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PUBLIC PREFERENCES FOR FARMED LANDSCAPES: THE CASE OF TRADITIONAL CHESTNUT ORCHARDS IN SOUTH TYROL

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Abstract: Sweet chestnuts are, from a farming point of view, a marginal crop in South Tyrol, though historically rooted. Chestnut orchards represent a cultural heritage, as well as an important aesthetic element of the cultural landscape, besides assuming a high ecological value for many animal and plant species. Public awareness towards this ecosystem is generally higher in autumn, when fruit consumption sees its peak and events take place. Using a Choice Experiment, we assessed whether seasonality interferes in people's willingness-to-pay for a traditional chestnut orchard and its ecosystem services. We also investigated the importance of respondent origin (residents vs tourists) and, finally, a Latent Class analysis allowed us to depict segments of society in relation to their preferences. Our results show that tourists are ready to pay more than locals for chestnut orchards and for fruits, whereas seasonality has generally a low impact.

Keywords: Tourism, farming, chestnut orchards, ecosystem services, choice experiment

Abstract: La castanicoltura in Sudtirolo ha origini antiche e, sebbene fornisca produzioni marginali, è tuttora la protagonista simbolica dell'autunno. I castagneti rappresentano un'eredità culturale e un importante elemento estetico del paesaggio rurale, oltre ad assumere un importante potenziale ecologico per specie animali e vegetali. La consapevolezza del pubblico nei riguardi di questa coltura è generalmente più elevata in autunno, momento di massimo consumo dei frutti e di eventi enograstronomici. Con l'uso di Esperimenti di Scelta, abbiamo valutato l'influenza della stagionalità nella disponibilità a pagare per un castagneto ed i suoi servizi ecosistemici, quella della provenienza dei rispondenti (residenti vs turisti) e, infine, un'Analisi a Classi Latenti ha permesso di identificare segmenti di società in relazione alle preferenze espresse. I risultati evidenziano la maggiore disponibilità a pagare dei turisti rispetto ai residenti, mentre la stagione ha un impatto irrilevante.

Parole chiave: Turismo, agricoltura, castagneti, servizi ecosistemici, esperimento di scelta

1. Introduction

1.1 Chestnut orchards: an anthropogenic ecosystem

The Sweet Chestnut (*Castanea sativa* Mill.) was dispersed in all Central-Southern Europe by the Romans during the 1st century a.d. with the double aim of obtaining nourishing fruits as well as poles for vineyards from their wood (Conedera et al., 2004). However, chestnut cultivation in South Tyrol, a very northern alpine region of Italy, started only in "more recent" times, i.e. around the 13th–14th century (Rachewiltz, 1992), giving birth to a long and prosperous chestnut culture. Eventually, the competition with other more advanced chestnut regions, the replacement of chestnuts as staple food with alternative crops, such as maize and potatoes, and the impact of an ongoing industrialization era, were the main causes of the start, in the 18th century, of a long-lasting declining phase, outlined by orchard abandonment and consequent succession into spontaneous forest (Marco Conedera, Manetti, Giudici, & Amorini, 2004). After the Second World War, similarly to what happened in the adjacent region Trentino, from the bottom of the valleys, modern apple-growing and viticulture spread up to about 1000 m a.s.l. replacing traditional forestry and agroforestry ecosystems, such as traditional chestnut orchards. Equally, the outbreak of chestnut blight and ink disease has decisively intensified the chestnut decline (Bazzanella, Gilli, & Tomasi, 2001).

Most chestnut orchards in South Tyrol belong nowadays to the so-called transitional agro-forestry ecosystems urging restoration interventions, before abandonment undergoes irreversible dynamics. Surviving managed orchards, on the other hand, need accurate maintenance. They are currently placed in steep slopes of often difficult access, which makes any agronomic operation costly and time-consuming (Bossi Fedrigotti & Fischer 2014). Nevertheless, chestnut

trees are considered as multipurpose, i.e. able to provide at once fruits, timber, other secondary products such as berries, mushrooms, honey, tannins and, when placed in an open land, together with the entire ecosystem, and even pasture.

Despite its decrease in the last decades (Scartezzini, 2002), chestnut growing is deeply rooted in South Tyrol and its fruit value is much more cultural than nutritive or economic (Bender, 2002). The link connecting chestnuts to cultural events is traditionally strong in South Tyrol, consisting of a regional phenomenon called Törggelen, basically a meal with new wine and chestnuts, which attracts tourists and residents to local rural taverns ("Buschenschänke") and practically contributes to the extension of the tourist summer season by two more months (Astat, 2018).

The definition of a traditional chestnut orchard used in this study refers to an extensively managed, fruit-oriented system i.e. a variable number of grafted chestnut trees (up to 60 trees/ha) scattered in an accessible open stand, where the balance between light and shade allows the growing of younger planted trees and, at the same time, guarantees some relief to the grazing sheep in hot summers. The structural combination of elements belonging to two different types of ecosystem, open meadows and forest, enriches this agro-forestry environment with ecological synergies, i.e. in the increase of plant and animal biodiversity (Obrist et al., 2011; Pradella et al. 2010: Python et al. 2013).

