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Willingness to Pay of Households for Conservation of Seagrasses in Nueva Valencia, Guimaras, Philippines

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Abstract

Seagrass is one of the neglected and undervalued coastal resources in the Philippines. This study was conducted to find solutions to the problem of seagrass decline by assessing the willingness of the residents of Guimbal, Iloilo, to pay for the conservation of seagrasses in Barangay Tando, Nueva Valencia, Guimaras. The lack of policies and conservation financing that would protect and improve the integrity of the seagrass is a constraint not only on the associated resources but also on the livelihood of the people who are dependent on the resource. Contingent valuation method (CVM) was used to elicit people's willingness to pay to a conservation trust fund for the protection and improvement of the state of the estimated 20 ha area of seagrass in Barangay Tando. The study found that 89.32 % of the respondents would be willing to pay, PHP900,917.64 (US$16,919.4) that could be raised annually to fund the conservation of seagrass. Given this potential source of revenue, the residents preferred a payment collection scheme through additional taxes on property or utility bills. Furthermore, this study reveals pertinent socio-economic and conservation financing implications that need to be considered in managing seagrass resources.

Keywords: seagrass, economic valuation, contingent valuation method, Guimaras

Introduction

Seagrass beds are considered one of the most productive natural ecosystems in the world (Phillips 1978) as they serve as nursery, refuge, breeding ground and home to many marine fishes, reptiles, and invertebrates with important economic, ecological and conservation value (Thorhaug 1986; Walker and McComb 1992). The Philippines is rich in seagrass diversity such that Fortes (2013) claims that 18 species of seagrass, out of the 60 species found worldwide (Saenger et al. 2013), are discovered within the 529 identified sites in the country. In Guimaras Island, Philippines

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seagrass meadows serve as the center of economic activities such as shellfish gleaning, seaweed farming, sea cucumber collection and fishing using gill nets (Nievales 2008).

However, similar to other marine ecosystems, seagrass beds are faced with serious threats from several anthropogenic activities. According to the respondents in Guimaras alone, the major threats to seagrasses include coastal infrastructure developments, deliberate harvesting of seagrasses and associated resources, water pollution, destructive fishing activities and increasing population in the coastal areas that is primarily dependent on the resource for food and basic sources of livelihood. Despite this, it is not clear how much the local communities value the benefits that can be derived from seagrasses, or if they are concerned of the seagrass ecosystem. Similarly, because the nature of the benefits provided by seagrass are unfamiliar or unknown to most people, its values are not realised, thus these are not given serious attention especially in the decision-making processes (Subade 2005).

This study aimed to determine how the people in the selected barangays of Guimbal, Iloilo perceived the economic value of seagrass beds in Brgy. Tando, Nueva Valencia, which are located across Iloilo Strait. It specifically aimed to determine the factors that affect their willingness to pay for seagrass conservation. This study could fill the gap with the knowledge on how the adjacent communities value the seagrass beds, using the willingness to pay of the people, who are not directly benefiting from the resource. In line with this, results of the study can help in providing information on the value and importance of seagrasses to the adjacent communities, so that activities that pose threats to its existence will be minimised and eventually removed. Furthermore, this study also focuses on determining the costs of conserving the seagrass resources and other benefits and determine the conservation value of or the social benefits derived from the said resource.

Materials and Methods

The study sites

The research focused on the non-use values of the seagrasses in Barangay, Tando, Nueva Valencia, Guimaras (Fig. 1). As a third-class municipality of Guimaras, Nueva Valencia is bounded by the municipality of Sibunag from the north, Iloilo Strait from the south and west, and Guimaras strait from the east. It has 22 barangays (14 are coastal, six are inland, and two are island barangays). Nueva Valencia, as of 2010 census, had a population of 37,852 and a total household of 8,176.

Guimaras Island is home to some of the richest marine ecosystems. One can also find a great number of marine protected areas, including the Taklong Island National Marine Reserve (TINMAR), which represents a large network of the marine protected area (MPA) that was established to secure the protection and improvement of marine biodiversity in the area. TINMAR is co-managed and maintained by various institutions under the Protected Area Management Board (PAMB) in which the University of the Philippines Visayas is a member. An estimated 20 hectares of seagrass covered area is found in TINMAR (Nievales 2008).

Barangay Tando is one of the 22 barangays comprising the municipality of Nueva Valencia. It is approximately 10 km from the Poblacion. Bounded by barangays Dolores and Napandong in the north and barangay Lucmayan in the east. As of 2014, Barangay Tando has a population of 1,020, distributed between 225 households and 278 families.

The contingent valuation survey on the non-use value of seagrass was conducted on an off-site area where there were no seagrass beds and where the residents are not benefitting directly from its goods and services. Based on the criteria above, the chosen off-site for the survey was the municipality of Guimbal, Iloilo (Fig. 1). The factors considered for choosing Guimbal as the off-site area for the survey were its considerably distance from the seagrass resource and low probability of the residents' having research or survey fatigue. The municipality of Guimbal is situated at the Southern part of Iloilo province. It is a fourth-class municipality of Iloilo and a coastal town that is facing the Guimaras Strait on its South-eastern seaboard. It is 29 kilometres away from Iloilo City. It is composed of thirty-three (33) barangays and with a population of 32,325 as of 2010.

Fig. 1. Map of study sites showing Guimbal, Iloilo and Nueva Valencia, Guimaras. Source: Adapted from OCHA (2014) 3W database.

