

Economic assessment of Cibodas botanical garden as environment and human health service-based ecotourism object

Edwina Firdhatarie Minaputri¹, Bum-Jin Park^{1*}, Dawou Joung¹, Rizal Bachtiar²

¹Department of Forest Environment and Forest Resources, Chungnam National University, Daejeon 34134, Korea

²Department of Resources and Environmental Economic, Bogor Agricultural University, Bogor 16680, Indonesia

*Corresponding author: bjpark@cnu.ac.kr



OPEN ACCESS

Citation: Minaputri EF, Park BJ, Joung D, Bachtiar R. 2017. Economic assessment of Cibodas botanical garden as environment and human health service-based ecotourism object. Korean Journal of Agricultural Science 44:123-132.

DOI: <https://doi.org/10.7744/kjoas.20170014>

Editor: Jungsoo Lee, Kangwon National University, Korea

Received: November 18, 2016

Revised: March 10, 2017

Accepted: March 14, 2017

Copyright: © 2017 Korean Journal of Agricultural Science.



This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

Nowadays, many people suffer from stress because of their jobs, studies, traffic, etc. Daily stress may cause many diseases (Garrett, 1991). One of the methods for reducing stress is experiencing a natural environment (Frumkin, 2001). Cibodas botanical garden (CBG) is one of the most famous travel destinations in Bogor, Indonesia. CBG has the potential for tourism activities. However, an economic assessment is required to verify their sustainability. The research objectives of this study were to identify the characteristics of tourism utilization in CBG, to analyze the economic tourism value of CBG, and to measure the effectiveness of traveling to a natural environment for reducing stress. The research method used was the survey. This study used three data analysis methods: (1) descriptive analysis which was used to identify the characteristics of tourists, (2) travel cost method (TCM), and (3) contingent valuation method (CVM). Results showed some differences in the characteristics of foreign and domestic tourists respondents in age, educational background, income level, number of dependents, and the frequency of their visits. CBG has a high economic value, amounting to IDR (Indonesian Rupiah) 5,508,932,605,405 or approximately USD (United State Dollar) 413,000,000. WTP (Willingness to Pay) of domestic tourist respondents was IDR 29,702 or USD 2.2 per visit, while the value of foreign tourist respondents reached IDR 39,700 or USD 2.9 per visit. Respondents found it preferable to pay more for tickets (WTP value) than to buy medication to reduce their stress.

Keywords: botanical garden, contingent valuation method, ecotourism, human health, travel cost method

Introduction

Indonesia is an archipelago country containing approximately 17,508 islands with different geographical and topographical conditions. Indonesia's current population of approximately 250 million is one of the reasons why job seeking competition is getting fierce. In addition, Indonesians

usually faced severe traffic congestion on a daily basis. Therefore, it is not surprising that these days, many people suffer from stress because of their jobs, studies, traffic, etc. Thus, one way of reducing stress is to take an ecotourism vacation. Tourism can be interpreted as a journey undertaken temporarily, which is held from one place to another, and its purpose is not related to business or to earning a living in the places visited but simply to enjoy sightseeing and to fulfill diverse desires (Pangemanan, 1993). Ecotourism is a special form of tourism activities. Unlike conventional tourism, ecotourism is tourism activities that pay great attention to the sustainability of tourism resources (Damanik and Weber, 2006).

The botanical garden is defined as “a place where plants are cultivated for scientific, educational, and ornamental purposes, often including a library, a herbarium, greenhouses, or an arboretum” (American Heritage® Dictionary of the English Language, Fifth Edition, 2011). CBG is one of the most famous botanical garden in Indonesia. CBG is an 84.99 hectare botanical garden on the slopes of Mount Gede, located in the Cibodas, West Java, Indonesia. It is operated by the Indonesian Institute of Sciences (LIPI). CBG was founded by Dutch botanist, Johannes Elias Teijsmann. The gardens were built at a high altitude, allowing the growth of subtropical plants. Plant collections are planted in gardens or plant houses in the case of Cacti, ferns, Succulents and Orchids. There are approximately 10,792 living specimens in the garden. This garden also has a herbarium and a seed collection. They have many program for research, education, and conservation.

