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HOUSEHOLDS' PREFERENCES AND WILLINGNESS TO PAY FOR WATERSHED SERVICES ATTRIBUTES IN NORTH SELANGOR PEAT SWAMP FOREST MALAYSIA

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ABSTRACT

Realising the objective of payment for ecological services (PES) schemes depends on adequate demand for these services and sustainable funding. We examine the viability of using locally financed payments as additional conservation funds to protect forest watershed services. The study employed choice experiment method to estimate the willingness to pay for watershed conservation in communities along Sungai Karang and Raja Musa forest reserve in Selangor Malaysia. A Multinomial logit (MNL) model was developed to derive the marginal value and mean willingness to pay (WTP) of the respondents on the non-market values of the forest reserve. The trade-off between four different forest watershed attributes showed that improvement in water quantity is the most preferred attributes. The total conservation value is estimated at RM12, 706.347.78. This indicates households are willing to pay for watershed conservation to ensure sustainable water supply. Thus proposing PES as an alternative source of fund for conservation of Sungai Karang and Raja Musa forest reserve.

Keywords: Forest management, Payment for ecosystem services, Choice experiment method, Households' preferences, Watershed service attributes.

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Contribution/ Originality

This study contributes to the existing literature by using the choice experiment approach to analyze willingness to pay for forest watershed conservation. It is also one of very few studies which have investigated Households' Preferences and Willingness to Pay for Watershed Services attributes in the forest reserve.

1. INTRODUCTION

Forest resource conservation in recent times has shifted from the conventional command and control practices to more dynamic approach such as Payment for Ecological Services (PES) for sustainable management. Forest ecological services are underestimated in development decisions because existing tools for assessing and valuing ecosystem services often fall short of the needs and expectations of decision makers. Thus, the need for integrated management options and PES, is a promising policy instruments for incorporating economic remuneration for ecological service to ensure sustainable watershed management. PES is a new conservation technique that focuses on

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incentives payments to land owners or stewards for investing in new land use practice that lead to conservation or production of specific environmental service (Engel *et al*., 2008).Therefore, the aim of this study is to estimate the economic benefit of forest watershed services and Households' Preferences and Willingness to Pay for Watershed Services Attributes. This research was conducted at the North Selangor Peat Swamp Forest (NSPSF) comprises of Sungai Karang Forest and Raja Musa Forest Reserves. This is largest remaining peat swamp forest on the west coast of Peninsular Malaysia, and is critical for biodiversity conservation, water resource management and carbon storage (Parlan, 2001).

In addition, the watershed recharge water downstream into *Sungai Bernam and Sungai Tengi* that drains into the main canal and the tertiary canals, and to the agricultural drain land of the Barat Laut Selangor irrigation area to ensure the supply of adequate and clean water for domestic and irrigation purposes. This watershed is seriously threaten as a result of human activities, couple with reduction in rainfall (Drought) (Aint1ddin and Goh, 2010; Sasidhran *et al*., 2016). Consequently, reduce water inflow which poses threat to sustainable supply of water for irrigation and domestic uses in the area. Despite broad recognition of the value of the goods and services provided by this forest watershed, Conservation programs of this watershed suffer inadequate funding, hence the need for alternative sources of conservation funs such as Payment for Ecological Services.

2. METHODOLOGY

This study specifically focuses on North Selangor Peat Swamp Forest Malaysia. Located at latitude 3^o 35" N and longitude 101^o 05" E, which covers an area of about 20,000 ha extending over the length of 40 km along the coast with a width of 5 km on average. The Forest comprises Sungai Karang Forest Reserve (50,106 hectres) to the North and Raja Musa Forest (23,486 hectres) to the South. The study area, (shaded), within the state of Selangor (delineated) in Peninsular Malaysia (displayed in the inset)(See figure 1).

2.1. Population

The target population for this section of the study are households at Kuala Selangor district who are eighteen years and over. The population of the district as at 2015 was projected to at 234,521 people (Department of Statistics Malaysia 2010). However, the population of the selected communities in the district are; Kuala Selangor town (12,961), Tanjong Karang (33,711), Ujong Permatang (10,647), and Pasangan (7,995) people.