The aim of this study is to determine the public willingness-to-pay (WTP) for a traditional chestnut orchard that offers, besides fruits, other non-marketed benefits, such as cultural aspects, aesthetic elements and biodiversity enhancement. In order to adopt a language that fosters interdisciplinary and allows a common terminology among scientists, policy makers and practitioners, benefits provided by chestnut orchards have been expressed with the use of an ecosystem services approach. The present study also points at investigating whether the connection of the main provisioning service of chestnut orchards with autumn leads to any bias, when consumers assess their preferences for the entire ecosystem. Moreover, the influence of the respondents' origin (i.e. locals versus tourists) on eliciting behavior is also taken into account. The results should provide relevant insights for future territorial planning decisions, as well as a starting argument for the implementation of monetary reward instruments for chestnut orchard keepers. Chestnut orchard restoration interventions – mainly consisting of the cleaning up of invasive arboreal and shrubby vegetation, pruning and (re)grafting – might be encouraged or discouraged, depending on the outcome of the analysis.

1.2 Ecosystem services approach

Over the past decade, there has been an intensive research effort to develop methodologies for assessing the benefits society gains from natural resources and biodiversity (Kumar, 2010; MEA, 2005). Simultaneously, the ecosystem services concept has been applied to assess land-use change and its consequences for biodiversity (Allan et al., 2015; Fontana et al., 2014). Recent studies have introduced the use of ES as indicators in their stated preference valuation methods, such as choice experiments or conjoint analysis, in order to improve the public understanding of environmental issues, e.g., amount of irrigation water, amount of carbon stored, habitat condition, population of an endemic species or of charismatic or non-charismatic species (Christie et al, 2012; Shoyama et al., 2013; Soy-Massoni et al., 2016).

Although the flow of ecosystem services and its trade-offs in relation to traditional land-use systems, as for instance, larch meadows or chestnut coppices, have been approached in the last few years (Fontana et al., 2013; Fontana et al., 2014; Radtke et al., 2013; Radtke et al., 2014), data and studies on chestnut-orchard related ecosystem services are mainly limited to the provisioning of non-wood forest products, except for a mentioning in Bellini (2005) and Bounous (2005).

Nevertheless, all the studies on chestnut agree with the definition of chestnut orchard as a multifunctional ecosystem and, consequently, able to provide a wide range of services (Bounous et al., 1999; Castellini et al., 2010; Conedera & Krebs, 2008; Diamandis, 2008; Krebs et al., 2012). Also, chestnut ecosystem services can be classified according to the international CICES classification and list, consequently, several *biotic provisioning services* (fruits, timber and

biomass, pasture, edible mushrooms, honey, forest litter, berries and tannin), *regulation and maintenance services* (pollination, carbon sequestration, hazard risk mitigation, soil fertility), *cultural services* (sense of place, identity, recreation, aesthetics, historical value) besides representing an habitat that supports life and maintains high levels of biodiversity (Haines-Young & Potschin, 2018).

1.3 WTP, seasonality and provenance

Temporal stabilities of environmental values, achieved by means of stated preference methods expressing public WTP, have recently been studied (Bliem & Getzner, 2012; Bliem et al., 2012; Liebe et al. 2012; Schaafsma et al., 2014). Gatto et al. (2014) have investigated the local awareness of the ES produced by the surroundings forests and estimated the public WTP, through the use of a choice experiment model. The empirical evidence about differences of users' behavior due to the seasonality, in the context of agro-forestry ecosystems, as well as of theme trails or landscape amenities is, however, very limited.

Off-season cultural tourism has been studied by Figini and Vici (2011), whereas preferences for seasonal provisioning services (i.e., food) were the topic of a research project conducted in theme parks, by asking the respondents to indicate, within the same survey, a preference for a spring destination and another for a summer theme park. Junge et al. (2015) reveal how public preferences are higher for flowering stages rather than for other phenological seasons in the case of Swiss agricultural landscapes. Another similar Swiss study reports that the scoring for orchards and hedgerows are significantly higher during the whole period of March to October (Schüpbach et al., 2016). However, bias due to the influence of highly season-dependent goods, as chestnuts in this study, have not been investigated so far. Chestnuts, indeed, represent the autumn fruit par-excellence, besides being a key driver for autumn festivals, tastings and folkloristic events (Castellini et al., 2010; Pettenella, 2001).

Respondent provenance also plays its role when landscape preferences are expressed. On the one hand, place attachment and place identity strongly influence landscape perceptions (Brown & Raymond, 2007). On the other hand, there are studies reporting that tourists are often ready to pay more for some ecosystem services, rather than residents (Herrero et al., 2012). Distinctions in the perception of ecosystem services – of coastal and marine ecosystem services especially, but not only – between tourists and locals have been identified: Daniel et al. (2012), for instance, underline the importance not to label the whole category of visitors simply under tourism, because overnight tourism behave differently than day tourism in terms of aesthetic appreciation and wellbeing. Rulleau et al. (2011) compared preferences between tourists and residents for forest recreation in a French coastal area: the former surprisingly reported a higher preference towards these ecosystem services rather than the latter, who preferred the beach. Herrero et al. (2012) found that tourists were ready to pay more than locals for cultural festivals in Northern Spain. South Tyrol being a highly touristic destination, it appears quite relevant to determine whether the origin of respondents might influence their landscape and ecosystem service perceptions.

2. Materials and Methods

2.1 Study area

The Autonomous Province of Bozen-Bolzano (South Tyrol) is located in the Eastern Alps, in the northernmost region of Italy and covers an area of 7,400 km^2. The mountain chains surrounding South Tyrol generate a subcontinental climatic condition in the Central Range with relatively mild temperatures (~4°C) and relatively low precipitation (~1000 mm) for an Alpine environment (Flury et al., 2012). The southern part of the province is less subjected to the influence of surrounding mountains and is characterized by sub-Mediterranean influence, including the growing of thermophilous species, such as downy oak, hop hornbeam and chestnut (Peer, 1980; Tasser et al., 2007).

