumption have put pressure on natural resources, leading to over-exploitation of resources. The rapid socio-economic development has led to changes in the natural landscape. Changes in land use and mass infrastructure development have reduced natural area, increased ecological fragmentation, and damaged wildlife habitat. The construction of many dams has blocked the migration of fish.

In Vietnam, though forest area and cover have increased, most forests consist of low biodiversity plantations, while high biodiversity natural forests are today in considerable decline (MONRE, 2008). Currently, environmental quality is degraded. Many environmental components are exhausted, and environmental pollution due to untreated waste is a significant threat to biodiversity by reducing and damaging the wildlife habitat. Pesticides are being widely used in agricultural production. The use of pesticides contributes to the decline of bird populations in rural and suburban areas. In addition, freshwater, coastal and marine ecosystems are also polluted by various pollution sources.

Vietnam is also sensitive to global climate change; it is one of the ten countries most seriously affected by climate change. Fragmented ecosystems might be too weak to respond to such changes and therefore, unable to prevent a rapid mass loss of various species (MONRE, 2008). Increases in average temperature could change the geographic distribution and population structure of many ecosystems. Scientists have found evidence of species migration resulting from global warming. Increasing temperatures trigger forest fires, especially in peat swamp, dipterocarp, and pine forests. Climate change, combined with decreasing watershed forests and irrational water use, may result in increased inundation, flash floods, and landslides, which would severely impact the environment and human livelihoods (MONRE, 2008). Due to limited financial resources from the state budget, local authorities often propose funds contributed by the people for biodiversity conservation (Khai & Yabe, 2014). However, this is complicated because the awareness and understanding of biodiversity, environment, and ecosystem services of the general public are low.

This study uses the approach of choice modeling to estimate the benefits of the proposed ecosystem conservation program in the U Minh forest and identify the social welfare due to loss of biodiversity and the trade-off between biodiversity and economics. This information might assist policymakers in formulating efficient and sustainable wetland management policies in the U Minh forest. The study is designed as follows. The next section describes the methodology, project scenario, and data collection. The section after that presents some results and discussions related to the estimation of marginal willingness to pay (MWTP) for the attributes of the conservation project. The final section presents the conclusion.

2. Methodology

The approach of choice modeling (CM) is an emerging stated preference technique for non-market valuation (Bennett & Blamey, 2001). Based on Lancaster's theory of consumer behavior, the CM technique is developed in the framework of random utility theory (RUT) (Adamowicz et al., 1998; Louviere et al., 2000). The CM technique applies experimental methods to form different hypothetical markets. Respondents are asked to choose their most preferred resource use option from a number of alternatives. The CM estimates not only the value of changes in individual attributes but also the value of aggregate changes in environmental quality. The CM approach has more advantages than the contingent valuation method (CVM) such as the description of actual choice behavior and the accurate attributes of a product, the valuation of new products based on surveys, strategic bias reduction, and choice options in CM are more intimate than the payment approach in CVM. The CM technique describes a utility as a latent construct that exists in the consumer's mind but cannot be observed directly (Adamowicz et al., 1998; Louviere et al., 2000). This unobservable consumer utility can be explained using the CM, while some proportion remains unexplained as shown in the following equation:

$$U_{an} = V_{an} + \varepsilon_{an} \tag{1}$$

where U_{an} is the latent or unobserved utility for a choice alternative, V_{an} is the systematic and observable component of the latent utility, and ε_{an} is the random component of the latent utility associated with option a and consumer n. Because of the random component, it is impossible to understand and predict preferences perfectly. This leads to the expression of the probability of choice:

$$P(a/C_n) = P[(V_{an} + \varepsilon_{an}) > (V_{jn} + \varepsilon_{jn})] \tag{2}$$

for all j options in the choice set C_n.

