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Rural sustainability and food choice: the effect of territorial characteristics on the consumers' preferences for organic lentils

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Abstract

The importance of pulse cultivation and consumption is recognized by the scientific community in terms of human nutrition, food security, biodiversity and a valid substitute for animal protein. In some marginal areas, pulse cultivation represents also a protection against the abandonment of agricultural land, the preservation of traditional landscape and the maintenance of natural environments, besides contributing to the safeguard of traditional gastronomy and culture.

This study explores how some characteristics connected with rural sustainability, like the preservation of the traditional rural landscape, production area in a Natura 2000 Site of Community Importance (SCI) and EU quality labels (PDO and PGI), might influence organic consumers' choice of lentils. Data were collected in the Umbria region (Italy) in 2014 by interviewing 213 consumers' members of Organic Solidarity Purchase Groups (O-SPGs). The Discrete Choice Experiment methodology was used, and three different models (Multinomial Logit Model (MNL), Mixed Logit Model (RPL) and Endogenous Attribute Attendance (EAA)) were applied to verify the reliability of the estimates. Attribute non-attendance (ANA) behaviour was taken into account. Results reveal that the presence of ANA had an impact on both the relative importance of the estimated attributes and the magnitude of the estimated mean WTP. Therefore, this study suggests that WTP mean estimates should be considered with caution for marketing purposes if ANA is not considered. Looking at pulses, the results help to understand the importance in monetary terms of the relationship between lentil choice and rural sustainability.

Keywords: Traditional rural landscape, Natura 2000 SCIs, PDO, PGI, Choice experiment, Attribute non-attendance

Introduction

With the declaration of 2016 as “International Year of Pulses” (IYP) and recognition of 10 February as World Pulses Day, both by the United Nations General Assembly (Eurostat, 2020), pulses have been given a central role in improving food security and nutrition and creating more sustainable and climate-resilient food systems (Curran et al., 2017; Xipsiti et al., 2017; Calles, 2016). Being pulses an essential nourishing food source in the low- and middle-income countries (LMICs) as well as part of their

traditional dietary component, however, nutritional and environmental pulse value is still underestimated and average consumption remains low in Western Europe (Xipsiti et al., 2017): it is estimated between 7 and 8 g/capita/day (FAOSTAT, 2016) comparing with the nutritional recommendations that range up to 20–35 g/capita/day (Marlett et al., 2002).

Pulse production has grown globally since the early 1960s in all the world's regions (92.4 million tons in 2019). Between 1998 and 2018, pulse production increased 63%. On the basis of continents, the highest pulse production in 2019 was in Asia (with an increase of 17.3 million tons over the past two decades) followed by sub-Saharan Africa (with a rise of 10.5 million tons in the same period) and America (with a gain of 7 million tons) (FAOSTAT, 2020). Moreover, even if the estimates suggest a growing world trade of pulses, there is still limited market information currently available on these products.

Conversely to world trends, the European production has decreased during the past two decades: Europe's share of global production declined from 20.1 to 8.8% (Joshi and Rao, 2016). The latest data (2018) show that in European farming systems area devoted to the cultivation of pulses was 2170 thousand hectares producing 4110 thousand tonnes (Eurostat, 2020, FAO, 2019).

In terms of trade, the EU is a net importer of pulses, and lentils in particular, due to an insufficient domestic production (Eurostat, 2017).

The most produced pulses all over the world are dry beans following by chickpeas, dry peas, cowpeas and lentils. Concerning lentils, in 2019, the world annual production was about 5.7 million tonnes and about 4.8 million hectares of land were under this pulse globally. From 1994 to 2019, lentils globally increased by +39% in production and over 100% in yield quantities, being cultivated principally in Canada, India and Turkey (FAOSTAT, 2020).

Lentil consumption habits are different in the EU countries, due to regional food habits and traditions: the Mediterranean countries, in particular Spain, but also France, Italy and Greece, lead the consumption. Europe is a relatively small producer of lentils: in 2019, the production volume was 124,756 tons, but its share is growing. Around 90% of European production volume occurs in Spain and France (FAOSTAT, 2020).

Among the Mediterranean countries, Italy is a traditional producer of lentils. This pulse cultivated, thanks to an optimal combination of climate, soil and moisture of some Italian regions, in ancient times has provided a cheap source of dietary proteins to rural and urban families (Piergiovanni, 2000). In the last 50 years, the lentil quickly disappeared from favourable areas, being restricted to marginal, hilly and mountainous areas. As the lentil market became more competitive at the international level, lentils from other countries especially Canada started flooding the Italian market at very low prices, transforming Italy from being an exporter to be a net importer of lentils (Piergiovanni, 2000). However, the latest available data show that the Italian lentil area cultivated has increased by 65% from 2011 to 2016 and, at the same time, the production has increased by 83% (FAOSTAT, 2018). Equally per capita Italian consumption has gradually increased: from 0.54 g/capita/day in 1961 to 1.64 g/capita/day in 2015 (Confagricoltura, 2016) due to different factors. Firstly, lentils have been seen to play an important role in health-improving and disease-preventing (Takruri and Issa, 2013; Bouchenak & Lamri-Senhadji, 2013; Afshin et al., 2014). Consumers are more

interested in a healthy and sustainable diet (Hoek et al., 2017), and their involvement in environmental and social responsibility is leading to a rapid growth of the organic lentil sector (CBI, 2015). Understanding these consumers and their behaviours could increase their consumption sustaining and growing the pulse industry (Curran, 2017). Secondly, lentils are an essential instrument ensuring nitrogen balance in the soil, especially in no-livestock systems that always present a deficit in nitrogen availability (David et al., 2005) and their potential contribution to the mitigation of climate change (Jensen et al., 2012). Last but not least, the promotion of specific varieties recognized by the European Union quality label (Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI)) has increased the consumer interest versus high-quality production¹.

Despite the exposed previous characteristics, in terms of benefits associated both with consumes of pulses (and lentils) and with environmental responsibility (as pulse cultivations reduce greenhouse gas emissions and help reduce animal-based consumption) (Magrini et al., 2018), the current literature on food consumer demand has never analysed preferences for lentils or organic lentils in Europe associated with the particular territorial characteristics of the production areas.