Nevertheless, there still is a lot of untapped potential because the facilities are not complete and the existing services still need to be improved. Before areas for improvement can be pinpointed, the characteristics of tourism utilization and economic value of CBG should be known. Therefore, identifying and analyzing them are crucial steps for the improvement of CBG.

Adding new facilities and improving existing facilities and services will involve additional costs. Thus, a way to increase their income should be found. One way to do that is to increase the price of entrance tickets. But, there is a limit to how much the entrance ticket prices can be increased. Increasing the entrance ticket too much will risk CBG to lose potential customers. The first question this study tries to answer is the following: “What is the appropriate increase in ticket price that costumers are willing to pay?”.

Daily stress may cause many diseases (Garrett, 1991). One of the methods for reducing stress is experiencing a natural environment (Frumkin, 2001). But the effectiveness of that stress relief method is hard to measure and to quantify because of the many variables that need to be measured. The second question the present study addresses is: “How effective is experiencing natural environment trip in reducing stress, specifically in CBG?”.

Based on these problems, the three objectives of this research are as follows: (1) identifying and describing the characteristics of tourism utilization in CBG, (2) analyzing the economic tourism value by travel cost method (TCM) and ticket price for CBG by contingent valuation method (CVM) in willingness to pay (WTP), and (3) measuring the effectiveness of traveling to a natural environment for reducing stress by statistical test (t-test).

Materials and Methods

Types and sources of data

The data collected in this research includes primary and secondary data. In 2015, primary data was collected through interviews with respondents using a questionnaire. The survey asked about respondent’s age, gender income,

marriage status, education level, number of dependents, frequency of visits, motivation for visits, how to arrival, cost for travel from home to CBG, and willingness to pay at ticket price. Secondary data were also obtained through a variety of relevant data sources such as reference books, literature sources or literature from the internet, and scientific journals.

Method of sampling

A non-probability sampling of visitors was used. In this method, not all population units had the opportunity to be used as research sample (Bungin, 2013). Respondents were taken by way of purposive sampling, in which researchers deliberately chose respondent according to particular considerations. The information gathering process was conducted through interviews and questionnaires to the respondents.

Method of analysis

Socio economic characteristics of visitors were identified and their descriptive analysis was performed. These characteristics were a description of the factors that would affect the willingness of visitors to pay for the sake of conservation efforts in CBG.

Assessment methods to measure the economic value of natural tourism most widely used is the TCM (Ryoo et al., 2004). These methods estimate the economic value of tourism area (in rupiah), based on the assessment given by each individual in invaluable pleasure, costs incurred to pay a visit to a tourist attraction, and both opportunity costs and expenses that directly incurred as the cost of transportation, food consumption, hotel, admission ticket, and so on.

WTP values of visitors of CBG were analyzed using CVM approach, in the following six stages (Amanda, 2009; Hong, 2016): (1) making hypothetical scenario marketing, (2) getting the offer of WTP value, (3) estimating the value of average WTP, (4) estimating curve of WTP, (5) adding up the data, and (6) evaluating the use of CVM by test of statistic and econometrics by XLStat 2016.

A total of six statistical and econometrical tests were used, (1) normality test, (2) test of F statistic, (3) test of T statistic, (4) multicollinearity test, (5) test of heteroskedasticity, and (6) test of autocorrelation.

F- and t-tests were done using XLStat 2016 for measuring the effectiveness of traveling to natural environment for reducing stress. T-test aims to determine whether the independent variables included in the equation individually affect the value of the dependent variable. This is done by testing the regression coefficients of each independent variable (Algifari, 2000).

The variables that are used in analysis are gender, age, education level, income, number of dependents, frequency of visit, residency, marriage status, occupation, distance to tourist places, time spent in tourist places, alternative destination of tourist place, number of travelling companions, and travel cost. After statistical tests, only five variables were shown to influence WTP. Those five variables are age, education level, income, number of dependents, and frequency of visit.

Results

Characteristic of the respondents

As many as 285 visitors of CBG were selected to be the respondents in this study. They consisted of 185 domestic

tourists and 100 foreign tourists. The characteristics of the respondents, classified into as domestic or foreign tourists categories, were chosen based on socio economic factors consisting of gender, age, marital status, education level, income level, and number of dependents (Table 1).

