

WILLINGNESS TO PAY FOR ENVIRONMENTAL SERVICE OF FOREST TREES BY COOPERATE ORGANISATIONS

M.F. Adekunle, M.O. Adedokun, and A.A. Adedoja

Paper prepared for presentation at the Farm Management Association of
Nigeria Conference, Jos, Nigeria, September 18-21, 2006

WILLINGNESS TO PAY FOR ENVIRONMENTAL SERVICE OF FOREST TREES BY COOPERATE ORGANISATIONS

Adekunle, M.F., Adedokun, M.O. and Adedoja, A.A.
Department of Forestry and Wildlife Management, University of Agriculture, Abeokuta

ABSTRACT

Payments for environmental services (PES) especially of the forests are considered a potential instrument to mitigate environment and development challenges faced in many tropical countries. The success of any PES scheme is highly dependent on reliable economic data and monetary values of the services provided by the forest trees and vegetation. Hence the relevance of this study which adopted the contingent valuation method (CVM) to derive a monetary valuation for the environmental service functions of forest trees in University of Agriculture, Abeokuta (UNAAB) urban environment. Data were obtained from a multistage random sampling of 48 out of the 75 registered students' Corporate Organisation made of Academic, Religion and Socio-cultural organisations and clubs. The results show that 77% of the respondents were willing to pay (WTP) various amounts ranging from N5 – N1000 monthly. One hundred naira (N100.00) was the modal value having recorded 38% response and closely followed by N200.00 with 30% response. The overall mean WTP value resulted into an aggregate estimate value of UNAAB urban forest trees environmental value of UNAAB urban forest trees environmental services which is N7,800 (US\$1 = N140). The semi-log model of regression equation revealed respondents' income, sources of income and years of existence as the socio-economic variables that significantly influenced WTP. It can be concluded from this study that the sampled respondent valued the environmental services of the forest especially the shade provided for them during their meetings to the extent that they are willing to contribute towards the continue existence of trees and by implication the forests in the University environment. Payment for environmental services either in form of voluntary donations or direct contribution towards forest tree plantings can be an incentive to the providers of the services be it private or government.

Key words: Contingent valuation, Environmental services, Willingness to pay (WTP),

INTRODUCTION

Appropriate pricing and valuation is an inevitable exercise if natural resources especially the forest is to continue to provide its goods and services in perpetuating on a sustain yield bases. Rapid deforestation and slow reforestation (if any) of degraded forestland is due to the failure of the market to price forest products to capture externalities and indirect use values of watershed management, wildlife protection and other non-market environmental services functions of the forest and trees.

The nature of the urban environment and the diverse needs of man place heavy responsibility on trees and forests (Popoola and Ajewole, 2002). This makes the role of urban forestry in environmental conservation and rehabilitation crucially important. Trees by their nature i.e. their anatomical structures and physiological functions serve as natural purifiers of the environment. The size, shape, colour and the seasonal variation have made the trees and forests the most visible natural living element that engender serenity and harmony within the urban environment. Other valuable environmental services of the forest have been documented in literatures. There includes climate stabilisation, carbon storage, protection of hydrological functions and biodiversity conservation (Scherr, 2004; Adekunle *et al.*, 2005).

In spite of the many acknowledged services of the forests, they are perceived to have less economic value than the land on which they stand. In many places, agriculture simply out-competes forest as a land use. Such agriculture may not always be sustainable, but immediate economic and financial imperatives commonly override concern for the more distant future. So it is in the humid tropics like Nigeria. The

global community may champion tropical rain forests for their extraordinary biological and environmental riches, but people at forest frontiers like industrial enterprises are clearing those same forests to plant crops and raise animals. In order to slow and reverse this process, there is need to find ways of making forest a more competitive land-use. To enable the sustainable management of the tropical forest make good economic sense, certain conditions must prevail (ITTO, 2004). For instance, the timber and non-timber products of the forest must be marketable and the prices must be the best obtainable on the open market. Payment for ecosystem/environmental services (PES) of the forest have been of a recent focus and may become a useful tool in mitigating forest degradation as well as incentives to forest service providers. Goal number seven (7) of the UN “Millennium Declaration Goals” (MDGs) is to ensure environmental sustainability. There is the need for adequate information and data on economic and monetary values of the environmental services of the forest as an input to developing an appropriate payment schemes for the environmental services of the forest as incentives to the provider of these services as one of the means of achieving this goal. The objective of this study therefore is to use the willingness to pay (WTP) format contingent valuation method (CVM) to derive a monetary valuation for the environmental services of urban forest trees in University of Agriculture Campus with registered student corporate organisations as a focus. This study becomes relevant as a result of the increasing interest in generating payments for environmental services as an incentive mechanism for forest land management either by private individuals or organised institutions.

