"INTERNATIONAL TOURISM AND ITS CONTRIBUTION TO THE VALUATION OF THE TROPICAL RAINFOREST: A PROPOSED METHOD AND APPLICATION IN COSTA RICA"

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Juan A. Aguirre, Ph.D., Senior Research Professor

Turrialba, Costa Rica
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I. Introduction

Tourism in Costa Rica has grown tremendously in the last decade. In 1996, 781,127 international tourists arrived in Costa Rica (ICT, 1996), as compared to the 371,582 tourists in 1982 (Boo, 1990). Additionally, in a 1996 survey conducted by ICT, approximately 52.7% of the tourists who visited Costa Rica participated in natural history related tourism and 38.3% participated in bird-watching activities (ICT, 1996). The increasing number of ecotourists implies a greater impact upon natural resources such as tropical rainforest and marine ecosystems while providing incentives for further conservation measures, responsible planning, and sustainable management of both existing and future protected areas.

Due to the shortcomings and limitations of the travel cost method and contingent valuation method with respect to multi-destination, international tourism, this study attempts to develop and test an alternative method which is closer to actual market values than the methods and studies previously described to value the tropical rainforest through the recreational contribution of tourism.

II. Objectives

The objectives of this study are:

→ To develop and test a methodology to estimate the value of certain natural resources by determining the recreation values of ecotourism related activities, such as tropical rainforest related activities, undertaken by multi-destination international tourists.

→ To determine the expenditure pattern of multi-destination international tourist visits in terms of time, expenses, and type of activities undertaken, and to identify the determining variables of the expenditure pattern.

III. Hypothesis

Forest based and related ecotouristic activities undertaken by international tourists make an important contribution to the total value of tropical rainforest.

Paper

IV. Review of Literature

Previous studies related to tourism expenditures argue that tourists to such countries such as Belize, Costa Rica, Mexico, and Ecuador maintain an average total trip-related tourism expenditure per day between US$131 and US$304. The lowest trip-related daily expenditure was Costa Rica while the highest was Ecuador (Boo, 1990).

In Costa Rica, a travel cost study was used to determine the consumer surplus of a visit to Monteverde Cloud Forest. The study included only domestic travel cost using the value domestic travel cost value also as a proxy for international travel costs. This study places a value of US$35 per visit or US$97,500 to US$116,200 on the Monteverde Cloud Forest (Tobias and Mendelssohn, 1991). Another study in Costa Rica uses the travel cost method to determine the recreation value of the tropical rainforest to be $1150 per visit (Menkhaus and Lober, 1995). This study not only includes the cost of international travel, which does not reflect distance, but it also neglects the adjustments for multi-destination and multi-activity travel.

A contingent valuation study undertaken in Costa Rica determines the willingness to pay by users for preservation and conservation of a national park to be between a one-time fee of US$130.43 or an annual fee of US$110.64. The study argues that the difference between the results of willingness to pay is due to the cultural-bias on the part of nationals and foreigners (Echeverria et al, 1994).

V. Methodology

A random sampling of 420 international visitors leaving Costa Rica were surveyed in personal interviews by one interviewer. Individuals surveyed were asked to indicate the amount of time and expenses spent in each activity which they undertook during their stay in Costa Rica, as well as, socioeconomic variables such as age, nationality, number of people accompanying the respondent, motive for travel to Costa Rica, and method of travel (package tour or independent).

The results of the surveys were divided into specific activity categories. The categories were:

- **Adventure**: bicycling, horseback riding and kayaking activities; **Beach**: surfing, sunbathing, swimming, jetskiing activities; **City**: city, garden, and souvenir-shopping activities; **Forest**: park, forest, reserve, and boat (canal tour) activities; **Nature**: volcano watching, cave exploring and tours, hot spring, rural tourism, turtle-watching, lake-fishing activities; **Rafting**: white-water rafting activities; **Reef**: snorkeling and scuba diving activities and **Other**: sportfishing, hot-air ballooning, cruise, arrival and exit day activities (mainly consisting of travel to and from the country), and other activities

The data allocated in activity categories was analyzed to determine both overall and activity specific expenditures per day, amount of time spent in each activity, average time and expenditures per stay, and surrogate consumer surplus related to each activity.
The results of the tabular analysis were used to determine equations for the regression analysis (expenditures per day in each activity), and the surrogate consumer surplus, which is important to the valuation methodology.

