Pay more for me, I'm from the mountains! The role of the EU Mountain Product term and other credence attributes in consumers' valuation of lamb meat

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Abstract

On-farm product differentiation represents a valuable opportunity for mountain agriculture. Consumers appreciate mountain products' characteristics, but when signalling instruments are lacking, consumers might not be able to recognize (and pay for) them. Through a choice experiment, this paper considers consumers' willingness to pay for three attributes (mountain origin through the EU Mountain Product term; local endangered landrace; agroecosystems stewardship through rotational grazing). It considers lamb meat production and North-Eastern Italian consumers, also exploring attitudes towards food and differences across groups of consumers. The highest willingness to pay is associated with the EU Mountain Product term, but communication strategies and public information provision are needed to enhance consumers' overall knowledge.

Keywords: Mountain Product term, Choice experiment, WTP, Local breed, Agroecosystem stewardship, Rotational grazing

Introduction

Areas facing natural or specific constraints include mountains and other marginal areas characterized by difficult natural conditions connected to climate, morphology and soil, which in turn cause higher production costs, lower yields, limited possibilities for the expansion of farms and limited production alternatives; hence, the profitability of farming activities is hindered (Institute for European Environmental Policy 2006; Renner et al. 2021). Although the severity of these issues varies in different areas of the EU (Schuh et al. 2020), low profitability leads, in general, to high rates of termination of agricultural activities and to widespread land abandonment (Fayet et al. 2022; MacDonald et al. 2000; Sluiter and de Jong 2007) with severe socio-economic and environmental consequences (Zavalloni et al. 2021).

Farmers in areas with natural constraints can adopt different strategies to improve their income (Bowler et al. 1996). They can integrate it through relying on off-farm

jobs (García-Martínez et al. 2011) or introducing on-farm product differentiation, farming diversification through service provision (e.g. tourism) (Ilbery and Bowler 1998; Sharpley and Vass 2006) and integration of processing and direct selling in the farm (Knickel et al. 2016).

Strategies based on on-farm product differentiation take advantage of specific product characteristics that might relate to a number of factors, such as the production methods, respect for animal welfare, or geographical origin. In this respect, farmers in mountain areas potentially have a large spectrum of opportunities to add value to their products in the eye of consumers. The less intensive methods of production (Teillard et al. 2012) as well as the use of less productive plant and animal landraces may be turned into value-adding factors thanks to consumers' perception of mountain products as healthier and more environmentally friendly (Bernués et al. 2014; Zuliani et al. 2018). Moreover, local landraces have a strong link with local cultures and traditions (Bellon 2008) and are more adapted to the specific local environmental conditions (Colino-Rabanal et al. 2018). Hence, products from such local resources could also benefit from the growing interest of consumers for local food and its links with tradition.

However, all these characteristics are credence attributes (Darby and Karni 1973), thus suffering consumers' information asymmetry. This issue might limit the demand and willingness to pay (WTP) for products from the mountains if no specific signalling instrument is adopted to increase consumers' awareness and trust, especially in the case of longer supply chains that involve large-scale retail. As a way to signal and valorize the mountain origin of the products, by differentiating them from flatland products, the European Union introduced the "Mountain Product" (MP) voluntary quality term in 2012 (Reg. (EU) no. 1151/2012).

Ten years after the adoption of the EU Regulation on the MP term, the literature exploring consumers' WTP for this label is still limited, as is research focusing on specific credence attributes of mountain products. Considering the importance of livestock rearing in mountain systems (Bernués et al. 2014), this paper contributes to this scarce literature by considering consumers' attitudes towards three attributes that often characterize animal-based mountain products: i) the local landrace; ii) the mountain origin communicated through the MP term; and iii) the adoption of a specific livestock rearing practice, i.e. rotational grazing, which improves the stewardship of agroecosystems. An element of novelty of the paper is to consider the three attributes simultaneously in the evaluation.

This paper focuses on lamb meat consumption, given that all the three aforementioned attributes can be associated with sheep rearing systems in North-Eastern Italian Alps. Through a choice experiment, the paper estimates consumers' WTP for them on lamb meat. In addition, it explores how the WTP varies across distinct groups of consumers and how it is affected by consumers' attitudes.

The rest of this paper is structured as follows. In Sect. "State of the art", we provide the state of the art of the scanty literature connected to the attributes under investigation. In Sect. "Methods", we detail the methodology used in designing and conducting the choice experiment. In Sects. "Results" and "Discussion", we present and discuss the results, while we conclude in Sect. "Conclusions and policy implications".

State of the art

Local endangered landraces

Local animal breeds play a significant role in rural territories in several areas of the world (Scarpa et al. 2003; Tienhaara et al. 2015; Zander and Drucker 2008). Local breeds and varieties are a source of genetic diversity to be exploited in breeding (Fadlaoui et al. 2006) and are adapted to the local territory and conditions (Colino-Rabanal et al. 2018). Thus, the advantages of maintaining local animal breeds and plant varieties are manifold: agrobiodiversity conservation, agroecosystem resilience (Hajjar et al. 2008), maintenance of traditions and culture (Bellon 2008; Marsoner et al. 2018), attenuation of climate change or disease outbreaks (Di Falco and Chavas 2009). These advantages are especially important for marginal areas, where the limited possibilities for human modification of the environment require using breeds and varieties suited to the specific local conditions rather than shaping the environment, using external inputs, to the needs of a certain (productive) variety or breed (Bellon 2006; Cavatassi et al. 2011).

Despite these advantages, local animal breeds are usually characterized by lower yields (Zander et al. 2013). Thus, their conservation should be supported through economic incentives for livestock farmers. The issue can be approached either from a "citizen" or a "consumer" perspective (Tienhaara et al. 2015). A few studies demonstrate that people are willing to pay for the conservation of local animal breeds both as citizens and consumers (Rodríguez-Bermúdez et al. 2020; Tienhaara et al. 2015; Zander et al. 2013). The citizen perspective was considered in academic studies when evaluating the willingness of respondents to support conservation programmes under public initiatives (Cicia et al. 2003; Pouta et al. 2014): for example, the EU Rural Development Programmes include payments for on-farm conservation of endangered local breeds. Under the consumer's perspective, the willingness of consumers to pay a price premium for products from local breeds offers a further valuable opportunity in addition to direct support and conservation programmes when enhanced through appropriate valorization strategies. The literature on consumers' perspective mostly focuses on beef and pork and provides quite homogeneous results. Resano and Sanjuán (2018) observed that consumers express a higher liking for beef from a local breed compared to a widespread cattle breed. Comparable results on beef products were obtained by Scarpa et al. (2013), Scozzafava et al. (2014) and Tienhaara et al. (2015) when estimating consumers' WTP. Díaz-Caro et al. (2019) found that Spanish consumers are willing to pay a price premium for ham produced from Iberian pigs compared to crossbred pigs, while the estimates of García-Gudiño et al. (2021) reveal that the pig breed is indeed the most important attribute for these consumers. The indication of the (local) breed may also serve as a useful complement to the indication of origin, adding further value to the product (Domínguez-Torreiro 2014; Resano et al. 2018). To the best of our knowledge, only one study, i.e. Gracia and De-Magistris (2013), deals with WTP for local lamb breeds, finding mixed results.

The previous studies highlight that, on average, consumers have positive attitudes towards livestock landraces. However, it has also been observed that consumers' preferences are heterogeneous (Zanoli et al. 2013): Gracia and De-Magistris (2013), for example, identify groups of consumers with a different valuation of the local breed for lamb, while Sanjuán and Khliji (2016) show that valuation of the breed attribute for beef differs according to geographical areas. Geographical proximity to the area where a breed

is usually reared (Zander et al. 2013), as well as knowledge of the breed (Zander et al. 2013), might positively influence the valuation even if opposite results are also observed (García-Gudiño et al. 2021).

The Mountain Product voluntary quality term

The MP term, introduced in the EU legislation in 2012, aims to provide mountain farmers with a tool to communicate to consumers the mountain origin of the products, hence avoiding the communication of misleading information about it (e.g. through the misuse of different mountain visual or textual references) (Santini et al. 2013). Thus, the MP term might represent a useful tool to add value to the production of mountain agricultural holdings, signalling the mountain origin of a product and differentiating it from similar products from the flatlands. The compliance rules to use the term concern the mountain location of the farming and processing activities and, in the case of animal products, the mountain provenance of feedstuffs. These rules, as well as the overall procedures to use the MP term, are usually not considered as a barrier by producers, mostly because of the limited transaction costs (Bonadonna 2016; Pagliacci et al. 2022).