Figure-1. The Study Area

2.1.1. Samples and Sample Size

In this section of study the Krejcie and Morgan (1970) table of sampling was used to determine the sample size. Based on the projected population of 234,521 people in the study area the sample size using the Krejcie and Morgan (1970) table was 384 respondents. From the sample size identified, 10% of the sample size (384) was added for missing questionnaire and incomplete information. Therefore, the total sample was put at 422 respondents and out of which 397 questionnaire were returned representing 94% response rate and 25 rejected/uncompleted.

2.1.2. Sampling Techniques

For the households, nine (9) villages were identifies close to the forest reserve, out of which four were selected using stratified random sampling technique. Two communities who were less than 10 km from the forest reserve were selected each from Kaula Selangor and Tanjong Karang local authorities. Samples were drawn using proportionate sampling according to the proportion of the village population. Kuala Selangor town 19. 84%, Tanjong Karang 51.61%, Ujong Permatang 16 .30% and Pasangan 12.25 %. First samples were randomly selected and subsequently every third household was drawn systematically.

2.1.3. Questionnaire Design and Administration

Related studies form a guide to the design of the questionnaire which was adapted and modified to suit the purpose of this study. The first part of the questionnaire was the warm up questions and introductory script on forest conservation programs. The role of forest watershed in towards water purification and related issues were presented to the respondents via pictures and graphs. Brief information on the environmental impacts of forest degradation and the objective of the study were included. A psychometric variable section presented on a 5 point Likert scale was to measure the respondents' perception and attitude toward watershed conservation and their preferences. This is followed by respondents' socioeconomic profile. Following the recommendation by NOAA panel (Arrow and Solow, 1993; Portney, 1994) face-to-face survey mode was used for data collection. This technique is the commonest adopted as evident in the literature review. Besides, this method has the potential to attract the highest response rate when compared to others (Bateman *et al*., 2002).

The questionnaire was translated into the local language (Bahasa Malaysia) and was tested in a pilot survey, in accordance with recommendations in the CE literature e.g. (Colombo *et al*., 2007). The questionnaire was administered to households at Kuala Selangor district. The survey was conducted from March to September 2015 with the help of 5 University Putra Malaysia (UPM) students as enumerators who were from the area and 2 Integrated Agricultural Development Areas (IADA) extension workers who were trained on the survey techniques specifically on the content and format of discrete choice questionnaire.

2.2. Generating Attributes for the Choice Experiments

This involves some stages, and the first step in selecting attributes and levels is the refinement of the problem in hand to assure the sufficient understanding of the researchers from the situation. The second step is defining the possible alternative as described by Hensher *et al.* (2005). Therefore, the selected alternatives in this research are labelled (Ecological functions, Water Quality, and Water Quantity) or (Management option 1, Management option 2, and Status quo). This decision of choosing labelled alternatives is an important part of the design because of its impact on the number of parameters to be estimated (Rose and Bliemer, 2009). Once the analyst has identified the number of alternatives to be included in the study, attributes and attributes' levels must be determined (Hensher *et al.*, 2005; Rose and Bliemer, 2009)

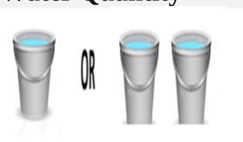
2.2.1. Selecting Attribute and Levels

The most applied methods to select attributes are qualitative approaches such as literature review, focus group studies, and in-depth interviews (Christie *et al.*, 2006; Kragt, 2013). A focus group discussion was organized to test the appropriateness of the attributes and their levels. Participants were asked to answer several general and specific questions on concept of environmental conservation and water saving. The participants were also shown the list of attributes and their levels, and they were asked to answer three CE questions. In addition Stakeholders' interview was conducted at different time involving officers in IADA Barat Laut Selangor, Department of Environment (DOE) and Syarikat Baketan Air Selangor (SYABAS). The interviews ensure the suitability of the proposed conservation policy and management option and possibility of implementation.

Levels in generic attributes are described according to the number of specific attributes available. Attributes with higher levels comprised of more specific attributes, than those with medium and basic levels. Three- three-level attributes and one two-level attribute have been chosen for this study. The attributes with three levels includes Ecological Functions, Water Quality, and package price. The levels are Weak/fair, Average/Moderate and Excellent/ Perfect. And the Price Package of 10%, 20% and 30% increment from current water bill. Water Quantity attributes is described with two levels: basic (220litres) and higher (440litres).