The dependent variables of expenditure per day in each activity category were set equal to a function of the independent variables (sex, age, nationality, motive for travel, number of people accompanying the respondent, type of travel, total disposable time, and total disposable income of the respondent).

Regression analysis were then run on these different equations to determine which independent variables were most explicative of the dependent variable (expenditures per day in each activity). In addition, an f-test was run to determine multi-collinearity between the independent variables.

The valuation methodology developed in this study proposes to use a surrogate consumer surplus obtained through the "real" tourism expenditures incurred in each activity undertaken by the tourist. This method captures the expenses incurred by a tourist during his or her visit to a natural resource, such expenses include local transportation to the site, lodging, entrance fees, food, tours, etc., as well as the time spent undertaking these activities.

The surrogate consumer surplus concept assumes that the average daily expenditures across all possible recreational activities undertaken by a tourist, is the bottom-line, short-run equilibrium situation. This means that a tourist must pay at least, the minimum, or the average daily expenditure over all activities, in order to satisfy his or her basic needs and to obtain some form of undefined general enjoyment. When the tourist chooses to spend more money per day than the average daily expenditure across all activities, it is assumed that the activity is of particular interest to the tourist, because the limited disposable income constraint forces him or her to make a choice between various activities.

The difference between actual expenditure in an activity and average expenditure across all activities may be considered a surrogate consumer surplus. The tourist is willing to pay more because the activity undertaken and the resources utilized provide a kind of enjoyment for which the tourist is willing to make a monetary and time sacrifice in the short-term.

This method is important because it does not rely on hypothetical willingness to pay, nor costs of travel, which do not correspond to the actual in-country expenditures. The surrogate consumer surplus valuation focuses on the expenditures actually made in the country by the tourist. The surrogate consumer surplus revenue obtained by tourism to a natural resource, such as a tropical rainforest determines the recreational value of that resource.

This method not only determines how much consumers value the resource by determining what consumers have actually paid to enjoy the natural resource, but also how much international tourism-related revenue is obtained by the host country economy. Therefore, the surrogate consumer surplus valuation methodology reinforces preservation and conservation by the host country and can guide government policies with respect to the valued natural resources.
The surrogate consumer surplus value obtained in the tabular analysis, then, was used to determine the value of the rainforest using the following methodology:

1. Determination of Average Surrogate Consumer Surplus per day per activity (SCSA)

\[ \text{SCSA} = \$/\text{day per activity} - \$/\text{day across all activities per stay} \]

2. Determination of the Value of the Natural Resource (VNR)

\[ \text{Consumer surplus $/\text{activity/stay} = \text{SCSA} \times \text{average # of days spent per activity/stay} = \text{SCSAS}} \]

3. Value of Natural Resource VNR = SCSAS \* annual # of tourists

4. Determination of the Valuation per Hectare of the Tropical Rainforest (VNR/hectare):

\[ \text{VNR = the value of the rainforest in terms of annual tourism consumer surplus} \]

\[ \text{VNR/hectare = VNR/ # hectares of protected area visited tourists} \]

The result is the recreational value of the tropical rainforest in terms of US$ per hectare, based upon a surrogate consumer surplus value.

VI. Results and Discussion

The 1996 Costa Rica Institute of Tourism (ICT) survey results which determined the average number of days per stay per tourist to be 11.3 nights, and the average expenditures per day to be $90.7 (ICT, 1996), results that are very similar to those of this study.

The results obtained from the tabular analysis of the survey data (Table 1) indicate that tourists could perform a possible total of 26 different activities during their stay and that the tourists were willing and able to provide a clear response of the actual amount of time (measured in days), and amount of expenditures (measured in US dollars) which they incurred while participating in different activities.