For partially filling the gaps found in the existing literature, we applied a Discrete Choice Experiment (DCE) to analyse consumers' preferences and willingness to pay (WTP) for organic lentils. The originality of our work lies in the understanding if particular territorial characteristics of the area of production (being part of a Natura 2000 SCI, the presence of a traditional rural landscape, or the EU quality labels—PDO and PGI) are considered important by consumers while purchasing organic lentils. A further aspect of originality lies in the data analysis approach that took into consideration the effect of respondents not considering all attributes present in the DCE (attribute non-attendance (ANA)). We applied ANA behaviour because different food choice experiment studies have underlined that the food attributes used to describe the profile of the products throughout assessing the alternatives' set in a choice task could be neglected by survey respondents (Caputo et al., 2018). As far as we know, this is one of the few papers (Caputo et al., 2013; Scarpa et al., 2013; Bello and Abdulai, 2016) that considered ANA when applying DCE in the food sector (Caputo et al., 2018).

We focused on consumers' preferences of Organic Solidarity Purchase Groups' (O-SPGs) members with the aim to investigate which attributes might influence their purchase of organic lentils basing on two considerations: (i) Italian lentil production is carried out on organic or low-input farms located in rural and fringe area and (ii) O-SPGs' members are generally considered "community-oriented conscious consumers" (Zoll et al., 2018, pg. 107) and, therefore, they should be the most responsive to this type of survey.

The paper is organized as follows: the "Theoretical background" section presents the study theoretical background; the "Material and methods" section focuses on the presentation of the DCE methodology, experimental design, questionnaire design, consumer sample selected and data collection. In the "Results" section, we present the

¹At this moment, six specific lentils were recognized by the EU quality label: two are Italian, two are French and two are Spanish lentils. In Italy, the PGI-labelled *Lenticchia di Castelluccio di Norcia* was recognized in 1997, while the PGI-labelled *Lenticchia di Altamura* was recognized in 2017. The PGI-labelled *Lenticchia di Castelluccio di Norcia* is cultivated in a SCI area.

results, and the discussion and conclusion are presented in the “Discussion and conclusions” section.

Theoretical background

Concerning lentils, few studies have examined consumer’s preferences for this product to the best of our knowledge: Ariyawardana et al. (2012) have examined the consumer preferences for red lentils in Sri Lanka and how these preferences differ across shopping channels and by socio-demographic factors using a Conjoint Analysis approach. The results have shown that the consumers consider more important the visual quality than the other attributes (size, packaging and price). Govindasamy et al. (2014) have analysed the consumer preferences for the country of origin of lentils in Sri Lanka using a logit model. The results have shown that consumers with a high income per month are more likely to consider the country of origin as an important factor while purchasing red lentils. Recently, Warne et al. (2019) analysed the producers and consumer perceptions of the sustainability profile (in terms of environmental, socio-economic and health dimensions) of the lentil system in the USA; applying multiple-choice, Likert-scale and open-ended questions, they report that consumers include their willingness to increase lentil consumption based on environmental (78%), economic (75%) and health and nutrition (72%) information of lentils.

In Italy, the organic lentil production is carried out in rural marginal, hilly and mountainous areas with particular environmental landscape value; in some cases, these productions have also been recognized by EU quality labels (PGI). All these elements, if incorporated in the food product and recognized by consumers as values, can be related to rural sustainability. In fact, aiming at the general enhancement in the human condition, rural sustainability could be defined as continuous research for development strategies maintaining and producing rural communities that should tend to be “healthy”. In such as rural communities, there are balances between economic, socio-cultural, political and environmental values and at the same time they “respond to any imperatives in these dimensions, at least in the long run” (Bryant and Granjon, 2009, p. 162).

Considering the evolution in time of knowledge and comprehension of economic, socio-cultural, political and environmental values and of a change in production systems, in consumer behaviour and community awareness, rural sustainability is considered a social construction and an ongoing process and, hence, its research is a dynamic one. Hence, sustainability in agriculture is not only a goal to be achieved but also a process (Buttel, 2006; Marques et al., 2012; Darnhofer, 2015).

In these terms, the natural socio-economic development that brings consequently the needs of the populations will evolve and, therefore, the rural sustainability strategies should consider the changes that occur. For example, it is natural that people’s choices evolve towards more sensitive choices than their own lives when they are able to satisfy some of their needs and when their vision of their world and that of others changes (Bryant and Granjon, 2009).

Investigating the interaction and the influence between the quality of the traditional rural landscapes throughout the world and food production-consumption is considered a fundamental matter for sustainable development by the international community. It is recognized that the landscape can correlate the different aspects (culture, agriculture,

food production, environment and tourism) that are territory characteristic (Magnaghi, 2010) and, in these terms, the connection between landscape, food and territorial history holds particular meaning in case of quality food productions (Roe, 2016). This results crucial for traditional rural landscapes that are of particular interest because of their historical and cultural value and their beauty giving the area unique characteristics and identity (Agnoletti, 2013; Antrop, 2005; Claval, 2005; Howley et al., 2012; Torquati et al., 2015; Torquati et al., 2017). Examining vineyard landscapes, Camaioni et al. (2016) have reaffirmed the importance of quality in connection to both food and landscape; in fact, they underlined that the connection producer-consumer support can encourage a more sustainable territorial economic development because of being more attentive to the quality and identity of places and the rural communities. Some studies carried out in Italy highlighted that the quality of the landscape can influence consumer preferences and their willingness to pay a premium price for the produces obtained preserving the traditional landscape (Tempesta et al., 2010; Tempesta et al., 2014; Tempesta and Vecchiato, 2019; Torquati et al., 2018; Troiano et al., 2016).