The CE questions were presented in a pictograph format to assist respondents in answering. Such a strategy of using images (i.e symbols, graphics, or pictures) has been employed by analysts such as (Campbell, 2007; Rolfe and Bennett, 2009). From the attributes and their levels generated, alternatives were design using orthogonal fractional design. These attributes and their levels are shown in Table.1

Table-1. List of Attributes and levels

Attributes	Definitions	Levels
Ecological functions 	The Forest Watershed provides ecological services such as water purification Nutrient cycling, Pollution control, Carbon Sequestration, flood control and prevent diverse effects on the whole forest ecosystem.	Weak* Moderate Perfect
Water Quality 	Quality of water supply is subject to the global Water Quality Standard that corresponds with WHO specifications like Acidity, PH level, Hardness, colour, smell etc.	Fair* Good Excellent
Water Quantity 	Quantities of water used for domestic purposes across households' shows average person using 220 litres a day. Households would like to use more water than what they currently do if only this water is available.	220 litres a day* 440 litres a day
Price of water 	A tariff could be introduced to cover part of the costs of watershed conservation. This amount would be added to your Water Bill and it means all households are to pay additional fees 10%, 20% and 30% on the current water tariff The money will be used exclusively as conservation fees if the proposed plan is implemented.	RM00* 10% increment 20% increment 30% increment

*Base line or Status quo

2.3. The Experimental Design

Based on the selected attributes and levels in this study, the experimental design technique was conducted and SPSS software was used to obtain orthogonal design. While full factorial design included multiple alternatives, using fractional factorial design was blocked to 16 alternatives. The final design consists of 10 alternatives in 5 choice sets, each choice set including two purposed options, plus status quo. So, the total number of alternatives used in the study is three. The combination is known as a choice card. The combination (two options and one status quo) has been employed by many analysts in Choice Experiments e.g. (Bergmann *et al.*, 2008; Boxall *et al.*, 2009). An Example of the show cards used in the research.

Table-2. Example of Choice card

ATTRIBUTES	OPTION 1	OPTION 2	STATUS QUO
Ecological Functions 	Moderate	Weak	*Or would you prefer no change to the current condition of weak ecological function, fair water quality, 220litres of water, and no conservation contribution?*
Water Quality 	Fair	Excellent	
Water Quantity 	440 litres	220 litres	
Water Charges 	RM28	RM30	
Option		X	

Source: Field survey (2015).

3. ANALYTICAL FRAMEWORK

Multinomial logit is frequently used to estimate the choice modelling exercise. It is one of the simplest variants of discrete choice method. In this study let us assumed a respondent *n*, faces a choice among *J* alternatives in a choice set. Label the observed attributes, either in qualitative terms (e.g. perfect/excellent, medium/average and low/weak) or quantitative terms (e.g. 10%, 20% , RM28, RM30, RM38) of alternative *i* in the choice set as faced by the respondent, *n* as the vector X_{in}. The probability (P_{in}) that respondent *n* chooses alternatives *i* depends on the observed attributes of alternative *i* compared with other alternatives (ie. X_{in} relative to all X_{jn}; $j \neq i$). In this study there are three alternatives; management option 1, management option 2 and the *status quo*. The probability can be represented by a parametric function of general form;

$$P_{in} = f\,(X_{in}, X_{jn}; j \neq i, \beta) \qquad (1)$$

Where; P_{in}= probability of respondent *n* choosing alternative *i*, X_{in}= a vector of observable characteristics of alternative *i* accessible to respondent *n*, *and* X_{jn}= a vector of observable characteristics of alternatives *j* accessible to respondent *n*

In this case, *f* is the function that relates the observed data with the choice probabilities. This function is specified up to some vector of taste parameter β to be estimated. Thus, in order to derive discrete choice models or the specific function of *f* in Equation (1), let us consider the utility obtained by the respondent from each alternative. Take the vector of all attributes of alternative *i* as faced by respondent *n* as Z_{in}. According to Lancaster (1966) the utility that respondent *n* obtains from alternative *i*, denoted U_{in} can be written as follows;

$$U_{in} = U(Z_{in}) \qquad (2)$$

U is a function. The respondent chooses the alternative that provides the greatest utility. When the respondent *n* chooses alternative *i*, we can write the behaviour model if and only if $U_{in} > U_{jn}$, ; $j \neq i$. Then we can write; $U(Z_{in}) > U(Z_{jn})$; $j \neq i$. This utility represents the deterministic component since the respondent is already known on their utility.