As seen in Table 1, certain activities have a much higher expenses per day than other activities. Such activities have a high expenditure per day due to value added in the activities such as equipment, tours, gasoline, transportation etc. These activities add revenue to the local economies and the multiplier effect provides further impacts to the rest of the national economy. This finding coincides with the profile of the “ecotourist”, which tend to be wealthier and spend more money than the average tourist (Whelan, 1991) (Boo, 1990).

Although ecotourism-related activities and other activities undertaken by tourists in Costa Rica have high expenditure per day, it can be observed that the overall average expenditure per day is low ($90.95/day).
Table 1. Results of Time (in days) and Expenditure (in US$) Survey per Activity

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>Total Time (days)</th>
<th>% of Total Time</th>
<th>Total Expenditures ($)</th>
<th>% of Total Expenditure</th>
<th>Expenditures per day ($/day)</th>
<th>Consumer Surplus ($)</th>
<th>% of Total Consumer Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>arrival</td>
<td>231.00</td>
<td>5.33</td>
<td>23270.25</td>
<td>5.91</td>
<td>100.74</td>
<td>9.79</td>
<td>0.58</td>
</tr>
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<td>balloon</td>
<td>1.00</td>
<td>0.02</td>
<td>208.00</td>
<td>0.05</td>
<td>208.00</td>
<td>117.05</td>
<td>0.06</td>
</tr>
<tr>
<td>beach</td>
<td>1808.50</td>
<td>41.76</td>
<td>127324.94</td>
<td>32.33</td>
<td>70.40</td>
<td>-20.54</td>
<td>-6.64</td>
</tr>
<tr>
<td>biking</td>
<td>84.50</td>
<td>1.95</td>
<td>7547.60</td>
<td>1.92</td>
<td>89.32</td>
<td>-1.63</td>
<td>-0.03</td>
</tr>
<tr>
<td>boat</td>
<td>31.75</td>
<td>0.73</td>
<td>3976.45</td>
<td>1.01</td>
<td>125.24</td>
<td>34.29</td>
<td>0.35</td>
</tr>
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<td>caves</td>
<td>1.75</td>
<td>0.04</td>
<td>106.10</td>
<td>0.03</td>
<td>60.63</td>
<td>-30.32</td>
<td>-0.01</td>
</tr>
<tr>
<td>city</td>
<td>550.75</td>
<td>12.72</td>
<td>53126.14</td>
<td>13.49</td>
<td>96.48</td>
<td>5.51</td>
<td>0.74</td>
</tr>
<tr>
<td>cruise</td>
<td>6.00</td>
<td>0.14</td>
<td>2187.00</td>
<td>0.56</td>
<td>364.50</td>
<td>273.55</td>
<td>1.52</td>
</tr>
<tr>
<td>diving</td>
<td>35.00</td>
<td>0.81</td>
<td>7279.93</td>
<td>1.85</td>
<td>208.00</td>
<td>117.05</td>
<td>2.18</td>
</tr>
<tr>
<td>exit</td>
<td>233.00</td>
<td>5.38</td>
<td>23651.05</td>
<td>6.01</td>
<td>101.51</td>
<td>10.56</td>
<td>0.63</td>
</tr>
<tr>
<td>forest</td>
<td>292.18</td>
<td>6.75</td>
<td>25982.45</td>
<td>6.60</td>
<td>88.93</td>
<td>-2.02</td>
<td>-0.13</td>
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<td>gardens</td>
<td>3.50</td>
<td>0.08</td>
<td>291.00</td>
<td>0.07</td>
<td>83.14</td>
<td>-7.80</td>
<td>-0.01</td>
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<td>horse</td>
<td>48.50</td>
<td>1.12</td>
<td>7247.00</td>
<td>1.84</td>
<td>149.42</td>
<td>58.48</td>
<td>1.08</td>
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<td>hot springs</td>
<td>27.17</td>
<td>0.63</td>
<td>2890.78</td>
<td>0.73</td>
<td>106.42</td>
<td>16.47</td>
<td>0.11</td>
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<td>kayak</td>
<td>18.50</td>
<td>0.43</td>
<td>2795.50</td>
<td>0.71</td>
<td>151.11</td>
<td>60.16</td>
<td>0.43</td>
</tr>
<tr>
<td>lake/fishing</td>
<td>8.34</td>
<td>0.19</td>
<td>855.82</td>
<td>0.22</td>
<td>102.62</td>
<td>11.67</td>
<td>0.03</td>
</tr>
<tr>
<td>park</td>
<td>383.50</td>
<td>8.86</td>
<td>31819.65</td>
<td>8.08</td>
<td>82.97</td>
<td>-7.98</td>
<td>-0.64</td>
</tr>
<tr>
<td>rafting</td>
<td>85.00</td>
<td>1.96</td>
<td>12579.00</td>
<td>3.19</td>
<td>147.99</td>
<td>57.04</td>
<td>1.82</td>
</tr>
<tr>
<td>reserve</td>
<td>202.04</td>
<td>4.67</td>
<td>22275.71</td>
<td>5.66</td>
<td>110.25</td>
<td>19.31</td>
<td>1.09</td>
</tr>
<tr>
<td>rural tourism</td>
<td>4.00</td>
<td>0.09</td>
<td>1600.00</td>
<td>0.41</td>
<td>400.00</td>
<td>309.05</td>
<td>1.25</td>
</tr>
<tr>
<td>shopping</td>
<td>12.50</td>
<td>0.29</td>
<td>1927.75</td>
<td>0.49</td>
<td>154.22</td>
<td>63.27</td>
<td>0.31</td>
</tr>
<tr>
<td>snorkle</td>
<td>7.50</td>
<td>0.17</td>
<td>895.00</td>
<td>0.23</td>
<td>119.33</td>
<td>28.39</td>
<td>0.06</td>
</tr>
<tr>
<td>spa/resort</td>
<td>13.00</td>
<td>0.30</td>
<td>4646.00</td>
<td>1.18</td>
<td>357.38</td>
<td>266.44</td>
<td>3.14</td>
</tr>
<tr>
<td>sport fishing</td>
<td>41.34</td>
<td>0.95</td>
<td>10417.13</td>
<td>2.65</td>
<td>251.99</td>
<td>161.04</td>
<td>4.26</td>
</tr>
<tr>
<td>turtles</td>
<td>2.19</td>
<td>0.05</td>
<td>342.20</td>
<td>0.09</td>
<td>156.26</td>
<td>65.31</td>
<td>0.06</td>
</tr>
<tr>
<td>volcano</td>
<td>197.93</td>
<td>4.57</td>
<td>18599.76</td>
<td>4.72</td>
<td>93.97</td>
<td>3.03</td>
<td>0.14</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4330.43</td>
<td>100.00</td>
<td>393842.19</td>
<td>100.00</td>
<td>90.95</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Table 2. Results of Time (in days) and Expenditure (in USS) and Consumer Surplus per Activity Category

