Research article

Willingness to Pay for the Conservation of Flooded Forest in the Tonle Sap Biosphere Reserve, Cambodia

ASIKIN YOEU
Royal University of Agriculture, Phnom Penh, Cambodia
E-mail: asikinyoeu@yahoo.com

ISABELITA M. PABUAYON
University of the Philippines, Los Banos, Laguna, Philippines

Received 19 December 2010 Accepted 31 January 2011

Abstract: This study aimed to determine the stakeholders' willingness to pay (WTP) for the flooded forest conservation (FFC) in the Tonle Sap Biosphere Reserve (TSBR), Kampong Chhnang Province, Cambodia. In addition to estimation of the WTP prices, the factors that affect the farmers' willingness to pay were determined. The possibility of establishing the mechanism for instituting payment for environmental services (PES) was examined. The study adapted the contingent valuation method (CVM) in estimating WTP and multiple regression analysis in determining the factors that affect WTP. Respondents included 157 farmer households randomly selected from the 3 villages, namely: Peam Khnang, Thnal Chheu Teal and Slat. The study found that the sample farmer-respondents have a high level of awareness on the benefits and functions of flooded forest. Sixty-four percent of the respondents were members of the FFC program; the rest did not join the program. Eighty-two percent of the respondents expressed willingness to pay for conservation of flooded forest. On average, the WTP price for a farm household was 2,357 riels per month. The respondents' willingness to pay was affected by factors such as age, income and participation in training program. They were willing to pay for conservation mainly because they wanted to protect the flooded forest as reported by 88 percent of the respondents. In terms of the method of collection, most of sample farmer-respondents would like the community themselves through the village leader to collect the WTP fund. The respondents said that they would prefer to pay the WTP fee monthly.

Keywords willingness to pay, conservation of flooded forest, Tonle Sap biosphere reserve, payment for environmental services, contingent evaluation method

INTRODUCTION

Even though the theoretical foundations of payments for environmental services (PES) were set several decades ago (Coase, 1960), the practical implementation of these market-based instruments for managing natural resources has started rather recently. Forests play a critical role in sustaining the aquatic ecology of the Tonle Sap Lake. A number of factors threaten these natural resources and the populations that depend on them, including deforestation around the lake and in upland watersheds, as well as dam construction. Clearing of over 50 percent of the flooded forests that surrounds the Tonle Sap has reduced the riparian buffer that limits the influx of sediment, and substantially lessens fish breeding grounds (Patrick et al., 2004).

This study aimed to determine the factors that affect the farmers' willingness to pay and examine the possibility of establishing the mechanism for instituting payment for environmental services (PES) provided by the Tonle Sap Biosphere Reserve (TSBR). The results of this study would help policy makers and private sectors in making the users of the environmental services fully aware of the importance of the flooded forest conservation in the TSBR.

© ISERD

METHODOLOGY

The study employed a single-bound, dichotomous choice format in the referendum style for WTP surveys. Household farmers were asked whether they are willing to pay a specified amount on top of the flooded forest program to improve and manage the environmental sector in the study area. The bid prices of WTP were given by 30 participants from different villages and government agencies during Focus Group Discussions (FGDs) and then the pre-test was conducted prior to the main survey.

Community Protected Area (CPA) is of paramount importance for sustainability of a participatory natural resource management initiative. There are four PCAs being developed in Prey Koh Biodiversity Conservation Area. A total of 3,337 local residents have registered as members of the Prey Koh Community Protected Area of which people are living in Thnal Chheu Teal, Peam Khnang, Slat and Kramal Village respectively. The study was conducted in three villages, namely, Peam Khnang with 78 respondents, Thnal Chheu Teal with 59 respondents and Slat with 20 respondents in Kampong Leang District, Kampong Chhnang Province. To compute the sample size of respondents, the researcher used the formula of Yamane (1967) with population size (359 households), and *e* is the level of precision (assumed 94% level of confidence or *e* is equal to 0.06) (Israel, 1992). Thus, the sample size was 157 respondents.