In line with the concept that sustainability is an ongoing process and that environmental sustainability and quality are becoming ever more important for life quality and economic enhancement of the territory, protected areas such as Natura 2000 Sites of Community Importance (SCIs) can be a tool for successful sustainable rural development especially in economically lagging areas (Bastian et al., 2010). The high nature value areas such as Natura 2000 SCIs have the potential to become a driver concept in the European model of agriculture by its multifunctional characteristics and its contribution to the diversity and sustainability of rural areas and through the conservation of biodiversity (Peneva et al., 2015). Different studies (European Commission, 2018; Kettunen, et al., 2009) have tried to examine the management of farms in Natura 2000 SCIs looking for ways to accommodate farming and conservation objectives; the principal aim is underlining that in the many cases they are actualized win-win strategies which respect the nature but also maintain the economic viability of the farmers involved and provide valuable services to society. The productions in Natura 2000 Sites have the potential to be marketed under an “environmentally friendly” product label to capitalize on the growing consumer demand for sustainable goods (Kettunen et al., 2009; European Commission, 2013). In fact, the increased consumer demand for sustainably and biodiversity-friendly products contributes to also increasing opportunities to develop food markets for labelled products from or associated with protected areas such as Natura 2000 areas network.

In addition to that, the farmers could take profit to the customer’s trend to increasing very keen on purchasing locally sourced food and to willing to pay extra for this characteristic (Carpio & Isengildina-Massa, 2009; Darby et al., 2008; Giraud et al., 2005; Hébert, 2011; Loureiro & Hine, 2002).

Several authors affirm that rural sustainability, implemented by the biodiversity preservation, landscapes and traditional knowledge, may be supported by the Geographical Indication (GI) protection (like EU quality labels PDO, PGI and TSG) (more recently: Bowen and Zapata, 2009; Lamarque and Lambin, 2015; Ricchieri et al., 2007; Vakoufaris, 2010) Barham, 2002; Guerra, 2004; Rangnekar, 2004; Williams and Penker, 2009;

Giovanucci et al., 2009; Belletti et al., 2017a). In fact, GIs are considered a tool at the international level to maintain multi-functionality in rural landscapes; involve local populations in biodiversity management, land use and landscape conservation (*environmental sustainability*) (Belletti and Marescotti, 2011; Vandecastelaere et al., 2009; Belletti et al., 2015); and preserve local and traditional knowledge and practice, favouring local actor cohesion, empowerment and inclusion (*social sustainability*) (Bérard and Marchenay, 2006; Belletti and Marescotti, 2011). From the economic side, several authors (Bramley and Biénabe, 2013; Babcock & Clemens, 2004; Bardhi & Kapaj, 2017; Barjolle et al., 2007; Barjolle and Sylvander, 2000; 2011; Larson, 2007; Bowen, 2008; Colinet et al., 2006; Belletti et al., 2017a) specified that GIs promote rural sustainability in terms of to obtain premium prices for products and at the same time to guarantee safety and quality to consumers, to improve redistribution of the added value to the actors (producers, processors, etc.) throughout the production chain and to bring added value to the region of origin increasing local jobs (*economic sustainability*) (Belletti and Marescotti, 2011).

This is particularly true in marginalized rural areas where the infrastructural, structural, geographical and cultural matters do not allow easy to achieve economic survival and community as a consequence. In addition, the rural areas' crisis may expose to danger their local economies determining negative effects on the quality of both environment and social wellbeing and cause territorial culture and traditions loss. In this sense, GIs are an important protection tool fostering sustainable rural development, "provided that it is inserted in a wider and coherent network of actors and actions" (Belletti et al., 2017b, p. 274).

Material and methods

The Discrete Choice Experiment methodology

In recent years, the Discrete Choice Experiment (DCE) methodology became among the stated preference methods (Brown, 2003), one of the most widely used for the analysis of consumers' preferences of food products (Van Loo et al., 2011; Cantillo et al., 2020; Louviere et al., 2000; Ortega et al., 2011; Gracia, 2014; Marian et al., 2014).

The DCE methodology (Ben-Akiva et al., 2019; Hauber et al., 2016; Hensher et al., 2005) usually consists in presenting respondents a set of choice options (choice set) among which they are requested to choose their preferred one. Each choice option is characterized by a set of attributes or product characteristics, and each characteristic can assume different levels. For example, an attribute can be the price of the good, and its levels are the different amount of money (1€; 2€; etc.) that are necessary to buy such good. While the price attribute is numeric, attributes can also be qualitative, like for example the "production method", and its levels in this case can be "organic" or "conventional". In this respect, each choice set presents a certain number of choice options that share the same attributes, but with different attribute levels.

Under the assumption that consumers make their choices rationally in order to maximize their utility (Luce, 1959; Thurstone, 1927), observing the choices made by respondents, it is then possible to indirectly derive how each attribute level

contributes to respondents' utility: using other words, the importance of each attribute in determining the consumer probability of choice of a given product. The latter aspect is consistent with Lancasterian consumer theory (Lancaster, 1966) that postulates that a good or service utility is given by the sum of the utilities of its characteristics.

DCE is applied to study consumer preferences to collect information on three main aspects:

- i) The WTP of respondents for the attributes analysed
- ii) The relative importance of attributes for respondents
- iii) The probability of success (namely choice) of a product, depending on its attribute levels

The WTP for each i th attribute can be computed as the negative of the ratio between the estimated coefficient (β_i) of the i th attribute and the coefficient of the monetary attribute (β_{price}) as explained in Eq. 1.

$$WTP_i = -\frac{\beta_i}{\beta_{price}} \quad (1)$$

It is possible that respondents do not always take into consideration all attributes proposed in the DCE when making choices in a choice set. This situation is known in the literature as attribute non-attendance (ANA) (Hensher et al., 2012). If ANA occurs, respondents do not trade-off among the attribute levels presented in the study. This might be due to heuristics adopted by respondents in order to ease the decision process (Gilovich et al., 2002). Not taking into account ANA during data analysis might have serious consequences on the reliability of the estimates both in terms of market share predictions and welfare measures (Scarpa et al., 2013). Therefore, we decided to take ANA into consideration in our data analysis, and the latter was structured following two steps: first, we applied a mixed logit model (RPL) (Train, 2009) that considered the sample heterogeneity in preferences neglecting the potential presence of ANA; second, we applied Hole (2011) endogenous attribute attendance model (EAA) that considers ANA endogenously. There are two main approaches to detect ANA: the first—stated ANA—directly asks respondents if they took into consideration the attributes included in the DCE design; the second, inferred or endogenous attribute attendance (EAA), can be modelled endogenously (Hole, 2011; Scarpa et al., 2009). With respect to stated ANA, EAA has the advantage of reducing fatigue of the respondents that are not subject to extra questions about “attendance” in the questionnaire and to avoid the problem of the reliability of the answers given about attribute attendance. Given such advantages, we decided to rely on Hole (2011) EAA model to check the reliability of our RPL model results. A Multinomial Logit Model (McFadden, 1974) was estimated for completeness and comparison purposes despite it does not consider respondents' heterogeneity and ANA.