Sampling method

In selecting participants for the focus group discussion (FGD), the respondents were chosen purposively, based on the group or sector of the community in which they belong. Each of the two conducted FGDs were comprised of four sectors from the community. For each sector, two individuals were picked to complete a total of eight participants per FGD session.

A total of 400 respondents (household representatives) were randomly selected for the survey. The sample size was determined based on the total number of households in Guimbal (N = 6,804) and using a confidence coefficient of 95 % (P = 0.05). Using the formula,

$$n = \frac{N}{1+Ne^2}$$

where N is the population size and e is the margin of error (Almeda et al. 2010 as cited in Tejada and Punzalan 2012).

The respondents were sampled using systematic sampling with a random start-with replacement. The sampling method was used to make sure that the sample would represent the whole population that was studied (Laerd Research 2012). The method was implemented to reassure that the process of selecting respondents was guided by probability methods. The study also adopted fixed-number sampling (of 20 households) spread across 20 randomly selected barangays among the total of 33 barangays in Guimbal. Also, the process of selecting the 20 barangays was through stratified sampling integrated with the fish-bowl approach. All the 33 barangays were stratified into three groups based on the barangays with the highest population, lowest population, and average population. Among the three groups, seven barangays were randomly picked, using fish-bowl approach. A systematic random sampling would only be possible if the master list of the respondents of the whole population is available (Laerd Research 2012). Hence the study acquired the updated lists of all households of the barangays which were randomly selected.

The contingent valuation method

Contingent valuation method (CVM) is a widely used method for estimating individuals' willingness to pay (WTP) values vis-à-vis the conservation or improvement of certain environmental resources. The CVM is employed by constructing hypothetical markets for a resource that has no prevailing market. Then through the hypothetical market, the respondents can express their willingness to pay for the specific changes in the quantity or quality of the resource under the specified contingencies (Mitchell and Carson 1989; Schkade and Payne 1994).

Since seagrass conservation is a non-market good, its non-use values were measured in this study using CVM. A dichotomous choice framework was used in eliciting for the bids or willingness to pay values of respondents.

The questionnaire that was used in this study was formulated using the data gathered from the focus group discussions. Before implementing the final survey, the designed questionnaires were pre-tested in one of the barangays in Tigbauan, Iloilo. During the final survey, a face-to-face interview was facilitated with an aide of pictures of seagrass.

Hypothetical scenario

The biology and functions of the seagrasses were conveyed to the respondents using colourful pictures of the seagrasses, the services it provides, and its associated resources. The hypothetical market is stated as follows:

"The seagrass resources of Nueva Valencia, Guimaras is slowly declining due to human activities. Thus, in order to remedy the problem, let us suppose, a multi-sectoral group, composed of various NGOs, POs, religious institutions, youth organizations and the Provincial Government of Iloilo and Guimaras, will be working together to establish a program which can help save and protect the seagrass resources of TINMAR – as part of our human obligation to preserve and protect the environment. However, for the program to materialise and its objectives realised, it needs sufficient funding from sustainable sources. Thus, the support of residents across the provinces of Iloilo and Guimaras in the form of monetary contribution shall be collected for the successful implementation of the project. Consequently, the committee shall collect a fixed amount of money from the residents for the said conservation program. The money that will be collected will only be used for the conservation of seagrasses in TINMAR.

The conservation program that will be implemented shall be institutionalised, which means areas where seagrasses are primarily located shall be established as a "No Take Seagrass Marine Reserve", wherein all forms of extractive activities shall be prohibited, and some other forms of non-extractive activities (including recreation) shall be regulated, through proper legislation.

The result of this survey will be used as a guide. If the majority votes for "Yes", that means the program will be implemented, and the local government will ask people for their contribution. However, if the majority for "No", that means the program will not be implemented because there will not be enough funds to support it."

Elicitation format

The elicitation format chosen in this study was the dichotomous choice framework. This is stated as follows:

"Considering the above situation, would you be willing to pay _____ pesos as your yearly contribution (through a monthly electric surcharge of ____ to the conservation fund for the next 5 years, to conserve and protect the seagrass ecosystem in Nueva Valencia, Guimaras? Please keep in mind your present income and financial commitments."

The interviewer then mentioned the randomly assigned price bid to the respondent. There were five bid prices which were derived during the focus group discussion mentioned earlier. Once the bid prices were determined, each of the price bids were equally randomly assigned to 80 study respondents out of the total 400 sampled respondents.

Development of contingent valuation model

The binary logit regression model was used in this study to determine the respondents' mean WTP. In total, four models were generated using different data sets, as adopted from similar studies of Subade (2005) and Bradecina (2014), namely:

a) the original or uncorrected model (Model 1) – which uses all the original positive and negative responses to the WTP question.
b) the certainty model (Model 2) – which applies to the positive responses. All positive responses of respondents who were either not sure or not very sure (whose certainty level falls below eight) of their answers were considered as negative responses and replaced with 0 (WTP = 0) in the binary logistics regression run.
c) the protest (scenario rejectors) model (Model 3) – which applies to the negative responses. Negative responses that were given for the reason: "I do not believe that this conservation program will solve the problem of seagrass depletion", which describes the hypothetical provision of the good (the conservation of Brgy. Tando Seagrasses), were dropped from the regression analysis.
d) the certainty plus protest model (Model 4) – considers the positive responses of respondents whose certainty level fell below eight as negative, and replaced them with 0 in the binary logistics run (as in Model 2); at the same time, observations with negative answers to WTP and protest statement were dropped from the regression analysis (as in Model 3).