Table 1. Characteristics of domestic & foreign tourist respondents.

Characteristics	Domestic tourist		Foreign tourist	
	Total (people)	Percentage (%)	Total (people)	Percentage (%)
Gender				
Males	89	48.11	59	59.00
Females	96	51.89	41	41.00
Total	185	100.00	100	100.00
Age (year old)				
20 - 25	48	25.95	21	21.00
26 - 30	65	35.14	38	38.00
31 - 35	27	14.60	20	20.00
36 - 40	21	11.35	13	13.00
41 - 45	11	5.95	4	4.00
46 - 50	6	3.24	2	2.00
> 50	7	3.78	2	2.00
Total	185	100.00	100	100.00
Marital Status				
Unmarried	88	47.57	65	65.00
Married	97	52.43	35	35.00
Total	185	100.00	100	100.00
Education Level				
High School	38	20.54	49	49.00
Undergraduate	123	66.49	41	41.00
Graduate	24	12.97	10	10.00
Total	185	100.00	100	100.00
Income Level (IDR/month)				
< 5.000.000	85	45.95	0	0
5.000.000 -10.000.000	72	38.92	0	0
10.000.001 -15.000.000	19	10.27	37	37.00
15.000.001 -20.000.000	7	3.78	39	39.00
> 20.000.000	2	1.08	24	24.00
Total	185	100.00	100	100.00
Number of Dependents (people)				
0	71	38.38	50	50.00
1	33	17.84	15	15.00
2	36	19.46	18	18.00
3	30	16.22	11	11.00
4	12	6.49	3	3.00
5	3	1.62	3	3.00
Total	185	100.00	100	100.00

Table 2. Characteristics of domestic & foreign tourist respondents in travelling.

Characteristics	Domestic tourist		Foreign tourist	
	Number of people	Percentage (%)	Number of people	Percentage (%)
Frequency of visits (time)				
1	64	34.60	83	83.00
2	48	25.95	17	17.00
3	38	20.54	0	0.00
4	18	9.73	0	0.00
5	14	7.57	0	0.00
> 5	3	1.62	0	0.00
Total	185	100.00	100	100.00
Arrival				
Alone	11	5.95	32	32.00
Groups	45	24.32	59	59.00
Family groups	74	40.00	9	9.00
Company groups	55	29.73	0	0.00
Total	185	100.00	100	100.00
Types of Vehicle				
Motorcycles	27	14.60	51	51.00
Cars	158	85.41	49	49.00
Total	185	100.00	100	100.00

Respondents' characteristics are distinguished also by their frequency of visits, motivation for visits, arrival method, and travel method (Table 2). In the past, tourists coming to this area had a specific purpose such as getting refreshed or doing research. Nowadays, travelers or tourists visiting CBG are not only those who are with a specific purpose but also is the general population.

Based on arrival characteristics (alone, in a group, family, or company groups), as many as 40% of domestic respondents visited CBG with family members. This suggests that the tourism activities in CBG could be more fun if done with the family. This is related to the characteristics of the respondents, most of whom were married. In general, they will take part in tours with their family members. Based on their travel methods, as many as 59% of respondents visited CBG in groups. This shows that, for foreign tourists, tourism activities in CBG would be more fun if done together with a group of friends. This is related to the characteristics of the respondents who were mostly unmarried and, in general, will conduct tourism activities with close friends or a group.

Perceptions of respondents at CBG are the views and assessment of the visitors to CBG. Based on survey, respondents perceptions at CBG are an effort to conserve the environment and can be used as information for tourism managers of CBG for decision making in doing CBG tourism development in the future.

Economic value of CBG

The economic value of tourism services of CBG was estimated using individual travel cost method (TMC). The economic value of tourism services can be obtained by knowing the consumers' surplus, i.e. by squaring the number of tourist visits last year and then dividing into twice the coefficient of travel expenses. Coefficient of travel expenses

was obtained from the regression analysis between the frequency of visits as the dependent variable and travel expenses as an independent variable. Based on the results of the regression analysis, the equation for domestic tourists is presented below:

$$FV = 2.769 - 0.0000001 \text{ TCI}$$

Explanation:

FV = Frequency of domestic tourist visits to CBG (per year)

TCI = Total cost of individual domestic tourists traveling to CBG per visit (IDR)

The economic value of tourism services of TCI can be obtained by multiplying the consumer surplus by the number of domestic tourist visits. The calculation of the economic value of CBG based on the domestic tourists can be seen in Table 3.