In other words, the probability of consumer n selecting option a from choice C_n is equal to the probability that the systematic and random components of option a for consumer n are greater than the systematic and random components of option j for consumer n from choice C_n. To estimate the choice probabilities using multinomial logit (MNL), the random components are assumed to be independently and identically distributed (IID) with the scale parameter μ. In this case, the probability is:

$$P(a/C_n) = \exp(\mu V_{an}) / \Sigma \exp(\mu V_{jn}) \quad (3)$$

where $j = 1, \ldots, C_n$

To introduce respondent heterogeneity, socio-economic variables are used as independent variables in each equation. When the data does not support IID, multinomial logit model (MNL) estimates might be biased. This triggers the use of nested logit, mixed logit or random parameter logit (RPL), and latent class models as detailed in Louviere et al. (2000), Layton (2000), Revelt and Train (1998), and Boxall and Adamowicz (2002) respectively. These models have been widely used to estimate environmental values (Othman et al., 2004; Whitten & Bennett, 2005; Birol et al., 2006).

Implicit prices for the attributes used to describe the choice alternatives are estimated on a ceteris paribus basis. That is, they are estimations of the WTP of respondents for an increase in the attribute of concern, given that everything else is held constant. Implicit prices for linear conditional indirect utility functions are determined using the following formula:

$$\text{Implicit price} = -\left(\frac{\beta_{\text{non-market attribute}}}{\beta_{\text{moneytary attribute}}}\right) \quad (4)$$

where β is a coefficient estimated in the MNL.

3. Project Scenario and Data Collection

The ecosystem conservation program is proposed to be carried out in the U Minh national forest, one of the most important protected areas in the Mekong Delta, with the objective of conserving this area. The project's hypothetical scenario is as follows: "Suppose the People's Committee of Kien Giang province and the People's Committee of Ca Mau province establish a U Minh ecosystem conservation fund (UMECF) using contributions from urban residents, the fund then receives additional support from international organizations as well as the government with amounts equal to or higher than the contribution of the urban residents. The contribution will only be used by the UMECF to:

1. Plan the increase of forest coverage, protect against soil erosion, landslides, and washout.
2. Promote investment for upgrading roads leading up to the U Minh forest to create favorable conditions for tourists.
3. Collaborate with domestic and foreign agencies and organizations to conserve biodiversity.
4. Strengthen forest management and biodiversity conservation through programs to protect and restore forest ecosystems, improve law enforcement capacity, and encourage state regulations on forest protection and development.
5. Implement livelihood projects to gradually improve the lives of local residents around the U Minh forest."

The presentation of this above scenario is followed by the CM questions. The most important step in designing the CM questions is to identify good attributes and their levels to be valued (Khai & Yabe, 2014). This study proposed various conservation activities with attributes identified based on previous similar studies (Khai & Yabe, 2014; Do & Bennett, 2009; Birol et al., 2006). The study conducted a pilot survey with 25 households to determine the understandability and feasibility of attributes and their levels and revise the questionnaire more concisely. The pilot survey also helps interviewers become familiar with how to ask the questionnaire.

Table 1 shows the selected attributes and their level in the CM model. The assumptions are that the conservation management strategies would create positive environmental impacts such as increasing the percentage of healthy vegetation, reducing the proportion of people affected by air pollution, increasing forest products (e.g., honey), changing research and education opportunities, and re-training local farmers to apply environmentally friendly farming techniques. These impacts were used as attributes of the CM model. The payment vehicle was used as a voluntary continuous donation, contributed through a monthly water bill for 3 years. The amount of contribution is fixed and does not vary with water usage in cubic meters. The payment levels of VND 20,000, 50,000, 80,000, 110,000, and 130,000 selected for the study are based on the focus group and pilot survey. These values are equivalent to values in US$ of $0.86, $2.16, $3.45, $4.74, and $5.60, respectively.

The study randomly interviewed households in urban areas in the Mekong Delta. The total number of respondents is 450 households, of which 150 in Can Tho city, 150 in An Giang, and 150 in Kien Giang. Following Louviere et al. (2000), there are 25 choice sets generated by the experimental design technique, namely Orthogonal Main Effect design. These choice sets were included in five different questionnaire versions and each questionnaire contains 05 choice sets.