However, in the choice probability, the element of Z_{in} is divided into two components; systematic component (denote as V) and random component or error term denoted as ε_{in} (Train, 2009)

$$U_{in} = V(X_{in}) + \varepsilon_{in} \quad (3)$$

In this case, the ε in is not known and is therefore treated as a random term. The joint probability density of the random vectors, $\varepsilon_{in}= (\varepsilon n_1, \varepsilon n_2 \ldots \varepsilon_{nj})$ is denoted f (εn). With this density, the researcher can make probabilistic statements about the decision-maker's choice. In random utility terms, the probability that respondent *n* chooses alternative *i* is

$$P_{in} = \text{Prob}\,(V_{in}+ \varepsilon_{in}) > (V_{jn}+ \varepsilon jn)\ ;\ j \neq i$$
$$= \text{Prob}\,(V_{in} - V_{jn}) > (\varepsilon_{jn} - \varepsilon_{in})\ ;\ j \neq i \quad (4)$$

The probability that an individual randomly drawn from the sample population of respondents will choose alternative i equals the probability of the difference between the systematic utility levels of alternative i and j for all alternatives in the choice set. This probability is a cumulative distribution, when the probability that each random term, $\varepsilon_{jn} - \varepsilon_{in}$ is lower than the observed quantity $V_{in} - V_{jn}$. Thus, by using the density g (ε_n) this cumulative probability can be written as;

$$Pin = \int I(\varepsilon_{jn} - \varepsilon_{in}) < (V_{in} - V_{jn})\, g(\varepsilon_n) d\, \varepsilon_n \quad (5)$$

In order to estimate a random utility model, a distribution on error terms must be specified. In this case, in order to develop a multinomial logit model, McFadden and Train (2000) were referred to. By assuming that all of the error terms in the choice set are independently and identically distributed, the multinomial logit model can be developed. Thus, the probability of respondent *n* choosing alternative *i* can be formed

as: $$P_{in} = \frac{\exp(\mu V_{in})}{\Sigma^J_j \exp(\mu V_{jn})} \quad (6)$$

By assuming that V_{in} is linear in parameters, the functional form of the respondent systematic component of the utility function can be expressed as:

$$V_{in}= \beta_1 X_{in}+ \beta_2 X_{2in}+ \ldots + \beta_k X_{kin} \quad (7)$$

Where X_s are variables in the utility function and the β_s are coefficients to be estimates. If a single vector of coefficients β that applies to all the utility functions associated with all the alternatives is defined and the scale parameter μ=1, (Swait and Jordan, 1993; Train, 2003) thus the equation (6) can be rewritten as:

$$P_{in} = \frac{\exp(\beta' X_{in})}{\Sigma^J_j \exp(\beta' X_{jn})} \quad (8)$$

Where; P_{in} = is a Respondent *n* choice probability of alternative i,

X_{in} and X_{jn} = are the vectors describing the attribute of *i* and *j* and

β = is a vectors of coefficients.

Then, the next step is to estimate the choice probability and to calculate the welfare measure. The ratio of an attribute's coefficient and the price coefficient represents the marginal implicit price of the attributes. This ratio represents the implied change in the implicit price of the attributes relative to a current situation as in the equation:

$$P_{i,k} = \frac{\partial V / \partial X_{i,k}}{\partial V / \partial P_{i,k}} = \frac{-1\ \beta_{i,k}}{\beta_{i,k=p}} \quad (9)$$

Therefore, this study the estimation procedure uses the econometric software program, LIMDEP, Nlogit 4.0. Other econometric software such as STATA and SAS are used to estimate the multinomial logit Model. However, most literatures stated that LIMDEP, Nlogit is much more convenient logit model package than many of those packages developed recently.

4. RESULT AND DISCUSSION

4.1. Socio-Economic Background of the Respondents

This section outline the socio-economic variables of the household respondents which includes; Age, Gender, Marital Status, level of Education, Occupation, Income, amongst others.