METHODOLOGY

Data and sampling Procedures

The data used in this study were obtained between January and July, 2005 using a questionnaire survey of forty eight (48) randomly selected students registered Cooperate groups. A preliminary list of all registered student of corporate groups were collected from the Student Affairs Unit of the University. They were seventy-five (75) in all made up of Academic societies, Religion organisations and Socio-cultural societies. Further details of the sampling procedure are shown in Table 1. The multistage random sampling was adopted to collect the primary data.

The questionnaire was designed in line with Hoehn (1992), Hanemann (1994) and Popoola and Ajewole (2002). The questionnaire was in two parts. Part ‘A’ was made to address the biodata of the respondent cooperate groups while Part ‘B’ bothered on the valuation and payment for environmental services of forest trees. The payment card system – contingent valuation method (CVM) was adopted to elicit willingness to pay (WTP) values from the respondents in line with White and Lovette 1999, Popoola and Ajewole (2002); Jenkin *et al.*, (2002) and Adekunle (2005).

Data Analysis

The questionnaire were collated separately and later pooled. The data were analysed using the statistical package for social sciences (SPSS). Some of the variables analysed include population of organization, age, number of monthly meetings, income, income sales WTP values, time and mode of payments. Both descriptive and inferential statistics were used in this study. This includes percentages, mean, mode and frequencies. The multiple regression was used to determine the socio-economic variable that influenced WTP for environmental services by the respondents. The general specification of the mode is as follows:

$$WTP = (x_1 + x_2 + x_3 + x_4 + x_5 + e).$$

x_1 = population

x_2 = income

x_3 = sources of income

x_4 = no. of monthly meetings

x_5 = years of existence

e = error term.

Three functional forms were tried in order to choose the one with the best performance. They are:

$$\begin{aligned}\text{Linear:} & \quad b_0 + x_1 + b_1x_1 + b_2x_2 \dots b_nx_n + e \\ \text{Semilog:} & \quad \text{WTP} = L_n b_0 + b_1 L_n x_1 + b_2 L_n x_2 \dots b_n L_n x_n + e \\ \text{Double log:} & \quad L_n \text{WTP} = L_n b_0 + L_n x_1 + L_n b_2 L_n x_2 \dots L_n b_n L_n x_n + e\end{aligned}$$

Where b_0 = constant
 L_n = natural logarithm
 $b_1 b_2 \dots b_n$ = regression coefficient for WTP
 e = error term

RESULTS AND DISCUSSION

Willingness to pay (WTP) within different socio-economic strata

A summary of mean WTP within different socio-economic variable are presented in Table 2. It can be observed from the table that respondents cooperate groups whose membership ranged from 1-100 students were in the majority. They were 17 in number or 58.7% of total with the largest mean WTP of N59.00. This is closely followed by those with 101-200 students with a mean WTP of N55.00. This findings show that most of the registered corporate organisation in the study area have their membership range from 1-200 students. This should be taken into consideration when planning a PES scheme. The table further revealed the age structure of the organisations sampled. A large number of them (14) have existed for between 6 and 10 years. Although the largest amount of N63.00 was elicited from respondents that have been in existence for between 1 and 5 years. The implication of this is that the organisations have a long history of accessing the environmental services of the areas hence they are willing to pay for continue of existence of trees on campus.

Majority of the respondent organisation holds between 1 and 5 meetings monthly. Specifically a total of 30 respondents were recorded in this category; with a mean WTP amount of N45.00. However, the highest mean WTP of N60.00 was elicited from the organisations that meet between 6 and 10 times monthly. The frequency of contact with the forest services could be a veritable input to any PES scheme and other rehabilitation or tree planting plans.

The foregoing is no doubt sufficient to conclude that the respondents are aware and appreciated the environmental services of the forest trees and are willing to pay for its sustenance. This could be attributed to their exposure to environmental education. The role of information in contingent valuation studies cannot be over-emphasized. It has been described as a structural element that might have a strong influence on CVM (Bergstorm *et al.*, 1989). Tkac (1998) had earlier emphasized the need for respondents to be adequately informed about the environmental goods being priced before eliciting WTP bids from them.