Chestnut orchards in South Tyrol are located between 500 and 1200 m a.s.l. in the exposed slopes around Bolzano, along the Valle dell'Adige, Valle Isarco and Val Venosta. So far, chestnut

farmers in South Tyrol can still count on public grant subsidies for maintaining their traditional orchards active and for avoiding their abandonment, as clearly reported by the Landscape Department of the Province of Bolzano ("Premi incentivanti per la cura ed il mantenimento del paesaggio," 2015).

In order to enhance and to foster the cultural component of chestnut orchards, two free theme trails have been realized by the Province nearby Bolzano, in Valle Isarco and in Völlan (Burgraviato region), respectively. Those trails significantly differ in their mission, as well as in the services supplied: the former twists along 60 km and offers scenic beauty and aesthetic elements, besides the possibility of buying and tasting chestnuts directly from the farmers; the latter (about 4 km) carries out an educational objective by providing didactic activities and interactive information about chestnut trees and biodiversity of chestnut environments. Both trails are promoted by tourist offices.

The Rural Development Program 2014–2020, moreover, foresees a measure for concrete chestnut orchard restoration actions, i.e., cleaning of shrubby invasive vegetation, pruning, grafting and replanting. However, the future of those financial rewards remains uncertain. The abandonment risk is therefore still high, even though a previous study, conducted in 2011–2012, highlighted a growing potential for the local market of chestnuts by verifying chestnut quality appreciation and by identifying at least one well performing sub-region, where future commercial strategies should be addressed. Unfortunately, the precise number of hectares covered by active chestnut orchards is difficult to assess, since hard data provided by the two official monitoring bodies in charge is contradictory; thus, an estimation of an actual surface of 200–300 ha can be considered realistic (Bossi Fedrigotti & Fischer, 2014).

2.2 Valuation approach: the Choice Experiment

A Choice Experiment (CE) was conducted to estimate public WTP for accessing a chestnut orchard able to provide a certain number of ecosystem services, i.e. benefits for the whole society. CE is a form of stated preference method in economic valuation techniques, and data are collected by means of a questionnaire in which respondents are asked to choose from among a set of options presenting the product/service under valuation in different configurations. Each set of options is called a choice set and each option a choice profile.

This methodology is based on three main steps (Hanley, 2001, 2003): (i) identification of the basic attributes (with their levels) of the good to be evaluated; (ii) administration of the survey where respondents choose among alternative hypothetical scenarios characterized by different combinations of attribute levels; (iii) econometric analysis of respondents' choices, which allows to estimate the relative importance of the attributes and, when a monetary factor or a price is included as an attribute, the WTP for different levels of the other attributes.

CE is appropriate for valuating environmental goods, as it allows to express also indirect use values and non-use values, concurring to the creation of the total value (Hanley et al., 1998). The first environmental applications of the CE technique were adopted by Adamowicz et al. (1994), followed by a big body of literature testifying other different application fields: forest and recreation were, amongst others, the subject of Hanley (2001), Horne et al. (2005), Christie et al. (2007), Juutinen et al. (2011), Saelen and Ericson (2013); whereas restoration actions were recently evaluated by Bliem et al. (2012), De Valck et al. (2014), Lanz and Provinz (2013), Meyerhoff et al. (2006), Nicosia et al. (2014), Tempesta (2010, 2014), Vecchiato et al. (2013).

CEs basically ground their econometrics on the random utility theory (Mc Fadden, 1973) where, consistently, consumers' utility is considered a latent structure that cannot be observed directly. By designing and implementing a valid preference elicitation procedure, a significant proportion of the unobservable consumer utility can be assessed:

$$Uij = Vij + \varepsilon ij \qquad Vj \in Cj, \tag{1}$$

In this equation, *Uij* is the utility an individual *i* is assumed to obtain from alternative *j* in choice set *Ci*. Parameter *Vij* is the observable or deterministic component of utility, held by consumer *i* for choice alternative *j*, while *Ɛij* is the random or unobservable element of utility. The deterministic component of (1), for each consumer, can be further described as a linear function of attributes (Dachary-Bernard & Rambonilaza, 2012):

$$Vj = \beta 0j + \beta 1jf(X1j) + \beta 2jf(X2j) + \beta 3jf(X3j) + ... + \beta kjf(Xkj) \quad (2)$$

where *β0j*, also known as alternative-specific constant (ASC), represents a dummy for the respondent's choosing the "status quo" alternative or the "none of those alternatives" (OPT-OUT) in the choice set or the unobserved utility.

The parameter *β1j* represents the marginal utility associated with attribute *X1* and with alternative *j*, while *k* = 1, … , *K* are the attributes considered in the CE. The presence of an economic attribute enables the estimation of the WTP for each level of the chosen attributes.

2.3 Design and structure of the questionnaire

In accordance with the objectives of the study and by means of the ES common terminology, a CE was used to estimate respondents' WTP for a multifunctional chestnut orchard.

The experiment presented respondents with hypothetical tours of the chestnut orchard described by five main attributes (Table 1) that have been identified after several interviews with local and international chestnut experts: landscape, biodiversity, didactic support, fruits and price. Biodiversity and didactic support constitute three levels, while landscape and fruit attributes, two. The improvement of each attribute from level 1 to level 2 and then possibly to level 3 is supposed to convey a quality upgrade.