<table>
<thead>
<tr>
<th>activity category</th>
<th>expenditure per day ($/day)</th>
<th>consumer surplus ($/day)</th>
<th>% of total time</th>
<th>% of total people</th>
<th>time per person</th>
<th>time per stay</th>
<th>average consumer surplus per stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>adventure</td>
<td>192.35</td>
<td>101.78</td>
<td>0.98</td>
<td>15.56</td>
<td>0.79</td>
<td>0.12</td>
<td>12.47</td>
</tr>
<tr>
<td>beach</td>
<td>70.40</td>
<td>-20.17</td>
<td>41.50</td>
<td>75.79</td>
<td>6.88</td>
<td>5.21</td>
<td>-105.12</td>
</tr>
<tr>
<td>city</td>
<td>97.85</td>
<td>7.08</td>
<td>13.00</td>
<td>49.88</td>
<td>3.28</td>
<td>1.63</td>
<td>11.58</td>
</tr>
<tr>
<td>forest</td>
<td>92.42</td>
<td>1.84</td>
<td>20.87</td>
<td>61.96</td>
<td>4.23</td>
<td>2.62</td>
<td>4.82</td>
</tr>
<tr>
<td>nature</td>
<td>101.07</td>
<td>10.49</td>
<td>5.54</td>
<td>44.96</td>
<td>1.55</td>
<td>0.70</td>
<td>7.30</td>
</tr>
<tr>
<td>other</td>
<td>118.01</td>
<td>27.43</td>
<td>12.89</td>
<td>92.80</td>
<td>1.72</td>
<td>1.59</td>
<td>43.74</td>
</tr>
<tr>
<td>rafting</td>
<td>148.55</td>
<td>57.97</td>
<td>2.37</td>
<td>15.56</td>
<td>1.92</td>
<td>0.30</td>
<td>17.29</td>
</tr>
<tr>
<td>reef</td>
<td>111.24</td>
<td>20.66</td>
<td>3.05</td>
<td>9.80</td>
<td>3.91</td>
<td>0.38</td>
<td>7.92</td>
</tr>
<tr>
<td>TOTAL</td>
<td>90.57</td>
<td>0.00</td>
<td>100.00</td>
<td>100.00</td>
<td>12.56</td>
<td>12.56</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The analysis of expenditure and time across the activity categories (Table 2) shows that the beach activities consist of the largest portion of time during a visitors stay (41.6% of the total time), while beach activities have the lowest average of expenditures per day (US$70.4). The forest-related activities (forest, park, reserve, and boat/canal tours) are a smaller percentage of total time (21.0% of the total time), but have a greater average expenditure per day (US$92.42). Therefore, forest-related tourism occupies approximately half of the time as beach-related activities, but approximately one quarter more the expenses.

