

ASSESSING WILLINGNESS TO PAY FOR THE TERRACED LANDSCAPE OF VINEYARDS IN MT. ETNA (ITALY)

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ABSTRACT

Dry stone walls often characterizes the agricultural landscape and the conservation of the terraced landscape can provide social and economic benefits for local communities. Nevertheless, in recent years many terraced landscapes have been destroyed to increase the arable land and therefore the profit of farmers. In order to avoid this, an increasing role can be played by private funds that can compensate farmers to maintain the dry stone walls inside their farms. The aim of this survey is to assess the benefits for the local community provided by the terraced vineyard landscape in Mt Etna (Italy). For this purpose, we estimated the willingness to pay to preserve the aforementioned landscape by using a Contingent Valuation approach. Results of our study show that the willingness to pay of local communities for the terraced vineyards of Mt Etna is positive, but the preservation of this historical resource implies the development of an environmental awareness and appropriate environmental education among potential users.

KEYWORDS

Dry stone walls, Agricultural Landscape, Contingent Valuation, Willingness to pay

INTRODUCTION

On November 28th 2018, UNESCO declares dry stone walls being a World Heritage Site, as the art of dry stone walling is an example of human manufacture both for residential and agriculture-related purposes. In particular, the usefulness of terracing in steep agricultural areas made in perfect harmony with the surrounding environment has been emphasized by UNESCO's decision. Dry stone wall plays an important role in the prevention of hydrogeological risk, in combating erosion, improving biodiversity and creating the best microclimatic conditions for agriculture practices.

Dry stone walls often characterize the agricultural landscape and the terraced landscape is an example of the perfect relationship between farmers and surrounding nature. Terraced landscape characterizes territories that have been preserved until today and contributes to the hydrogeological stability of slopes and cultural growth of the rural areas (Pappalardo et al 2013, Bellia et al., 2015; Valenti et al., 2017; Valenti et al., 2018; Chinnici et al., 2018; Selvaggi et al., 2018). Terraces are characteristic elements of agricultural landscape in many areas of the world and as such they represent a public good that can provide benefits for local communities (Pappalardo et al, 2015; Balbo and Puy, 2017; Vastola et al., 2017).

Several definitions of terracing have been provided in the literature. Gisotti (2003) defines the terracing as the result of the practice of interrupting the acclivity to cultivation purposes by creating sub-flat shelves or terraces whose land bearing is supported exclusively by structures made with stones and traditional "dry" technique (Balbo and Puy, 2017). Dry stone walls are built with stones found on the spot, according to the altimetry of the ground. Since terraces are aimed at hydrogeological defense and cultivation of sloping land, they are the most laborious manifestation of rural colonization of lands not suitable for agriculture (Baldeschi et al., 2005).

Terraces characterize the agricultural landscape and combining environmental, social and cultural factors they have an economic value (Magnaghi, 2005; Bellia & Safonte, 2015; Bellia et al., 2016; Di Franco et al., 2017; Bianchi et al., 2018). However, the link that binds the individual subject to the surrounding landscape is subjective and therefore not measurable within a conventional market (Filingieli, 2005). Also for this reason, in recent years many terraced landscapes have been destroyed to increase the arable land and therefore the profit of farmers. Therefore, to prevent the loss of this historical and cultural resource, cultural and emotional values should be explicitly recognized to dry stone walls, and farmers should be compensated to preserve this heritage.

A significant example of dry stone walling is the landscape of „terraced vineyards“ located in the Mt Etna in Sicily (Italy) where terraces characterize the vineyards landscape giving prestige to human presence and daily work of farmers, and becoming an example of an indivisible bond between man and territory (Scuderi et al., 2016). However, the preservation of the landscape of terraced vineyards in Mt Etna clashes with the limited profitability of traditional farming practices carried out in this area and the reduction of public funds destined for the protection of traditional agricultural systems (Vindigni et al., 2013; Scuderi et al., 2014; Scuderi et al., 2015; Vindigni et al., 2017). For this reason, the risk of abandonment and gradual destruction of terracing appears very high. In a context where public funds are constantly declining, an important role could be played by private funds voluntary provided by citizens through a voluntary contribution mechanism. Private funds could compensate farmers for the lack of public funds by contributing monetarily to safeguarding the terraced agricultural landscape.