In applying the three models, we used a linear and additive utility function (Eq. 2):

$$U(X_i) = \beta_{ASC} \times ASC + \beta_{SCI} \times SCI + \beta_{PDO} \times PDO + \beta_{TRADL} \times TRADL + \beta_{PRICE} \times PRICE \quad (2)$$

where ASC is a dummy variable assuming the value 1 if the choice option is the no-buy option (“none of these”) and 0 otherwise², SCI is a dummy variable assuming the value 1 if the proposed good is produced in a Natura 2000 SCI, PDO is a dummy variable assuming the value 1 if the product is characterized by a EU quality label (PDO or PGI), TRADL is a dummy variable assuming the value 1 if the lentils are produced in an area characterized by traditional rural landscape, and PRICE is a continuous variable for the attribute price.

DCE data were analysed using Stata version 16, and the models were estimated using the *mixlogit* (Hole, 2007) and *eealogit* (Hole, 2011) modules.

In our questionnaire, we included some “control questions” in order to check if respondents considered all of the proposed attributes and therefore made the necessary trade-offs among them. In order to check for attribute attendance, we used stated attribute attendance, and in particular a “serial approach” (Caputo et al., 2018). In the serial approach, respondents are requested to declare the attributes they attended at the end of the full set of choice tasks (3 in our case), while in the “choice task approach” they are requested to state which attributes they attended after each choice task.

Discrete Choice Experiment design

We used an “unlabelled” DCE design where four attributes were considered: two are strictly related to the territorial characteristics of organic lentils area production, one is a proxy for territorial quality and the last one is the price of the product (Table 1).

The two territorial attributes are the location of the production area in a Natura 2000 SCI and the presence of a well-preserved traditional rural landscape. The Natura 2000 SCIs act as a proxy for the natural quality of the place, while the traditional rural landscape acts as a proxy for the cultural identity and visual beauty of the place of production. The third attribute considered is the EU quality label (PDO or PGI) that can be considered a proxy for the quality of production. The price attribute was expressed as €/500g package of lentils. Basing on the previous price analysis of organic lentils sold through the AFNs at a premium price of +30% with respect to conventional ones, three price levels (3.79€/500g; 4.99€/500g; 6.19€/500g) were chosen for the survey (Table 1).

The choice sets presented to the respondents were obtained with an unlabelled D_p -efficient design (Rose & Bliemer, 2009) using Ngene software. It consisted of 6 choice sets, with 2 choice options each and a “none-of-these” option. The design was blocked into 2 blocks, and therefore, we presented 3 choice sets to each respondent. Figure 1 shows one of the choice tasks used during the data collection.

Data were collected with a questionnaire that consisted of an introductory part and three sections. The introductory part presented the survey and the institutions involved in the study, stressed the importance of participating in the survey and assured respondents that their answers would remain anonymous. A box insert

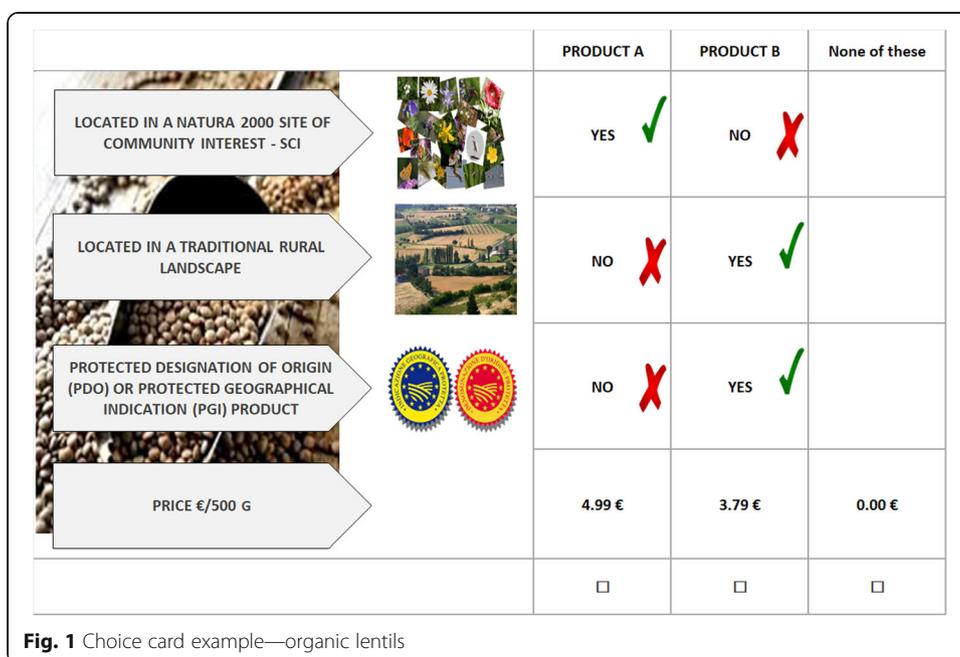
²This is motivated by our experimental design that is “unlabelled”. While dealing with unlabelled designs that include a status-quo or no-choice option, it is necessary to include the effect of not choosing in the utility function specification with a dummy variable (ASC in our case). See Hensher et al. (2005), Appendix 10A “Handling unlabelled experiments” pg. 371, for an in-depth explanation of such requirement.

Table 1 Choice experiment attributes and levels

Attributes	Levels
Located in a traditional rural landscape	Yes/no
Located in Natura 2000 SCI	Yes/no
EU quality label (PDO or PGI)	Present/absent
Price (€/500g)	3.79; 4.99; 6.19

summarized the research topic in simple language. In particular, interviewees were provided some information about the meaning and the importance of the traditional rural landscape and the Natura 2000 SCIs; interviewees were provided also the meaning of the EU quality labels for PDO and PGI. While introducing respondents to the meaning of the traditional rural landscape in the DCE scenario introduction, we drew upon Antrop’s delineation of a “well preserved traditional rural landscape”: “It contains the complex history of a place or region, which still can be read from its composition and structure” (Antrop, 2005, p.25). While introducing respondents to the meaning of the Natura 2000 SCIs, we drew upon the European Commission definition as reported on its website: “Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right; network established by the European Union for the aim to ensure the long-term survival of Europe’s most valuable and threatened species and habitats”.