Analysis of the data

In this study, the dichotomous, close-ended CVM was used. The WTP formula that was employed in this study was adopted from the model specified by Hanemann (1984) as cited by Subade (2005) and Bradecina (2014), which assumes a representative consumer who has an indirect utility function V (P, M, Q, S), where the person's total utility depends on (P) price, (M) income, (S) socioeconomic characteristics, (Q) and quality of the good (or resource) that is being studied. When asked whether he/she would pay a given price P to help conserve and protect the seagrass meadows in Barangay Tando, Nueva Valencia, Guimaras, the person will answer "yes" if:

$$V(M - P, Q^1, S) > \ V(M - 0, Q^0, S) \qquad (Equation\ 1)$$

Equation 1 shows that the respondent will answer "yes" if the utility derived from improving the quality of seagrass meadows in Barangay Tando, Nueva Valencia, Guimaras (Q^1) and the paying price (P) is higher than the utility derived from not having improved the seagrass meadows (Q^0) and not paying the price (P = 0). Thus, the probability of the respondent saying "yes", if V (P,M,Q,S) is the observable component of the utility, can be expressed as:

$$Prob\ (Yes) = Prob\ [\ V\ (M - P, Q^1, S)\ +\ \varepsilon_1 >\ V\ (M - 0, Q^0, S)\ +\ \varepsilon_0] \qquad (Equation\ 2)$$

where $\varepsilon_i$is an unobservable component of the utility. Assuming that the random variable ε_i follows a logistic probability distribution, the equation can be written as:

$Prob(Yes) = \frac{1}{1+e^{-\Delta}}$, where $-\Delta\ =\ V\ (M - P, Q^1, S) >\ V\ (M - P, Q^0, S)$ $\qquad (Equation\ 3)$

Hence, the non-use benefit of the hypothetical market to conserve and protect seagrass meadows is reflected to the WTP and is defined as:

$$V\ (M - WTP, Q^1, S)\ >\ \ V\ (M - P, Q^0, S) \qquad (Equation\ 4)$$

Hanemann (1984) shows that if the indirect utility function V(M,P,Q,S) is linearly specified, then the probability of the respondent saying "yes" is defined by,

$$Log\left[\frac{Prob\ (Yes)}{1 - Prob\ (Yes)}\right] =\ \alpha_0 - \beta_1 P\ +\ \beta_2 Q\ +\ \Sigma\beta_1 S_1 \qquad (Equation\ 5)$$

Parameters $\alpha_0\ and\ \beta_i$ was estimated parametrically with the use of binary logistic regression, through the help of GRETL. The mean WTP for the conservation and protection of seagrass meadows in Barangay Tando, Nueva Valencia, Guimaras was calculated using the formula:

$$Mean\ Maximum\ WTP\ =\ \frac{1}{\beta_1}\left[1n\left(1 + e^{\alpha_0+\beta_2 Q+\Sigma\beta_1 S_1}\right)\right] \qquad (Equation\ 6)$$

Equations 5 and 6 were estimated using GRETL and EXCEL.

However, Subade (2005), Haneman's mean WTP sometimes has an over-estimated value when the percentage of "no" responses are increasing as the bid prices increase. Haab and Turnbull Mean WTP was stressed by Subade (2005) that offers best estimates.

Turnbull Mean WTP is defined as:

$$Mean\ WTP = \sum_{j=0}^{M*} tj(F^*j + 1 - F^*j)$$

Where:

F*j = $\frac{N*j}{T*j}$

N_j = number of responses

T_j = number of people offered in the specific bid

t_j = bid prices

The social WTP was determined by multiplying the mean WTP to the total number of households in Guimbal:

Social WTP = (Mean WTP) × (Total number of households in Guimbal)

Results

Socio-economic and demographic characteristics of the study respondents

Table 1 shows the socio-economic and demographic characteristics of the respondents. Respondents of this study have an average age of 50 years, and most of them are females (64.75 %). Out of the interviewed respondents, 71.25 % are married, and 56.64 % are household heads. The mean educational attainment of the study respondents is 10 years or High School level. The average household size of the study respondents is four and with an average of two individuals contributing to the annual household income where 70 % are employed. The top sources of income are farming (12.75 %), skilled labour (10.00 %) and retirement pension as well as financial assistance from relatives (9.75 %). On average, the annual income of the respondents' household is PHP149, 040.00 (US$2,808).

Awareness of national issues related to coastal problems

The three major coastal problems identified by the respondents, in the order of its perceived severity and seriousness are illegal fishing (35 %), waterborne pollution (22 %), and sea level rise (20 %). However, a large percentage of the respondents did not rank their perceived coastal problems, and only seven respondents identified the problem of decreasing seagrass beds as a major environmental problem. Hence it has the lowest rating among all the listed coastal problems (Table 2).

Table 1. Socio-economic and demographic characteristics of survey respondents from Guimbal, Iloilo.