Starting from this point of view, the aim of this survey is to assess the benefits for the local community provided by the terraced vineyard landscape in the Mt Etna (Italy). For this purpose, we estimated the willingness to pay of local communities to preserve the aforementioned landscape by using a Contingent Valuation approach.

1. BACKGROUND INFORMATION ON TERRACED VINEYARDS IN MT ETNA

Terraces contribute to the characterization of the agricultural landscape around Mt Etna which is the largest volcano in Europe. Dry stone walling in this area is the result of a centuries-old anthropic interaction between natural and economic aspects (Barbera et al., 2015). Around Mt Etna, the construction of dry stone walls has mainly spread in the areas cultivated with vineyards, adapting the surrounding territory to human needs (Di Vita et al., 2013; Di Vita et al., 2015). Terraces on Mt Etna are built with local lava rock, rough or worked, stone on stone without any glue and with the skilful work of local labor.

The main municipalities around Mt. Etna where the dry stone walling has become widespread within the vineyards are Randazzo with 1,669 hectares of terraced surface, Castiglione di Sicilia with 2.204 hectares, Linguaglossa with 1.128 hectares and Piedimonte Etneo with 1.068 hectares (Barbera et al., 2015) (Table 1). However, comparing the terraced surface with the overall municipal surface, it is possible to highlight that in the area of Piedimonte Etneo the incidence of terraced surface is 41.7% of the total municipal area. In the other municipalities, this incidence is lower and varies from 18.7% of Castiglione di Sicilia and Linguaglossa to 10.1% of Randazzo. These data show how the abandonment of these artefacts could compromise the landscape integrity of an entire area with negative consequences also from the hydrogeological point of view.

Table 1. Total and percentage distribution of terraced areas by main municipalities around Mt. Etna

Municipality	Municipal Area (ha)	Terraced Surface (ha)	Percentage
Castiglione di Sicilia	11.581	2.204	18,7
Linguaglossa	5.799	1.128	18,7
Piedimonte Etneo	2.441	1.068	41,7
Randazzo	16.063	1.669	10,1

(Source: Barbera et al., 2015).

2. METHODOLOGY

The economic value of the terraced vineyard landscape around Mt Etna has been estimated by interviewing a sample of citizens residents in the area surrounding the volcano. The willingness to pay (WTP) has been estimated to achieve an environmental improvement that involves an increase in the quality of the agricultural landscape through the conservation of dry stone walls.

To this end, a Contingent Valuation approach was used to estimate the total economic value of the terraced vineyard landscape of Mt Etna since this approach it is a technique that allows to estimate both the use and non-use values and it is widely used among scholars (Cicia et al., 2010; Tinch et al., 2015; Visintin et al., 2016).

A specific questionnaire was used respecting as far as possible the indications drawn in the literature. The questionnaire was structured as follows:

- identification of the characteristics of the terraced vineyards agricultural landscape around Mt Etna;
- estimation of the willingness to pay to avoid a negative change in well-being (conservation and protection of vineyard terraces);
- socio-economic characteristics of the interviewee.

The first section of the questionnaire included questions on the agricultural landscape, Etna volcano and vineyards around the volcano. In addition, the interviewees were asked whether the landscape of the vineyards of Etna was important for the development of tourism in the area and if the terraces limit the productivity of the vineyards. Finally, respondents were asked whether allocating public money to protect the agricultural landscape of Etna's terraced vineyards is useful or useless or whether public funds should be allocated for other goals.

Subsequently, the participants' willingness to pay was assessed by hypothesizing the following payment scenario: "Given the limited public funds granted to winegrowers to compensate them for the reduced profit due to the presence of dry stone walls, we hypothesize the creation of a specific fund, managed by a hypothetical non-profit agency, in which the monetary amounts voluntarily paid by citizens will converge. The funds collected in this way will be donated to the winegrowers who undertake to keep the dry stone walls. The protection of the terraced vineyards landscape can take place if farmers undertake to preserve the existing agricultural landscape, to treat it according to tradition, to cultivate existing vines according to good agricultural practices handed down over time. The same fund can also be used by wine producers if they are supplied exclusively by farms that maintain dry stone walls. Given this scenario, are you willing to pay voluntarily and *una tantum* a monetary amount to this fund?"

After describing the scenario, respondents were asked if they were willing to pay to protect the terraced vineyard landscape and to this end the Open-Ended format was used to elicit the willingness to pay in case of affirmative answers.