A hypothetical conservation program was proposed to prevent biodiversity losses in the U Minh forest and keep them from being degraded every year. In the CM questions, each respondent was asked to answer 05 choice sets, choosing among three alternatives that show various options of ecosystem conservation management in the U Minh forest (Table 2). Alternative A and B ensure the improvement of ecosystem conservation and an increase in

Table 1: Attributes and Levels Used in the CM Model

Attributes	Description	Alternative Levels
Increasing Biodiversity	Increasing the percentage of healthy vegetation	+ *Status quo* – unchanging; + *Minor improvement* - increasing 10%; + *Partial improvement* - increasing 20%; + *Major improvement*- increasing 30%.
Improve Air Quality	Reducing the percentage of affected people due to air pollution	+ *Status quo* – unchanging (80% affected people by air pollution) + *Minor improvement* - reducing 10% affected people due to air pollution; + *Partial improvement* - reducing 20% affected people due to air pollution; + *Major improvement*–reducing 30% affected people due to air pollution.
Product	Increasing the percentage of forest products (e.g. honey)	+ *Status quo* – unchanging; + *Minor improvement*–Increasing 10% + *Partial improvement* - Increasing 20%; + *Major improvements* -Increasing 30%.
Research & education Opportunity	The educational, research, and cultural information that may be derived from the existence of the wetland, including visits by scientists, students, and school children to study ecology and nature.	+ *Low* - Deterioration from the current levels of opportunities; + *High* - Improving the level of educational and research opportunities by providing better facilities
Re-trained farmers	Re-training of local farmers in environmentally friendly farming techniques.	The number of farmers re-trained in environmentally friendly farming techniques: 30, 50, 75, 115, 150.
Prices	Surcharge on household water bills in thousand VND	Contribution amounts: VND 20, 50, 80, 110 and 130.

their benefits from the U Minh forest. Alternative A is a status quo scenario level with the problem of U Minh forest degradation and its unchanging benefits from the forest. Besides CM questions, the questionnaire also includes the socio-economic characteristics of the respondents such as age, gender, education, and income, and their knowledge about the U Minh forest as well as attitudes and awareness toward the issues of the environment and forest conservation. This is very necessary to decrease potential information bias because respondents have little knowledge about ecosystem services.

To determine the relationship between CM data, the study used the conditional Logit model and NLogit 5.0 software and assumed that utility could be observed in the study (Khai & Yabe, 2015). There are three linear equations that show the utilities of the respondents, each created by one of the three alternatives. Calling V_j is the utility of respondents when selecting j and ASC is the constant of the equation of utility for each specific choice. Besides it also contains the average value of unobserved gain and random error. The model was specified as follows.

Alternative 1:

$$V_1 = \text{ASC} + \beta_1\text{Price} + \beta_2\text{Re-training} + \beta_3\text{Diver} + \beta_4\text{Air} + \beta_5\text{Product} + \beta_6\text{StudyHigh} \quad (5)$$

Alternative 2:

$$V_2 = \text{ASC} + \beta_1\text{Price} + \beta_2\text{Re-training} + \beta_3\text{Diver} + \beta_4\text{Air} + \beta_5\text{Product} + \beta_6\text{StudyHigh} \quad (6)$$

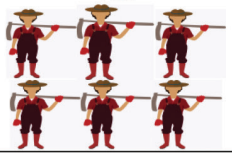
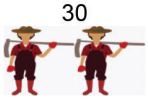
Status Quo:

$$V_3 = \beta_1\text{Price} + \beta_2\text{Re-training} + \beta_3\text{Diver} + \beta_4\text{Air} + \beta_5\text{Product} + \beta_6\text{StudyHigh} \quad (7)$$

