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The Eucalyptus Firewood: Understanding Consumers' Behaviour and Motivations

Nadia Palmieri *, Alessandro Suardi, Francesco Latterini and Luigi Pari

CREA Research Centre for Engineering and Agro-Food Processing, Via della Pascolare, 16, Monterotondo, 00015 Rome, Italy; alessandro.suardi@crea.gov.it (A.S.); francesco.latterini@crea.gov.it (F.L.); luigi.pari@crea.gov.it (L.P.)

* Correspondence: nadia.palmieri@crea.gov.it; Tel.: +39-06-9067-5219

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Abstract: Italy is one of the world's major importers of firewood, despite the large amount of Italian eucalyptus plantations that could satisfy part of the country's internal demand. The demand is critical for farmers to understand developing market dynamics and people's willingness to buy a product is related to several parameters, including different supply methods. This study aimed to analyse the willingness to consume domestic eucalyptus firewood, and the related motivations of consumers considering the preferred supply method. Data was collected through a web-survey and analysed applying a multilevel regression. In general, the sample showed that attention is paid to both the type of wood and its origin, and that there is a preference for loose firewood as a supply method. Our findings suggest that factors such as age, experience, and familiarity with a product, the supply method, attitude towards novelty, provenience, and energetic density of firewood have an important role in shaping individual inclination towards consuming domestic eucalyptus firewood. This implies that the owners of eucalyptus plantations should target mostly young and detail-oriented consumers, and should also try to clearly give information regarding the origin of the product and its technical characteristics.

Keywords: consumer choices; eucalyptus; firewood; Italy; multilevel logistic regression model; willingness to consume

1. Introduction

Eucalyptus (*Eucalyptus* spp.) forests and agro-forestry plants cover about 20 million hectares in the world. These species show faster biomass growth if compared to other species [1] and can be used to obtain pulp, paper, and firewood. In regards to the environment, the management of eucalyptus plantations can be considered more sustainable than other energy crops [2]. Due to its fast growth and modesty, eucalyptus can contribute to biodiversity conservation [1,3]. Moreover, it shows an important role in climate change mitigation [1] due to its high capacity of carbon sequestration during growth [4,5].

In Italy, agro-forestry plants mainly aim towards the bioenergy production of eucalyptus (*Eucalyptus* spp.), poplar (*Populus* spp.), and black locust (*Robinia pseudoacacia* L.), which cover more than 100,000 ha [6]. Considering this, eucalyptus could provide a biomass that can fulfill about 72% of Italian demand [7–9]. Notwithstanding this large availability of wooden biomass, Italy is one of the major global importers of wood for energy purpose [10], used particularly for domestic heating [11,12]. The major part of imported fuelwood originates from the Balkans' area, and this is mainly due to the lower cost of labour and of raw materials in these countries [11,13].

Considering the growing importance of Eucalyptus plantations throughout the world, many researches have focused on both environmental impacts related to eucalyptus management [1,4,14–16]

and cultivation methodology [10]. However, lower attention has been put on the economic aspects of cultivation, i.e., investigation of the supply chain analysis [2,17,18] as well as of the demand of such species' wood.

Consumer choice is a key variable for farmers to understand developing market dynamics [19], moreover people's willingness to buy a given product is related to several parameters [20]. In fact, consumer attitude is an important aspect to analyse because it allows us to study the acceptance of a particular good by consumers [21]. According to this, it could be important to investigate the willingness to consume domestic eucalyptus fuelwood, given that eucalyptus firewood shows similar heating value to other species, such as oak [22], and thus it could be an interesting alternative.

In this framework, the study aimed to understand people's willingness to consume domestic eucalyptus firewood and their motivations, considering also people's preferred supply method. This last parameter is indeed important in consumer behaviour [23], even if, to the best of our knowledge, current literature studies that consider this wood supply chain are lacking.

This paper is structured as follows: Section 2 describes the materials and methods used. The results and discussion are presented in Section 3 and the conclusions are handled in Section 4.

2. Materials and Methods

2.1. Data Collection, Sample and Questionnaire

Data was collected through a web-based survey performed during the period January–April 2020, from an initial sample of 300 Italian people. In particular, consumers were recruited through invitations to participate in the online survey (performed by Google drive) via social networks (Instagram, Twitter, and Facebook). Moreover, snowball sampling recruitment was also adopted, using the interpersonal relations of the authors (via email) to reach a larger number of participants [24]. For these reasons, the sample was not representative of the Italian population, which happens in many studies about consumer behaviour where a convenience sample was used [21,25–30]. Subsequently, 18 respondents were excluded from the survey because they stated not to be domestic firewood consumers. The final sample was consequently made up of 282 consumers. Before starting the survey, an interview with 80 consumers was carried out in order to understand if the investigated topic was understandable through our questionnaire.

The questionnaire was made up of three sections: (1) Consumers' behaviour towards firewood; (2) consumers' willingness to consume domestic eucalyptus firewood and related motivations; and (3) socio-demographic features of respondents.

The first two sections applied a five-point Likert scale (1 = totally disagree; 2 = disagree; 3 = indifferent; 4 = agree, and 5 = totally agree), with the exception of some questions in Section 2 in which categorical variables (i.e., *Forn*, *Will*, *Cons*, and *Familiarity*) have been used [23]. Furthermore, the Cronbach Alpha coefficient for each item group was calculated to assess the reliability of the scale, which showed a good level (from 0.70 to 0.90).

In the first section of the questionnaire we analysed the consumers' attitudes about firewood species, ethical aspects of the choice, geographic provenience (*Prov*) (i.e., if firewood comes from tropical countries or Mediterranean ones), and the origin of firewood (*Origin*) (if firewood comes from an agro-forestry plant or natural stand) [29].