In contrast to domestic tourists, the following are the results of the regression analysis in which equation for foreign tourists was obtained:

$$FV = 1.3478 - 0.00000001 \text{ TCI}$$

Explanation:

FV = Frequency of tourist visits to CBG (per year)

TCI = Total cost of individual trips of foreign tourists to CBG per visit (IDR)

The economic value of tourism services of CBG can be obtained by multiplying the consumer surplus with the number of foreign tourists' visits to CBG. The calculation of the economic value of CBG by foreign tourists can be seen in Table 3.

Both values of economy of CBG based on domestic and foreign tourists are summed to determine the overall economic value of CBG. The value of tourism services in CBG amounts to IDR 5,508,932,605,405.41 or approximately USD 413,000,000. This value indicates that the economic value of CBG is high. Therefore, the existence of CBG should be maintained. If we do not take care and develop it, the value will be lost.

Table 3. Calculation of economic value (in IDR) of CBG.

Explanation	Value (Domestic travelers)	Value (Foreign travelers)
Number of Respondents (a)	185	100
Number of visits (b)	434	111
Number of visits in 2012 (c)	453,008	35,184
Coefficient of travel cost (d)	0.0000001	0.0000001
Surplus of consumers (e) = $b^2/2d$	941,780,000,000.00	61,605,000,000.00
Surplus of consumers /individual/visits (f) = $e/a/b$	11,729,729.73	5,550,000.00
Economic value (g) = $f \times c$	5,313,661,405,405.41	195,271,200,000.00
Total of Economic value (h) = (g) domestic + (g) foreign	5,508,932,605,405.41	

*IDR : Indonesian Rupiah

Estimating the value of WTP

Based on the calculations, the average value of the WTP of domestic tourists is IDR 29,702 or USD 2.2 per person and for foreign tourists is IDR 39,700 or USD 2.9 per person. The average value can be used as a reference or consideration in the determination of the rate of entry for tourists in CBG (Table 4).

Table 4. Distribution of average value of the domestic & foreign tourists' WTP.

No	WTP value (IDR/person)		Number of respondents (people)		Value of WTP × Number of respondents (IDR)	
	Local	Foreigner	Local	Foreigner	Local	Foreigner
	a		b		c (a × b)	
1	15,000	30,000	6	19	90,000	570,000
2	17,500	35,000	11	24	192,500	840,000
3	20,000	40,000	10	9	200,000	360,000
4	25,000	45,000	25	11	625,000	495,000
5	27,500	50,000	45	6	1,237,500	300,000
6	30,000	60,000	31	7	930,000	420,000
7	35,000	70,000	27	6	945,000	420,000
8	40,000	80,000	19	6	760,000	480,000
9	45,000	85,000	7	1	315,000	85,000
10	50,000	100,000	4	11	200,000	1,100,000
Total			185	100	5,495,000	3,970,000
	Average Value of WTP (Total of b/Total of c)				29,702.7	39,700

Analysis of factors affecting the amount of WTP of respondents

Analysis of factors that affect the value of WTP of domestic and foreign tourists was conducted by using multiple regression analysis. The independent variables used to analyze these factors were age, education level, income, number of dependents, and the frequency of visits. After being tested with several test parameters it was concluded that all independent variables are not in violation of ordinary least squares' (OLS) assumptions. The resulting model performs well and has been tested for its normality, autocorrelation, multicollinearity, and heteroscedasticity. All four of which aren't violated by the model.

The data processing, performed by using XLSTAT 2015, resulted in WTP models for domestic respondents producing the following:

$$\text{WTP} = 1,634.491 + 120.011 \text{ Age} + 1,529.498 \text{ Education Level} - 0.3290 \text{ Income} + 1,785.142 \text{ Number of Dependents} - 759.839 \text{ Frequency of Visits} + \varepsilon_i$$

The outputs of multiple regression analysis of WTP model of visitors are presented in Table 5.

