

## Monumental trees and their existence value: case study of an Italian natural park

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**ABSTRACT:** The paper deals with the evaluation of the existence value of monumental trees in a protected area. Financial resources to be destined for protection interventions have been decreasing more and more, with a high risk of losing this natural heritage. A Contingent Valuation Method (CVM) survey was carried out among the Madonie Park (Sicily, Italy) resident households to evaluate the existence value of monumental trees of the nature trail named “Piano Sempria-Piano Pomo”, represented by a population of “Giant hollies” and by 7 other individual trees. These are the main results of the CVM survey: the overall response rate was 40%, individual average WTPs (Willingness To Pay) were €12.37 for the protection of the holly population and €13.45 for all the monumental trees along the nature trail. The median WTPs were €2.00 and €5.00, respectively. The aggregate WTP estimates for the Park residents range from a minimum of €10,520.40 to a maximum amount of €83,479.37 depending upon the investigated resource and the statistics considered.

**Keywords:** contingent valuation method; Giant hollies; parks, Sicily; Willingness to Pay

Outdoor recreation and ecotourism are becoming more and more important leisure time activities with many implications both in economic and environmental terms (ASCIUTO et al. 2013; LANFRANCHI et al. 2014). According to WILD et al. (1994), ecotourism may encourage local employment and small business development, promoting economic multipliers; at the same time it is compulsory that the environments interested in ecotourism remain unchanged, also in order to preserve resources and ensure the profitability of investments in the long run (KENT 2003). Ecotourism is defined as a subset of nature tourism, and it is the form that is most suited to the visitors of parks, indeed, it is based on the observation and enjoyment of nature and cultural traditions present in an area, trying to minimize the impact on the various aspects of the environment (natural, cultural, social) and, on the contrary, contributing to the protection and preservation of natural areas, and at the same time generating economic benefits for local communities (BIMONTE, PAGNI 2003).

Since the 1950's forests, coasts, lakes and rivers, mountains have often been associated with outdoor

recreation activities and are nowadays frequently designated as national park or similarly protected areas. Although in the four Sicilian Regional Natural Parks there is a significant touristic activity, the full valorisation of all the historic, environmental and architectural resources of the parks is not currently achieved. In the last few years a significant reduction in the funds for the management of Regional Parks and Natural Reserves has taken place and the financial situation of the four parks has therefore become rather precarious. With specific regard to the Madonie Regional Park, the investigated Sicilian case study, it seems rather difficult to implement projects for the protection of natural resources, to promote further demand for outdoor recreation and ecotourism and also to give a boost to the development of the area, by encouraging the resident population to start related economic activities (e.g. hospitality, craftsmanship, supply of traditional food, etc.).

In this park we find, among other natural resources, an important station of “Giant hollies”; these latter, together with other isolated ancient trees, represent by age and size (according to

SCHICCHI and RAIMONDO (2007) and RAIMONDO and SCHICCHI (2009), other factors concurring in the definition of monumentality are: relationships with art, literature, surrounding landscape, particular events of history, myths, legends and local traditions, besides the botanical rarity) a monumental agro-naturalistic complex, whose conservation and valorisation could create opportunities for the economic growth of the area through tourism and environmental protection activities (DETTORI et al. 2014).

Some of the projects proposed by the Park Management Plan (CI.RI.TA. 2008), in particular the Plan Action (GES HAB 33) for the "Safeguard of monumental holly population" (with a total estimated cost of €150,000), are unlikely to be implemented for the lack of funding, and these resources would be in danger of degradation.

The economic development of the area through ecotourism however cannot abstract from the community awareness and knowledge of the benefits deriving from the conservation of these monumental trees. This study investigates the local community knowledge of monumental trees and the perception of their importance, the first step in the building of public financial support for the projects concerning the monumental tree protection. Among the Decision Support Tools available to appraise environmental resources in monetary terms, the Contingent Valuation Method (CVM) is the only direct method allowing to evaluate all the components of the Total Economic Value (TEV) of a resource, that is both use and non-use values.