4. Results and Discussion

The data from the choice experiment method are estimated using a multinomial logit model (MNL). The variables and their coding for the model are presented in Table 3. The non-attribute variables such

Table 2: Profile Example of Choice Set

	The following factors will vary under different managements	Alternative A	Alternative B	Alternative C (Status quo)
	**Increasing** the biodiversity (increasing healthy vegetation area)	10% 	20% 	unchanged 
	**Reducing** the percentage of people affected by air pollution	10% 	20% 	unchanged 
	**Increasing** the percentage of healthy honey	10% 	20% 	unchanged 
	Research & Education Opportunity	Low 	High 	unchanged 
	The number of re-training farmer	150 	30 	0 
	Surcharge on household water bills (VND/month)	20.000 	50.000 	0 

as socioeconomic characteristics and knowledge of respondents are shown in Table 4.

Table 4 shows the socio-demographic description of the respondents. The age of respondents ranges from 21 to 76 years old with an average age of 37 years and about 43.7% are females. More than half of the respondents have completed high school and higher. On average, respondents have more than 12 years of schooling. Respondents have an average monthly household income of about VND 13.82 million, ranging from VND 4 to over VND 30 million.

Table 5 presents the MNL estimation results of the two models. Model 1 is the estimated result of the model with attribute variables only, while Model 2 includes attribute variables and interaction variables generated by interacting non-attribute variables (e.g., monthly household income, age, education, civil status of respondents) with the alternative specific constant (*ASC*). The study shows that Model 2 has a higher level of parametric fit than Model 1 because of the bigger values of log-likelihood and ρ^2 in Model 2 compared with those of Model 1. These improvements could be tested for significance by applying the Swait–Louviere[1] log-likelihood ratio test. The likelihood ratio test statistic is LR = 2(2,310.809 – 2,163.427) = 294.764 which exceeds the critical value of the Chi-square distribution of 14.067 at the 95 % significance level on 7 degrees of freedom[2]. According to Rolfe et al. (2000), the CM model includes non-attribute variables to reduce unobservable effects and improve the consistency of the model. The result also shows that Model 2 has appropriate improvements and results better than Model 1. Thus, Model 2 will be used for the final results of the study.

All the attribute coefficients of Model 2 are significantly different from zero. The positive signs of attribute coefficients reveal that respondents select their choice options with the

Table 3: Variables Used in the Choice Model

Variables	Descriptions
Attribute Variables	
Price	Surcharge on the monthly water bills (thousand VND)
Re-training	The number of farmers re-trained in environmentally friendly farming techniques (persons)
Diver	Increasing the percentage of healthy vegetation (%)
Air	Reducing the percentage of people affected by air pollution (%)
Product	Increasing the percentage of healthy honey (%)
StudyHigh	The higher opportunity for research and education (1 = yes, 0 = no)
Non-Attribute Variables	
Income	Monthly household income of respondents (million VND)
Age	Age of respondents (years)
Education	Education of respondents (years)
Married	Civil status of respondents (1 = married, 0 = otherwise)
Children	Number of children under 15 years old (persons)
Effect	Respondents are willing to pay for the project if neighboring households also want to pay (1 = yes, 0 = no)
Knowledge[€]	Total points of respondent's knowledge (scores)

Note: [€]Each respondent was asked 5 questions related to biodiversity and threats to the U Minh forest. The knowledge score is equal to 1 if the respondent chooses "I know well," equal to 0.5 for choosing "I know," and equal to 0 for choosing "I don't know."

Table 4: Socio-Demographics of Respondents

Variables	Unit	Mean	SD	Min	Max
Income	Million VND	13.82	6.31	4	30
Age	Year	36.89	10.19	21	76
Education	Year	12.24	3.66	1	18
Married	–	0.76	0.43	0	1
Children	Person	0.98	0.91	0	6
Effect	–	0.77	0.2	0	1
Knowledge	Point	2.25	1.16	0	5

concern of an improvement scenario. Similar to the results of other studies (Birol et al., 2006; Do & Bennett, 2009; Khai & Yabe, 2014), Model 2 shows that respondents with higher incomes are more likely to choose improvement scenarios because of the positive coefficient of ASC * Income variable at 1% significance level.