Since 2012, implementation of the EU Regulation at country level has been scarce and patchy (Euromontana 2020). Italy, one of the forerunning countries with respect to the MP term, issued a comprehensive legislation and approved a national logo for MP products only in 2017. Consequently, the MP term adoption rate by farmers is, to date, quite low, especially in sectors other than dairy (Euromontana 2020; Pagliacci et al. 2022). However, the MP term may have a large potential. Although it is not possible to claim that mountain products necessarily show a higher intrinsic quality, consumers usually show a positive attitude towards them, since they perceive food produced in mountain areas as more environmentally friendly, healthier, more traditional and of higher quality (Bentivoglio et al. 2019; Bernués et al. 2014; Zuliani et al. 2018). Bassi et al. (2021) observe that this perceived image of mountain food can induce a positive attitude also towards the MP label, stimulating purchase intentions. Some studies investigated consumers' response to livestock products from the mountains. Endrizzi et al. (2021) found that informing consumers about the mountain origin of cheese increases its "acceptability". Similarly, the addition of an explicit reference to a mountain area increases consumers' stated liking for beef (Resano and Sanjuán 2018). These positive attitudes seem to affect the purchasing behaviour (Hersleth et al. 2012) and the WTP for cheese and meat from mountain areas (Nam et al. 2020; Tempesta and Vecchiato 2013). So far, however, few studies explored the MP labelling on cheese, estimating positive WTPs (Mazzocchi et al. 2021; Mazzocchi and Sali 2022; Stiletto and Trestini 2022), while none assessed the WTP for MP meat.

Rotational grazing

Rotational grazing is a rearing practice consisting in dividing pastures in smaller areas and regularly moving livestock from one grazing area to the other. This practice, which is commonly associated with the rearing of livestock landraces in the Alps, is thought to have multiple positive effects, allowing for longer resting periods of the grazing areas. With respect to the production process, rotational grazing can increase forage production (Díaz de Otálora et al. 2021; Holechek et al. 1999) and quality (Jacobo et al. 2006).

At the same time, rotational grazing increases stewardship of agroecosystems by providing valuable public services such as higher biodiversity levels for plants and insects (Perotti et al. 2018; Ravetto Enri et al. 2017; Ingty 2021), increased water conservation (Park et al. 2017; Qian et al. 2021) and soil improvement (Díaz de Otálora et al. 2021; Teague et al. 2011).

Until now, to our knowledge, no studies investigating consumers' attitude towards this livestock rearing practice have been published, possibly due to the specificity of the issue. However, some literature exists exploring consumers' preferences for different types of livestock rearing systems. Such studies most often observe a positive WTP for products obtained from animals reared on pastures compared to fodder-fed animals reared in barns (e.g. Font i Furnols et al. 2011; McKendree et al. 2013; Risius and Hamm 2017). However, these findings might be linked to the perception that they have positive impacts also on human health and animal welfare, besides the environment in general (Cardoso et al. 2016; Getter et al. 2015; Wätzold et al. 2016). In this respect, it might be more relevant to look for studies that asked consumers to evaluate specific ecosystem services provided by livestock rearing. To this end, Schulze et al. (2021) found that consumers' WTP for beef is higher when the livestock production takes place in nature conservation areas, while Markova-Nenova and Wätzold (2018) estimated a positive WTP for milk obtained from biodiversity conservation practices.

Methods

Questionnaire and choice experiment

As most of the Alps, North-Eastern Italian Alps have witnessed, in the last forty/fifty years, a progressive abandonment of farming and pastureland and a general dramatic decline in the number of farms, farmers and reared animals (Sturaro et al. 2005). This has caused a rewilding of the mountain environment that conflicts with demand of regulating and cultural ecosystem services. In the Veneto region (as in the rest of the EU), maintaining traditional farming practices and supporting the still existing farms rearing livestock landraces is one of the tools devised by the Rural Development Programme to contrast these trends. The Sheep-UP Project (n. 4113748), financed by the Measure 16—Cooperation of the Veneto region Rural Development Programme 2014–2020 and next to its completion, is one of these initiatives. It is a four-year multidisciplinary project aiming at identifying tools and strategies for adding value to products of four endangered sheep landraces in the regional mountainous areas and strengthen their connection with demand for local traditional food products and ecosystem services linked with their breeding, thus contributing to re-vitalize the farming activities. Considering the review of the literature on this topic and the relevant aspects associated with the consumption of lamb meat emerged through a participatory approach carried out within the project, a questionnaire-based choice experiment was set and implemented to estimate consumers' WTP for the three credence attributes.

First, a pilot study (October 2021) on 34 respondents tested the questionnaire and provided initial estimates for the consumers' valuation of the attributes of interest. Assuming no prior knowledge about the respondents' attitudes towards the studied attributes, an orthogonal design was used, and a conditional logit model was implemented. The results of the pilot study were used to define both an efficient discrete choice experiment

Table 1 Attributes used in the choice experiment

Attribute	Type	Levels
Sheep breed	Binary	Local breed (1); Unspecified (0)
Mountain Product	Binary	Italian MP logo (1); No logo (0)
Grazing practice	Binary	Rotational grazing (1); No grazing information (0)
Price (€)	Categorical	8.00; 10.00; 12.50

(DCE) design and the optimal sample size. Following de Bekker-Grob et al. (2015), we checked that the final sample size was large enough to identify the effects of the attributes on consumers' choices at the 95% significance level.

The final survey was conducted on a stratified sample of 528 respondents from the Veneto region.[1] An online questionnaire was administered in November 2021 by a market and social survey company. The questionnaire consisted of five sections, which address: i) respondents' general sheep meat consumption habits and knowledge of local endangered sheep landraces reared in the North-Eastern Italian Alps; ii) respondents' knowledge of the "Mountain Product" term; iii) respondents' general food consumption habits and environmental attitudes; iv) implementation of the DCE, where respondents are asked to choose among different product alternatives; and v) respondents' socio-demographic characteristics.

The product offered in the DCE was packaged lamb ribs (500 g), a lamb meat product Northern Italian consumers are familiar with. The DCE allowed investigating consumers' stated preferences for three attributes: *Sheep breed*, *Mountain Product* and *Grazing practice*. Table 1 reports the levels of each attribute, including the price attribute, which is needed to estimate the WTPs.

Each non-price attribute was briefly described to the respondents at the beginning of section iv of the questionnaire (the DCE section), given that some consumers might be unfamiliar with them. The description, reported in Table 8 (Annex 1), was agreed with the multidisciplinary project team. The choice to describe the attributes before the DCE makes estimates valid conditional on a basic consumers' knowledge of these characteristics (Kragt and Bennett 2012).

The price levels were based on retail prices of lamb ribs observed in the region. Similar to Apostolidis and McLeay (2016), Van Loo et al. (2011) and Gracia (2014), the lower and upper prices in the DCE were set equal to the second lowest and the second highest market price, while the middle price equalled the average market price.

Each choice set included two purchasing alternatives in addition to a no-buying option, identified by the binary variable *No choice*, to make the hypothetical choice more realistic (Hensher et al. 2005). Figure 1 provides an example of a choice set.

Identification of the choice sets was based on a DB-efficient design, built using the R package `idefix` (Traets et al. 2020). The package adopts the Modified Fedorov algorithm

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[1] The sample selection procedure excluded vegetarian and vegan respondents, since they are not concerned with meat consumption. However, among non-vegan and non-vegetarian consumers, those not purchasing lamb meat were included, since they might be potential consumers, at least in the future.
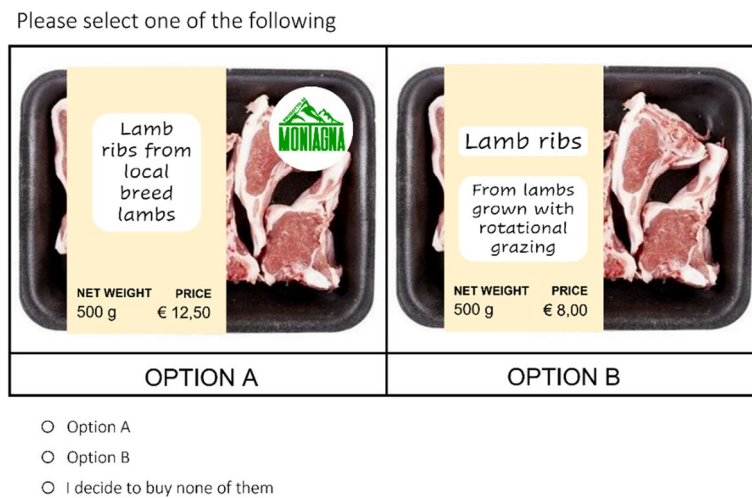
Please select one of the following

Fig. 1 Example of a choice set provided to respondents

to build Bayesian efficient designs, which are more robust than the usual D-efficient designs (Walker et al. 2018). The adopted design "aims to select those choice sets that force the respondents to make trade-offs, hereby maximizing the information gained from each observed choice" (Traets et al. 2020: p. 2). To build a DB-efficient design, it is necessary to specify in advance the prior distributions of the parameters associated with the attributes included in the choice experiment. Normally distributed priors are used, obtained from the estimates from the pilot study. The final design consists of seven choice sets and has a DB error of 0.47.