Tab 1. Attributes and levels used in the choice sets. Source: own elaboration from Haines-Young and Potschin (2018)

Attributes	Levels	Code	Affected ES
Landscape structure	*1. Open stands; few trees, much light* *2. Closed stands; many trees, less light*	LAND LAND1	Regulating services; Cultural services; Provisioning Services
Biodiversity	*1. Presence of few species* *2. Presence of more species (only common)* *3. Presence of more species (common and rare species)*	BIO BIO1 BIO2	Regulating services; Cultural services; Provisioning services
Didactic support	*1. Simple informative boards* *2. Interactive 3D support and multimedia* *3. Personal guide*	DID DID1 DID2	Cultural services
Fruits	*1. Mix of non-selected varieties* *2. Selected varieties*	FRU FRU1	(Biotic) Provisioning services
Entrance fee	*1€, 2€, 5€ (per person)*	PRICE	-

Each attribute was chosen within the frame of the ES and eventually decoded into more user-friendly terms or iconographies, so that all respondents could easily comprehend the choice task. Not all attributes directly correspond to as many ES: biodiversity, for instance, is not properly an ES category, nevertheless, changes in biodiversity affect three types of ES, i.e., regulating, cultural and provisioning services (Science for Environment Policy, 2015).

Landscape structure

The habitat provided by an agro-forestry ecosystem has very distinctive characteristics, since elements of open ecosystems, as meadows and pastures, meet elements belonging to woody ecosystems (Bergmeier et al., 2010). Scattered trees in open stands contribute to shape the landscape in a typical mosaic-aspect that is aesthetically highly appreciated (Fontana et al., 2013; Fontana et al., 2014). High-stem fruit trees, low-intensity pastures and meadows are the most beloved landscape components also according to Junge et al. (2015). Grafted chestnut trees and grazing open lands are, therefore, the omnipresent components of such ecosystems (Marco Conedera et al., 2004). However, their proportions might change, according to the type of management and to the land keeper needs: in this study, we considered two degrees of tree density. Newly restored, as well as very old chestnut orchards, count with less trees and wider pastures; on the contrary, in regularly managed orchards trees are denser, since new plants are set to increase fruit production and to replace old and/or damaged trees.

Biodiversity

Managed orchards and patches of managed coppices in the landscape are beneficial for many bird species (Farina, 1998; Fuller & Moreton, 1987; Python et al., 2013), common species as well as rare species. Biodiversity highest level is depicted by the icon of a well-known inhabitant of traditional chestnut orchards, i.e., the hoopoe, which has an easily recognizable shape, and represents therefore a good flagship species for open and semi-open agro-forestry ecosystems (Schaub et al., 2014). Nomenclature and taxonomical references were intentionally not revealed to respondents, in order to keep the presence of rare species as general and intuitive as possible (De Valck et al., 2014).

Didactic support

Information is the way educational and cultural value are expressed in this study. Different types of information are an important feature of existing chestnut theme trails, such as “Sentiero del Castagno” in the Southern part of Switzerland (Ente Turistico del Luganese), “Kastanienerlebnisweg” in South Tyrol (Forest Department Provincia Autonoma di Bolzano). Therefore, didactic support was adopted as one of the attributes and articulated into three levels, from the very basic informative plaques and tags, to more interactive 3D and multimedia tools. As for the third and highest level, we hypothesized the presence of a personal guide walking the visitor along the trail in a sort of outdoor museum or natural park.

Fruits

Chestnuts are the main provisioning service of orchard ecosystems and, therefore, the benefit most frequently perceived by farmers and consumers. Despite the size of the national chestnut variety assortment, i.e., more than 300 cultivars known in Italy, as reported by Bellini (2005; 2008), only 20% of South Tyrolean chestnut farmers consciously grow a precise cultivar (Bossi Fedrigotti & Fischer, 2014). This means that at a local level, it is more frequent to find a mixture of partly unknown varieties when walking through chestnut orchards, rather than marroni type of chestnuts or other precious selected varieties, which might excel in size, taste, peelability or resistance against pests. Fruits are so far bought and tasted in the local “Buschenschänke” or in impromptu stalls along the theme trails, free collection from the ground is strictly forbidden.

Entrance fee

The entrance fee is indicated in euros (€) and is meant per visitor. The choice of expressing the price attribute with an entrance fee rather than through an increase of taxes, as often used in CE surveys (Colombo et al, 2013; Huang et al., 2015) was adopted because of a general similarity of the current study with others concerning visits to protected areas or natural parks (de León et al., 2015; Wang et al., 2014). In this way, no payment vehicle distinction between tourists and residents is necessary.

The chosen attributes and levels result in a full factorial design of 108 possible combinations. A fractional factorial orthogonal design, as frequently used in empirical studies (Louviere,

Hensher, & Swait, 2000), was generated with SAWTOOTH SSI Web 8.2.4® software and a final set of 18 treatment combinations (choice profiles) was derived. Respondents had to face 6 choice sets with 3 treatment combinations each (non-labelled alternatives) plus the opt-out alternative ("none of these"). They were asked which of any of the various tours presented would they select, their responses were used to estimate a choice model and the resulting marginal valuation of each tour characteristic.

2.4 Administration of the survey

Data was collected by means of a questionnaire including a CE preceded by a series of ice-breaking questions on: (i) knowledge about traditional crops in South Tyrol; (ii) chestnut consumption and frequency; (iii) familiarity with biodiversity definition and chestnut ecosystems; (iv) familiarity with chestnut theme trails, (v) socio-economic characteristics. All questions were multiple-choice, with a set of predefined answers for the respondent to choose between. The CE was firstly introduced and the attributes, as well as their corresponding levels, were repeated before each respondent was faced with the choice sets (Fig. 1).