The first section gathered information about the respondents’ habits with organic product purchase; specifically, it asked if the respondents are a member of solidarity-based purchasing groups and, if yes, the share of organic products buying through solidarity-based purchasing groups. The questionnaire is focused then on the respondent purchases of organic products examined: lentils.



The second part focused on the choice experiment. After introducing the hypothetical scenario, we presented three lentil choice tasks to each respondent to facilitate them.

The last section of the questionnaire collected socio-economic information about the respondents (age, level of education, residence, gender, employment status, number of household members and standard of living).

Sample and data collection

Concerning the consumer sample choice, we focused on those that purchase through two O-SPGs, i.e. AFNs, because these types of supply chain are defined by several authors (Venn et al. 2006; Follet, 2009; Raffaelli et al. 2009; Sini 2009) as aimed at the dissemination of organic production methods, exchange and consumption that they pursue objectives of socio-economic and environmental sustainability as the health and quality of food, the protection of natural resources and biodiversity and the promotion of work and local culture.

Specifically, the two O-SPGs involved in our study are the two largest Organized Group of supply and demand (OGSD) present in Umbria managed in terms of logistics and organization by the Italian Association for Organic Agriculture (IAOA) and Organic Trade Association (OTA), both based on the collaborative relationship between producers and organic consumers (Viganò et al., 2012; Torquati et al., 2016).

Between March 2014 and April 2014, data were collected with a “web-based survey” in order to contact quickly the consumer sample selected (n. 682 members of the two O-SPGs). Specifically, we used Lime Survey®, an open-source software application that allowed us to collect the data online. The survey software itself is self-guiding for the respondents who are participating. We managed to collect 213 completed questionnaires suitable for data analysis (more than 31% of response rate).

Results

Sample characteristics and lentil consumption preferences

The general overview of the socio-demographics of the people interviewed is presented in Table 2: of the 213 respondents, 67.6% were women and 49.7% were between the ages of 31 and 50. The interviewees have a high level of education: 50.2% hold a master’s degree or PhD and 22.1% had earned a bachelor’s degree while 26.3% hold a high school certification. More than 70% of the sample members were employed, while 12.2% were retirees and 5.2% students. Housewives were a pronounced minority at 4.7%. On average, most households were composed of three or four members (55.9%), while singles or couples without children accounted for 36.6% of respondents. In 22.57% of cases, the household had 1, 2 or 3 children under 7 years of age, while in 19.2% the household had 1, 2 or 3 children between 8 and 14 years of age. In 17.8% of the households, the members were seniors (aged 65 and over).

Most respondents lived in urban areas (70.4%) while 29.6% of them lived in rural areas, either in villages or isolated houses.

In general, the average profile of the organic consumer’s sample interviewed confirms what was also described in other studies (Hughner et al., 2007; de Magistris and Gracia,

Table 2 Interviewee characteristics

	Number	Percentage		Number	Percentage
Gender			Family members		
Female	144	67.6	Children (0–7 years)	48	22.5
Male	69	32.4	Youth (8–14 years)	41	19.2
Age			Elderly (65 or >)	38	17.8
20–30	19	8.9	Place of residence		
31–40	48	22.5	Urban area—centre	71	33.3
41–50	58	27.2	Urban area—periphery	79	37.1
51–60	59	27.7	Rural area—village	26	12.2
> 60	29	13.6	Rural area—isolated house	37	17.4
Educational level			Association membership		
Middle school certification	3	1.4	Environmental	163	76.5
High school certification	56	26.3	Cultural	123	57.7
Bachelor's degree	47	22.1	Consumers	163	76.5
Master degree or PhD	107	50.2	Volunteering	167	78.4
Occupation			Sport	159	74.6
Employed	150	70.4	No association	3	1.4
Unemployed	16	7.5	Family income		
Retired	26	12.2	< 10,000 €	13	6.1
Housewife	10	4.7	Between 10,001 and 30,000 €	86	40.4
Student	11	5.2	Between 30,001 and 50,000 €	58	27.2
Household size			> 50,000 €	23	10.8
1–2	78	36.6	Not responded	33	15.5
3–4	119	55.9			
5 and over	16	7.5			

2008; Annunziata & Vecchio, 2016): she is a woman, with a high education level, aged between 31 and 50 and she mostly lives in urban areas.

Many were involved in some kind of volunteer association (78.4%), environmental association (76.5%) and consumer association. Only 3 respondents were not involved in no-one association.

With regard to household earnings, 40.2% of respondents declared an income between 10,001 and 30,000 € and 27.2% indicated it between 30,001 and 50,000 while 10.8% declared it over 50,000€.

The average monthly household spending of interviewees on food was € 371.64, of which 48.55% was made up of purchases of organic products.

Specifically, it was asked to the respondents also whether they belonged to an SPG: 55.87% of the respondents are SPG members, since 4 years on average, and they bought 57.46% of organic food through SPG.

Of the 213 respondents, 69.95% of them said that they buy them once a week, while 14.08% buys organic products once every 2 weeks. The consumers' occasional rate (who buy organic products "not regularly and less than once a month") was low (4.23%).

The organic products most purchased by respondents were mainly fruits, vegetables, grains, legumes and eggs; secondly, they also bought dairy products, flour, pasta and baked products.

The interviewees were asked to rate the importance of various factors influencing their choice for buying organic products, with five possible answers ranging from “not important at all” to “highly important” (using a 5-item Likert scale) (Table 3). The factors that have the greatest impact on organic product purchase are buy healthy products (4.48)³, protect the environment by reducing the environmental impact (4.38) and buy good products (4.35). Instead, the factors that are considered less influential are buy products hand-crafted (3.69), buy products with social content (3.57) and buy for trend (1.12).