The econometric model

DCEs draw on Lancaster's theory, which considers each product as a bundle of attributes, claiming that individuals derive their utility from the specific attributes of a good, rather than from the good as a whole (Lancaster 1966). Based on this theoretical construct, it is possible to estimate the consumers' valuation of each attribute of a product.

This theoretical approach is translated in the conditional logit (CL) model (McFadden 1974), namely the traditional econometric strategy used to analyse respondents' choices in DCEs, based on the random utility theory (McFadden 1974). As this model cannot account for heterogeneity in individual preferences, a way to solve this issue is offered by the random parameter logit (RPL) model (Hensher and Greene 2003; McFadden and Train 2000; Train 2003), which builds on the CL model assuming a distribution of the attribute parameters over the sample of respondents. In particular, the RPL model assumes that the utility that an individual *n* derives from choosing alternative *j* on choice occasion *t* is:

$$U_{njt} = \beta_n^{'} X_{njt} + \varepsilon_{njt} \qquad (1)$$

The utility function in (1) includes a non-stochastic component, i.e. a linear function of a vector of attributes X_{njt} and their associated parameters β_n, which account for individual preferences heterogeneity. Under utility maximization, and assuming the stochastic

error term ε_{njt} is i.i.d. extreme value type I, the probability P of an individual n choosing alternative i over alternative j in choice occasion t is given by:

$$P_{nit}(\beta_n) = P\left(U_{nit} > U_{njt}\right) = \frac{exp(\beta_n{'} X_{nit})}{\sum_j exp(\beta_n{'} X_{njt})} \tag{2}$$

It is important to note that the probability in (2) is conditional on β_n. However, since β_n is unknown and it is therefore impossible to condition on it, the unconditional choice probability is obtained by:

$$P_{nit} = \int \left(\frac{exp(\beta_n{'} X_{nit})}{\sum_j exp(\beta_n{'} X_{njt})} \right) f(\beta) d\beta \tag{3}$$

where $f(\beta)$ is the density distribution of the parameters. As highlighted in Train (2003: p.139), the probability in (3) is "a weighted average of the logit formula evaluated at different values of β, with the weights given by the density $f(\beta)$". It is up to the researcher to choose, for each random parameter, the most appropriate density distribution.

In our specification, the respondents' choices are modelled using a RPL model where $X = \{$*Sheep breed, Mountain Product, Grazing practice, Price, No choice*$\}$. All variables are treated as random with a triangular density distribution $\tau(\beta)$, which is lower bounded at zero for *Sheep breed*, *Mountain Product* and *Grazing practice*, and upper bounded at zero for *Price* and *No choice*.[2] Triangular distributions $\tau(\beta)$, in which β is both the mean and the dispersion parameter, have the advantage of constraining respondents' parameters for each specific attribute to have all the same sign (Campbell et al. 2008). In our case, assuming a positive distribution for the three non-price parameters and a negative distribution for the price parameter, this assumption ensures positive individual WTPs for the three non-price parameters. In addition, the use of triangular distributions prevents the problem of estimating unreasonably large parameters for some individuals, a concern that arises when using, for example, normal or log-normal distributions (Train 2003). Both the estimation of the RPL model and the analyses detailed in the next section were performed using the R software.

The analysis of individual preferences

In the RPL model framework, using simulation techniques, it is possible to retrieve the preferences of single respondents based on their observed choices. Specifically, the individual parameters and WTPs are obtained generating 10,000 pseudo-random draws from the unconditional distribution of the estimated parameters, computing their individual-specific values for each draw and aggregating them at the individual level using (4) and (5), as reported in Greene et al. (2005).

$$\widehat{\beta}_n = \frac{\frac{1}{R} \sum_r \beta_n^r P\left(y_n | x_n, \beta_n^r\right)}{\frac{1}{R} \sum_r P\left(y_n | x_n, \beta_n^r\right)} \tag{4}$$

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[2] The decision to assign a negative triangular distribution to the *No choice* attribute is driven by the strongly negative estimates obtained for this variable in the pilot study.

$$\widehat{WTP}_n = \frac{\frac{1}{R}\sum_r \frac{\beta_n^r}{\gamma_n^r} P(y_n|x_n, \beta_n^r)}{\frac{1}{R}\sum_r P(y_n|x_n, \beta_n^r)} \tag{5}$$

In (4) and (5), $\widehat{\beta}_n$ and $\widehat{WTP}_n$ are the estimated individual parameters and WTPs, R is the number of draws, β_n^r and γ_n^r are, respectively, the non-price and price parameters extracted in the rth draw and $P(y_n|x_n, \beta_n^r)$ is the individual likelihood of observing the specific set of choices y_n conditional on the attributes and on the extracted parameter.

The individual parameters and WTPs were used to conduct two types of analysis. The first one is observational: it compares the distribution of the individual parameters and WTPs, for each attribute, among distinct groups of individuals.[3] This is done performing statistical tests for the difference in group means.

The second analysis aims at identifying the impact of respondents' general attitudes on their WTP for the attributes considered. Before the DCE section, respondents were provided with a set of eleven statements (Table 9) about habits and behaviours when purchasing food, as well as about environmental attitudes.[4] As common in the literature analysing consumer attitudes (e.g. Weinrich and Elshiewy 2019; Roininen et al. 1999), respondents were asked to rate each item on a numerical scale according to their degree of agreement. Here, a seven-point scale is used, from "1—Strongly disagree" to "7—Strongly agree". An exploratory factor analysis was conducted to identify general respondents' attitudes, whose effect on the WTP for each attribute was identified through three OLS regressions. In the models for the *Sheep breed* and *Mountain Product* attributes, the prior knowledge of either a local breed or the MP label was added to the model, under the assumption that this knowledge directly affects the WTP, increasing the familiarity of the respondent with the breed's name or the MP label.

Results

Respondents' characteristics and attitudes

Table 2 reports the socio-economic characteristics of the sample of respondents compared to the regional data.[5] Table 3 shows the frequency of consumption of lamb meat in general and of local breeds. It is important to notice that 22.5% of the respondents do not consume lamb meat, mostly because of their eating habits, which are more important barriers than taste-related ones.[6] The fact that taste is not the main obstacle to the decision to buy lamb meat supports our choice to also include lamb meat non-consumers in the sample, since they might be potential consumers in the future. With respect to

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[3] An alternative for the analysis of heterogeneity in respondents' preferences was to include interactions between attributes and group variables in the specification of the structural model. However, in nonlinear models, the interaction effects are not a simple function of the coefficients associated with the interaction terms (Greene 2008). This leads to (Ai and Norton 2003): i) the interaction parameters are not revealing of either the sign or the magnitude of the interaction effects; ii) the standard t-tests on the parameters cannot be used to test the statistical significance of the interaction effects; and iii) the value of the interaction effects is conditional on the independent variables.

[4] The specific items reported in Table 9 were selected to investigate those consumer attitudes that are potentially relevant for sheep meat consumption, as emerged from discussions with retailers and restaurant owners involved in other project activities.

[5] The sample is representative of the regional population with respect to gender, NUTS3 region of residence and mountain residence, as shown in Table 2. For other variables, differences are observed, presumably due to self-selection, which led to oversampling consumers under 44 years old by around 10%.

[6] The share of lamb meat non-consumers might be underestimated with respect to the actual share in the Veneto population due to self-selection.