The regression analysis made apparent that tourism expenditures per day are directly related to disposable income. Therefore, in order to increase tourism revenues, it is necessary to increase the number of tourists with high disposable incomes and low disposable time, rather than targeting mass, low-expenditure tourism.

**Activity**  
**Equation**

\[ Y_1 = 85.01 + (-4.97)X_3 + (-5.15)X_7 + (0.089)X_8, \text{ R Squared} = 0.6813 \]

\[ [2.20] \quad [0.31] \quad [0.004] \]

\[ Y_2 = 55.96 + (7.38)X_2 + (-3.82)X_7 + (0.06)X_8 \text{ R Squared} = 0.5364 \]

\[ [3.14] \quad [0.35] \quad [0.004] \]

\[ Y_3 = 76.70 + (-4.57)X_7 + (0.078)X_8 \text{ R Squared} = 0.5530 \]

\[ [0.47] \quad [0.005] \]

\[ Y_4 = 90.24 + (-4.57)X_7 + (0.61)X_8 \text{ R Squared} = 0.4411 \]

\[ [0.66] \quad [0.006] \]

\[ Y_5 = 95.7 + (-7.66)X_7 + (0.104)X_8 \text{ R Squared} = 0.3742 \]

\[ [1.20] \quad [0.011] \]
other activ**: \[ Y_6 = 33.57 + (15.89)X2 + (-5.02)X7 + (.08)X8 \] R Squared: .3589 
\[ [5.05] \quad [.78] \quad [0.07] \]

rafting activi: \[ Y_7 = 27.36 + (48.02)X4 + (-5.58)X7 + (.10)X8 \] R-squared = .6947 
\[ [18.51] \quad [1.16] \quad [0.09] \]

reef activi; \[ Y_8 = -148.03 + (159.43)X4 + (.07)X8 \] R Squared = .6990 
\[ [37.00] \quad [.02] \]

adventure activi; \[ Y_9 = 94.24 + (-6.40)X7 + (.07)X8 \] R Squared + .6723 
\[ [.99] \quad [.08] \]

* The standard errors are in brackets and are located beneath the equations. ** The intercepts values were not significant in f-test at the .05 confidence level.