Distribution of Elicited WTP and Aggregate Monthly Values

Our investigations found out that majority of the respondents (i.e. 77% of total) were willing to pay various amounts of money as stated in the payment card (PCS) (Table 3). This ranged from N5 – N1000; N100.00 being the modal value having recorded the highest percentage of response i.e. 37.8% (Table 4). This is closely followed by N200.00 with 29.7% of response as shown in the table. None of the respondents were willing to pay higher values ranging from N500 – N1000. This could be due to financial constraints of the associations. The mean individual group elicited values ranged from N83.13 – N117.62 while the overall mean elicited WTP value is N104.43 (Table 5). Multiplying the overall mean WTP value of N104.43 by 75 (the total population of cooperate groups in the campus) equals N7,800 being the monthly aggregate value that all cooperate groups would pay for environmental services (PES) of forest trees in the study area. These WTP responses can be a reliable indicator or predictor of future behaviour if a PES shown were actually designed or initiated in the study area.

Perception of environmental services (ES) of forest trees by the respondents

Respondents' perception of ES of forest trees was assessed through the frequency of mention. The result is summarized in Table 6. According to the table, 'shade provision' had the highest percentage of mention i.e. 50% while food and medicinal values had the lowest percent of mention of 7.6%. This result agreed with Ajewole (2001). He recorded a large percent of mention of environmental protection was the most enjoyed service of the forest in form of 'shade' by corporate organizations in Ibadan, Nigeria. The policy implication of this is that public preferences should be taken into consideration when choosing trees species for urban landscaping. Percent mention has been described as the strongest criteria for selection and ranking of multi pose trees (Adeola 1995). Some of the prominent tree species observed in the study especially where the corporate group use to meet include *Spondias mombin*, *Cola gigantea*, *Vetex doniana*, *Albizia saman*, *Cassia spp.*, *Delonix regia*, *Ficus spp.*, *Morinda lucida*, *Anogessious lecocarpus*, *Gmelina arborea* and *Mangifera indica*. The importance of the shade width of trees has been emphasized in the University of Ibadan (U.I.) campus. For instance, *Albizia semman* trees have been reported to cover almost all the road networks in U.I. with its large shade (Agbeja and Adesoye, 2003).

Respondents time of payment (TOP) and payment instruments (PI)

Having earlier established the overall mean WTP as N104.00 (Table 5), the study further investigated the respondents most preferred time and mode of payments. The result is shown in Tables 7 and 8. According to Table 7, a large percentage of the respondents i.e. 43% wanted the money to be paid monthly while the most preferred mode of payment is by voluntary donation having recorded the highest percentage of response i.e. 46% (Table 8). The management implication of these finding is that decision makers can use this observations as additional inputs in assessing public support for urban reforestation and preference for urban green environment. This also shows that respondents use to consider time and mode of payments before making monetary commitments. This is necessary where most of the organizations receive periodic incomes which are sometimes erratic.

Regression analysis and degree of influence of independent variables on WTP

The three functional forms of tested regression equations were significant. This shows that at least one of the tested independent socio-economic variables have influence on the dependent variable (WTP) in each of the regression equations. However, the semi-log function was chosen as the best equation for the regression model. It has the highest coefficient of determination ($R^2 = 0.953$), minimum standard error (0.1068) and highest F-value (35.97). The student t-test indicates that three of the independent variables influence WTP values (Table 9). Thus, income, sources of income and years existence was significant (at $P < 0.01$, 0.05 and 0.10 respectively) and has positive influence on corporate organizations WTP for forest tree environmental services in the study area.

Even though population was shown to be insignificant, it was highly expected to have significant influence on WTP. This could be because of the nature of the population i.e. they are not income (salary) earning individuals. They depend on their parents and guidance for money. Hence many of them might not be financially committed to their organizations. In the same vain, number of meetings held per month was expected to be having significant influence on WTP. This was not so which might be because it might not be in all the meetings would contributions be required. More so our investigation revealed that monetary commitments to the associations were made once in a semester especially by the socio-cultural organization members. The management implication of these findings is that if these socio-economic factors are properly harnessed, they could contribute meaningfully to PES scheme design. However, some other variables might be contributing to the WTP which have not been included in this model. This requires further investigations.