Variables	Respondents (N = 400)
Age (years)	Mean = 50 St.dev = 14.4
Sex	
Male	141 (35.25 %)
Female	259 (64.75 %)
Civil Status	
Single	42 (10.50 %)
Married	285 (71.25 %)
Widowed	62 (15.50 %)
Separated	6 (1.50 %)
Living-in	3 (0.75 %)
Common-Law	2 (0.50 %)
Household Heads	218 (56.64 %)
Others	181 (41.36 %)
Educational Attainment (years)	Mean = 10, St. dev = 4.2
Religion	
Roman Catholic	382 (95.50 %)
Protestants	6 (1.50 %)
Iglesia Ni Cristo	3 (0.75 %)
Aglipayan (IFT)	0 (0.00 %)
Seventh Day Adventist	0 (0.00 %)
Islam	1 (0.25 %)
Others (Baptist, Jesus Is Lord, and Assembly of God)	8 (2.00 %)
Household Annual Income (PHP)	Mean = 149,040.00 St. dev = 224,350.00

Table 2. Coastal environmental problems identified by survey respondents from Guimbal, Iloilo.

Variables	N = 400			
	1st	2nd	3rd	Total
1. Illegal fishing	141 (35 %)	55 (14 %)	42 (11 %)	238
2. Increasing population (in the coastal areas)	48 (12 %)	64 (16 %)	27 (7 %)	139
3. Overfishing	24 (6 %)	39 (10 %)	37 (9 %)	100
4. Decreasing seagrass beds	- 0	3 (1 %)	4 (1 %)	7
5. Increasing number of commercial fishers	8 (2 %)	19 (5 %)	11 (3 %)	38
6. Water pollution	68 (17 %)	88 (22 %)	59 (15 %)	215
7. Sea level rise	60 (15 %)	41 (10 %)	81 (20 %)	182
8. Natural calamities (storms, tsunami, storm surges)	19 (5 %)	6 (2 %)	6 (2 %)	31
9. Destruction of coastal resources (land reclamation, dredging)	4 (1 %)	12 (3 %)	7 (2 %)	23
No answer	28 (7 %)	73 (18 %)	126 (32 %)	227

Note: Respondents were allowed multiple responses. Values in parentheses are a percentage of last-column totals.

Knowledge and awareness

In measuring the knowledge and awareness of the study participants about seagrass, they were asked whether they heard and knew about the resource prior to the conduct of the survey. The majority of the participants have not heard (68 %) nor have had any knowledge or idea (69 %) about seagrass (Table 3). Subsequently, only 31 % of the respondents correctly answered that seagrass are plants (however some use it interchangeably with seaweeds) and 68 % of them do not have any knowledge or basic idea as to what constitutes a seagrass.

Table 3. Guimbal respondents' knowledge and awareness of seagrass.

	Idea about seagrass			
	Has heard about seagrasses		Have an idea about seagrasses	
Answer				
	No.	%	No.	%
Yes	128	32	126	32
No	272	68	274	69
Total	400	100 %	400	100 %
	Perception towards seagrass			
	No		%	
Wood	1 (mangrove)		.3	
Bird	0		0	
Plant	126		31	
Animal	0		0	
Others answers	1		.3	
No answer	272		68	

The willingness to pay results

The willingness to pay of the study respondents from the sampled barangays of Guimbal is presented in Tables 4. The result shows that 75 % (301) of the total number of study participants answered "YES" to the willingness to pay question with the corresponding bid price without the adjustment to the level of certainty. The results also show that there is a consistently decreasing trend in the number of participants who answered "yes" to the WTP question as the bid price increases, which is consistent with the law of demand.

Table 4. Willingness to pay results of survey respondents from Guimbal, Iloilo.

Bid prices	Without the adjustment to the level of certainty			With the adjustment to the level of certainty (8–10)		
	Yes	No	N	Yes	No	N
20	69 (86 %)	11 (14 %)	80	58 (73 %)	22 (27 %)	80
50	63 (79 %)	17 (21 %)	80	49 (61 %)	31 (39 %)	80
100	60 (75 %)	20 (25 %)	80	47 (59 %)	33 (41 %)	80
150	58 (73 %)	22 (27 %)	80	41 (51 %)	39 (49 %)	80
200	51 (64 %)	29 (36 %)	80	37 (46 %)	43 (54 %)	80
Total	301 (75 %)	99 (25 %)	400	232 (58 %)	168 (42 %)	400

Note: Values in parentheses are percentages of total N.

However, when adjusted to the level of certainty (which means those who answered "YES", but their level of certainty was seven and below, their "yes" response was considered as a "NO" response), respondents who were willing to pay were only 58% of the total sample.

Respondents who answered "YES" were also asked among the variables their reasons for their willingness to pay for the conservation of the seagrass meadows in Brgy. Tando (Table 5). They were also asked to rank these reasons from 1st to 3rd to know the rationale behind their positive WTP. The results suggest that the primary reason why the respondents want to conserve the seagrasses was for the benefit of the future generations (bequest value, rank 1st), followed by the desire to conserve it for the benefit of the different animals and fish species that depend on seagrasses for their own survival (existence value, rank 2nd), and thirdly the desire to sustain the lives of the people who depend greatly on the seagrasses for food, income, livelihood, and protection (non-paternalistic altruistic motive, rank 3rd).

Table 5. Guimbal respondents' reason for willingness to pay for the conservation of seagrasses in Nueva Valencia, Guimaras.