Table-3. Households Socio-economic background

Variables	Frequency	Percent	Mean	SD	Min.	Max.
Gender						
Male	254	64.0				
Female	143	36.0				
Age Groups			**46.31**	**11.40**	**24**	**73**
Below 35	55	13.9				
35-44	125	31.5				
45-54	107	27.0				
55 and Above	110	27.7				
Ethnicity						
Malay	247	62.2				
Chinese	88	22.2				
Indians	62	15.6				
Marital Status						
Married	307	77.3				
Single	62	15.7				
Widow	12	3.0				
Divorce	16	4.0				
Level of Education						
Primary School	42	10.6				
High School	208	52.4				
College/Polytechnic	108	27.2				
University	39	9.8				
House Hold Size			**4.70**	**1.7**	**1.00**	**9.00**
< 3	27	6.8				
3-4	163	41.1				
5-6	147	37.0				
7 and Above	60	15.1				
Income Level (RM)			**2275.06**	**898.48**	**500.00**	**5000.00**
500-1900	150	37.8				
2000-2900	139	35.0				
3000-3900	70	17.6				
4000 and Above	38	9.6				
Occupation						
Government	186	46.9				
Private Sector	95	23.9				
Self Employed	88	22.2				
Unemployed	28	7.1				

Source: Field survey (2015).

Gender for the household shows that, Out of the total valid response obtained (397), male were 254 this constitute (64.0%) while 143 (36.0) were females. The first category (< 35) is referred to young age group (55) who are youth which constitute (13.9%) of the respondents. In this case the age category of the respondent shows that the average age was (46.31). Majority 125 (31.5%) and some 107 (27.0%) fall with the productive ages of 35- 54 year. While 110 (27.7%) of the households are aged 55 and above.

The distribution of ethnic groups among the communities show, 62.2% Malay, 22.2% Chinese and 15.6% Indian. There are few strong reasons behind this uneven distribution of sample with respect to race. The survey is clustered based on place rather than ethnicity. Within a geographical location, the survey is conducted on random basis, but geographically in most cases the same race group stay together and their localized distributions are not same at all. For the marital status, it shows that majority of the respondents 309 (77.3%) are married, 61 (15.7%) of the respondents are singles, while 12 (3.0%) are divorced and 16 (4.0%) widows.

With regards to level of education, 42 of the household respondents, constituting (10.6%) have basic primary education. And majority 208 (52.4%) acquired secondary education. Considerable portion of the respondent attended College/ Polytechnic constitute (27.2%) while 9.8% of the have tertiary education. The occupational distribution of the households reveals that, the bulk of the respondent 186 (46.9%) work with the government, however 95 (23.9%) are employed in the private sector. It also shows 88 of the respondent constituting (22.2%) are self-employed while (7.1%) are unemployed

For the house hold size, the study shows that, the average family size is four persons, with a minimum of one person and a maximum of nine. Although significant number of the respondents (37.0%) have 4-6 family members, the study reveals that, majority of the respondents 163 (41.1%) have less 3-5 family members. Though, 27 (6.8%) have < 3 members, yet 60 (15.1%) of the families have more than seven members in each family.

The income level among the households shows an average income of RM 2275.06. Though majority of the households 150 (37.8%) earn between RM 500-1900 who are considered low income group. Most of the households 139 (35.0%), and some households 70 (17.6%) earn between RM 2900-3900 considered as middle income earners. However, 38(9.6%) earn RM 4000 and above, these are the high income group.

4.2. Multinomial Logit Model

In this section, the estimated Multinomial Logit Model (MNL) models for forest watershed conservation is presented in Table 4.Three models were estimated, one is the basic MNL model and the model with marginality, and the other is the MNL model incorporating interactions with the socio-demographic characteristics. All models were estimated using maximum likelihood (ML) procedures. The difference between the basic MNL model and the MNL with interactions model lies in the coefficient.

In each model, the coefficients for EFN2, EFN3, WQL2, WQL3, WQT2 at all the levels, and Price were significant at least at the 5% level. It is not able that the coefficient values for the higher level were greater than the coefficient values for the lower level. This indicates that the marginal utility received by respondents for higher levels of an attribute are greater than the utility received at the lower level. This follows the axioms of choice: *non-satiation*, where the utility received by a consumer increases if the commodity used by the consumer increases.