The interviewees were asked about their purchase behaviour of the lentils. Of the 213 respondents, 39.44% declared they buy lentils not regularly and less than once a month, while 31.92% usually purchases lentils once a month and 12.21% once every 3 weeks; 8 respondents affirmed that they do not usually buy this product. On average, the respondents bought 7 kg/year of lentils and 6 kg of these was organic.

RPL model results

The RPL model has a good interpretative capacity (adj. R^2 0.24) and a better performance compared to the MNL model. All estimated parameters are significant, considering a 1% significance level, and the price attribute has a negative sign as expected (the higher the price, the lower on average respondents' utility). The RPL model results confirm the presence of quite heterogeneous preferences among respondents (Table 4), given that the standard deviation of the 3 parameters assumed normally distributed results statistically significant. Looking at the kernel distributions of the individual estimated parameters (see the [Appendix](#), Fig. 2), it emerged that they are multimodal, suggesting the presence of potential clusters of respondents that share the same preferences.

The analysis of the relative importance of the attributes highlights that respondents' choices, without considering the price attribute, were mainly influenced by the location of the production area in a traditional rural landscape, followed by the presence of an EU quality label (PDO or PGI).

The sample mean WTPs (Table 4) calculated for a 500-g pack of lentils by means of the RPL model reflect the relative importance of attributes and are 1.61€ for lentils produced in a traditional rural landscape, 1.55€ for lentils with a EU quality label and 0.90 € for lentils produced in a Natura 2000 SCI.

EAA model results

Considering our control questions about stated ANA, we first looked at the descriptive statistics of how many attributes were considered by respondents (aggregate statistics of attendance), and it emerged that 50.7% of our respondents considered all 4 attributes “always or sometimes”, 33.33% of them considered 3 attributes and 12.7% of them considered 2 attributes while 3.3% of them considered 1 attribute. More specifically (Table 5), the attribute less considered (namely the most subject to ANA) was the location in a Natura 2000 SCI, followed by the

³Values in parentheses are calculated as an average on the Likert scale from 1 (minimum) to 5 (maximum).

Table 3 Factors considered when buying organic products, with average scores from a 5-point scale (5 indicating strong agreement)

	Mean	Std. deviation
Buy healthy products	4.481	0.733
Protect the environment by reducing the environmental impact	4.386	0.757
Buy good products	4.357	0.733
Protect biodiversity	4.200	0.942
Buy local products to reduce the supply chain	4.090	0.828
Ensure fair prices for farmers	4.052	0.903
Defend animal welfare	4.043	0.882
Buy local products to support local producers	4.029	0.852
Preserve the traditional agricultural landscape	3.919	0.987
Buy products with ethical content	3.814	0.987
Buy products handcrafted	3.690	0.956
Buy products with social content	3.576	0.991
Buy for trend	1.129	0.388

price attribute, the EU quality label (PDO or PGI) and the location in a traditional rural landscape that were never considered by 25.8%, 19.2%, 15% and 8.5% respectively.

Our statistics about the stated ANA justify the need to check the reliability of our estimates of the MNL and RPL models with an EAA model (Table 4).

In terms of adj. R^2 , the EAA model has a good fit (0.25) and brings a slight improvement compared to the RPL model. Even in this case, the estimated coefficients are statistically significant at a 99% level and the coefficient for the price attribute has a negative sign. According to the EAA model, 45% of the sample considered the location in a Natura 2000 SCI attribute, 42% the EU quality label, 31% the price attribute and 19% the location in a traditional rural landscape attribute.

It is possible to notice that the mean probability of attendance statistics estimated by the EAA model differs by the stated attendance statistics reported in Table 5 if we consider the column “Always” in terms of frequency of attendance.

Looking at the relative importance of attributes, taking into consideration ANA introduces differences compared to the RPL results. The most important attribute is now the EU quality label (WTP = 1.90€), followed by the traditional rural landscape (WTP = 1.45€), while the less important attribute is the location in a Natura 2000 SCI (WTP 1.14€) for both models.

Comparing the WTPs estimated with the three models looking at the confidence intervals (Table 4) and at the Z-test results (see the Appendix, Table 6), it is possible to notice that they cannot be considered statistically different considering a 95% probability. Despite the mean WTPs are not statistically different between the RPL and EAA model, it should be considered that mean WTPs are usually considered in driving conclusions from DCE results. In this respect, just looking at the mean WTPs of the RPL model that do not consider ANA (ANA is taken into account by the EAA model estimates) would lead in an overestimation of WTP in one case (located in a traditional rural landscape, +11% = [(1.61 – 1.45)/

Table 4 DCE model results

	MNL		RPL°		EAA		
	Coeff.	WTP (€/500g)	Coeff.	WTP (€/500g)	Coeff.	WTP (€/500g)	Probability of attendance
ASC	-3.23*** [-4.02, -2.44]		-4.87*** [-6.30, -3.44]		-6.33*** [-8.35, -4.31]		
Located in Natura 2000 SCI	0.79*** [0.54, 1.03]	0.88 [0.63, 1.13]	1.29*** [0.78, 1.80]	0.9 [0.59, 1.21]	2.14*** [1.13, 3.15]	1.14 [0.67, 1.60]	0.45*** [0.20, 0.69]
Located in a traditional rural landscape	1.33*** [1.08, 1.58]	1.49 [1.19, 1.79]	2.31*** [1.70, 2.92]	1.61 [1.27, 1.94]	2.74*** [1.94, 3.53]	1.45 [1.10, 1.81]	0.19** [0.04, 0.34]
EU quality label (PDO/PGI)	1.44*** [1.12, 1.76]	1.61 [1.37, 1.85]	2.22*** [1.56, 2.88]	1.55 [1.24, 1.85]	3.58*** [2.49, 4.66]	1.9 [1.52, 2.28]	0.42*** [-0.29, 0.54]
Price (€/500g)	-0.90*** [-1.09, -0.70]		-1.44*** [-1.82, -1.05]		-1.88*** [-2.46, -1.31]		0.31*** [0.18, 0.44]
Standard Deviation of Random Parameters Distribution							
Located in Natura 2000 SCI			1.64*** [0.97, 2.31]				
Located in a traditional rural landscape			1.54*** [0.89, 2.19]				
EU quality label (PDO/PGI)			2.07*** [1.36, 2.79]				
Observations	1917		1917		1917		
Respondents	213		213		213		
LL	-560,376		-532,140		-525,289		
adj. R^2	0.2018		0.2420		0.2517		
AIC	1130.75		1080.28		1068.58		
BIC	1158.54		1124.75		1118.60		

95% confidence intervals in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

°1000 Halton draws, random parameters assumed normally distributed

1.45] \times 100) and in an underestimation in 2 cases (located in Natura 2000 SCI, - 21% = $[(0.90 - 1.14)/1.14] \times 100$, and EU quality label, - 18% = $[(1.55 - 1.90)/1.90] \times 100$).