The CVM was officially born with an article on the valuation of the economic effects of preventing soil erosion (CIRIACY-WANTRUP 1947). The CVM "circumvents the absence of markets for public goods by presenting consumers with hypothetical markets in which they have the opportunity to buy the good in question" (MITCHELL, CARSON 1989). There is an abundant and well-established literature on the use of CVM in different fields of the applied research, though a lack of works dealing specifically with monumental trees is apparent. There are several studies dealing with similar topics, such as endangered animal and plant species (BOYLE, BISHOP 1987; KOTCHEN, REILING 2000; CICIA et al. 2009) as well as with the valorisation and/or the protection of urban and natural forests (TYRVÄINEN, VÄÄNÄNEN 1998; LORENZO et al. 2000; AMIRNEJAD et al. 2006). With regard to the latter issue, LOOMIS et al. (1996) and ASCIUTO et al. (2004) estimated the TEV for the protection of old-growth forests from fire in Oregon and in Sicily,

respectively, while SATTOUT et al. (2007) obtained individual Willingness To Pay (WTP) for existence, option and bequest values of 12 cedar forest relics in Lebanon from citizens and villagers, users and non-users.

In this study, a survey on a selected sample of local households was carried out through WTP to evaluate the benefits deriving from the existence of the monumental trees along the naturalistic trail named "Piano Sempria-Piano Pomo" created within the "European Geoparks Network". Finally, aggregated WTP was determined with the aim to understand the actual interest of the entire local community in the monumental trees. The present research, which refers to a specific Sicilian protected area, might represent a valid contribution to policy-makers, considering the current absence of studies about monumental trees carried out with the support of CVM, in order to help critical decisions on the allocation of financial resources for their protection.

## MATERIAL AND METHODS

**Study area.** Madonie Regional Natural Park is one of the four Sicilian natural parks, officially established on 9 November 1989. It is about 40,000 ha and encompasses the mountainous massif of the same name, situated on the northern coast of Sicily, between the Imera and Pollina rivers at about 100 km of Palermo, the capital city of Sicily. The park is renowned for its interesting naturalistic, historical, and artistic heritage. For example, despite the Park area represents just 1.6% of the Sicilian territory, its flora includes over 56% of the taxa present in the whole region (GIARDINA et al. 2007). In particular the latter is characterized by endemic species, like *Abies nebrodensis* (a relict of ancient glaciation), centuries-old olive groves, cork tree woods, chestnut tree woods, woods of ilex and beech trees, ash trees, downy oak woods. Along the above-mentioned naturalistic trail there are 7 monumental trees (2 Downy Oaks, 2 Cornish Oaks, 2 Beeches and 1 Field Maple of estimated ages ranging from 300 and 700 years and circumferences between about 4 and 7 m) and the giant holly population of Piano Pomo. The latter includes 317 great-sized entities clustered in 5 nuclei localised on 1 hectare area. Among the most representative exemplars there are 10 large shoots (10.5 metres of circumference) gathered on a stump and a single tree 19 metres high with a circumference of nearly 6 metres. Their estimated age is approximately 350 years.

**Contingent valuation method.** The CVM was used to evaluate preferences of a sample of park residents for a program of monumental trees conservation. Before the final survey, a pre-test was implemented through an open-ended WTP questionnaire, so that people would not be restricted by defined values (SATTOUT et al. 2007). This preliminary survey provided, among other things, the WTP values to be used in the final questionnaire, where the WTP elicitation question was in a “payment card” format.

**The survey questionnaire.** A questionnaire was designed, consistent with the guidelines of scientific literature on CVM, in which “the information provided should be, on the one hand, consistent with scientific and expert knowledge and, on the other, comprehensible to an average citizen who probably knows little or nothing about the good under valuation” (HOYOS, MARIEL 2010). It was structured into different sections, the first of which describes the resource in its present condition, including the map to localize both the path and the territory. Then it investigates the attitudes of respondents towards Park natural resources and, more in detail, towards the monumental trees of the area, as well as their use of the trail in order to assess the acquaintance of interviewees with them. Then the hypothetical scenarios and the questions to elicit the WTP are illustrated. The last section contains questions about the socio-economic characteristics of interviewees. Explanatory pictures of the monumental trees of the trail were not included in the questionnaire due to our strict budget constraints, but they were shown in an open forum set up on a website indicated in the questionnaire, which was quite successful, with over 200 visitors at the time of the survey and around 1,500 visits up to now. In the questionnaire, respondents were presented a rapid worsening of monumental tree health conditions which would occur in the absence of the interventions targeted to their conservation and valorisation, recommended in the Madonie Park Management Plan.