Multiple regression analysis resulted in R² value of 40.34%. This value shows that 40.34% of respondents' WTP diversity can be explained by the diversity of explanatory variables included in the model, and the remaining 59.66% was explained by other variables that were not included in the model.

According to Mitchell and Carson (1989) in Hanley and Spash (1993), studies related to the objects of the

Table 5. Outputs of multiple regression of WTP of domestic respondents.

Variables	Coefficient	T	Pr > t	Lower bound (95%)	Upper bound (95%)
<i>Constant</i>	1,634.49	0.38	0.70	-6,962.89	10,231.88
Age	120.01	1.68	0.09	-21.10	261.12
Education level	1,529.49	6.22	< 0.0001	1,044.28	2,014.70
Income	-0.32	-0.03	0.97	-24.17	23.51
Number of dependents	1,785.14	4.05	< 0.0001	915.18	2,655.09
Frequency of visits	-759.84	-2.25	0.03	-1,426.33	-93.34
R ²	40.34%				
R ² (adj)	38.67%				

environment can tolerate R2 values of up to 15%, which is due to environmental research related to human behavior so that R2 does not have to be big. Therefore, the results of the implementation of CVM in this research can still be believed to be true and reliable.

WTP models of the foreign tourists is presented below:

$$\text{WTP} = -45,905.142 - 64.112 \text{ Age} + 535.353 \text{ Education Level} + 5,276.638 \text{ Income} - 4,644.875 \text{ Number of Dependents} + 139.232 \text{ Frequency of Visits} + \varepsilon_i$$

The outputs of multiple regression analysis of WTP model of visitors are presented in Table 6.

Multiple regression analysis resulted in R2 value of 71.39%. This value shows that 71.39% of respondents' WTP diversity can be explained by the diversity of explanatory variables included in the model, and the remaining 28.61% was explained by other variables that were not included in the model.

Many variables affected the value of WTP. Those variables were estimated to influence the value of WTP of respondents in the efforts of preservation of environment CBG.

Table 6. Outputs of multiple regression of WTP of foreign respondents.

Variables	Coefficient	T	Pr > t	Lower bound (95%)	Upper bound (95%)
<i>Constant</i>	-45,905.14	-4.91	< 0.0001	-64,446.42	-27,363.86
Age	-64.11	-0.23	0.81	-601.43	473.20
Education level	535.35	0.73	0.46	-909.62	1,980.32
Income	5,276.63	11.27	< 0.0001	4347.11	6,206.16
Number of dependents	-4,644.87	-3.75	0.0003	-7,098.82	-2,190.92
Frequency of visits	139.23	0.03	0.96	-6,800.38	7,078.84
R ²	71.39%				
R ² (adj)	69.87%				

Respondents' effectiveness of traveling to CBG for reducing stress

To know the effectiveness of traveling to natural environments for reducing stress, we compared the WTP value with the cost to buy medication for any illness resulting from stress using XLSTAT 2016 with F statistic test and t statistic test for the results. Comparison can be seen in Table 7 and 8.

Table 7. Group statistic.

Group	N	Mean	Std. deviation	Std. error mean	
Domestic	WTP	185	29,702.70	7,628.83	560.88
	Medication	185	18,883.78	14,351.99	1,055.17
Foreigner	WTP	100	50,700.00	22,774.91	2,277.49
	Medical	100	33,650.00	69,608.77	6,960.87

Table 8. Independent sample test.

		Levene's test for equality of variances		T-test for equality of means			
		F	Sig.	T	Df	Sig. (2-tailed)	Mean difference
Domestic	Equal variances assumed	77.03	.000	9.05	368	.000	10,818.91
	Equal variances not assumed			9.05	280.29	.000	10,818.91
Foreigner	Equal variances assumed	51.34	.000	2.32	198	.021	17,050.00
	Equal variances not assumed			2.32	119.95	.022	17,050.00

From F statistic test, we can see that the data from domestic and foreign respondents are heteroscedastic. From t statistic test, we can see that value of medication and tickets by WTP are different. Therefore, we can say that respondents find it preferable to choose to pay more for tickets (WTP value) than to buy stress reducing medication. It's true that some medicine is cheaper than the price for a ticket, but respondents think medications could create a dependence, and thus they choose to pay more for tickets. Furthermore, visiting nature site is healthier and more relaxing than taking medicine.