Discussion and conclusions

Consumer demand for food products with certain characteristics of the area of production could have an important role in indirectly strengthening the economic development of rural territory: an interesting example of this phenomenon could be pulses.

Currently, pulses (and as consequence lentils) are more and more becoming known as trendy food (Lemken et al., 2017) thanks to their several health and environmental benefits. As a result, the still low European and Italian consumption levels started to grow in the last years. This increase in internal demand per annum is leading to a gradual lentil cultivation growth. In this sense, it is important to remind that the Italian

Table 5 Attendance statistics by attribute based on stated attribute attendance

	Attribute attendance						tot <i>n</i>
	Always		Sometimes		Never		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Located in Natura 2000 SCI	26	12.2	132	62.0	55	25.8	213
Located in a traditional rural landscape	74	34.7	121	56.8	18	8.5	213
EU quality label (PDO/PGI)	71	33.3	110	51.6	32	15.0	213
Price	83	39.0	89	41.8	41	19.2	213

organic lentil production is carried out frequently low-input or organic in rural marginal areas with particular rural landscape value, and in two cases, these productions have also been recognized by PGI EU quality labels. All these elements are related to rural sustainability, and this product could represent one of the drivers for the rural territories where lentils are cultivated precisely because these values are recognized by organic consumers as demonstrated by the results of this work.

This study highlighted how traditional rural landscape, quality label and environmental quality play a significant role in organic consumer behaviour who are willing to pay a premium price for them. Our results are crucial for understanding the importance in monetary terms of the relationship between lentil choice and rural sustainability.

Results reveal that the most important attribute affecting the interviewees' propensity to pay a premium price to buy organic lentils is the EU quality label according to the EAA model (willingness to pay 1.90€/500g), while it is the traditional rural landscape in the RPL model (willingness to pay 1.61€/500g). These results confirm that the PGI EU quality label is particularly crucial for fringe or fragile areas (Colinet et al., 2006) where the agricultural technique intensification would not be possible and valid and where the PGI EU quality label could be a presidio against abandon of these rural areas and a tool of producing premium prices that can support productions and economic activities (Barjolle et al., 2011).

One important aspect highlighted is the mutually beneficial relationship between the consumption of organic lentils and the preservation of the traditional rural landscape. The WTP of 1.61€/500g of lentils in the RPL model, or of 1.45€/500g of lentils in the EAA model, demonstrates that traditional rural landscape preservation through the lentil cultivation can be a driver of rural development because it can improve farm income and consequently the resilience of farms in a marginal territory, as already stated in previous works (Paquette and Domon, 2003; Domon, 2011; Tempesta, 2019; Torquati et al., 2015; Gullino, 2018; Torquati et al., 2018).

Starting to the concept that the consumer perception towards landscape features of food production is linked to different cultural backgrounds, factors and emotional values (Tempesta et al., 2010), we may affirm that the influence of landscape attribute on consumer behaviours is strictly connected to the product and the agricultural system where it is produced (in terms of intensive/extensive) (Cosmina et al., 2016). In a recent study on extra-virgin olive oil purchase, the results underlined that a specific market segment of people (that usually buy olive oil at the supermarket) is willing to pay more for olive oil obtained from olive trees cultivated in a traditional rural

landscape (WTP of 2.95 €/l for EVOO) (Tempesta and Vecchiato, 2019), while Cosmina et al. (2016) analysing the honey consumer demand demonstrated that the production obtained in a traditional well-preserved landscape attribute influenced only a small group of consumers in terms of WTP.

From our results, the presence of ANA had an impact on both the relative importance of the estimated attributes and the magnitude of the estimated mean WTP. Looking at the estimated probability of attendance, we found that our EAA estimates differ from the stated attribute attendance by respondents. A similar result was found from Caputo et al. (2018) comparing endogenous (inferred) ANA probabilities and serial stated attendance. Looking at the estimated mean WTPs, we found some discrepancies between the estimates of the three models. The same was found by other authors (Hensher & Greene, 2010; Hole, 2011; Scarpa et al., 2009), suggesting that ANA should not be neglected during data analysis in order to avoid biased estimates. It is interesting to look at Hole (2011) results given that he applied the same EAA model used in our paper. The author found that its estimates were lower compared to MNL estimates for 4 attributes out of 5; in our DCE, we found nearly the opposite, with the EAA model overestimating WTPs for 2 attributes out of 3 both compared to the MNL and RPL models.

A further result is that in our case the estimated WTPs of the RPL and EAA models could not be considered statistically different (it should be noted that the estimated confidence intervals are quite wide). Mean estimates should, therefore, be considered with caution for marketing purposes, and taking the estimated mean WTPs of the 3 models (without considering their confidence intervals) would lead to differences in the mean WTPs that have a minimum magnitude of 11% and a maximum magnitude of 23% in absolute terms (considering the RPL and EAA results). In this respect, neglecting ANA and just using a standard RPL model would have introduced an error in mean estimates of a maximum of 23% in our case.

The statistical-descriptive analysis of the participants to the survey has highlighted a complex and evolved consumer figure, above all if we consider that this study was carried out in a general context of international economic crisis and, as a consequence, of erosion of the families' purchasing power that is characterizing this decade's end, above all in Italy. These outcomes highlight the consumer sensibility in terms of responsibility and awareness of the productions' impact on the environment, as highlighted in other studies (Briamonte, Giuca, 2010; Hughner et al., 2007; Pearson et al., 2011; Oates et al., 2012; de Magistris and Gracia, 2008). Our results, as stated also by several authors (Gullino et al., 2018; Belletti et al., 2015), showed that connecting rural landscape with food high-quality products (PGI/PDO) should be regarded as having high important potential and value for rural areas in terms of preservation and development.