Respondents were asked to state their WTP in the form of a one-off payment with the aim to set aside financial sums for a monetary fund intended for the achievement of conservation projects concerning the monumental tree heritage.

Two programs were proposed in order to detect possible part-whole bias: the first package concerned just the protection of the holly population, while the second program would grant the conservation of all the monumental trees present in the environs of the nature track.

**The survey design.** A preliminary study of bibliography concerning flora, vegetation and geo-

morphology of the places, short interviews with experts and field surveys to assess the state of the area (through GPS and pictures) were conducted.

The survey was administered by delivering 500 questionnaires through a sample of schools localised in 15 municipalities of the Madonie District area – taking into account the population of each municipality – and then collecting them after a month. This choice was suggested by different order of reasons, on the one hand the necessity of reducing costs and answer times, and on the other hand the need of ensuring a satisfactory response rate. Initially, following DOYLE (2005), who stated that “since face-to-face interviews put people on the spot by requiring an immediate answer, questions that require a lot of reflection or a search for personal records are better handled by the self-paced format of a mail survey”, a mail survey had been planned. Later, taking into account both the costs of a mail survey and the indications derived from the pre-test concerning the unwillingness to be interviewed shown by elderly people, schools seemed to represent a valid option to a standard mail survey. The presence of school representatives able to act as intermediaries in the communications between interviewers and parents, the usual advantages of a mail survey – that is to receive the questionnaire at home (through their children) and to have a sufficient time to fill it in – and the absence of the disadvantage of mailing the questionnaire by the respondents themselves, steered our final decision on carrying out a “school survey”.

## RESULTS AND DISCUSSION

### Response rate

The overall response rate of questionnaire administration in the final CVM survey was 40%, with 200 questionnaires returned out of 500 delivered to the schools. This percentage is relatively consistent with the values indicated in literature with reference to similar CVM studies (MITCHELL, CARSON 1989; LOOMIS 1990), but greater than results from postal surveys carried out in Italy (15–20%), as stated by GIOS and NOTARO (2001).

### Questionnaires and sample size

The 200 questionnaires were so distributed: 171 properly filled out and 29 unfinished. After a careful reading of the 171 filled-in questionnaires, 41 of them (about 24%) were removed from the sample because

respondents had stated not to be willing to answer the question on the household income, 4 questionnaires (correspondent to 2.3%) due to major inconsistencies among the answers, 6 (equal to 3.5%) respondents were identified as possible free-riders (this percentage is relatively consistent with what referred by some authors (MITCHELL, CARSON 1989), that free-riders usually represent 5–10% of the sample size in a CVM survey) and 2 respondents were thought of as potential over pledgers – having stated a WTP (€500) larger than 1–2% of their yearly income – according to RANDALL (1981), and then removed from the sample. Within the remaining questionnaires (118) usable in the analysis of WTPs, 18 were identified as protest zeros (15.3%) (such a value of protest-zeros lies in the range (15–30%) indicated by RÖMER (1992) in a literature review concerning several CVM studies). Nevertheless, they were held in the sample in order to obtain a conservative estimate of the aggregate WTP of park resident households.

### Socio-economic characteristics of the sample

With reference to school qualifications, the  $n = 118$  sample, is composed of people who have low (44.1%) and high (31.3%) secondary school diploma, of graduates (13.6%), of respondents with a vocational school certificate (5.9%) and finally of people who hold a primary school certificate (5.1%).

The employed people represent just 53.4% of the interviewees in the sample, with 63 respondents (out of 118), maybe because questionnaires were mainly filled out by housewives. Clerks and teachers are significantly present in the percentage of 50.8% of working respondents, followed by labourers (22.2%), self-employed (11.1%) and professionals (7.9%).

Table 1. Main descriptive sample statistics

|                              | WTP for the protection |                          |
|------------------------------|------------------------|--------------------------|
|                              | giant hollies          | all the monumental trees |
| No. of observations          | 118                    | 118                      |
| Mean                         | 12.37                  | 13.45                    |
| Median                       | 2.00                   | 5.00                     |
| Mode                         | 0.00                   | 0.00                     |
| Mode <sub>WTP &gt; 0</sub> * | 10.00                  | 10.00                    |
| SD                           | 27.13                  | 26.98                    |
| Asymmetry                    | 3.876                  | 3.477                    |
| Symmetry standard error      | 0.223                  | 0.223                    |
| Kurtosis                     | 16.19                  | 12.82                    |
| Kurtosis standard error      | 0.442                  | 0.442                    |

\*second mode only refers to the positive WTP values

The economic condition of respondents was surveyed through the information on the average monthly income of households: 36.4% of sample earn less than €1,000, 39.9% between €1,000 and €1,999, 21.1% between €2,000 and €3,999 and the remaining 2.6% over €4,000.