The study used a combination of both quantitative and qualitative methods. The primary data and secondary data were gathered through direct interviews of respondents, and through reports and the summary records of the Department of Environment (DoE), the Department of Agriculture Forestry and Fisheries (DAFF), and other state offices in the study region. In this study, descriptive statistics and comparative means tests involving T-tests were used to compare the significant difference of average values of some variables for the two groups of farmers (FFC members and non-members). Multiple regression was used to determine the factors that affect the dependent variable of WTP using the STATA 8.0 program.

$$WTP = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + u_i \quad (1)$$

WTP is willingness to pay (riels per month) of farmers who are participating in flooded forest conservation. This study aimed to test the general hypotheses that the higher the willingness to pay for environmental services, the higher is the probability that the farmers will enter into natural resource conservation. The specific hypotheses are as follows:

- Age X_1 (Years): Older people are more financially stable and may also attribute a bequest value to conserve the forest. Hence, they are more willing to pay than younger people.
- Educational attainment X_2 (Years in school): Respondents with higher education have more knowledge and in general will be more willing to pay.
- Gender X_3 (1 = male, 0 = female): Male heads are more able to earn money and may also pay more to conserve the forest.
- Household size X_4 (Number of persons in household): The bigger the household size, the more expenses the household has and the less money it has available for additional expenses, much less for forest conservation.
- Household income X_5 (riels per month): Households with higher income have higher WTP price in flooded forest conservation.
- Distance of the farmers X_6 (Kilometres): The farther the family residence and the more inaccessible the location of the flooded forest is, the lower is the WTP price.
- Participation in training course of natural resource management X_7 (1 = yes; 0 = no): Farmers who join such courses are expected to have higher WTP price in flooded forest conservation than non-participants.

© ISERD

RESULTS AND DISCUSSION

Both Flooded Forest Conservation (FFC) members and non-members were asked about the WTP prices. All FFC members are willing to pay for conservation of the flooded forest at different price levels while only half of non-members (51 percent) expressed willingness to pay (Table 1). Results show that the average WTP values of the two groups differed significantly at one percent level with F-value of 13.558 (Table 2). This means that the average WTP value of FFC members is greater than that of non-members. The mean WTP values for FFC members and non-members are 2,560 riels and 842 riels, respectively.

Table 1 Sample farmer respondents who are willing to pay for FFC Program

Item	Willingness To Pay For The FFC Program				Total	
	Yes	Percent (%)	No	Percent (%)	No.	Percent
FFC members	100	100	0	0	100	64
FFC non-members	29	51	28	49	57	36

Table 2 Comparative mean test of FFC and non-FFC groups for WTP prices

Item	Number of Farmers	Mean (riels)	Standard Deviation
FFC members	100	2,560	2,304
Non-FFC members	57	842	1,085
F-value	13.558**		

*Note ** refers to significance at 1% level*

The main reasons for their decisions are given in Table 3.The major reason is desire to protect the flooded forest as reported by 88 percent of the respondents. They also wanted to lead more protection efforts for the endangered species and to protect their community from disaster. They thought that the flooded forest provides many benefits to their lives for their daily livings. Calderon et al. (2004) cited some reasons why people were willing to pay for water supply improvement. Mainly, they wanted a reliable water supply for both present and future generations. This will increase the diversity of the resource species, protect the people from natural disasters, keep the good view of the environment for young generations in the future, and involve themselves in the conservation of the natural resources of the country.

Table 3 The Reasons of Sample Farmer-Respondents for Willingness to Pay Program

Reason[a]	Number	Percent (%)
Want to protect the flooded forest	114	88
Lead more protection efforts for the endangered species	75	58
Protect our community from the natural disasters	74	57
Provide so many benefits to our lives	72	56
Counterpart funding with non-government organization (NGO)	66	51
Keep a good view in the future	66	51
Get more profit if the resources are not depleted	61	47
Live with healthy surrounding and good environment	55	43
This is the valuable resource in the country	31	24

[a] *Multiple responses*

Respondents who were not willing to pay for the conservation of the flooded forest said that they could not afford any additional contribution fees (71 percent on Table 4). Thus, the top reason for being not willing to pay was affordability. Similar to the findings of Calderon et al. (2004) and

© ISERD

Truong (2007), respondents were not willing to pay because they thought the government should have responsibility for water supply improvement and they have income constrains.

Table 4 The reasons of sample farmer-respondents for non-WTP

Reason[a]	Number	Percent
I cannot afford the amount	20	71
The money I pay will not actually be used for conservation	10	36
The government or NGO should be responsible for this	8	29
Conservation of the flooded forest is not worth doing	6	21
The majority of the poor will be affected	5	18
Other resources are more important than forest	4	14
I prefer giving money to humanitarian causes instead	3	11

[a] *Multiple responses*

Given the farmers' willingness to pay (WTP) estimated for the sample farmer-respondents, the determinants of this variable were identified. The sample farmer-respondents included all those who are willing to pay for the FFC and did not distinguish between FFC and non-FFC farmers. The estimated results of the multiple regression model on the farmers' willingness to pay are summarized in Table 5.