Table 2 Socio-demographic characteristics of the sample and in the Veneto region (percentage values)

Variable	Sample of respondents	Veneto region
Gender (males)	50.8	49.1
Age		
18–29	18.5	15.3
30–44	30.5	22.6
45–54	27.1	21.4
55–80	23.9	40.8
Education		
None	1.9	7.4
Primary school	2.5	21.6
Lower secondary school	24.2	30.1
Upper secondary school	47.2	30.7
University degree	24.2	10.2
Family members		
1 person	9.7	29.4
2 persons	29.5	27.9
3–4 persons	53.2	36.6
More than 4 persons	7.6	6.1
Presence of children aged less than 18	68.4	–
Income situation		–
Difficult	7.0	–
Modest	26.9	–
Normal	47.2	–
Good	15.5	–
Very good	1.1	–
No answer	2.3	–
Mountain resident	20.5	19.9
NUTS3 region of residence (provincia)		
Belluno	4.4	4.1
Padova	19.7	19.2
Rovigo	4.9	4.7
Treviso	17.0	18.1
Venezia	17.6	17.3
Verona	18.6	19.1
Vicenza	17.8	17.6

Sample of respondents: authors' elaboration on primary data. Veneto region: authors' elaboration on Veneto region Statistical System—2020 data (gender, age, mountain residence, NUTS3 region of residence) and on ISTAT Census—2011 data (education, family members). No official data available for children under 18 and income situation

Table 3 Share of respondents buying lamb meat and lamb meat of local breeds (values in %)

Frequency	Lamb meat	Lamb meat of local breeds
I do not know any local breed	–	53.4
Never	22.5	11.0
At least once a year	32.4	18.0
At least once a month	23.1	12.1
At least once a week	22.0	5.5

Table 4 Estimated parameters and standard deviations from the RPL model, standard errors in parenthesis

Variable	β	σ
Sheep breed	1.26* (0.06)	0.51
Mountain product	1.37* (0.06)	0.56
Grazing practice	0.95* (0.06)	0.39
Price	− 0.47* (0.02)	− 0.19
No choice	− 6.23* (0.30)	− 2.54
Log-likelihood	− 2705.9	
AIC	5421.82	
BIC	5443.17	
McFadden pseudo-R^2	0.28	

* Statistically significant at the 5% level

The standard deviation (σ) of centred triangular distributions is obtained as $\sigma = \Delta / \sqrt{6}$, where Δ is the difference between the median value (β) and the minimum (Forbes et al. 2011)

local breeds, the share of non-consumers is 64.4%. This is mainly due to the poor knowledge of these breeds (more than half of the respondents do not know any Veneto local breed[7]), since among respondents who knows them, the share of non-consumers falls to 11%.

Also, the respondents' knowledge of the MP label is poor, with only 40% of respondents being aware of it. Moreover, only 13% of respondents can identify the correct meaning of the term. Despite this little knowledge, respondents have positive expectations towards products bearing the MP term, such as maintaining the farming activity in the mountains, the local identity and environmentally friendly production methods. In terms of purchases, among those who know the label, 60% buy these products at least once a month. MP cheese and milk are bought the most (72.6% and 43.3% of respondents, respectively), while MP meat is bought by only 35.1% of respondents.

Random parameters logit model results

Table 4 reports the estimated parameters of the RPL based on the DCE responses (the *No choice* option was chosen in 15% of the choice sets). All estimates are statistically significant at 5% level. Consumers evaluate each of them independently from the others, as suggested by an alternative specification showing that interactions among the attributes are not statistically significant.

Performing 10,000 pseudo-random draws from the distributions of the estimated parameters, both the individual parameters and marginal WTPs are estimated. Table 5 shows their average values, reporting in the third column the average calibrated marginal WTPs, computed using the median calibration factor identified by Murphy et al.

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[7] The questions used for assessing the knowledge of local breeds and for the MP term are reported in Table 10 of Annex A.

Table 5 Means of the simulated individual parameters and marginal WTPs

Attribute	Average simulated β_n	Average simulated WTP_n	Average calibrated WTP_n
Sheep breed	1.23	4.47	3.31
Mountain Product	1.34	4.67	3.46
Grazing practice	0.94	3.35	2.48
Price	− 0.44	–	–
No choice	− 6.15	–	–

Table 6 Average values of the individual parameters and WTPs for distinct groups of respondents

Grouping variable	Group	Price	Sheep breed		Mountain Product		Grazing practice	
		β_n	β_n	WTP_n	β_n	WTP_n	β_n	WTP_n
Lamb meat consumption	No	− 0.54[a]	1.18[a]	3.27[a]	1.32[a]	3.52[a]	0.93[a]	2.53[a]
	Unspecified breed	− 0.44[b]	1.23[ab]	4.25[b]	1.34[a]	4.50[b]	0.93[a]	3.16[b]
	Local breeds	− 0.37[c]	1.27[b]	5.52[c]	1.35[a]	5.63[c]	0.96[a]	4.10[c]
Knowledge of local breeds	No	− 0.47[a]	1.21[a]	3.91[a]	1.33[a]	4.15[a]	0.93[a]	2.94[a]
	Yes	− 0.40[b]	1.26[b]	5.11[b]	1.35[a]	5.28[b]	0.95[a]	3.81[b]
Knowledge of MP term	No	− 0.46[a]	1.23[a]	4.18[a]	1.31[a]	4.29[a]	0.94[a]	3.14[a]
	Yes	− 0.40[b]	1.24[a]	4.92[b]	1.39[b]	5.27[b]	0.94[a]	3.66[b]
Mountain resident	No	− 0.44[a]	1.22[a]	4.36[a]	1.35[a]	4.64[a]	0.94[a]	3.29[a]
	Yes	− 0.42[a]	1.26[a]	4.90[a]	1.30[a]	4.82[a]	0.94[a]	3.56[a]

Superscript letters indicate whether the group means are statistically different at the 5% level, according to a Tukey test or a *t* test

(2005) in a meta-analysis of stated preference valuation studies.[8] The parameters means in Table 5 and estimates in Table 4 are similar, suggesting that the model is correctly specified and consistently estimated (Allenby and Rossi 1998; Train 2003).

The results indicate that consumers, on average, are willing to pay for the three attributes of lamb ribs: local sheep breed, MP term and rotational grazing. The WTP for the first two attributes is higher than that for the environmentally friendly production method. However, the results show that consumers' WTP varies across consumers' groups, defined by the following characteristics: lamb meat consumption, knowledge of local breeds, knowledge of the MP term and residence in mountain areas (Table 6).

The statistically different parameters among groups denote a different appreciation of consumers for a given attribute, while statistically different WTPs also capture the price effect. The results show that both the individual parameters and the WTPs for the sheep breed attribute significantly vary between consumers who know and do not know local

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[8] Calibration might be necessary to take account of the hypothetical bias that may arise in this type of study, although this bias is usually lower for WTP elicitations (compared to willingness to accept ones) and for private than for public goods (List and Gallet 2001). However, it is important to note that the calibration factor identified by Murphy et al. (2005) results from a wide variety of diverse goods, so the calibrated WTPs in Table 4 should be taken as indicative.

Table 7 Estimated coefficient of the OLS regression of consumers' attitudes on ln(WTP)

Variable	Sheep breed	Mountain Product	Grazing practice
Intercept	0.73* (0.16)	0.70* (0.15)	0.40* (0.15)
Attitude: Quality	0.06* (0.01)	0.06* (0.01)	0.06* (0.01)
Attitude: Convenience	− 0.04* (0.01)	− 0.03* (0.01)	− 0.04* (0.01)
Attitude: Environment	0.02* (0.01)	0.02* (0.01)	0.03* (0.01)
Breed knowledge	0.18* (0.05)	–	–
MP term knowledge	–	0.18* (0.05)	–
Adjusted R^2	0.13	0.14	0.13

* Statistically significant at the 5% level

breeds. The same occurs for knowledge of the MP attribute. Conversely, when considering the grazing practice, the differences among all the subgroups are statistically significant only for WTPs. Finally, both the parameters and the WTPs do not depend on the proximity of the consumers to the mountains, which is the area where local sheep breeds are reared in the studied context.

Consumers' attitudes and WTPs

The exploratory factor analysis identifies three factors affecting the consumers' purchasing decisions (Table 9 in Annex A). These factors express the respondents' attitudes towards food quality related to the origin and tradition (*Quality*), food convenience characteristics (*Convenience*) and conservation of the environment (*Environment*). The internal consistency of the three factors, measured through the Cronbach's alpha coefficient ($\alpha_{Quality} = 0.80$, $\alpha_{Convenience} = 0.73$, $\alpha_{Environment} = 0.74$), can be considered satisfactory.

The log-regression of the respondents' WTPs for each attribute on the identified factors produces the results in Table 7.[9] Both the consumers' *Quality* and *Environmental* attitudes positively affect the WTP for all attributes, while *Convenience*, as expected, has a negative effect on the individual WTPs. Knowing either local breeds or the MP term increases the WTP for the respective attributes.