As to the question focused on the knowledge of monumental trees, 70.3% of respondents answered “yes”, whereas 22.9% said “no” and the remaining 6.8% answered “I don’t know”.

With regard to the respondents’ perception on the financial resources addressed to the environmental protection, 41.5% of sample state that funds are “sufficient, but badly administered” (this high incidence is ascribable both to regional policies – considered costly and ineffective – and to local policies carried out by the Madonie Park Board, which are seen as too restrictive and not at all aimed to the socio-economic development of the area), 27.1% of respondents consider them “insufficient”, 22.1% answer that “has no sufficient information to answer”, 9.3% think that funds are “sufficient”.

### Median and average WTP estimate

On the whole, 78 out of the 118 respondents (66.1%) expressed a positive WTP for at least 1 of the 2 protection packages: more in details, 72 people for the protection of the holly population, 77 respondents for all the monumental trees.

If protest noes (18) are taken into account, the sample reduces to 100 respondents and the percentage of positive WTP increases to 78%, coherently with the results of CVM studies on conservation values (SIGNORELLO et al., 2006; SATTOUT et al. 2007). These findings indicate that conservation demand for monumental trees is quite important to residents of the Madonie area. The mean WTP of the sample is €12.37 for the protection of the holly population and €13.45 for all the monumental trees in the surroundings of the Nature Trail, including the holly population. The median WTPs were €2.00 and €5.00, respectively (Table 1).

From the exam of the statistics on the WTP frequency distributions with regard to the two above-mentioned protection packages, WTP means are far higher than WTP medians and frequency distribution curves are sensibly asymmetric, positively skewed, confirming the usual WTP distribution curve shape, with more concentrated observations at the lower end of the scale, and with a right tail of distribution showing the presence of some values far higher than the average WTP.

Table 2. Two-paired sample *t*-test

| T-test – two paired samples/one (left) tailed |        |
|-----------------------------------------------|--------|
| Difference                                    | -1.076 |
| <i>t</i> (observed value)                     | -0.702 |
| <i>t</i> (critical value)                     | -1.658 |
| df                                            | 117    |
| <i>P</i> -value (unilateral)                  | 0.242  |
| $\alpha$                                      | 0.05   |

On the grounds of a preliminary comparison among the main descriptive statistics of sample WTP, it seems that there are not any sensible differences between the WTPs concerning the two protection packages proposed to the respondents. In order to accept or reject statistically such an impression, a *t*-test was carried out to test the hypothesis of equality between the average WTPs of the two packages, whose results are summarized in Table 2. In conclusion, we have no statistical evidence of existing differences between the average WTPs (hollies and all the monumental trees protection packages).

In the final survey, according to DAY (1999), BATEMAN et al. (2008) and METCALFE et al. (2012), who highlighted the effects of the order in which elicitation questions are presented on the respondents' WTP, the sample was split in two sub-samples to be able to test sensitivities to these effects. In the A typology of questionnaire, respondents were firstly asked to express their WTP for the "Giant hollies", and secondly for "all the monumental trees" safeguard projects; in the T questionnaires the order of presentation was inverted. The Mann-Whitney U-test was performed to confirm or reject the equality of average WTPs (€8.7 and €10.6 in the A questionnaire and €17.2 and €17.2 in the T questionnaire for hollies and all monumental trees programs, respectively) in relation to the type of proposed questionnaires. As to the WTP for hollies

protection, *P*-value is by far higher (21%) than the fixed alpha error (5%), therefore the null hypothesis cannot be rejected. On the other hand, in the case of WTP for all the monumental trees of the trail, *P*-value is lower (0.03) than 5%, so the presentation order of the elicitation question seems to have some effects on the WTP stated by respondents.