Variables	N	Ranking		
	(%)	1st	2nd	3rd
1. I want to conserve it for I regularly go there. (Direct use)	120 (40 %)	5 (2 %)	4 (1 %)	3 (1 %)
2. I want to conserve it for it is where I get the fish that I catch and consume. (Direct use)	188 (63 %)	37 (12 %)	29 (10 %)	23 (8 %)
3. I want to conserve it so the future generations. (Bequest value)	287 (95 %)	93 (31 %)	40 (13 %)	49 (16 %)
4. I do not use the seagrasses right now but, but I am willing to contribute for its conservation to have the option of visiting or using it in the future. (Option value)	249 (83 %)	26 (9 %)	28 (9 %)	20 (7 %)
5. It is my greatest pleasure to know that there are still seagrasses. (Existence value)	279 (93 %)	5 (2 %)	22 (7 %)	15 (5 %)
6. I am concerned with the different species of animals and fishes that depend on seagrasses. (Existence value)	295 (98 %)	38 (13 %)	58 (19 %)	41 (14 %)
7. I believe that it is our moral duty, as humans, to conserve it. (Moral duty)	291 (97 %)	49 (16 %)	53 (18 %)	59 (20 %)
8. I want to conserve it because I am concerned with the people who depends on the goods and services that the seagrasses could provide, and also, these goods and services should be available to others. (Non-paternalistic altruistic motive)	290 (96 %)	42 (14 %)	50 (17 %)	70 (23 %)
9. I want to be active in the different programs that the government is having to conserve seagrasses. (Good cause)	225 (75 %)	4 (1 %)	13 (4 %)	14 (5 %)
10. Seagrass could help in maintaining the beauty of nature, sequester carbon, and may help in battling climate change	4 (1 %)	2 (1 %)	0	1 (0.3 %)
No answer	0	0	4 (1 %)	6 (2 %)

Note: N = 301. Values in parentheses are percentages of the total respondents who answered YES to WTP. Respondents were allowed multiple responses and then variables were ranked from 1st to 3rd.

Although in the proposed hypothetical scenario, the contribution was only once a year and it would be billed through the electric surcharge, all those who answered "YES" were still asked if they were given an option, how often would they want to pay per year and what payment vehicle would they want to use? The results suggest that the majority of the respondents who answered "YES" still prefer the proposed frequency of payment and payment vehicle in the proposed hypothetical scenario (Table 6).

Table 6. Payment vehicle and time preference of respondents from Guimbal, Iloilo.

Variables	N	%	Variables	N	%
Yearly	262	87	Community tax	70	23
Quarterly	25	8	Electric bill	149	50
Semiannually	14	5	Pay directly to the organization that is in charge of the program	82	27

Note: N = 301

Respondents who indicated their unwillingness to pay for the study were also asked to indicate their reasons (Table 7). Among the 99 respondents who answered "NO" for the WTP questions, 71 % identified the lack of money to pay for conservation as the number one reason for their unwillingness to pay, followed by mistrust in the local government in terms of implementing the program (33 %) and the strong belief that only those who directly benefit from seagrasses should participate and pay for its conservation (16 %). Additional reasons were also cited by the respondents like being too old to participate in the said conservation program and not directly benefiting from seagrass.

Similar to what other CVM studies claimed (Subade, 2005), the following reasons were considered as "Protest Votes":

1) reason no. 1 - I do not believe that this conservation program will solve the problem
2) reason no. 3 - No matter how much the government planned to conserve the seagrasses, they will not be successful because the residents of the area are the number reason why the resource is depleting,
3) reason no. 5 - I do not trust the local government for this program
4) reason no. 9 - I do not believe that the fund will go directly to the seagrass conservation

Table 7. Guimbal respondents' reason for non-willingness to pay for the conservation of seagrasses in Nueva Vaencia, Guimaras.

Variables	No.	Ranking 1st	2nd	3rd
1. I do not believe that this conservation program will solve the problem.	63 (64 %)	5 (5 %)	2 (2 %)	12 (12 %)
2. The local government could ask for additional funds in the higher government.	83 (84 %)	7 (7 %)	12 (12 %)	14 (14 %)
3. I strongly believe that no matter how much the government planned to conserve the seagrass, they will not be successful because the residents of the coastal areas are the number one reason why the resource is depleting.	78 (79 %)	2 (2 %)	10 (10 %)	9 (9 %)
4. I have no money to pay for the said resource.	87 (88 %)	70 (71 %)	11 (11 %)	2 (2 %)
5. I do not trust the local government for this program.	68 (69 %)	6 (6 %)	33 (33 %)	12 (12 %)
6. Those who directly benefit from are the ones who should conserve it.	69 (70 %)	0	9 (9 %)	16 (16 %)
7. Those who have higher income are the ones who should conserve it.	61 (62 %)	1 (1 %)	4 (4 %)	13 (13 %)
8. I would rather give my money to those who really need it like charities.	61 (62 %)	0	3 (3 %)	2 (2 %)
9. I do not believe that the money that I will contribute will go directly for seagrass conservation.	70 (71 %)	2 (2 %)	3 (3 %)	4 (4 %)
10. I am too old to help for seagrass conservation	5 (5 %)	6 (6 %)	1 (1 %)	1 (1 %)
11. I do not really benefit from seagrass (directly)	3 (3 %)	0	0	0
No Answer	0	0	11 (11 %)	14 (14 %)

Note: N = 99. Values in parentheses are percentages of the total respondents who answered NO to WTP. Respondents were allowed multiple responses and then variables were ranked from 1st to 3 rd.