Similar to the results of the study by Khai and Yabe (2014), older respondents are more likely to select the status quo alternative than younger since the interaction variable of ASC * Age has a significantly negative parameter at the level of 1%. It can be explained that young respondents are exposed to more knowledge about the current situation and environmental problems than older ones, as such, they have better awareness and more willingness to pay for the conservation project. The coefficient of ASC * Education variable is significantly positive at the 1 % level, showing that respondents with higher education are more likely to support the ecosystem conservation project, which is similar to the studies by Diafas et al. (2017); Birol et al. (2006), Do and Bennett (2009), and Khai and Yabe (2014).

Regarding knowledge about the U Minh forest, the variable of Knowledge is determined to be the total score of respondents after answering five questions related to the U Minh forest's ecosystem. The coefficient of ASC* Effect interactive variable has a significantly positive sign which is similar to the studies of Do and Bennett (2009) and Khai and Yabe (2014). Respondents with broad knowledge and understanding of the U Minh forest are more willing to pay for the ecosystem conservation project while that of Effect is a dummy variable equaling 1 if respondents agree to pay according to the surrounding households and 0 if they do not agree. The coefficient result of the ASC * Effect interactive variable is positive, meaning that respondents affected by decisions made by neighbors and those around them will be more likely to support the project, which is consistent with the findings of Gou et al. (2014).

Table 5: Estimated Results of the Multinomial Logit Model for Ecosystem Conservation in the U Minh Forest

Variable	Model 1		Model 2	
	Coefficient	Standard Error	Coefficient	Standard Error
ASC	0.23107	0.15760	−2.37637***	0.41274
Price	−0.13250D−04***	0.8789D−06	−0.13957D−04***	0.9154D−06
Re-training	0.00287***	0.00075	0.00303***	0.00077
Diver	0.01158***	0.00399	0.01176***	0.00405
Air	0.00978***	0.00395	0.01015**	0.00401
Product	0.00765**	0.00383	0.00738*	0.00389
StudyHigh	0.23693***	0.05335	0.24245***	0.05364
ASC * Income			0.31328***	0.10808
ASC * Age			−0.01537***	0.00577
ASC * Education			0.09127***	0.01480
ASC * Married			−0.00631	0.14259
ASC * Children			0.07065	0.05894
ASC * Effect			1.27089***	0.11214
ASC * Knowledge			0.17500***	0.04500
Log Likelihood	−2,310.809		−2,163.427	
ρ^2	0.0597		0.1196	
Observation	2250		2250	

Note: ***, **, and *Indicate statistical significance at the 0.01, 0.05, and 0.1 level, respectively.

Table 6: Implicit Price Estimates and Confidence Intervals Unit: VND

Attributes	Model 1			Model 2		
	MWTP	95% CI		MWTP	95% CI	
		Lower Bound	Upper Bound		Lower Bound	Upper Bound
Diver	874.3***	288.9	1,459.7	842.7***	268.3	1,417.1
Air	738.0**	153.1	1,323.0	727.0**	152.5	1,301.6
Product	577.6**	13.8	1,141.5	528.5*	−5.5	1,062.5
StudyHigh	17,882.0***	9,602.3	26,161.8	17,377.1***	9,631.6	25,122.5
Re-training	216.6***	99.3	333.9	217.0***	103.4	303.6

Note: ***, **, and *Indicate statistical significance at the 0.01, 0.05, and 0.1 level, respectively.

We cannot directly explain the effects of the corresponding explanatory variable on the probability of choosing each attribute of the ecosystem conservation of the U Minh forest by using the coefficient of results in Table 5. Therefore, the implicit price for each attribute is used to represent the marginal willingness (MWTP) for a change of an attribute. The implicit price is estimated using the ratio of a factor and price coefficient to the following equation (4).