Table 5 Results of the multiple regression analysis for the factors affecting the sample farmer-respondents' WTP

Variable	Variable Name	Parameter	Coefficient	Standard Error
	Constant	β_0	951.5926	594.4008
X_1	Age	β_1	18.3509*	10.1925
X_2	Education	β_2	36.5860	48.9088
X_3	Gender	β_3	-235.6883	278.2241
X_4	Household size	β_4	-101.5595	65.9466
X_5	Income	β_5	0.0003**	0.0000
X_6	Distance	β_6	-29.4080	30.0337
X_7	Training	β_7	884.6740**	312.2889
R_2			0.3885	
F			13.52**	

*Note ** and * refer to significant at 1% and 10% level, respectively*

To sum up, the multiple regression model had the value of R_2 = 0.3885 indicates that the variables included in the model are able to explain 38.85 percent of the total variation in WTP. This model is also statistically significant at a one percent probability level based on the F-test.

The coefficient of the age of the sample farmer-respondent has a positive sign significant effect on WTP at a 10 percent probability level. This implies that older people are more financially stable and may tend to attribute a bequest value to conserve the forest. However, the study of Truong (2007) showed that the age of the respondent did not affect WTP. The coefficient of the income of the farmers shows that income is positively associated with the WTP value for each individual. This variable is statistically significant at a one percent level. This result implies that income has a strong positive effect on WTP. This finding indicates that for sample farmer-respondents who agree to pay more for these services, their maximum WTP value is highly dependent on income. The coefficient of the training variable has a positive sign significant at a one percent level. The regression result implies that forest users who understand what the flooded forest is have a greater appreciation of its importance and are willing to pay more for conservation.

© ISERD

Most of the sample farmer-respondents preferred to pay the WTP fee monthly. They thought that it is better to collect the money every month, maybe the first week or last week of the month because they will not forget it and it is easy to keep some money for the project.
In terms of the payment vehicles, most of the sample farmer-respondents (95 percent) would like the community itself to collect the WTP fund (Table 6). They have confidence in the implementation if the community collects the contribution fee. They also prefer the village leader or community leader to collect the money.

Table 6 Payment vehicle for the WTP fee of sample farmer-respondents

Item	Number	Percent (%)
Community collector	122	95
Tax	3	2
Electricity bill	4	3
Total	129	100

CONCLUSION

Findings of the multiple regression model on the farmers' WTP revealed that three of the seven explanatory variables were significantly related to the respondents' willingness to pay. The respondents' was affected by factors such as age, income and participation in training programs. In terms of the method of collection, most of respondents would like the community itself through the village leader to collect the WTP fund. The respondents said that they would prefer to pay the WTP fee monthly.

The following recommendations are aimed at helping to improve flooded forest conservation efforts through a conservation fund which can be set up by determining the farmers' WTP. The funds collected from the use of natural resources must be invested in areas where these originate, be it directly in the areas where the resources are generated or into direct activities which promote sustainable use of resources. Capacity building activities on CNRM to strengthen management and conservation efforts must be undertaken. A conservation fee in the Prey Koh Biodiversity Conservation Area must be imposed and collected.

REFERENCES

Calderon, M.M., Camcho, L.D., Carandang, M.G., Dizon, J.T., Rebugio, L.L. and Tolentino, N.L. (2004) A water user fee for households in Metro Manila, Philippines.

Coase, D. (1960) The problem of social cost. Journal of Law and Economics.

Israel, G.D. (1992) A series of the agricultural education and communication department, Florida cooperative extension service. Institute of Food and Agricultural Sciences, University of Florida, USA.

Patrick, T., Melisa, M. and Kiran, P. (2004) Flood forests, fish, and fishing villages, Tonle Sap, Cambodia.

Truong, T.D. (2007) Willingness to pay for conservation of the Vietnamese Rhino. EEPSEA publication http://www.eepsea.org.

Yamane, T. (1967) Statistics, an introductory analysis, 2nd ed., New York: Harper and Row.

© ISERD