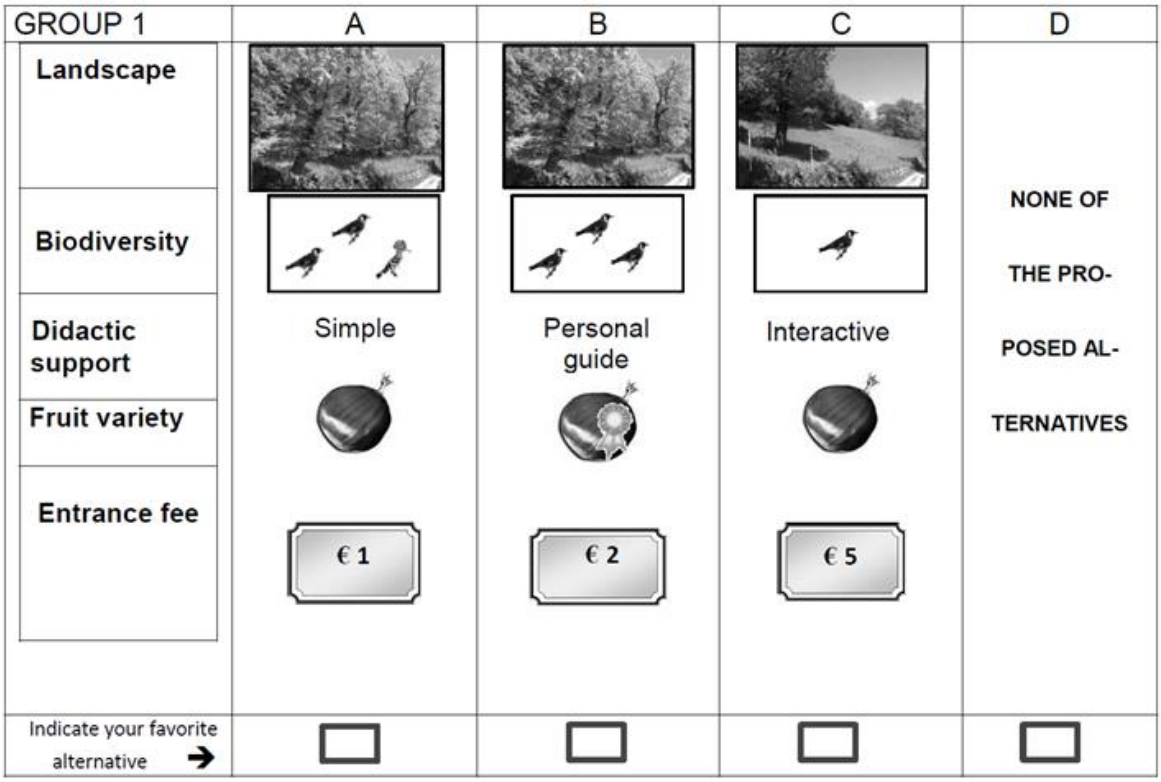

Fig 1. Example of a choice set. Source: own data elaboration

A pilot questionnaire was pre-tested in June 2013, and submitted to 30 testers to spot bias, as well as difficulties related to the comprehensibility and to the use of icons, text and graphical representations in the choice set. After receiving some feedback, the choice set was adjusted and finalized in its ultimate version. Between October and November 2013 and, eventually, between May and June 2014, 245 and 242 questionnaires respectively were compiled through face-to-face interviews. An additional key legend was provided to help the respondents interpreting symbols and icons of the choice tasks. In case of further difficulties in understanding the contents, the interviewer was available for assistance.

Both surveys were conducted in the cities of Bolzano, Merano (main city of the Bugraviato region) and Bressanone (standing for the Valle Isarco region), all renowned tourist destinations. The only sampling stratification regarded gender and provenance (residents vs tourists), for which quotas were settled at 50%. In all locations and both times, residents, as well as tourists, participated in the survey. The survey was conducted in Italian and in German, the two official languages spoken

in the region, in order to avoid any misunderstanding due to idiomatic reasons. Respondents were addressed in the streets of the pedestrian city centers, while strolling through the city or while doing their shopping, from approximately 9 am until 5 pm. Each interview lasted around 10 minutes and no financial incentives were offered to the respondents.

2.5 Analysis

Data was analyzed using NLOGIT® software version 4.0. We first applied a Multinomial Logit Model (MNL). In a second analysis, data was treated with a Latent Class Model (LCM) to analyze respondent heterogeneity and therefore consider the possibility of segmentation of preferences into different unobservable user groups.

MNL models have been widely applied for exploratory analysis, as they do not satisfy the assumption of Independence from Irrelevant Alternatives (Vecchiato & Tempesta, 2013). Nevertheless, they provide a good first analysis when two or more groups of respondents are compared. LCM are more flexible, as not subject to the IIA assumption, and can be considered a semiparametric variant of MNL models (Hensher, 2005). Both models, MNL and LCM, share the same utility function specification, derived from (2) and summarised in the following:

$$Vj = ASCj + \beta_1 LAND\ 1 + \beta_2 BIO\ 1 + \beta_3 BIO\ 2 + \beta_4 DID\ 1 + \beta_5 DID\ 2 + \beta_6 FRU\ 1 + \beta_7 PRICE \quad (3)$$

where the effect-coded variables (i.e. dummies) for the attributes are codified as in table 1. The coefficients β_1, β_2, β_3, β_4, β_5 and β_6, are the marginal utilities associated to the ecosystem services, while β_7 refers to the monetary attribute.