In the last part of the questionnaire the main socio-economic characteristics of the interviewees were acquired.

In order to verify the comprehension of the questions contained in the questionnaire, we conducted a preliminary test on a sample of 20 statistical units. The results of the pre-test showed an acceptable comprehension of the questions both in form and in content, in some questions it was decided to add some clarifications and continued with the test.

After the pre-test, we conducted the definitive survey with face-to-face interviews in the period from July to September 2018. Overall, the number of respondents was 250 units, all residing in the Sicilian provinces of Catania and Siracusa.

3. RESULTS

3.1. Descriptive analysis

The sample included 148 males and 102 females, ranging from 19 to 82 years (Table 2). As regard the level of education, 49.6% of the subjects have the high-school level and 40% the degree level. 12.8% of the interviewed sample is member of social voluntary associations, 21.6% of subjects belong to environmental associations, while the remaining 65.6% are not member of any associations. 46.4% of the interviewed have made in the past monetary donations. As regards the annual income of the interviewees, the most represented income class is "from 20,000 to 30,000 €" with 32.4%, followed by "less than 10,000 to 20,000 €" with 30.4%, while 24% fall into the class with income "from € 30,000 to € 50,000" and 13.2% into the class with income "from € 50,000 over".

Table 2. Sample socio-demographic characteristics

Variable	Classes	Frequency	Percentage	Cumulative Percentage
Gender	Males	148	59,2	59,2
	Females	102	40,8	100
Province	Catania	153	61,2	61,2
	Siracusa	97	38,8	100
Education	Elementary	6	2,4	2,4
	Medium school	12	4,8	7,2
	High school	124	49,6	56,8
	Degree	100	40	96,8
	Other	8	3,2	100
Member of association	None	164	65,6	65,6
	Social association	32	12,8	78,4
	Environmental association	54	21,6	100
Previous donations	Si	116	46,4	46,4
	No	134	53,6	100
Income	<10000 a 20000	76	30,4	30,4
	da 20000 a 30000	81	32,4	62,8
	da 30000 a 50000	60	24	86,8
	da 50000 oltre	33	13,2	100

(Source: our elaborations from sampled data).

3.2. Willingness to pay for the terraced vineyards landscape

The analysis of participants' willingness to pay for financially support the hypothetical non-profit agency described in the payment scenario, showed that out of the 250 respondents, 96 units, equal to 38.4% of the total sample, declared a willingness to pay equal to zero. Among those units, we distinguished between those who have shown total indifference to the protection of the landscape of Etna's terraced vineyards and those who are willing to pay but do not believe that granting economic aid to farmers is a efficient mechanism to protect the dry stone walls.

Those who declared total lack of interest in the conservation of dry stone walls were not considered in the estimation of the average willingness to pay. As a consequence, the statistical units taken into consideration for the final analysis were 229. Table 3 shows the descriptive statistics of willingness to pay, ie frequencies, percentage and cumulative percentage. The highest frequency of WTP was obtained for the value of 0 euro provided by 75 subjects equal to 32.7% of the total sample. Apart from this zero value due principally to the lack of confidence that this method of subsidy can be effective to preserve dry stone walls, the highest monetary frequency was recorded for the value of 10 euros indicated by 47 units equal to 20.5% of the total sample. Other monetary values follow with significantly lower percentages such as 25 euros indicated by 10 subjects (4.4%), 15 euros indicated by 9 subjects (3.9%) and 50 euros (6 units equal to 2.6% of the sample).

Table 3. Willingness to pay for agricultural landscape of terraced vineyards preservation

Values (Euro)	Frequency	Percentage	Cumulative percentage
0	75	32,7	32,7
1	1	0,4	33,1
2	1	0,4	33,5
3	2	0,9	34,4
5	48	21	55,4
10	47	20,5	75,9
15	9	3,9	79,8
20	16	7	86,8
25	10	4,4	91,2
30	3	1,3	92,5
50	6	2,6	95,1

Values (Euro)	Frequency	Percentage	Cumulative percentage
60	1	0,4	95,5
100	9	3,9	99,4
Unable to quantify	1	0,4	100
Total	229	100	

(Source: our elaborations from sampled data).