In particular, considering the GI propensity to function as "the reproduction of local resources" (FAO, 2011) in terms of territorial, natural and cultural value preservation, it is fundamental that local stakeholders involved take into consideration the information and tools for their future assessments and decision making. In this sense, producers should orient towards sustainable development of production areas considering overexploitation of natural and human resources could damage the GI system itself and its viability from one side, and from another side, the

sustainability of the products is increasingly demanded by consumers and it is becoming an essential condition for market access (Vandecastelaere et al., 2018).

Another important aspect, although Natura 2000 SCI is the less important attribute (willingness to pay 1.14€/500g in the EAA model and 0.59€/500g in the RLP model), highlighted how the conservation of nature could have consistent positive repercussions for economic activities in Natura 2000 Sites. In fact, previous searches have shown how farms in Natura 2000 Sites can be not only viable but also competitive (Kettunen et al. 2009; European Commission, 2013).

The results of this work suggest the need to communicate the value of pulses (Belletti et al., 2017b) and, in particular, of lentils to consumers (Lemken et al., 2017). In fact, considering both the lack of publicity and modern marketing strategies focusing on pulses, as some researchers have underlined (Klemcke et al., 2013; Lemken et al., 2017), the trend in the lentils' consumption could change if advertising about the lentils will be addressed towards ecological, sustainable and quality matters added to human health advantage information. As a consequence, this marketing strategy could have a positive effect on lentil producers and their territories of production. These marketing strategies should be strictly connected to measures and activities needed to ensure improved productivity and high quality, so that pulses can be marketed, at local, regional and international levels, creating a valuable addition to farmer's incomes. In this way, the farmers could maintain their role in conserving and increasing the landscape's beauty and biodiversity in rural and marginal areas devoted to lentil cultivation.

Some limitations should be noted in this research. First is that the study was conducted in only one country (Italy) with 682 consumers-members of the two O-SPGs; the response rate was more than 31%. Even if O-SPGs are spreading in Italy, this model of AFNs is considered a niche market for organic products. However, we focused on O-SPGs because of their aim to support local producers and their products like are actually lentils for Umbrian rural areas. Second, the focus of this study was on organic lentils that have still both production and consumption little share, even if their market is gradually increasing. Thus, cautions must be applied as the findings from this study might not be generalizable to the entire population of Italian organic lentil consumers.

On the other hand, both the study's focus on a niche product and on such specific attributes limit the worries concerning the effect that the survey carried out 7 years ago could have on the validity and topicality of the results obtained. This statement is supported by the fact that at the end of 2021 a campaign to promote organic lentils will be launched based on a communication model resulting from the results obtained from this work.

All in all, if organic lentil consumption plays an important part in healthy human nutrition, food security, biodiversity and protection against the abandonment of the marginal rural areas, we should have a picture of that role as correct as possible. In this paper, we take some steps towards painting that picture.

Appendix

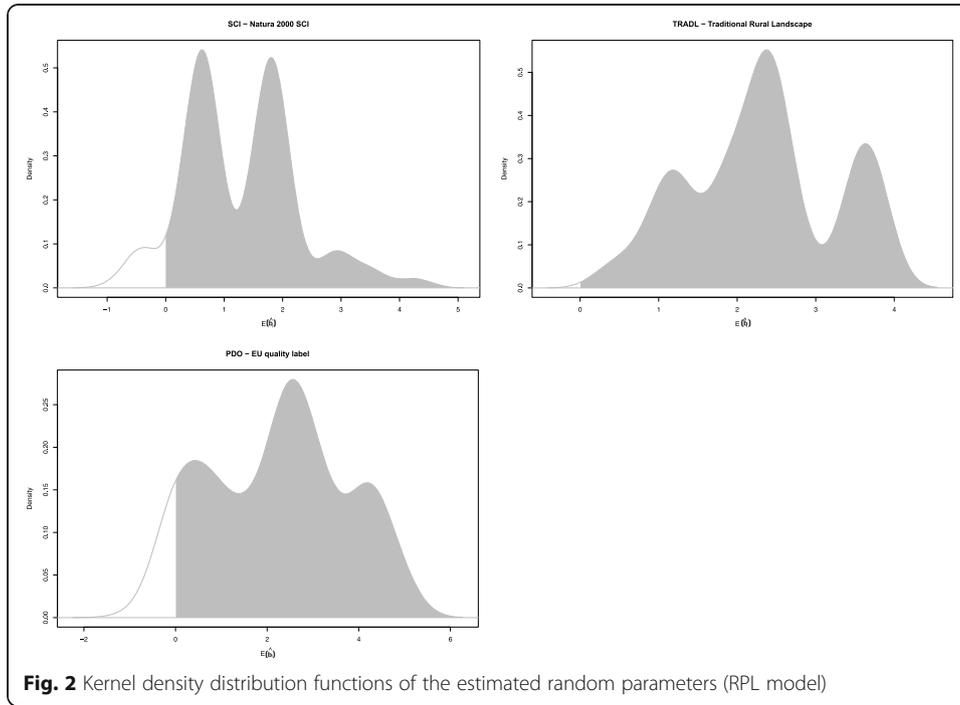


Table 6 Z-test (two-tailed) of equality of the estimated mean WTPs between models

Attribute levels	Model comparison		
	RPL-MNL Z-score	EAA-MNL Z-score	EAA-RPL Z-score
Located in Natura 2000 SCI	0.098	0.965	0.842
Located in a traditional rural landscape	0.523	-0.169	-0.642
EU quality label (PDO/PGI)	-0.303	1.265	1.408

Z-score critical value: $|Z\text{-score}| < 1.96$; $\alpha = 5\%$

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Authors’ contributions

C.P.: investigation, data curation, writing, reviewing and editing and visualization. B.T.: conceptualization, project administration, funding acquisition and supervision. T.T.: methodology and writing the original draft preparation. S.V.: investigation. D.V.: formal analysis, writing, reviewing and editing. The authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations**Ethics approval and consent to participate**

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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