Discussion

The DCE results show positive significant marginal WTPs for each considered attribute (*Sheep breed, Mountain Product, Grazing practice*). Each attribute is valued independently by respondents, with no overlaps in the overall appreciation of lamb meat. With respect to the MP term, this result is in line with the evidence from Stiletto and Trestini (2022), who observed that there is no conflict in consumers' evaluation between the MP term and the organic labelling on cheese.

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[9] The robustness of the estimates is assessed performing an additional estimation through FGLS. No differences are observed, suggesting that heteroskedasticity is not an issue.

The highest average WTP is attached to the EU Mountain Product quality term. This shows the importance consumers attach to the public assurance of the quality labels. From a producers' perspective, the MP term makes it easier to trustworthily communicate the mountain origin of their products, thus capturing the positive image that consumers associate to mountain farming (Bernués et al. 2014; Zuliani et al. 2018). This result extends the positive evaluation of the EU MP label to meat products, adding to the findings provided by Mazzocchi et al. (2021), Mazzocchi and Sali (2022) and Stiletto and Trestini (2022) for cheese.

The second highest average WTP is estimated for the local sheep landrace. The evidence of a positive WTP is consistent with previous findings (Gracia and De-Magistris 2013 for lamb; García-Gudiño et al. 2021 for pigs; Resano et al. 2018 for beef). The willingness of consumers to pay an additional price premium confirms the market as a viable complement to publicly funded conservation programmes to protect local breeds from the risk of extinction (Tienhaara et al. 2015), increasing the profitability of farming as well.

Respondents expressed a positive attitude also towards the environmentally friendly rearing practice, i.e. rotational grazing, but the marginal WTP average value is around 30% lower than that for the MP term. The positive valuation of this attribute is consistent with other evidence showing interest of consumers for environment-related attributes in livestock products (Markova-Nenova and Wätzold 2018; Schulze et al. 2021; Stampa et al. 2020). The lower average WTP observed for this attribute can be explained by its public nature, for which people are usually more willing to pay as taxpayers than as consumers (see Defrancesco et al. 2017 for a review).

Like other studies on consumers' valuation of local breeds (e.g. Gracia and De-Magistris 2013; Zanoli et al. 2013), mountain origin (Sanjuán and Khliji 2016; Tempesta and Vecchiato 2013) and MP term (Mazzocchi and Sali 2022), our results show that consumers' preferences are heterogeneous. In our case, preference heterogeneity is not linked to the proximity of consumers to the area where the local breed is reared or to their residence in the mountains, as observed by some authors (e.g. Zander et al. 2013; Oliveira et al. 2021). Rather, it seems linked to prior respondents' knowledge of the attributes and their consumption habits.

Knowledge of the attributes by consumers is a crucial factor. In the EU context, consumers are often scarcely aware of food quality labels (Eurobarometer 2020). This also occurs in our sample, where most of the respondents were not previously aware of the meaning of the MP term and of the other attributes. This is in line with previous studies on consumers' knowledge of livestock systems (Cardoso et al. 2017; Clark et al. 2019) and local breeds (García-Gudiño et al. 2021; Zander et al. 2013). However, prior knowledge of local breeds and of the MP term increases the respondents' WTP for these attributes: this suggests that providing information to consumers might play a key role to further exploit their market potential. With respect to consumption habits, the WTP for each attribute is higher for respondents who buy lamb meat, and even higher for those who already purchase lamb meat of local breeds.

With respect to consumers' general attitudes, all the considered product attributes are valued more by respondents who pay attention to the quality (certifications, origin,

tradition) of the food products they buy and have a high environmental attitude, albeit the latter aspect plays a more limited role. These positive impacts on WTPs play in favour of a market segmentation, supported by information and communication strategies targeted to quality-oriented consumers, in order to capture their higher WTP. In addition, while most non-buyers maintain that price is not a relevant barrier to the purchase of local breed or MP meat, convenience attributes (e.g. the ease of finding the meat of local breeds) matter. Therefore, market segmentation strategies might be valuably complemented by making the product more available in the retail channels where the final consumer usually buys lamb meat (e.g. in butcheries and large-scale retail). The evidence collected from the survey that the attitudes of consumers affect the evaluation of the three attributes in the same direction might facilitate the implementation of such a market strategy.

Conclusions and policy implications

In line with the objectives, our work has assessed the consumers' WTP for three credence attributes of lamb meat: local endangered landrace, mountain origin assured through the EU MP term and rotational grazing allowing stewardship of agroecosystems. The paper contributes to the scarce literature on the issue, providing a simultaneous evaluation of the three attributes, which is an element of novelty. Consumers are willing to pay a premium price for all three attributes independently of one another.

With respect to the European MP term, this result suggests that it might create potential opportunities to valorize mountain products, in line with the objective of the EU legislation. Above all, the MP term thus offers producers an alternative strategy for on-farm product differentiation, signalling the mountain origin of the product with relatively lower burdens and costs compared to certified quality schemes, i.e. geographical indications (GIs). In addition, producers are not bound to be involved in any cooperative structure, although locally based cooperation strategies might add further value to local mountain products and reduce the transaction costs associated to the adoption and the management of the MP term. On the other hand, producers already involved in GI schemes might benefit as well from the adoption of the MP term, which can act as a within-GI differentiation tool. However, further research is needed to test these findings in larger areas, e.g. in other alpine contexts, and to explore the relation of the MP term with other valorization tools.

Despite the potential for valorization, a major factor limiting it with regard to all attributes might be the poor prior knowledge by consumers. This limiting factor—which is not new in the broader literature, but has been scarcely explored in the specific context of meat products from mountain areas—asks for the implementation of communication strategies by producers, targeted specifically to food quality-oriented consumers, to capitalize on their higher WTP.

The existence of this limiting factor for the adoption of the MP term calls for a proactive role of policymakers. Actually, our results confirm that "the [MP] scheme has not yet fully met its potential in the Member States due to a short time of its

application" (European Commission 2022: p. 24). In particular, even if the EU MP term objective was to provide "mountain producers with an effective tool to better market their product and to reduce the actual risks of consumer confusion as to the mountain provenance of products on the market" (European Commission 2022: p. 24), the scarce knowledge of the tool among consumers jeopardizes its effectiveness. Hence, some policy actions might be advisable, both to strengthen producers' communication strategies on the MP term and to complement them by a direct information activity carried out by public institutions at the EU and country level. In Italy, rural development programmes (RDPs) already provided financial support to producers' communication activities for quality schemes. However, this support was targeted to producers' associations (e.g. consortia) only, hence limiting its effectiveness for MP producers. This issue remains even in the new 2023–2027 Common Agricultural Policy according to the Italian Strategic Plan.

Similarly, the rearing of endangered local breeds is financially supported by the EU RDPs, but with no information provision to consumers by public institutions aiming at increasing their knowledge. Valorization of the environmentally friendly food products is currently left to quality schemes developed at the national level, which has an even more limited impact on consumers, at least in the Italian case. Actually, in Italy, these schemes are managed at the regional scale, which results in the presence of multiple logos, a possible source of confusion for consumers. To this end, the EU "Farm to Fork" strategy (European Commission 2020) aims to empower consumers to make sustainable food choices, by proposing a sustainable food labelling framework in 2024. A single EU labelling system could enhance consumers' knowledge and provide a trustworthy assurance scheme also for this credence attribute.

Consumers' confusion deriving from the existence of multiple logos also characterizes the market of mountain-origin products. While the introduction of the MP term was precisely aimed at solving this issue, the implementation of a strict control activity on the market by institutions and public authorities is still limited, thus threatening MP producers to fully reap the benefits of the MP term. A rigorous institutional control activity would also benefit consumers, allowing their purchase decisions to be based on more reliable information.

In line with the issues mentioned above, further research is needed. While this study showed the important role of consumers' prior knowledge of the attributes, a deeper understanding of the impact of information provision on increasing the WTP for the considered attributes might be useful to better tailor public and private information activities. Additionally, the actual harm caused by the presence of multiple logos signalling the mountain origin can be investigated to justify the implementation of control activities.

Appendix

See Tables 8, 9 and 10.