These reasons were considered as "Protest Votes" or "non-zero value reasons" by other researchers who used CVM. These protest votes were said to be non-zero values, therefore should not be included in regressing the WTP function. Respondents may answer these reasons for not-willing-to pay, but that does not indicate that their answers were considered as zero. The respondents may be objecting to some aspects of the survey, for example, they objected how the contingent valuation was phrased or questioned, and these respondents were also called "scenario rejecters" because they are against of the hypothesized market for the said "good". Moreover, respondents who replied "NO" to the WTP question may be undecided.

Factors affecting WTP for seagrass conservation

The variables used for CVM regression are identified and described in Table 8. Based on the four possible logit models (Table 9), the preferred model to be used for WTP estimations is the fourth model, wherein scenario rejecters are excluded, and certainty criterion were applied (protest plus certainty); because based on the similar studies to which the authors used as reference, this model could provide them with a more reliable and realistic WTP estimate. Subade (2005), explains that "the 'no' replies of scenario rejecters, otherwise called protests, are non-zero 'no's', as such it does not make sense to include them in the analysis and taking them as zeroes. If these observations with non-zero no's are included in the regression, it only means recognising them as actual zero, and so the resulting WTP would be smaller."

Table 8. Definition of variables used in the willingness to pay regression.

Variable	Definition
AGE	respondent's age in terms of years
EDUC	years of formal education
SEX	sex of respondent
KNOWIND	knowledge index (score based on a 10-point scale)
HEADHH	position of the respondent in the household (head of the household or not)
HEARD	heard or learnt about the seagrasses
SIZEHH	the size of the respondent's household
ECONSTAT	respondent's economic status (dependent or independent to/from other members of the household)
INCOME	annual income of household in pesos
BID	bid price (willingness to pay for seagrasses) in pesos

In addition, the "yes" replies need to be qualified "since several of those that were given by respondents whose certainty of their reply is less than eight, and thus the 'yes' virtually became a zero". Ideally, the adjustment could have extended to 9–10 certainty, hence "yes" replies with a certainty of eight and below would have been changed into "no", however, the regressions estimates that were generated were not good.

Generally, the integration of these two conditions (scenario rejector and uncertainty) in the model would mean a lower (or more conservative) estimate of the mean WTP.

The results in Table 9 shows that the variable bid amount (BID) was significant in all models except for model 3. Age was also significant, however only for model 1. Household size (SIZEHH) was also significant for models 1 and 2 but not for models 3 and 4. The economic status of the respondent (ECONSTAT) was significant only in model 2.

Among all models, model 4 had the most number of statistically significant variables, which are the bid amount (BID), the years of education (EDUC), sex (SEX), and economic status (ECONSTAT).

Table 9. Regression results of binary logistic regression model on willingness to pay for conservation of sea grass in Nueva Valencia, Guimaras, 2015.

Variables	Model 1 Uncorrected	Model 2 Certainty	Model 3 Protest	Model 4 Protest + Certainty
CONSTANT	1.301	- 1.141	2.208	- 1.594
	(0.837)	(0.749)	(1.454)	(0.936)
BID	- 0.006	- 0.006	- 0.006	- 0.005
	(0.002) [a]	(0.002) [a]	(0.003)	(0.002) [b]
AGE	- 0.021	0.003	-0.028	0.011
	(0.001) [b]	(0.009)	(0.015)	(0.01)
EDUC	- 0.001	0.026	0.083	0.107
	(0.028)	(0.028)	(0.064)	(0.044) [b]
SEX	- 0.297	0.267	0.232	0.631
	(0.305)	(0.260)	(0.458)	(0.3) [b]
KNOWIND	0.084	0.065	- 0.034	-0.002
	(0.044)	(0.039)	(0.065)	(0.045)
HEADHH	0.278	0.085	0.788	0.237
	(0.316)	(0.27)	(0.457)	(0.303)
HEARD	0.334	0.205	0.691	0.185
	(0.309)	(0.252)	(0.472)	(0.283)
SIZEHH	0.142	0.121	0.062	0.0578
	(0.069) [b]	(0.0596) [b]	(0.1)	(0.068)
ECONSTAT	0.399	0.601	0.563	0.725
	(0.266)	(0.239) [b]	(0.396)	(0.277) [a]
INCOME	1.369E - 06	6.206E - 07	- 1.462E - 07	- 1.912E - 07
	(8.086E - 07)	(5.74E - 07)	(8.624E - 07)	(6.002E - 07)
No. of Observations	400	400	337	337

Note: Values inside parentheses are standard errors [a] significant at $P < 0.01$ and [b] significant at $P < 0.05$

The negative vectors of BID throughout the four models were consistent with the study hypothesis and the theoretical framework. Although, the positive sign of income did not remain consistent especially in the last two models (models 3 and 4). The negative and significant correlation of bid amount to the WTP implies that the probability of respondents' willingness to pay for the conservation of seagrasses in Brgy. Tando decreases as the bid amount increases.