The average value of the WTP was 12,11 euros with a standard deviation of 20,76 euros and a median value of 5 euros. The maximum value of the willingness to pay was 100 euros (Table 4).

Table 4. Statistics of willingness to pay for dry stone walls preservation

Statistics	Values
Mean	12,11
Median	5,00
Standard DEviation	20,76
Minimum	0,00
Maximum	100,00

(Source: our elaborations from sampled data).

3.3. Factors affecting willingness to pay for preserving the terraced vineyards landscape

The willingness to pay to protect the terraced vineyards landscape of Mt Etna is affected by some socio-economic factors of the interviewed sample. To identify the variables that influence the WTP, we proceeded to estimate a logit model on the integral sample of 250 units in which the dependent variable is the binary variable that takes zero value if the willingness to pay is negative and 1 otherwise. The independent variables of the model are the socio-economic variables detected during the survey ie gender, age, education, income, etc. The results of the logit model and the variables used are shown in Table 5.

Results of the logit model show that the province of residence of the interviewees and the level of education positively influence the willingness to pay for the protection of the terraced vineyards landscape of Mt Etna. Likewise, membership of environmental associations has influenced a positive response for the protection of this agricultural landscape. All other socio-economic variables were not statistically significant.

Table 5. Logit model results

Variables	Coefficients	p-value
const	-6,935	<0,0001 ***
Gender	-0,359	0,2679
Age	-0,007	0,5674
Province	0,783	0,0202 **
Education	0,514	0,0746 *
Farmer	0,301	0,4295
Member of social associations	0,574	0,2527
Member of environmental associations	2,101	0,0002 ***
Previous donations	-0,095	0,7841
Income	0,121	0,5452

(Source: our elaborations from sampled data.

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively)

Looking at marginal effects of socio-demographic variables (Table 6), „province” affects the willingness to pay to protect agricultural landscape of terraced vineyards and residents in the province of Siracusa are more likely to pay (+17,8%) than residents in the province of Catania. The same for the variable „education” where the marginal effects take a positive sign indicating that interviewed with high level of education are more willing to pay to protect the terraced landscape than units with a lower level of education. Finally, the probability of obtaining a positive willingness to pay among those who made previous donations is 13% higher than those who have never made donations in the past.

Table 6. Average marginal effects

Variables	dy/dx	P-value
Gender	-0.081	0.267
Age	-0.002	0.568
Province	0.178	0.020 **
Education	0.117	0.075 *
Farmer	0.068	0.430
Member of social associations	0.130	0.251
Member of environmental associations	0.477	0.000 ***

Variables	dy/dx	P-value
Previous donations	-0.021	0.784
Income	0.028	0.545

(Source: our elaborations from sampled data).

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Finally, a linear OLS regression model was estimated. Looking at Table 7, we can argue that the amount of money that people are willing to pay is positively related to „province”. On average, residents in the province of Siracusa are willing to pay 0,16 euros more than residents in the province of Catania. Moreover, the willingness to pay is positively correlated to the membership of environmental associations. In fact, interviewed that belong to environmental associations are willing to pay 0.31 euros more than those who are not members of associations. Finally, people with high income are willing to pay more than those with low level of income. All the other variables were statistically not significant.

Table 7. OLS regression results

Variables	Coefficients	p-value	
const	-0,623893	0,0196	**
Gender	-0,066551	0,2660	
Age	-0,000992233	0,6675	
Province	0,15659	0,0124	**
Education	0,0830715	0,1089	
Farmer	0,0350168	0,6175	
Member of social associations	0,104519	0,2297	
Member of environmental associations	0,308636	<0,0001	***
Previous donations	0,0292402	0,4443	
Income	0,108449	0,0158	**

(Source: our elaborations from sampled data).

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively)

CONCLUSIONS

According with UNESCO decision, the results of this study may have important implications for wine growers since the remuneration of the qualitative services provided by farmers through the maintenance of dry stone walls can increase farms profitability, and maintain this important environmental and cultural resource also for future generations. The findings of this study show that the protection of the terraced vineyards landscape around Mt Etna implies the development of an environmental awareness and an appropriate environmental education. The awareness of the social and economic benefits that this landscape can have for local communities will contribute to making the agricultural landscape of the terraced vineyards in Mt Etna a place of "niche" that preserves and transmits historical and cultural values, and where individuals are willing to pay to preserve it.

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