CONCLUSION

This study have succeeded in establishing the preference of corporate organization in the University of Agriculture, Abeokuta for the continue existence of trees in the campus. This have demonstrated through

their willingness to pay for the maintenance of trees on campus. For instance not less than 77% of the respondents expressed their WTP various amounts for this purpose out of which 37.8% are willing to pay N100; which represented the modal value while N104.00 was found to be the overall mean WTP value. The respondents favoured the adoption of monthly voluntary donation as the payment instruments. Provision of shade was found to be the most frequently mentioned environmental services accessed by the respondents.

The management implication of these finding is that much emphasis should be placed on the monetary value of services provided by the natural environment. According to Popoola and Ajewole (2002) total economic valuation of (TEV) of forest resources will no doubt take adequate care of the basic conservation themes which include resource scarcity, ecological balance, quality of life, wasteful and destructive use of our forests. Although the values obtained in this study are quantified indications of the value placed by the society on forest tree services, it shows peoples readiness and willingness to respond to PES schemes if actually initiated in the study area. This study also agreed with Weyerhauser (2005) that greater inclusion of stakeholders in payment schemes can improve its design, strengthen linkages between producers and beneficiaries, lower enforcement costs and improve results.

REFERENCES

- Adekunle, M.F.; Momoh, S. and Agbaje, B.M. (2005). Pricing of urban forest tree environmental service functions in university of Agriculture, Abeokuta (UNAAB) Nigeria. Paper presented at the 2nd Annual Conference of Nigeria Society of Environmental Management (NISEM). 5th – 8th Sept., 2005 UNAAB 30p.
- Adeola, A.O. (1995). The process of Multipurpose tree prioritization for Agroforestry research. In: Proceeding of Forestry Association of Nigeria (FAN). Oduwaiye, E.A. (eds.) Nov. 1995, 235-246.
- Agbeja, B.O. and Adesoye, P.O. (2003). Community perceptions on added values and conservation of trees in the University of Ibadan, Nigeria. *Aboricultural Journal* 2003, Vol. 27, pp. 117-138.
- Ajewole, O.I. (2001). Economic valuation of environmental service functions of forests in Ibadan Metropolis. M.Phil. Thesis, Dept. of Forest Resources Management University of Ibadan (U.I.) Nigeria, 165p.
- Borgstorm, J.; Stoll, J.; Randall, A. (1989). Information effects in contingent markets. *Amer. J. Agr. Econ.* 71 (August 1989): 685-91.
- Heinemann, W.M. (1994). Valuing the environment through contingent valuation. *The Journal of Economic Perspectives*, 8(4), 19-43.
- Hoehn, J.P. (1992). Contingent valuation in fisheries management: The Design of satisfactory contingent valuation formats. In Markandya, A. and Richardson J. (eds.). *The Earthscan Reader in Environmental Economics*. Pp. 101-11 (London: Earthscan Publications Ltd.).
- ITTO (2004). International Tropical Timber Organisation (ITTO) Tropical Forest Update 14/2 (2004) 11-14.
- Jenkin, D.H.; Sullivan, J.S.; Amacher, G.S.; Nicholas, M.C. and Reares, D.W. (2002). Valuing high altitude spruce-fir forest improvements: Importance of forest condition and recreation activities. *J. Forest Economics* 8, 77-99 (2002).
- Popoola, L. and Ajewole, O. (2002). Willingness to pay for rehabilitation of Ibadan urban environment through reforestation projects. *Int. J. Sustain Dev. World Ecol.* 9 (2002) 256-268.
- Scherr, S.; White, A.; Khare, A.; Inbar, M. and Moyan, A. (2004). For services rendered: The current status and future potential of markets for the ecosystem services provided by tropical forests. ITTO Technical Series No. 21 (2004) 69p.
- Tkac, J. (1998). The effects of information on willingness to pay values of endangered species. *Amer. J. of Agric. Econ.* 80(5) 1214-1220.

Weyerhauser, H. (2005). Paying for environmental services in China: Lessons learned from a promising approach. In European Tropical Forest Research Network (ETFRN) News No. 45-46 Winter 2005/06 44-46.