Table 8 Description of the attributes provided to respondents before the choice experiment

Attribute	Description
Sheep breed	Traditional local breeds are considered at risk of extinction, while they have a strong link with the tradition and culture of their territories of origin. The focus here is on local breeds reared in the Veneto region
Mountain Product	The presence of the EU "Mountain Product" label on the product guarantees that animals were reared and slaughtered in a mountain area and fed with feedstuff mainly produced in a mountain area
Grazing practice	All lambs are reared on pasture. Under rotational grazing only, pasture is split in plots which are alternatively used according to a specific scheme. This has positive effects on the quality of the fodder, increases the pasture biodiversity and improves the landscape mosaic, also preventing the overexpansion of the forest

Table 9 Results of the exploratory factor analysis on 11 attitude statements (seven-point scale)

Statement	Mean	SD	Factor	Loading
When purchasing food products, I pay specific attention to the presence of quality labels (e.g. PDO, PGI, organic)	5.29	1.38	Quality	0.8
When purchasing food products, I pay specific attention to the region/area of origin	5.29	1.41	Quality	0.7
When purchasing food products, I pay specific attention to the traditional character of products	5.11	1.42	Quality	0.6
When purchasing food products, I pay specific attention to the fact that price is not too high	5.22	1.32	Convenience	0.7
When purchasing food products, I pay specific attention to the ease in preparing/cooking them	5.25	1.43	Convenience	0.7
When purchasing food products, I pay specific attention to the ease in finding them in the habitual places where I buy food	5.34	1.31	Convenience	0.6
When purchasing food products, I pay specific attention to the fact that they are products that I consume regularly	4.94	1.38	Convenience	0.6
I usually talk about the environment with my friends	4.56	1.67	Environment	0.8
The environmentally sustainable production method is an important choice criterion when I purchase a food product	5.25	1.38	Environment	0.7
I feel frustrated and angry when I think about how some factories pollute the environment	5.54	1.51	Environment	0.6
I would be willing to pay an additional pollution tax on diesel oil and gasoline if this contributes to significantly lower air pollution	4.11	1.90	Environment	0.6

Table 10 Questions used to assess the knowledge of the local breeds and of the MP term

Question	Alternatives
In Veneto some local sheep breeds are reared. Did you hear about any of the following? (Multiple answers are possible)	Alpagota (Alpago lamb)
	Brogna
	Foza
	Lamon
	None
Did you see this logo before? (MP label was shown on the questionnaire)	Yes
	No
In your opinion, which of the following characteristics a product must have to be labelled with the MP logo? (Multiple answers are possible)	It must be produced using environmentally sustainable methods
	It must be produced using raw materials mainly produced in mountain areas
	It must be produced following traditional production methods
	It must be produced using methods guaranteeing animal welfare
	It must be produced without the use of GMO products
	It must be produced in Veneto region
	The processing of the product must take place in mountain areas

References

Ai C, Norton EC (2003) Interaction terms in logit and probit models. Econ Lett 80:123–139
Allenby GM, Rossi PE (1998) Marketing models of consumer heterogeneity. J Econom 89:57–78. https://doi.org/10.1016/S0304-4076(98)00055-4
Apostolidis C, McLeay F (2016) Should we stop meating like this? Reducing meat consumption through substitution. Food Policy 65:74–89. https://doi.org/10.1016/j.foodpol.2016.11.002
Bassi I, Carzedda M, Grassetti L, Iseppi L, Nassivera F (2021) Consumer attitudes towards the mountain product label: implications for mountain development. J Mt Sci 18:2255–2272. https://doi.org/10.1007/s11629-020-6616-z
Bellon MR (2006) Crop research to benefit poor farmers in marginal areas of the developing world: A review of technical challenges and tools. CAB Rev Perspect Agric Vet Sci Nutr Natl Resour. https://doi.org/10.1079/PAVSNNR20061070
Bellon MR (2008) Do we need crop landraces for the future? Realizing the global option value of in situ conservation. In: Kontoleon A, Pascual U, Smale M (eds.) Agrobiodiversity conservation and economic development. Routledge, pp 75–85. https://doi.org/10.4324/9780203890127-13.
Bentivoglio D, Savini S, Finco A, Bucci G, Boselli E (2019) Quality and origin of mountain food products: the new European label as a strategy for sustainable development. J Mt Sci 16:428–440. https://doi.org/10.1007/s11629-018-4962-x
Bernués A, Rodríguez-Ortega T, Ripoll-Bosch R, Alfnes F (2014) Socio-cultural and economic valuation of ecosystem services provided by Mediterranean mountain agroecosystems. PLoS ONE. https://doi.org/10.1371/journal.pone.0102479
Bonadonna A (2016) What does the optional quality term "Mountain Product" involve? The Biellese Mountain (North-West Italy) farmers' opinions. Mediterr J Soc Sci 7:18–23. https://doi.org/10.5901/mjss.2016.v7n1p18
Bowler I, Clark G, Crockett A, Ilbery B, Shaw A (1996) The development of alternative farm enterprises: a study of family labour farms in the northern Pennines of England. J Rural Stud 12:285–295. https://doi.org/10.1016/0743-0167(96)00015-0
Campbell D, Scarpa R, Hutchinson WG (2008) Assessing the spatial dependence of welfare estimates obtained from discrete choice experiments. Lett Spat Resour Sci 1:117–126. https://doi.org/10.1007/s12076-008-0012-6
Cardoso CS, Hötzel MJ, Weary DM, Robbins JA, von Keyserlingk MAG (2016) Imagining the ideal dairy farm. J Dairy Sci 99:1663–1671. https://doi.org/10.3168/JDS.2015-9925
Cardoso CS, Von Keyserlingk MAG, Hötzel MJ (2017) Brazilian citizens: expectations regarding dairy cattle welfare and awareness of contentious practices. Animals. https://doi.org/10.3390/ani7120089
Cavatassi R, Lipper L, Narloch U (2011) Modern variety adoption and risk management in drought prone areas: insights from the sorghum farmers of eastern Ethiopia. Agric Econ 42:279–292. https://doi.org/10.1111/j.1574-0862.2010.00514.x
Cicia G, D'Ercole E, Marino V (2003) Costs and benefits of preserving farm animal genetic resources from extinction: CVM and Bio-economic model for valuing a conservation program for the Italian Pentro horse. Ecol Econ 45:445–459. https://doi.org/10.1016/S0921-8009(03)00096-X
Clark B, Panzone LA, Stewart GB, Kyriazakis I, Niemi JK, Latvala T, Tranter R, Jones P, Frewer LJ (2019) Consumer attitudes towards production diseases in intensive production systems. PLoS ONE 14:1–24. https://doi.org/10.1371/journal.pone.0210432
Colino-Rabanal VJ, Rodríguez-Díaz R, Blanco-Villegas MJ, Peris SJ, Lizana M (2018) Human and ecological determinants of the spatial structure of local breed diversity. Sci Rep 8:1–10. https://doi.org/10.1038/s41598-018-24641-3
Darby MR, Karni E (1973) Free competition and the optimal amount of fraud. J Law Econ 16:67–88. https://doi.org/10.1086/466756
de Bekker-Grob EW, Donkers B, Jonker MF, Stolk EA (2015) Sample size requirements for discrete-choice experiments in healthcare: a practical guide. Patient 8:373–384. https://doi.org/10.1007/s40271-015-0118-z
Defrancesco E, Perito MA, Bozzolan I, Cei L, Stefani G (2017) Testing consumers' preferences for environmental attributes of pasta. Insights from an ABR approach. Sustainability 9:1701. https://doi.org/10.3390/su9101701
Di Falco S, Chavas JP (2009) On crop biodiversity, risk exposure, and food security in the Highlands of Ethiopia. Am J Agric Econ 91:599–611. https://doi.org/10.1111/j.1467-8276.2009.01265.x

Díaz de Otálora X, Epelde L, Arranz J, Garbisu C, Ruiz R, Mandaluniz N (2021) Regenerative rotational grazing management of dairy sheep increases springtime grass production and topsoil carbon storage. Ecol Indic 125:1470–2160. https://doi.org/10.1016/J.ECOLIND.2021.107484

Díaz-Caro C, García-Torres S, Elghannam A, Tejerina D, Mesias FJ, Ortiz A (2019) Is production system a relevant attribute in consumers' food preferences? The case of Iberian dry-cured ham in Spain. Meat Sci 158:10790. https://doi.org/10.1016/j.meatsci.2019.107908

Domínguez-Torreiro M (2014) Alternative experimental design paradigms in choice experiments and their effects on consumer demand estimates for beef from endangered local cattle breeds: an empirical test. Food Qual Prefer 35:15–23. https://doi.org/10.1016/j.foodqual.2014.01.006

Endrizzi I, Cliceri D, Menghi L, Aprea E (2021) Does the 'Mountain Pasture Product' claim affect local cheese acceptability? Foods 10(3):682

https://doi.org/10.2762/621294

Euromontana (2020) Implementation of the EU Optional Quality Term "Mountain Product". Where do we stand in the Different Member States? www.euromontana.org.