### Aggregate WTP estimates

The estimate of the existence value was obtained by multiplying the mean or the median value of WTP by the number of resident households, the latter adjusted in relation to the actual response rate of questionnaires (23.6%), obtained from the ratio between 118 usable questionnaires and 500 questionnaires handed out. The estimated value is therefore quite prudential, since this approach assumes that people who did not answer the questionnaire had zero WTP.

The aggregate WTP for the protection of the "Giant hollies", starting from the average WTP, was €65,068.67 for the  $n = 118$  sample and €76,798.92 for the  $n = 100$  sample (without protest-zeros).

The estimate of the aggregate WTP for the protection of all the monumental trees of the nature trail, again calculated on the grounds of the average WTP, was €70,749.69 for the  $n = 118$  sample and €83,479.37 for the  $n = 100$  sample. When using the median WTP value instead of the average WTP, we obtained an even more prudential estimate of the aggregate WTP, since median is a more robust statistic. The estimate of the aggregate WTP for hollies protection was €10,520.40 for  $n = 118$  sample and €26,301.00 for  $n = 100$  sample.

The estimate of aggregate WTP for the protection of all the monumental trees starting from the median WTP value was €26,301.00 for the  $n = 118$  sample and €39,451.50 for the  $n = 100$  sample (Table 3).

Table 3. Calculation of the aggregate WTP for the protection of hollies and of all the monumental trees of Piano Sempria-Piano Pomo

| WTP       | Resident households* | Giant hollies protection package | Aggregate WTP for giant hollies protection | Protection of all the monumental trees package | Aggregate WTP for the protection of all the monumental trees |
|-----------|----------------------|----------------------------------|--------------------------------------------|------------------------------------------------|--------------------------------------------------------------|
| $n = 118$ |                      |                                  |                                            |                                                |                                                              |
| Average   | 5,260.20             | 12.37                            | 65,068.67                                  | 13.45                                          | 70,749.69                                                    |
| Median    | 5,260.20             | 2.00                             | 10,520.40                                  | 5.00                                           | 26,301.00                                                    |
| $n = 100$ |                      |                                  |                                            |                                                |                                                              |
| Average   | 5,260.20             | 14.60                            | 76,798.92                                  | 15.87                                          | 83,479.37                                                    |
| Median    | 5,260.20             | 5.00                             | 26,301.00                                  | 7.50                                           | 39,451.50                                                    |

\*datum concerning the number of resident families on 9/10/2011 was 22,289 (ISTAT 2012) and it was reduced by using a 0.236 factor (response rate of questionnaires)

## CONCLUSIONS

The results of the aggregate WTP obtained from the median WTP lead us to state that the project for the safeguard of giant hollies -like the GES HAB 33 action- is not economically convenient under a cost-benefit perspective, since its costs of €150,000 would not be balanced by the calculated benefits. It is important, though, to remind that:

- the aggregate WTP is referred to the single existence value that is a mere part of the non-use values of the resource, which include also bequest and option values, as well as the use values;
- our estimates have been very conservative, since the aggregate WTP was obtained by adjusting the population size through the response rate to the questionnaire (0.236).

On the basis of the statistical tests performed on the collected data, it was not possible to say that the average WTP for the hollies safeguard is statistically different and in particular smaller than the average WTP for the second package (for the protection of all the monumental trees of the nature trail).

The expressed WTP, rather than the real WTP for the proposed projects, could actually represent a symbolic value ascribed to the idea of “monumental tree”, identifiable in €10, the second mode ( $\text{Mode}_{\text{WTP}>0}$ ) for both projects in the frequency distribution curves.

In a medium-term perspective, when referring to the new EU programming (2014–2020), such CVM studies might support decision-makers, when requested to identify the maximum level of financial incentives to be granted in the various areas, for projects aiming to protect, valorise and make safe single monumental trees. CVM surveys might be implemented with the purpose to evaluate all the TEV components concerning the resources to be safeguarded on the grounds of the benefits perceived by the interested categories of stakeholders. In particular, an important development of the study might concern the evaluation of the benefits perceived by the park visitors in connection with monumental trees in the nature trail. Such a survey would allow to integrate the research framework on the monumental trees, since residents and visitors are complementary in their perception of the economic value related to the benefits deriving from the natural resources of the Madonie Park.

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Received for publication July 23, 2014

Accepted after corrections December 10, 2014

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