Conclusion and recommendations

Based on the results and discussion of the research, it is concluded that domestic tourists were 26 to 30 years old, undergraduates, whose income was less than IDR 5,000,000 per month, with no dependents. The highest frequency of visits they made was once a year and most of them came with family. Foreign tourists were aged 26 to 30, high school graduates, with an income of IDR 15,000,001 - 20,000,000 per month, with no dependents. The highest frequency of visits they made was once a year and they came with a group or friends.

The economic value of tourism services in CBG was IDR 5,508,932,605,405.41. This value indicates that CBG has significant economic value. Therefore, the existence of Cibodas Botanical Garden should be maintained as a botanical garden location. If we do not take care and develop it, the value will be lost.

The average value of the domestic respondents' WTP was IDR 29,702.7 per visit and the average value of the WTP of foreign respondents was IDR 39,700 per visit. The WTP is helping the maintenance of CBG. The factors that influenced the WTP of the domestic tourists at a significant level (5%) were level of education, number of dependents, and number of frequency visits. The factors that affected the WTP of foreign tourists were the income and number of dependents at a significance level of 5%.

The computed p-value is greater than the significance level $\alpha = 0.05$ for domestic and foreign respondents. Respondents found it preferable to choose to pay more for tickets (WTP value) than buy some medication to reduce their stress. It's true that some medications are cheaper than the price for tickets, but respondents think that medicine

will give them addictions, and thus they choose to pay more for tickets. Furthermore, natural products are healthier and respondents can relax because of nature.

The process developed in this study can use the WTP values obtained as the price of admission fee. CBG can develop its infrastructure and facilities to help the tourists who want to relax, play, and reduce their stress.

Based on the results and discussion of the research, it is recommended to use the WTP obtained as the price of admission. This will help CBG in the development of its infrastructure. More advanced research is needed in relation to number of tourists in CBG, so CBG can control number of visitors and prevent the overcrowdedness during peak season.

References

- Algifari. 2000. Theory, cases, and solution of regression analysis, Yogyakarta, Indonesia: BPFY-Yogyakarta. [in Indonesian]
- Amanda S. 2009. Analysis of willingness to pay of Situgede lake's visitors in efforts of environment conservation. Bogor, Indonesia: Institute Pertanian Bogor. [in Indonesian]
- American Heritage®. 2011. Dictionary of the English language, fifth edition. Houghton Mifflin Harcourt Publishing Company.
- Bungin B. 2013. Social & economic research methodology: The Formats for quantitative and qualitative sociology, public policy, communications, management, and marketing, Jakarta: Kencana Prenada Media Group. [in Indonesian]
- Damanik J, Weber HF. 2006. Ecotourism planning from theory to applications, Yogyakarta, Indonesia: Penerbit ANDI. [in Indonesian]
- Frumkin H. 2001. Beyond toxicity: Human health and the natural environment. American Journal of Preventive Medicine 20:234-240.
- Garrett V, Brantley PJ, Jones GN, McKnight GT. 1991. The relation between daily stress and Crohn's disease. Journal of Behavioral Medicine 14:87-96.
- Hanley N, Spash CL. 1993. Cost benefit analysis and the environment, Hants United Kingdom: Edward Elgar Publishing Limited.
- Hong SJ. 2016. Measuring benefits of providing water for environmental improvement in Daechi-stream and Ji-stream. Korean Journal of Agricultural Science 43:275-287. [in Korean]
- Mitchell RC, Carson RT. 1989. Using surveys to value public goods: The contingent valuation method. Resources for the Future. Accessed in <http://econweb.ucsd.edu/~rcarson/papers/UsingSurveysToValuePublicGoods.pdf>.
- Pangemanan AP. 1993. The application of travel cost model for predicting demand function and tourism benefits in Bunaken national park, North Sulawesi [thesis], Bogor, Indonesia: Institut Pertanian Bogor. [in Indonesian]
- Ryoo YH, Lim JH, Koo SM. 2004. An economic estimation of tourism effects by travel cost method-application for Daeho rural tourism & leisure complex. CNU Journal of Agricultural Science 31:123-134. [in Korean]