Table-4. Shows the result for Basic Multinomial model for conservation

Variable	Coefficient	Standard Error	b/St.Er.	P[>z]
EFN2	.71550485	.07479299	9.566	.0000**
EFN3	.77072828	.09271016	8.313	.0000**
WQL2	.26040410	.08786620	2.964	.0030**
WQL3	.34413922	.07075180	5.864	.0000**
WQT2	1.49520868	.14399433	10.384	.0000**
PRICE	-.01323732	.00680116	-1.946	.0516*
Number of observation 1985				
Wald Statistic = 4.84352				
Prob. from Chi-squared[5] = .43527				

Note: ** significant at 1% and * significant at 5% confidence level

All attributes in the model were significant (at the 1% level) in the basic and some are significant at (at the 5% level) in the interactions models. The models display the expected signs for the attribute terms: positive utility for improved ecological function, positive utility for ensuring the provision of quality drinking water, positive utility for improved quantity of water. The sign of the conservation fees is negative, as expected. Moreover, Water Quantity (WQT) has the highest coefficient. This indicates that the respondents prefer improvement in Water quantity.

4.3 Interaction Models

The inclusion of socio-economic attributes is an important step for estimating more accurate models of choice, (McConnell and Tseng, 1999; Rolfe *et al.*, 2000). As socio-demographic variables are the same for a given respondent, apart from selecting options 1, 2 or 3, for each choice question, so these variables entered the model with interaction of the attributes variables. Therefore, the socio-demographic characteristics of respondents enter the model as intercept shifters. Status quo were selected as base level in all the models obtained. The interaction models can be seen in Table 5.

Table-5. The result for basic Multinomial Interactive model for conservation

Variable	Coefficient	Standard Error	b/St.Er.	P[>z]
EFN2	.5099554269	.11629547	4.385	.0000
EFN3	.5795558591	.13893525	4.171	.0000
WQL2	1.410727559	.33477594	4.214	.0000
WQL3	.4387127347	.87159887E-01	5.033	.0000
WQT2	1.499533961	.14424119	10.396	.0000
PRICE	-.1286037834E-01	.68250611E-02	-1.884	.0595
EFN2_GEN	.3174809405	.13883019	2.287	.0222
EFN3_GEN	.2953448260	.16575175	1.782	.0748
WQL2_GEN	-.3161052174	.16826443	-1.879	.0603
WQL2_AGE	-.1593090508E-01	.65676909E-02	-2.426	.0153
WQL2_EDU	-.5622122923	.15660534	-3.590	.0003
WQL3_EDU	-.2370591104	.13254620	-1.789	.0737
Number of observation 1985				
Log likelihood function -1879.344 Log fnc No coefficient (5) -2180.7454				
R square .13821				
Adjusted R square .13560				

Source: Author's Computation

The inclusion of socioeconomic indicators such as income, education, gender, and age as attribute interactions into the model has a positive influence on the model fit. Generally there are few ways to improve the fitness of the model, and to examine where the source of inaccuracy might be occurring in choice modelling; this will no doubt help in generating rich data sets. One of the possibilities is to incorporate the socio-demographic attributes of the respondents, so that heterogeneity of preferences may be accounted for Yacob *et al.* (2009). In this study information on the socio-demographic characteristics of the respondent was used to interact with the main attributes, and determine the influence of such variables on the choice behaviour of the respondents. The interactive Model reveals that gender, age and education have an impact on choice.

The justification of the inclusion the socio-demographic attributes has been proved from the log likelihood ratio of the model with the interaction have improved compared to the basic model, Table 2 where the Pseudo R^2 was also improved from 0.132 in the basic model compared to 0.138 in the interactive model Table 3 and the log likelihood from -1892.334 to -1879.344. This shows that the statistics indicators, log likelihood ratio and the Pseudo R^2 have improved in the interactive model and therefore, indicates a more accurate model specification has been achieved.

The interaction model specification for conservation is as follows:

$U = \beta1X1 + \beta2X2 + ... + \beta6X1Y1 + \beta7X2Y1 + \beta8X3Y1 + \beta8X32 + \beta9X3Y3 + \beta10X4Y3 + \varepsilon0$

Where X1 is EFN2, X2 is EFN3, X3 is WQL2, and X4 is WQL3.
Whereas, Y1 is GEN, Y2 is AGE, and Y3 is EDU, which represents the parameter interacting with main attributes.

β = the Coefficient

ε = the error term

There are five main attribute in the interactions model. All of the main attribute variables EFN2, EFN3, WQL2, WQL3, and WQT2 which are allsignificantwithatleast5% significant level. All of these variables also conform to the expected signs.

The positive sign of EFN2_GEN and EFN3_GENwhich are alsosignificantat5% level indicates that female respondents were more incline than the male respondents to support the ecological conservation. Other interaction variables are also significant but show negative coefficient. The variable WQL2_GEN prove significant 5% but with a negative coefficient, this means that female respondent are willing to pay more for improve water quality. WQL2_AGE is also significant 5% and also with a negative coefficient, this implies that young age group prefer improved water quality status than the elderly.