Using coefficients based on regression results, and the corresponding mean of the variables, the mean WTP was computed following the formula of Hanemann:

$$Mean\ WTP = \frac{1}{-0.00486929}\left[1n\left(1 + e^{\{-1.59385+0.0113092(49.745)+\ldots..\}}\right)\right]$$

$$= \text{PHP } 318.63$$

The resulting WTP estimate (Table 10) for seagrasses calculated through Hanemann's formula was PHP318.63 (US$6.00) which was low compared to the annual average income of the residents in Guimbal. To compute for a more conservative (or the lower bound) estimate of the mean WTP, the Turnbull estimator by Haab and McConnell was used (Subade 2005). Consequently, the computed Turnbull WTP, using the preferred model (Model 4), was PHP132.41 (US$2.50). Again, using the

Turnbull WTP, the total social WTP or social benefit of conserving the seagrasses of Barangay Tando, Nueva Valencia amounted to PHP900,917.64 (US$16,796.10) per year.

Table 10. Mean WTP estimates based on the survey conducted.

	Model 1 Uncorrected	Model 2 Certainty	Model 3 Protest	Model 4 Protest + Certainty
Mean WTP	348.94	227.31	534.6	318.63
Turnbull WTP	144.31	109.75	175.7	132.41
No. of Observations	400	400	337	337
Yes response to WTP	301 (75.25 %)	232 (58 %)	301 (89.32 %)	232 (68.84 %)

Discussion

The result of the study showed that residents of Guimbal, Iloilo, were willing to pay for the conservation of seagrasses in barangay Tando, Nueva Valencia, Guimaras. This is reflected on their positive response to the dichotomous choice WTP question about contributing towards a trust fund for the seagrass conservation and protection program. These positive responses amounted to 89.32 % of the total 337 valid observations (after dropping the scenario rejecters). This percentage of "YES" replies is significantly and inconsistently higher compared to the findings of other studies on non-use values, whose "YES" results usually fall below 50 % (Subade 2005). The possible reason for this is the relatively low value of the higher bound price bids, i.e., PHP150 (US$2.82) and PHP200 (US$3.76).

Compared to other valuation studies which used CVM, the resulting WTP estimate (PHP318.63=US$6) is also absolutely lower. Nevertheless, this estimate is still higher compared with the maximum price bid of 200.

The WTP amount if properly collected through the household's electric bill could serve as a source of fund for starting an environmental program or policy which would serve to protect, conserve, and improve the quality of seagrasses and its associated resources in Barangay Tando.

The study of Unsworth et al. (2010) provides the first direct assessment of the financial value of a seagrass ecosystem with special reference to the Australian region. With minimal protection and valuation of the direct financial value of seagrass, its standing stock could triple. The study also indicates the importance of seagrass meadows in Indonesia and suggests that the estimated value of seagrass could be an important factor for adding seagrass conservation in their budget.

Socio-demographic variables that affected the respondents' willingness to pay decision were: years of formal education, sex, and economic status (of being dependent or independent). All these variables had positive effects or relationship to the likelihood of WTP. The positive relationship between years of education and WTP imply that if any person has greater knowledge, appreciation,

and understanding towards any particular resource, this would increase the likelihood of that person willingness to pay for the protection or conservation of that resource. Also, the positive coefficient of the dummy variable "SEX" denoted that women positively affects the WTP. In addition, the positive relationship between WTP and the dummy variable "economic status" suggested that economically independent persons increase the probability of WTP. On the contrary, as expected, the bid price had a significant negative effect to WTP, which is consistent with the law of demand.

The main motives or reasons for WTP were dominantly non-use values. In particular, the top three reasons for WTP, based on the respondents' answers, were bequest values, existence values, and non-paternalistic altruistic motive. This support the finding of other studies on non-use values who found that WTP per household for environmental conservation or protection was attributed dominantly by non-use values, with bequest value as the most cited reason for WTP (Walsh and Bjonback 1990; Subade and Francisco 2014). Although a majority of the respondents had also identified use values (direct and option value) as reasons for their WTP, only a few had cited it as the main reason.

Some natural resources are thought to be "priceless" and "invaluable" that is why their financial value is often neglected. If the resource has no known financial or economic value, people are less willing to conserve it, and the loss of this resource may be perceived to be inconsequential or unavoidable (Unsworth and Cullen-Unsworth 2010). Therefore, providing economic value to the seagrass meadow can be based upon the different services and benefits it can provide. The value of seagrass varies across the world, and one value may not fit all. In 1997, Costanza et al. calculated the value of seagrass across the world according to the good and services that it could provide to be US$16–54 trillion per year for providing in cycling materials especially in acting as filters in the coastal waters. In East Bintan, Indonesia, seagrass is worth US$ 3.5 million to the local communities as estimated by Dirhamsyah (2007). Table 11 provided a list of studies conducted in valuing the seagrass meadows.

Table 11. Summary of seagrass valuation studies.

Service	Study	Location	Value
Fisheries exploitation	Watson et al. (1993)	Queensland, Australia	3,500 US$. ha^{-1}. yr^{-1}
Fisheries production	Author Unknown	Indian River Lagoon, US	1,862 US$. ha^{-1}. yr^{-1}
Fisheries production	McArthur et al. (2006)	South Australia	133 US$. $ha^{-1}.yr^{-1}$
Fisheries standing stock	Unsworth et al. (2010)	Wakotabi, Indonesia	47-109 US$. ha^{-1}. yr^{-1}
Nutrient cycling	Costanza et al. (1997)	Globally	19,004 US$. ha^{-1}. yr^{-1}
Restoration	Thorhaug (1990)	US	1,236 US$. ha^{-1}. yr^{-1}
Restoration	Engeman et al. (2008)	Florida US	140,752 US$. ha^{-1}. yr^{-1}
Use values	UNEP (2004)	SE Asia	215,000 US$. ha^{-1}. yr^{-1}
Use values	Kuriandewa et al. (2003)	South China Sea	80,226 US$. ha^{-1}. yr^{-1}
Carbon sink	Duarte and Cebrian (1996)	Mediterranean	*Up to 27 US$.$ha^{-1}.yr^{-1}$
Carbon standing stock	Duarte and Chiscano (1999)	Global	*Mean 28 US$. ha^{-1}
Total economic value	Dirhamsyah (2007)	East Britain, Indonesia	2,287 US$. ha^{-1}. yr^{-1}