The existence of the price attribute allows to obtain a value of the mean WTP for attributes with statistically significant coefficients. The WTP is defined as the negative ratio of the selected attribute coefficient and the monetary coefficient.

The MNL model is useful for analyzing the relative marginal utility of the attributes of the whole sample, as well as of the seasonal surveys.

3. Results

3.1 Sample characteristics

The survey samples, one for the autumn session and one for the spring session, were defined using two main strata, namely the place of residence – whether the person lived in one of the chestnut areas or abroad – and gender.

The samples are described in Table 2. Gender is balanced in all the groups and the average age of respondents is around 50 years. Also, the percentage of tourists is rather stable in all three samples, making comparisons between autumn and spring possible. Tourists mostly come from Germany (65%) and Switzerland (25%), only 8% from the rest of Italy. Chestnut woods and chestnut orchards are mostly unknown to the respondents, whereas biodiversity is a familiar term, especially to the spring sample. The rate of chestnut consumers averages a bit more than 50% and the percentage of interviewees having walked at least once a chestnut theme trail is about 40%, somewhat higher in autumn. In all three groups, the majority of respondents declare more than €50,000 as income per household.

Tab 2. Characteristics of the sample expressed in percentage, n=487 for the entire sample, n=254 for the autumn sample and n=242 for the spring sample. Source: own data elaboration

		All sample (%)	Autumn sample (%)	Spring sample (%)
Gender	F	53.4	48.2	53.7
	M	46.6	51.8	46.3
Age mean (SD)		49.6 (15.75)	49.4	50.3
No. family members mean (SD)		2.96 (1.336)	3.01	2.96
Living area:	South Tyrol	54.2	51.4	57.0
	Abroad	45.8	48.6	43.0
Familiarity with:	*Chestnut woods*	22.2	24.1	18.2
	Chestnut orchards	8.6	6.1	10.7
	Biodiversity	45.4	33.5	53.7
Chestnut consumers		54.8	50.6	56.2
Walked a theme trail at least once		39.6	44.1	38.8
Income (€)	*0–10,000*	5.1	5.3	4.1
	10,001–30,000	13.1	17.5	11.2
	30,001–50,000	31.0	30.2	30.9
	>50,0001	40.0	33.9	45.0
	No answer	10.7	13.1	8.7

3.2 MNL results

MNL results are displayed in table 3. The coefficients are significant at the 95% confidence level (*p* value), except for the biodiversity medium level in the spring survey (90% confidence level).

Tab 3. MNL results and seasonal differences. Source: own data elaboration

Entire survey					Autumn		Spring	
	β	St. Er	*β* /St. Er.	WTP	*β*	WTP	*β*	WTP
OPTOUT	0.604***	0.113	5.344		0.345***		0.786***	
LAND1	0.275***	0.891***	3.092	1.44	0.257***	1.38	0.248***	1.29
BIO	-0.372***	0.104***	-3.561	-1.94	-0.428***	-2.29	-0.275**	-1.43
BIO2	0.898***	0.672***	13.360	4.69	0.870***	4.66	0.934***	4.88
DID1	0.603***	0.097***	6.221	3.15	0.734***	3.93	0.447***	2.33
DID2	0.708***	0.118***	6.014	3.70	0.816***	4.37	0.593***	3.10
FRU1	0.446***	0.109***	4.092	2.33	0.375***	2.01	0.528***	2.76
PRICE	-0.191***	0.197***	-9.734		-0.187***		-0.191***	

***significant at 95%; **significant at 90%

The highest marginal utility is represented by biodiversity including rare species. This can be observed in autumn as well as in spring. Price, as expected, as well as biodiversity with common species have a negative marginal utility in all three surveys. Interviewees like interactive information and even more the presence of a personal guide, although definitely in autumn more than in spring. Selected varieties of fruits, instead, are appreciated in spring more than in autumn, whereas landscape with higher tree density has a generally low, though positive, marginal utility in all three cases. Optout values are positive, however, they do not exceed other utilities, indicating that the 'none' option is preferred to some combinations but not to all: in autumn, respondents find many more acceptable attribute combinations than in spring.

Differences between the relative marginal utility of the attributes of the residents and tourists who participated in our survey have also been analyzed (Table 4). All estimated parameters are highly significant for respondents, except for landscape and biodiversity with common species attributes for tourists. The marginal utility of a biodiversity that includes rare species stands out among the preferences of tourists, their WTP being considerably higher than the locals. Both levels of didactic, as well as the fruit selection, achieve values of WTP for tourists that exceed eight times the values of WTP expressed by residents.

Tab 4. MNL results according to the respondents' origin. Source: own data elaboration

	Residents (N=264)	Tourists (N=223)		
	β	WTP	β	WTP
OPTOUT	0.438***		0.342***	
LAND1	0.338***	0.83	0.704	/
BIO	-0.703***	-1.73	-0.205	/
BIO2	0.901***	2.22	0.882***	18.49
DID1	0.499***	1.23	0.575***	12.04
DID2	0.683***	1.68	0.683***	14.31
FRU1	0.371**	0.91	0.611***	12.81
PRICE	-0.406***		-0.048**	

3.3 LCM results

For testing for latent heterogeneity among respondents, a LCM was estimated to take into consideration the possibility of segmentation of respondents' preferences into a number of different groups. By comparing the statistics of Log likelihood function (LL), McFadden Pseudo R^2, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) for different numbers of classes (Table 5), the four-class model was selected.