Table 1: Sampling Procedures

Categories of Corporate Associations	Total No. Registered	% of Total No. Registered	Total No. Sampled	% of Total No. Sampled
Religion Associations	13	17.3	8	26.7
Academic Association	17	22.7	10	20.8
Socio-cultural Association	45	60	30	62.5
Total	75	100	48	100

Table 2: Socio-Economic Characteristics of the Corporate Groups and their WTP Values

Population	Frequency	Total WTP	Mean WTP	Mode
Classes				
1 – 100	17	997.5	58.7	1-100
101 – 200	9	494.8	54.97	
201 – 300	2	33.3	16.1	
301 – 400	1	20	20	
401 – 500	4	124.2	31.05	
501 – 600	2	6.25	3.13	
601 – 700	1	25	25	
Above 700	1	50	50	
Years of Existence				
1 – 5	7	596.5	63.28	1 – 5
6 – 10	14	872.3	62.31	
11 – 15	8	114.6	14.32	
> 16	6	194.8	32.49	
Income Distribution				
100 – 5000	28	1438.3	51.37	15001 - 20000
5000 – 10000	4	96.25	24.06	
10001 – 15000	2	58.3	29.15	
15001 – 20000	2	108.3	54.15	
20001 – 25000	-	-	-	
25001 – 30000	1	50	50	
No. of Monthly Meetings				
1 – 5	30	1340.4	44.68	6 – 10
6 – 10	4	240.8	60.2	
11 – 15	3	170	56.67	

Table 3: Distribution of Respondents WTP for Environmental Services of Forest of Trees

Response	Religious Frequency	Academic Frequency	Soc./Cultural Frequency	Total Frequency	% of Total Frequency
Yes	8	8	21	37	77.01
No	0	2	9	11	22.9
Total	8	10	30	48	100

Table 4: Distribution of Elicited WTP Values for Environmental Services of Forest by the Respondents.

Elicited Values	Religious Frequency	Academic Frequency	Soc./Cultural Frequency	Total Frequency	% of Total Frequency
5	-	1	-	1	2.7
10	-	-	-	-	-
20	2	3	1	6	16.2
50	-	-	5	5	13.6
100	4	2	8	14	37.8
200	2	2	7	11	29.7
500	-	-	-	-	-
1000	-	-	-	-	-
Total	8	8	21	37	100

Table 5: Monthly Aggregate WTP for environmental Services of Forest Trees by the Respondents

Categories of Registered Corporate Groups	Total No. Registered Group	No. Sampled	Population No. WTP	Total Elicited WTP Values ₱	Mean Elicited WTP Values ₱	Aggregate WTP ₱
Religion Associations	13	8	8	840	105.0	1,365
Academic Association	17	10	8	665	83.13	1,411
Socio-cultural Association	45	30	21	2470	117.62	5,292.86
Total	75	48	37	3975	104.43	7,800

Table 6: Distribution of Respondents Perceptions of Environmental Services of Forest Trees.

Categories of Environmental Services	Religious Frequency	Academic Frequency	Soc./Cultural Frequency	Total Frequency	% of Total Frequency
Shade Provision	8	10	28	46	50
Climatic Amelioration	3	2	8	13	14.1
Pollution Reduction	2	6	10	18	19.6
Aesthetics	1	2	5	8	8.7
Food/Medicinal	2	-	5	7	7.6
Total	16	20	56	92	100

Table 7: Distribution of Respondents Time of Payment (TOP) for Tree Services.

Time of Payment	Religious Group Frequency	Academic Group Frequency	Soc./Cultural Groups Frequency	Total Frequency	% of Total Frequency
Month	6	2	8	16	43.24
Quarterly	1	6	4	11	29.73
Annually	1	-	9	10	27.03
Bi-Annually	-	-	-	-	-
Total	8	8	21	37	100

Table 8: Distribution of Respondents Mode of Payment (Payment Instruments)

Payment Instruments	Religious Group Frequency	Academic Group Frequency	Soc./Cultural Groups Frequency	Total Frequency	% of Total Frequency
Taxation	1	2	1	4	10.81
Voluntary Donations	4	4	9	17	45.95
Annual Maintenance Levy	3	2	11	16	43.24
Total	8	8	21	37	100

Table 9: Summary of Semilog Regression Model

Predictor Variable	Regression Coefficient	Standard Error	F-ratio	Significance
Constant	0.2727	0.1846	1.48	0.150
Population (X ₁)	0.0005	0.0003	1.60	0.121
Income (X ₂)	0.1560	0.0550	2.84	0.008***
Sources of Income (X ₃)	0.202	0.250	2.050	0.043**
No. of Meeting (X ₄)	0.0113	0.250	0.45	0.657
Years of Existence (X ₅)	0.3258	0.1785	1.82	0.078*

$R^2 = 95.3$

Adjusted R = 92.7

Standard Error = 0.1068

F-ratio = 35.97

* Significant at 10%

** " " 5%

*** " " 1%