Source: Unsworth and Cullen-Unsworth (2010)

It is also worth noting that during the first part of the interview, respondents did not identify nor recognise environmental problems and the loss of seagrasses as an important national issue. This could imply that they simply do not care or lack the necessary knowledge about important environmental issues. But when seagrass' benefits, status, and the need for conservation were presented to them, these posed a significant factor on the respondents' willingness to pay. Nevertheless, a number of the respondents were still sceptical about the resource, especially those who were new to the idea of seagrasses and those who have never heard of seagrasses. The lack of information on seagrass could be a factor to the small mean willingness to pay estimate.

According to Fortes (2013), in the last 30 years, almost all studies regarding seagrasses has been focused only on scientific and biological inquiry, while it was only in last 15 years that some researchers started to consider initiating ecological researches and adopting other approaches in their study. In order or address challenges related to the management of seagrass resources, a transdisciplinary approach is needed, with each proposed step undertaken holistically and not compartmentalised. Moreover, to make the measured economic values of seagrass relevant, integrated economic valuation (IEV) need to be undertaken, transcending demonstration (measurement) and capturing such (i.e. appropriation) through implementable policies / programs, and using (i.e. utilization) the captured economic values for (seagrass) resource renewal and sustainability (Subade 2013). Furthermore, there is a great opportunity and compelling grounds for regional collaboration and cooperation to undertake the issue of seagrass conservation (Fortes et al. 2018).

For future CVM studies on seagrass, it is recommended that sampled respondents be increased to minimise the effect of protest voters and will improve statistical results of regression. The scope of the study area should be widened to achieve greater diversity among the sampled respondents, and the willingness to pay will be true for a wider area. Moreover, it is recommended that an extensive research be undertaken on the different factors that could affect the willingness to pay for seagrasses and the reasons for rejection.

In light of the potential implementation of programs for the improvement of the resource, one aspect that the local government and other stakeholders could look into is the advocacy and campaign on education for raising awareness and knowledge about seagrasses since education is a significant factor affecting the WTP of people for conservation. These campaigns and advocacies should target schools, universities and colleges, and more importantly high schools and elementary levels. These programs should integrate into the curriculum a course on coastal resources management to help shape the consciousness of the youth regarding the importance of the environment and the current issues and concerns surrounding it.

The estimated 20-hectare area of seagrass meadows found in Brgy. Tando, should be included in the integrated system of MPA networks in Nueva Valencia, which are under the protection of an existing environmental institution and supporting forces like the *bantay dagat* (coastal patrol). The study showed that the main motivation for the people's WTP was bequest value. Hence, it is important

that the campaigns and advocacies for raising awareness about the coastal resources should integrate and emphasise the significance of the present generation's actions and obligations towards maintaining a healthy ecosystem for the future generations. These should also highlight the potential negative impacts of mismanagement and overexploitation of resources and to provide mechanisms to reverse the situation.

It is also important for the government to draft legislation declaring the coastal zones of Brgy. Tando as a protected area, supplemented by proper zoning and a regular budget appropriation. There should also be municipal ordinances that would serve to protect the coastal resources of the local community not only seagrasses as being part of the responsibilities and commitment of the LGU.

The growing popularity in seagrass studies will eventually result in the gradual change in people's views about seagrass. Consequently, the findings of the present study are expected to inspire many researchers and other government and non-government institutions to explore different approaches in developing their own studies and apply these to seagrass conservation. Furthermore, policy application of seagrass valuation needs should be pursued such that measured economic values can be captured for co-financing conservation.

Conclusion

This study empirically confirmed that off-site residents (in this case from Guimbal, Iloilo) placed positive economic valuation for seagrass conservation in a distant site (Nueva Valencia), as evidenced by their willingness to pay, providing evidence for non-use values for such vital coastal ecosystem.

Among the triumvirates of marine ecosystems (mangroves, coral reefs and seagrass) that protects the marine resources and environment seagrasses resources have been negleted because not much has been done in determining its value and importance. Until now the overall status of seagrass in the country is still unknown. This is due to the reason that multi-disciplinary studies on seagrasses, especially social studies, are particularly lacking, aside from the fact that previous studies covered limited sites across the country.

This study shows that as a normal good, seagrass conservation can solicit willingness to pay of Filipinos from off-site residents, following the law of demand. Women gave higher valuation of seagrass, while years of education positively influence willingness to pay, for the respondents covered by the study. This gives insights on applicable local policies and programs to conserve seagrass that are considered valuable by the respondents concerned.

Linking measured economic values with implementable policies and programs to capture such economic values, and translate them to sustainability of coastal ecosystems (like seagrass) will be a challenging task for integrated approaches in managing coastal resources.

Indeed, research on the social aspects, and even on multi-disciplinary and even trans-disciplinary perspectives of coastal ecosystems and fisheries need to be further pursued.

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