Tab 5. Latent class model statistics. Source: own data elaboration

	LCM-2	LCM-3	LCM-4	LCM-5
LL	-3048.080	-2863.229	-2804.384	-2718.342
AIC	2.117	1.998	1.966	1.915
BIC	2.159	2.064	2.056	2.030
HQIC	2.132	2.022	1.998	1.956
McFadden Pseudo R^2	0.24	0.29	0.30	0.32

According to Boxall and Adamowicz (Boxall & Adamowicz, 1999), the number of classes can be based on the Bayesian Information Criterion (BIC), but the chosen number of classes must also account for significance of parameter estimates and can be tempered by the analysts' own judgment on the meaningfulness of the parameter signs (Scarpa & Thiene, 2005). In this study, the decision to apply four classes was subjective. Although the model with five classes should be considered statistically preferred, the estimates it produces show several insignificant coefficients. Therefore, for the sake of simplicity, we decided to discuss the model with four classes.

Tab 6. LCM results with four classes. Source: own data elaboration

	Latent Class Model							
	Class 1 (47%)		Class 2 (24%)		Class 3 (5%)		Class 4 (24%)	
	"All-around visitors"		"Fruit lovers"		"Price conscious"		"Biodiversity fans"	
Variable	Coeff. (St.Er.)	WTP (€/tour)	Coeff. (St.Er.)	WTP (€/tour)	Coeff. (St.Er.)	WTP (€/tour)	Coeff. (St.Er.)	WTP (€/tour)
OPTOUT	-0.50 (0.19)***	/	1. 56 (0.56)***	/	-0.77 (33.68)	/	-0.65 (1.13)	/
LAND1	-0.37 (0.17)***	/	2.40 (0.58)***	4.44	2.75 (33.61)	/	-0.35 (1.16)	/
BIO	-0.06 (0.20)	/	-1.49 (0.67)***	-2.76	-0.61 (2.23)	/	-2.60 (5.20)	/
BIO2	1.08 (0.10)***	/	1.96 (0.44)***	3.63	1.57 (1.62)	/	2.49 (0.77)***	0.83
DID1	0.22 (0.19)	/	0.86 (0.36)***	1.59	1.11 (33.63)	/	0.27 (1.04)	/
DID2	0.49 (0.23)***	/	0.90 (0.60)	/	4.39 (33.59)	/	-0.55 (4.40)	/
FRU1	0.61 (0.23)***	/	2.43 (0.67)***	4.50	-1.00 (33.71)	/	1.83 (1.67)	/
PRICE	-0.02 (0.03)		-0.54 (0.13)***		-2.56 (1.22)***		-3.01 (0.73)***	
Average probability	0.47		0.24		0.05		0.24	
Theta in class probability model:								
Female	-0.49 (0.27)**		-0.15 (0.29)		-0.06 (0.57)		Fixed parameter	
Tourist	2.61 (0.32)***		0.96 (0.35)***		-12.33 (3557.38)			
Autumn	-0.11 (0.29)		0.46 (0.30)		-1.20 (0.68)**			

Results of the four Latent Classes are displayed in Table 6. The four classes represent 47%, 24%, 5% and 24%, respectively, of the sample.

The LCM results show various sources of preference heterogeneity in the utility perceived respondents, as highlighted by the analysis we obtained for each class.

The coefficients for respondents belonging to class 1 are all significant at a 95% confidence level, apart from the presence of an interactive 3D and multimedia support, biodiversity with common species and price, which are not significant. Participants of this group show a strong preference for both the presence of rare species and provisioning services, i.e., for selected varieties of chestnuts. Referring to landscape, closed stands with more trees are not appreciated. These respondents consider tree density a negative aspect, rather than a quality improvement. However, the presence of a personal guide seems to be an important attribute when choosing a tour, while price is not taken into consideration. Due to the lack of statistical significance of price coefficient, it is not possible to estimate respondents' willingness to pay in favor of these attributes. They could be defined as "all-around visitors", i.e., respondents enjoying all the most relevant aspects of a chestnut tour experience, without worrying about the price.

As "Fruit lovers" could be labelled respondents belonging to class 2. Coefficients are all statistically significant at the 95% confidence level, except for the presence of a personal guide as a didactic support. Selected varieties of chestnuts are highly appreciated by these respondents (WTP €4.50). In addition, closed stands increase their utility (WTP €4.44). Moreover, as regards biodiversity, members of this class have a clear preference for the presence of more species, including rare ones (WTP €3.63/tour). An interactive 3D and multimedia support is less appreciated.

In the third class, the "price conscious" citizens can be distinguished. Coefficients for group 3 are not statistically significant at 95% confidence level except for price. This latent class shows a relatively high price coefficient value (in absolute value terms), indicating a group of consumers who are relatively more concerned about the price. The insignificant coefficients indicate that respondents are indifferent between the levels of those attributes. The WTPs are therefore assumed to be equal to zero and, thus, not presented. For this group of respondents, the price is the leading reference in choosing a tour. They seem to be price sensitive respondents; it should, however, not be excluded the possibility that the class might represent a small group (5% of the sample) of careless participants, not wanting to reveal their real preferences and expressing their "protest" that way.

Interestingly, all coefficients for class 4 are not significant (p>0.1), price and common and rare species presence making exceptions. The members of this class, by choosing the most preferred alternatives, have mainly considered said attributes, being substantially indifferent to the other ones. Compared to the other three classes, this class exhibits a higher preference toward biodiversity. Hence, this group definitely includes the "biodiversity fans".