European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. COM (2020) 381. Brussels

European Commission (2022) Proposal for a Regulation of the European Parliament and of the Council on European Union geographical indications for wine, spirit drinks and agricultural products, and quality schemes for agricultural products, amending Regulations (EU) No 1308/2013, (EU) 2017/1001 and (EU) 2019/787 and repealing Regulation (EU) No 1151/2012. COM (2022) 134. Brussels

Fadlaoui A, Roosen J, Baret PV (2006) Setting priorities in farm animal conservation choices—expert opinion and revealed policy preferences. Eur Rev Agric Econ 33:173–192. https://doi.org/10.1093/erae/jbl004

Fayet CMJ, Reilly KH, Van Ham C, Verburg PH (2022) What is the future of abandoned agricultural lands? A systematic review of alternative trajectories in Europe. Land Use Policy 112:105833. https://doi.org/10.1016/J.LANDUSEPOL.2021.105833

Font i Furnols M, Realini C, Montossi F, Sañudo C, Campo MM, Oliver MA, Nute GR, Guerrero L (2011) Consumer's purchasing intention for lamb meat affected by country of origin, feeding system and meat price: a conjoint study in Spain, France and United Kingdom. Food Qual Prefer 22:443–451. https://doi.org/10.1016/j.foodqual.2011.02.007

Forbes C, Evans M, Hastings N, Peacock B (2011) Statistical distributions. Wiley, Hoboken

García-Gudiño J, Blanco-Penedo I, Gispert M, Brun A, Perea J, Font i Furnols M (2021) Understanding consumers' perceptions towards Iberian pig production and animal welfare. Meat Sci. https://doi.org/10.1016/j.meatsci.2020.108317

García-Martínez A, Bernués A, Olaizola AM (2011) Simulation of mountain cattle farming system changes under diverse agricultural policies and off-farm labour scenarios. Livest Sci 137:73–86. https://doi.org/10.1016/j.livsci.2010.10.002

Getter KL, Behe BK, Howard PH, Conner DS, Spaniolo LM (2015) Increasing demand for pasture-based dairy: What attributes and images do consumers want? In: Freyer J, Bingen RJ (eds.) Re-thinking organic food and farming in a changing world. The international library of environmental, agricultural and food ethics, vol 22. Springer, Dordrecht, pp 125–140

Gracia A (2014) Consumers' preferences for a local food product: a real choice experiment. Empir Econ 47:111–128. https://doi.org/10.1007/s00181-013-0738-x

Gracia A, De-Magistris T (2013) Preferences for lamb meat: a choice experiment for Spanish consumers. Meat Sci 95:396–402. https://doi.org/10.1016/j.meatsci.2013.05.006

Greene WH, Hensher DA, Rose JM (2005) Using classical simulation-based estimators to estimate individual WTP values. In: Scarpa R, Alberini A (eds.) Applications of simulation methods in environmental and resource economics. Springer, Dordrecht, pp 17–33. https://doi.org/10.1007/1-4020-3684-1_2.

Greene WH (2008) Econometric analysis 6th edition. Pearson Prentice Hall, Upper Saddle River, New Jersey US

Hajjar R, Jarvis DI, Gemmill-Herren B (2008) The utility of crop genetic diversity in maintaining ecosystem services. Agric Ecosyst Environ 123:261–270. https://doi.org/10.1016/J.AGEE.2007.08.003

Hensher DA, Greene WH (2003) The Mixed Logit model: the state of practice. Transportation 30:133–176. https://doi.org/10.1023/A:1022558715350

Hensher DA, Rose JM, Greene WH (eds) (2005). Cambridge University Press, Cambridge

Hersleth M, Næs T, Rødbotten M, Lind V, Monteleone E (2012) Lamb meat—importance of origin and grazing system for Italian and Norwegian consumers. Meat Sci 90:899–907. https://doi.org/10.1016/j.meatsci.2011.11.030

Holechek JL, Gomez H, Molinar F, Galt D (1999) Grazing studies: what we've learned. Description by grazing region forage production and stocking rate grazing intensity: What is moderate stocking? Rangelands 21:12–16

Ilbery B, Bowler I (1998) From agricultural productivism to postproductivism. In: Ilbery B (ed) The geography of rural change. Longman, Harlow, pp 57–84

Ingty T (2021) Pastoralism in the highest peaks: Role of the traditional grazing systems in maintaining biodiversity and ecosystem function in the alpine Himalaya. PLoS ONE 16:e0245221. https://doi.org/10.1371/journal.pone.0245221

Institute for European Environmental Policy (2006) An evaluation of the less favoured area measure in the 25 member states of the European Union. Available via https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/ext-eval-rural-dev2-full_text_2006_en.pdf

Jacobo EJ, Rodríguez AM, Bartoloni N, Deregibus VA (2006) Rotational grazing effects on rangeland vegetation at a farm scale. Rangeland Ecol Manag 59:249–257. https://doi.org/10.2111/05-129R1.1

Knickel K, Renting H, Van Der Ploeg JD (2016) Multifunctionality in European agriculture. In: Brower F (ed) Sustaining agriculture and the rural economy. Edward Elgar, Cheltenham, pp 81–103

Kragt ME, Bennett JW (2012) Attribute framing in choice experiments: How do attribute level descriptions affect value estimates? Environ Resour Econ 51:43–59. https://doi.org/10.1007/s10640-011-9487-5

Lancaster KJ (1966) A new approach to consumer theory. J Polit Econ 74:132–157. https://doi.org/10.2307/1828835

List JA, Gallet CA (2001) What experimental protocol influence disparities between actual and hypothetical stated values? Environ Resour Econ 20:241–254. https://doi.org/10.1023/A:1012791822804

MacDonald D, Crabtree JR, Wiesinger G, Dax T, Stamou N, Fleury P, Gutierrez Lazpita J, Gibon A (2000) Agricultural abandonment in mountain areas of Europe: environmental consequences and policy response. J Environ Manag 59:47–69. https://doi.org/10.1006/JEMA.1999.0335

Markova-Nenova N, Wätzold F (2018) Fair to the cow or fair to the farmer? The preferences of conventional milk buyers for ethical attributes of milk. Land Use Policy 79:223–239. https://doi.org/10.1016/j.landusepol.2018.07.045

Marsoner T, Vigl LE, Manck F, Jaritz G, Tappeiner U, Tasser E (2018) Indigenous livestock breeds as indicators for cultural ecosystem services: a spatial analysis within the Alpine Space. Ecol Indic 94:55–63

Mazzocchi C, Sali G (2022) Supporting mountain agriculture through "mountain product" label: a choice experiment approach. Environ Dev Sustain 24:701–723. https://doi.org/10.1007/s10668-021-01464-3

Mazzocchi C, Orsi L, Sali G (2021) Consumers' attitudes for sustainable mountain cheese. Sustainability 13:1–17. https://doi.org/10.3390/su13041743

McFadden D (1974) Conditional logit analysis of qualitative choice behavior. In: Zarambka P (ed) Frontiers in econometrics. Academic Press, New York, pp 105–142

McFadden D, Train K (2000) Mixed MNL models for discrete response. J Appl Econom 15:447–470. https://doi.org/10.1002/1099-1255(200009/10)15:5%3c447::aid-jae570%3e3.0.co;2-1

McKendree MGS, Widmar NO, Ortega DL, Foster KA (2013) Consumer preferences for verified pork-rearing practices in the production of ham products. J Agric Resour Econ 38:397–417

Murphy JJ, Allen PG, Stevens TH, Weatherhead D (2005) A meta-analysis of hypothetical bias in stated preference valuation. Environ Resour Econ 30:313–325. https://doi.org/10.1007/s10640-004-3332-z

Nam K, Lim H, Ahn B (2020) Analysis of consumer preference for milk produced through sustainable farming: the case of mountainous dairy farming. Sustainability 12:3039. https://doi.org/10.3390/su12073039

Oliveira M, Sidali KL, Busch G (2021) Mountain beef and wine: Italian consumers' definitions and opinions on the mountain labelling-scheme. Economia Agro-Alimentare 23:1–39. https://doi.org/10.3280/ecag1-2021oa11549

Pagliacci F, Cei L, Defrancesco E, Gatto P (2022) The EU Mountain Product voluntary quality term as a valorization tool for livestock farms: challenges and opportunities in an Alpine context. Sustainability 14:3292. https://doi.org/10.3390/su14063292

Park JY, Ale S, Teague WR, Dowhower SL (2017) Simulating hydrologic responses to alternate grazing management practices at the ranch and watershed scales. J Soil Water Conserv 72:102–121. https://doi.org/10.2489/JSWC.72.2.102