Similarly, variables WQL2_EDU, and WQL3_EDU were all significant at 1% and 5% level respectively, then again with a negative coefficient, this indicates that low educational level support watershed conservation to ensure water quality. Lastly, other socio-demographic factors such as INC, STATUS, and OCCUP etc. are not significant and thus remove from the model.

4.4. Marginal Willingness to Pay

The marginal willingness to pay (WTP) was calculated by computing the marginal rate of substitution between the attribute of interest and the cost factor (in other words, taking the total derivative of the utility index). This "value ratio", is also identifiable between non-monetary elements of utility (attribute trade-offs), called the implicit price or (IP) (Hanley and Barbier, 2009). For instance in our study one of the attributes was ecological functions, dividing the β value of this attribute by β value of price, would show the average willingness to pay of respondents on improve ecological functions from current level. The marginal value of the conservation attributes was estimated using following formula:

MV= - βattribute / β monetary variable

Wald procedure in Limdep 8, Nlogit 4, was employed to estimate the WTP values of the attributes. The result, as reported in Table 6 shows that the mean values ranges from RM 54 for ecological function to RM 112 for improvement in the quantity of water supply. Therefore water quantity (WQT) has highest marginal value, followed by Ecological function and water quality status.

Table-6. Marginal Regression Model

Variable	Coefficient	Standard Error	b/St.Er.	P[>z]
EFN2	54.05208759	26.581785	2.033	.0420
EFN3	58.22388561	27.367259	2.128	.0334
WQL2	19.67196320	13.020728	1.511	.0308
WQL3	25.99764841	15.158058	1.715	.0863
WQT2	112.9540222	56.012081	2.017	.0437
Number of observation	1985			
Wald Statistics	4.84352			
Prob. from Chi square	.43527			

Source: Author's Computation

In this model the probability statistics of EFN2 and EFN3 are significant at 5% level, EFN3 coefficient is higher than that of EFN2 which means that respondent prefer EFN3 to EFN2, because EFN3 is perfect ecological function. Same implies with Water quality (WQL), here also the probability statistics of WQL2 and WQL3 shows that, though all are significant at 5% level, the coefficient of WQL3 is higher than that of WQL2 thus, respondent prefer WQL3 to WQL2, since WQL3 is excellent quality of water. Lastly the result shows WQT2 with the highest coefficient and implies respondent prefer improvement in the quantity of water supply. Therefore water quantity (WQT) has highest marginal value, followed by Ecological function and water quality status.

Aggregate annual conservation benefit measured from the improvement in conservation options in the marginality model, where WQT2 has the highest coefficient and indicates respondent choose improvement in the quantity of water supply as the most prefer conservation attribute followed by Ecological function and water quality status. The marginality accordingly are RM54, RM58, RM19, RM25, and RM112.By taking the average, it shows that the mean WTP for conservation benefit is RM54.18.

Even though households pay high amount for water bills, the outcome of the WTP was encouraging. From the mean WTP obtained from the households (RM54.18), the expected conservation value of the forest watershed of the Sungai Karang and Raja Musa forest reserved can be estimated base on the result from the logit model and the population of Kuala Selangor district (234,521). Computing this figure with the mean WTP, the total conservation value is estimate at RM12, 706.347.78. This indicates households are willing to pay for watershed conservation to ensure sustainable water supply.

5. CONCLUSION AND RECOMMENDATION

Putting payment for ecological services program in to practice depends on adequate demand for services and sustainable financing. Thus demands an integrated approach, by engaging all stakeholders in environmental conservation including the community. In view of this we examine the viability of using locally financed payments as from communities along Sungai Karang and Raja Musa forest reserve as additional conservation funds to protect the forest watershed services. The study employed choice experiment method to estimate the willingness to pay for watershed conservation in Selangor Malaysia.

Despite the fact that households pay high amount for water bills, the result of the WTP was promising. This indicates households are willing to pay for watershed conservation to ensure sustainable water supply. Therefore, recommends PES as additional conservation funds in the area for sustainable forest management and financial sustainability. This will no doubt supplement the cost of forest management as a result of the moratorium policy of timber harvesting imposed on the forest reserve.

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