The recreational value of a hectare of forest was estimated at US$13.16 dollars per year per hectare. The calculations were as follows:

1. Determination of the SCSA SCSA= $/day in forest activities - $/day across all activities per stay = $1.84/day

2. Determination of the Value of the Natural Resource (VNR)

Consumer surplus $/activity/stay = SCSA * average # of days spent in each activity/stay 
= $1.84/day * 2.62 forest activity days/stay = $4.82 in forest activities/stay

3. Value of Natural Resource = SCSAS * annual # of tourists 
= $4.82/stay * 581,264 tourists=$2,801,692.40/ forest activity per year= VNR

44. - Determination of the Recreational Valuation per Hectare of the Tropical Rainforest 
= $2,801,692.40 / 212,920.2 hectares of protected area= $13.16/hectare

The estimated average value generated by international tourism per year of one hectare of protected area is $13.16. It should be noted that this value is conservative, for this study was limited to only those international tourists arriving by air. In addition, this value is not the total recreational value because it does not include domestic tourism receipts. The total recreational value would in fact be larger if domestic tourism was included because the number of visits to protected areas by nationals is greater than that of foreign visitors. In 1996, 389,883 national visits and 268,774 international visits to protected areas were recorded by SINAC (SINAC, 1996).
This value is lower than values obtained in other studies (Tobias and Mendelshon, Menkhaus and Lober, de Groot). This can be attributed to three reasons:

1. Other studies, which utilize the travel cost method, do not consider the multi-destination and multi-activity nature of international tourism. Therefore, such studies overvalue the tropical rainforest for they attribute all costs to forest areas while neglecting to factor out destinations and activities not directly related to forest tourism.

2. Other studies include international travel cost or airfare as part of the travel cost, while this study disregards such costs, considering them equivalent to sunk costs, and for the recipient country such costs have little meaning.

3. Other studies may include all tourists who visit the country, not limiting the study to a particular means of tourist travel such as air travel.

Although the value provided by the methodology of this study is an actual value, and it incorporates multi-destination and multi-activity travel, its limitation lies in the fact that it is based on a surrogate consumer surplus and assumes that the average daily expenditure over all activities reflects a short-run equilibrium position and bottom-line minimum expenditure.

McNeely, for example, argues that park management costs in a tropical rainforest are between US$1- US$3 per hectare per year (McNeely, 1989). Similarly, the recreational value of the tropical rainforest in this study (US$13.16/hectare) suggests that the tropical rainforest can “pay for itself” in the form of funding forest management and conservation efforts.

Conclusion

The analytical procedure used provides a solution to the problem of multi-destination and multi-activity tourism; the methodology does not determine tourist activity preferences or utility functions, although it may be implied by the manner in which the money is spent. The manner in international tourist selects destinations and allocates time is a difficult a process to evaluate, because it is based on tourist references for activities, knowledge of areas, etc.

This study provides evidence that specialized; high quality tourism can be more profitable while conserving the environment. Mass tourism tends to be beach tourism and is infrastructure intensive. With mass tourism, there is great demand for investment by transnational who invest in tourism services such as lodging and concessions and tend to repatriate their revenues. Furthermore, the less developed the economy, the greater the leakages, as more imported goods are required by the tourism sector. Mass tourism also places excessive strain upon natural resources as overcrowding, pollution, excessive infrastructure etc. may destroy the natural resource, which attracts tourism.
The third implication of the study is the importance of the relationship between international tourism to developing countries, valuation of the tropical rainforest, and preservation. Through the surrogate consumer surplus results, it is apparent that forest-related tourism and ecotourism tourism can provide surplus revenues to the tropical rainforest. The surplus revenues provide an economic value of the rainforest and therefore, the economic incentive necessary to encourage preservation and conservation.

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**Abstract:** Previous tropical rainforest valuation techniques have encountered certain limitations with respect to international, multi-destination, multi-purpose travel. This study develops and tests an alternative methodology to determine the recreational value of tropical rainforests in Costa Rica, using the actual tourism expenditures related to ecotourism in protected areas of Costa Rica. The study determined the surrogate consumer surplus related to ecotouristic activities through a time and expenditure survey of 347 international tourists, and determined that the international recreational value of the tropical rainforest in Costa Rica was US$13.16 per hectare. This value can be used to encourage and promote conservation and preservation.