Table 6 shows the implicit prices for each attribute of U Minh forest conservation in both models. Implicit prices have a positive sign for all attributes, indicating that respondents are more likely to pay for the increase in the level of each attribute of the project. The results show that respondents accept to pay an average of VND 843 per month for 1% more healthy vegetation with a 95% confidence interval For the attribute of reducing the number of people affected by air pollution, respondents are willing

to pay an additional VND 727 to reduce 1% more people affected by air pollution and respondents are willing to pay VND 528.5 for every 1% increase in the number of forest products. In addition, respondents agree to pay an additional VND 17,377 monthly on the water bill with an increase in the opportunities for training and education. Moreover, they agree to contribute about VND 217 to each re-trained farmer with a 95% confidence interval in the range of VND 103–304.

The study also estimates the marginal rate of substitution between non-monetary attributes (Table 6): 1% increase in healthy vegetation is equal to 1.16 % reduction in affected people due to air pollution, 1.59% increase in forest products, and 3.88 re-trained farmers; 1% reduction in affected people due to air pollution is equal to 0.86% increase in healthy vegetation, 1.38% increase in forest products, and 3.35 re-trained farmers; 1% increase in forest products is equal to 0.63% increase in healthy vegetation, 0.73% reduction in affected people due to air pollution, and 2.44 re-trained farmers; Each re-trained farmer is equal to 3.88% increase in the healthy vegetation, 3.35% reduction in affected people due to air pollution, and 2.44% increase in forest products.

The CM model demonstrates that respondents are willing to contribute a positive amount to the U Minh forest ecosystem conservation project to ensure an increase in the provision of valuable ecosystem services. Considering the case that the U Minh forest conservation project has improved at the lowest level (10% increase in healthy vegetation, 10% reduction in the number of people affected by air pollution, 10% increase in forest products, higher research and education opportunities and 30 re-trained farmers), a total amount that respondents are willing to contribute to the project is estimated to be VND 44,869 ($10 \times 842.7 + 10 \times 727 + 10 \times 528.5 + 17{,}377.1 + 30 \times 217$). For the highest level of improvement (30% increase in healthy vegetation, 30% reduction in the number of people affected by air pollution, 30% increase in forest products, research and education opportunities are higher than at present, and 150 re-trained farmers), a total amount that respondents are willing to contribute to the project is estimated to be VND 67,477 VND ($30 \times 842.7 + 30 \times 727 + 30 \times 528.5 + 17{,}377.1 + 150 \times 217$).

5. Conclusion

This study is the application of a choice experiment to assess Mekong Delta urban households' preferences and motivations for ecosystem conservation in the U Minh forest. The results showed that Mekong Delta urban residents paid much attention to the proposed project to protect and develop the U Minh forest. The reasons for their willingness to pay were the increase in healthy vegetation, the decrease in the affected people due to air pollution, the increase in forest products, the opportunity of higher research and education, and more re-training farmers in the U Minh forest. They accept to pay an average of VND 843 monthly for 1% more healthy vegetation, VND 727 to reduce 1% more affected people due to air pollution, VND 528.5 for an additional increase in forest products. In addition, respondents agreed to pay an additional VND 17,377 per month on the water bill with an increased educational opportunity, while they agree to contribute about VND 217 to each re-trained farmer.

In addition, the results showed that higher education, income, knowledge of the U Minh forest revealed a higher likelihood of selecting the project, while the older residents would select the status quo more than the younger ones. The study also proved that the effect of participation had a strong impact on the willingness to pay for the project. This information could be useful for local authorities or policymakers to take more action to raise resident's awareness and willingness to pay for the U Minh forest ecosystem conservation project.

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Endnotes

[1]Calculated by the formula LR = –2(LL1 – LL2), log-likelihood statistics for the different models.

[2]The degrees of freedom are given by the difference in the numbers of parameters estimated in the two models.