Perotti E, Probo M, Pittarello M, Lonati M, Lombardi G (2018) A 5-year rotational grazing changes the botanical composition of sub-alpine and alpine grasslands. Appl Veg Sci 21:647–657. https://doi.org/10.1111/AVSC.12389

Pouta E, Tienhaara A, Ahtiainen H (2014) Citizens' preferences for the conservation of agricultural genetic resources. Front Genet. https://doi.org/10.3389/fgene.2014.00440

Qian D, Du Y, Li Q, Guo X, Cao G (2021) Alpine grassland management based on ecosystem service relationships on the southern slopes of the Qilian Mountains, China. J Environ Manag 288:112447

Ravetto Enri S, Probo M, Farruggia A, Lanore L, Blanchetete A, Dumont B (2017) A biodiversity-friendly rotational grazing system enhancing flower-visiting insect assemblages while maintaining animal and grassland productivity. Agric Ecosyst Environ 241:1–10. https://doi.org/10.1016/J.AGEE.2017.02.030

Renner S, Sauer J, El Benni N (2021) Why considering technological heterogeneity is important for evaluating farm performance? Eur Rev Agric Econ 48:415–445. https://doi.org/10.1093/erae/jbab003

Resano H, Sanjuán AI (2018) Exploring the role of mountain origin and autochthonous breed on urban consumers' acceptability. Sustainability. https://doi.org/10.3390/su10124423

Resano H, Olaizola AM, Dominguez-Torreiro M (2018) Exploring the influence of consumer characteristics on veal credence and experience guarantee purchasing motivators. Meat Sci 141:1–8. https://doi.org/10.1016/j.meatsci.2018.03.001

Risius A, Hamm U (2017) The effect of information on beef husbandry systems on consumers' preferences and willingness to pay. Meat Sci 124:9–14. https://doi.org/10.1016/j.meatsci.2016.10.008

Rodríguez-Bermúdez R, Miranda M, Orjales I, Ginzo-Villamayor MJ, Al-Soufi W, López-Alonso M (2020) Consumers' perception of and attitudes towards organic food in Galicia (Northern Spain). Int J Consum Stud 44:206–219. https://doi.org/10.1111/ijcs.12557

Roininen K, Lähteenmäki L, Tuorila H (1999) Quantification of consumer attitudes to health and hedonic characteristics of foods. Appetite 33:71–88. https://doi.org/10.1006/APPE.1999.0232

Sanjuán AI, Khliji S (2016) Urban consumers' response to the EU food mountain labelling: an empirical application in Southern Europe. New Medit 15:72–80

Santini F, Guri F, Gomez S (2013) Labelling of agricultural and food products of mountain farming: executive summary. Seville, Spain

Scarpa R, Drucker AG, Anderson S, Ferraes-Ehuan N, Gómez V, Risopatrón CR, Rubio-Leonel O (2003) Valuing genetic resources in peasant economies: the case of "hairless" creole pigs in Yucatan. Ecol Econ 45:427–443. https://doi.org/10.1016/S0921-8009(03)00095-8

Scarpa R, Zanoli R, Bruschi V, Naspetti S (2013) Inferred and stated attribute non-attendance in food choice experiments. Am J Agric Econ 95:165–180. https://doi.org/10.1093/ajae/aas073

Schuh B, Andronic C, Derszniak-Noirjean M, Gaupp-Berghausen M, Hsiung CH, Münch A, Dax T, Machold I, Schroll K, Brkanovi S (2020) The challenge of land abandonment after 2020 and options for mitigating measures

Schulze M, Spiller A, Risius A (2021) Do consumers prefer pasture-raised dual-purpose cattle when considering meat products? Meat Sci, A hypothetical discrete choice experiment for the case of minced beef. https://doi.org/10.1016/j.meatsci.2021.108494

Scozzafava G, Casini L, Contini C (2014) Analysis of Italian consumer preferences for beef. New Medit 13:66–72

Sharpley R, Vass A (2006) Tourism, farming and diversification: an attitudinal study. Tourism Manag 27:1040–1052. https://doi.org/10.1016/j.tourman.2005.10.025

Sluiter R, de Jong SM (2007) Spatial patterns of Mediterranean land abandonment and related land cover transitions. Landscape Ecol 22:559–576. https://doi.org/10.1007/s10980-006-9049-3

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Stampa E, Schipmann-Schwarze C, Hamm U (2020) Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: a review. Food Qual Prefer 82:103872. https://doi.org/10.1016/J.FOODQUAL.2020.103872

Stiletto A, Trestini S (2022) When less isn't more and more isn't less: is there an overlap between "protected designation of origin", "mountain product" and "organic" in Italy? Br Food J. https://doi.org/10.1108/BFJ-02-2022-0107

Sturaro E, Cocca G, Fuser S, Ramanzin M (2005) Relationships between livestock production systems and landscape changes in the Belluno province. Ital J Anim Sci 4:184–186. https://doi.org/10.4081/ijas.2005.2s.184

Teague WR, Dowhower SL, Baker SA, Haile N, DeLaune PB, Conover DM (2011) Grazing management impacts on vegetation, soil biota and soil chemical, physical and hydrological properties in tall grass prairie. Agruc Ecosyst Environ 141:310–322. https://doi.org/10.1016/J.AGEE.2011.03.009

Teillard F, Allaire G, Cahuzac E, Léger F, Maigné E, Tichit M (2012) A novel method for mapping agricultural intensity reveals its spatial aggregation: Implications for conservation policies. Agric Ecosyst Environ 149:135–143. https://doi.org/10.1016/J.AGEE.2011.12.018

Tempesta T, Vecchiato D (2013) An analysis of the territorial factors affecting milk purchase in Italy. Food Qual Prefer 27:35–43. https://doi.org/10.1016/j.foodqual.2012.06.005

Tienhaara A, Ahtiainen H, Pouta E (2015) Consumer and citizen roles and motives in the valuation of agricultural genetic resources in Finland. Ecol Econ 114:1–10. https://doi.org/10.1016/j.ecolecon.2015.03.005

Traets F, Sanchez DG, Vandebroek M (2020) Generating optimal designs for discrete choice experiments in R: The idefix package. J Stat Softw 96:1–41. https://doi.org/10.18637/jss.v096.i03

Train KE (ed) (2003). Cambridge University Press, Cambridge

Van Loo EJ, Caputo V, Nayga RM, Meullenet JF, Ricke SC (2011) Consumers' willingness to pay for organic chicken breast: evidence from choice experiment. Food Qual Prefer 22:603–613. https://doi.org/10.1016/j.foodqual.2011.02.003

Walker JL, Wang Y, Thorhauge M, Ben-Akiva M (2018) D-efficient or deficient? A robustness analysis of stated choice experimental designs. Theor Decis 84:215–238. https://doi.org/10.1007/s11238-017-9647-3

Wätzold F, Drechsler M, Johst K, Mewes M, Sturm A (2016) A novel, spatiotemporally explicit ecological-economic modeling procedure for the design of cost-effective agri-environment schemes to conserve biodiversity. Am J Agric Econ 98:489–512. https://doi.org/10.1093/AJAE/AAV058

Weinrich R, Elshiewy O (2019) Preference and willingness to pay for meat substitutes based on micro-algae. Appetite. https://doi.org/10.1016/J.APPET.2019.104353

Zander KK, Drucker AG (2008) Conserving what's important: Using choice model scenarios to value local cattle breeds in East Africa. Ecol Econ 68:34–45. https://doi.org/10.1016/j.ecolecon.2008.01.023

Zander KK, Signorello G, De Salvo M, Gandini G, Drucker AG (2013) Assessing the total economic value of threatened livestock breeds in Italy: Implications for conservation policy. Ecol Econ 93:219–229. https://doi.org/10.1016/j.ecolecon.2013.06.002

Zanoli R, Scarpa R, Napolitano F, Piasentier E, Naspetti S, Bruschi V (2013) Organic label as an identifier of environmentally related quality: a consumer choice experiment on beef in Italy. Renew Agric Food Syst 28:70–79. https://doi.org/10.1017/S1742170512000026

Zavalloni M, D'Alberto R, Raggi M, Viaggi D (2021) Farmland abandonment, public goods and the CAP in a marginal area of Italy. Land Use Policy 107:104365. https://doi.org/10.1016/j.landusepol.2019.104365

Zuliani A, Esbjerg L, Grunert KG, Bovolenta S (2018) Animal welfare and mountain products from traditional dairy farms: How do consumers perceive complexity? Animals. https://doi.org/10.3390/ani8110207

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