In a preliminary step of the LCM estimations, socio-demographic and behavioral variables were included to improve class explanation: it turned out that they were not generally significant. Consequently, only the two most significant and relevant variables were retained, i.e. the gender and the discrimination between residents and tourists. In detail, as concerns gender, female prove significant, with a negative coefficient relative to class 1 meaning that female do not tend to fall into this class. The distinction between residents and tourists seems to determine the belonging to a number of classes. In fact, tourists have a higher probability to be in the first and in the second class, where the WTPs are higher and where, comparing to class three, price is considered as a sign of quality, meaning that tourists are more willing to pay for traditional chestnut orchards conservation rather than locals.

Finally, the only significant result concerning the role of seasonality is the lower probability for the autumn respondents to be included in the third class, where price seems to be the only characteristic when choosing a tour.

4. Discussion and conclusions

The South Tyrolean chestnut farming sector faces decline due to economic, structural and ecological reasons. The local demand for chestnuts, despite the awareness of higher prices, compared to imported products, is, however, a sign of potential growth. In this scenario, the ability of chestnut orchard ecosystems to supply other benefits and services than fruits, could conduct to new and important strategies for restoring abandoned orchards and for maintaining the existing active and well managed. Restoration actions should take into high consideration some of the attributes proposed in this study, when implemented; namely, respondents are ready to spend the highest amount of money for a high level of biodiversity which includes also rare species. This result is in line with De Valck et al.'s (2014) outcome, where two latent classes out of three were attributing rare species, the second-highest marginal utility.

As for the landscape attribute, the biggest group of respondents, i.e. 47% of the interviewees, confer a negative marginal utility to denser stands, whereas of the remaining 53%, only 24% rate open stands as important. Other studies focusing on landscape aesthetics preferences support those data: semi-open landscapes scattered with trees are preferred by society (Fontana et al., 2013; Howley, 2011). Biber et al. (2015), when analyzing the sensitivity of ecosystem services to different densities in forestry management, have similar results: less tree density means an increase of recreation and landscape aesthetics. Junge et al. (2015), too, confirm that a combination of vertical elements and low intense pastures or meadows are to be preferred among different scenarios. The economic effort of keeping the orchard dense enough to guarantee a certain chestnut production seems not to be recognized by the majority of the respondents, nor do the relief and the pleasantness of a shady environment. Neither in autumn, nor in spring are shading and freshness a prominent feature of an ecosystem. More generally, a landscape structure cannot be entirely perceived without experiencing it live and in person. To overcome the limit of a visual questionnaire, the next phase of the study should probably foresee a reiteration of the survey during summer season and directly in loco.

Selected fruits surprisingly do not seem to be the most appreciated service, though respondents are ready to pay around €2 for it in autumn and slightly more (€2.7) in spring. One the other hand, when distinguishing between residents and tourists, selected varieties of chestnuts become one of the most important attribute in the choice of tourists, who declared a high WTP for them. That means that the only the provisioning service generally excels among other ecosystem services, but it does not constitute a seasonal bias. The lack of appreciation when considering differences between autumn and spring is possibly due to the real unavailability of such a seasonal good during the rest of the year. Higher familiarity with biodiversity and higher income in favor of spring respondents do not lead to significant differences in their WTP. From the point of view of the decision maker, the latter is a good result, as any kind of restoration action, resulting in an orchard open to the public would be of great interest throughout the year for the entire society. However, considering that chestnut fruits seem not to interfere with seasonal preferences, it might occur to find much more significant differences between summer and winter, as suggested by Schüpbach et al. (2016), rather than between spring and autumn. The aesthetical beauty of flowering stage of chestnut trees and other species in spring do probably compensate the lack of availability of chestnut fruits, making the whole good season equally appreciable.

The origin percentages (residents vs. tourists) observed in our sample are quite unusual for South Tyrolean yearly tourism fluxes, nevertheless representative of the low-season trends. Italians embody, as a matter of fact, the second most important group of tourists (almost 35% as an average of the period 1991–2017), though mainly concentrating in winter (40%) and in summer (57%). May and October show, hence, a lower presence of Italians (12% and 11% respectively), against the high presence of German tourists in both months (around 70%), as reported by Astat (2018). Thus, it is reasonable to state that the majority of the foreign respondents come from richer countries (Germany or Switzerland) compared to Italy, hence their willingness-to-pay is much higher than the resident, due to an objective higher amount of economic resources. This might correspond also to an overestimation of the public preferences, since the behavior of tourists on vacation is probably not corresponding to their behavior in daily life. The trend is also suggested in a Spanish study by Soy-Massoni et al. (2016), where the highest WTP for all

ecosystem services is expressed by tourists and the lowest by several categories of locals. Decision makers must, however, keep in mind that real tourism fluxes change their composition during high season, when tourists with less purchasing power might prevail (Astat, 2018). Any new strategy that fosters chestnut orchard restoration and/or maintenance should concretely involve the tourism sector: initiatives ranging from “pick-on-your-own” offers to any “chestnut orchard birdwatching” experience might represent a valid alternative income for chestnut farmers and should be supported and encouraged by the local tourism authorities.

Finally, when the land is privately owned, as in the case of chestnut orchards, management decisions are ultimately made by farmers themselves (Fontana et al., 2013). Farmers are forced to manage their properties economically efficient due to naturally challenging conditions and increasing production costs (Streifeneder, 2007). At this point, the concern about service trade-offs arises, i.e., increasing the provision of one (private) good may reduce the production of another (public) good. It is therefore crucial that society recognizes the total economic value of such a demanding ecosystem, including non-use value, in order to reward farmers for providing more services (Dale & Polasky, 2007).

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