The second part of the questionnaire investigated respondents' willingness to consume domestic eucalyptus fuelwood (*Will*) with a binary choice (Yes vs. No), their willingness to pay per 100 kg of biomass (*Price*), and the amount of eucalyptus firewood which the consumer would be willing to consume yearly (*Will_q*). It is important to underline that, if respondents were not willing to consume it, the quantity of eucalyptus firewood was considered zero.

The questionnaire also requested to indicate the consumer's familiarity (*Familiarity*) with eucalyptus fuelwood and if they have consumed it in the past (*Cons*) [30], and in both cases the

question was asked as a binary choice (Yes vs. No). It is important to underline that familiarity was investigated using the question: "Have you ever heard about eucalyptus as firewood alternative?"

Moreover, another important aspect considered in the survey is consumers' motivation to use eucalyptus firewood. These aspects were investigated by asking questions related to curiosity (*Curiosity*), to technical characteristics (*Energetic*), as well as to environmental aspects [29]. In particular, the question about curiosity was "You are willing to consume domestic eucalyptus firewood for curiosity (How much do you agree with the following statements? Express your judgment by putting a tick from 1 to 5. 1 = totally disagree. 5 = totally agree)", while questions on technical characteristics were "You are willing to consume domestic eucalyptus firewood if it had better combustion behaviour (wood burning duration) than other firewood species (How much do you agree with the following statements? Express your judgment by putting a tick from 1 to 5. 1 = totally disagree. 5 = totally agree)" [23]. Moreover, it is important to highlight that the questions concerning the environmental aspects of firewood were asked to respondents but these questions were subsequently excluded because, using the stepwise procedure, they did not fit in the applied model. Finally, respondents had to select their preferred supply method (*Forn*), i.e., loose firewood, firewood arranged in pallets, or firewood in 10–15 kg bags. Other questions about where consumers usually buy firewood (i.e., *Woodman*, *Retail*, *Internet*, etc.) were asked to respondents but these questions were also excluded because they did not fit in the applied model.

In the last section of the questionnaire, data about socio-demographic features of the sample, such as age (*Age*), gender, area of residence, and education level were collected [31–34].

2.2. Statistical Analysis

A logistic regression model describes the relationships between the willingness to consume a particular product and the motivations of consumers, without including the variability among predictors of different levels (in case of data with nested structure) [35]. Given the nested structure of the studied sample, this study utilized multilevel logistic regression model to understand the consumers' willingness to consume domestic eucalyptus firewood and their motivations, considering the people's preferred supply method.

The multilevel logistic regression model consists of an extension of the regression model in which data are arranged in groups and coefficients can differ among the various groups [19].

In particular, several steps were followed to lead the analysis [19,35]. In fact, in the first step, it is necessary to understand if the dataset show a nested structure calculating the intra-class correlation (ICC) coefficient [36]. After such a check, analysis can be carried out, calculating, and comparing: The simplest two level model, an intermediate model, and the full multilevel logistic regression model [35]. This procedure allowed us to have a final model accounting both for the effects of the lower-level predictor variables and for higher level ones [35].

In particular, following some authors [19,35] and as above mentioned, to examine the existence of a nested structure of the data, an intra-class correlation (ICC) coefficient was calculated [19,35,37]. The ICC coefficient estimates the heterogeneity of the dependent variables among groups i.e., people's preferred supply method. Values of ICC range from 0 to 1, in which 0 indicates that probability does not vary among groups while 1 means the result probability only differentiate between groups. In our case, the ICC coefficient was 0.1432, therefore the calculated ICC of the total dataset means 14% of the difference in the probability of willingness to consume domestic eucalyptus fuelwood was related to the difference in people's preferred supply method. Therefore, to build up the single-level logistic regression model would not be appropriate to describe the relationship between the probability of willingness to consume domestic eucalyptus fuelwood and the motivations of consumers without considering the preferred supply method [38].

Successively, the following steps were applied:

- *The first step: Building up of the simplest two level model.*

The simplest two level model represents the model in which intercepts casually vary among groups [19]. In particular, the simplest two level model was described as:

$$Pr(Will = Yes|x) = \gamma 0 + u0j + rij \quad (1)$$

where *Will* refers to the probability that people are willing to consume domestic eucalyptus firewood, $\gamma 0$ is the fixed intercept, *u0j* represents the random intercept, and *rij* represent the error. In other words, $\gamma 0$ represents the overall average probability that people are willing to consume domestic eucalyptus firewood of the total dataset, while *u0j* represents the variety in the average probability that people are willing to consume domestic eucalyptus firewood. Equation (1) shows two sources of errors in its random part (*u0j* + *rij*) i.e., the between-groups variance (σ_1) and the within-group variance (σ_2). The parametric estimation results for the empty model are given in Table 1.

Table 1. Parametric estimation results for the simplest two level model Equation (1).

AIC	BIC	LogLik			
300.3	307.2	−148.1			
Random effects		$\sigma_1 = 0.38$	$\sigma_2 = 0.62$		
Fixed effects		Value	Standard Error	z value	*p*-value
Intercept		0.51	0.1739	2.965	<0.001

Note: The AIC (Akaike information criterion) and the BIC (Bayesian information criterion) are the well-known model fit indices.

Source: Our elaboration.

- *The second step: Building of the intermediate model.*

The result of the first phase (i.e., ICC estimation) allowed the identification of the two-level model as the most suitable for the analysis. In particular, Equation (1) represents the model in which intercepts casually vary among groups while a general model considers fixed predictors, both at an individual and group level [19]. Using a stepwise procedure [24], several models were identified and the one which showed the lowest AIC was selected. The AIC calculates the likelihood of a model for future estimations and in particular, a smaller AIC means that the corresponding model shows a better prediction performance [19,35].

Moreover, the likelihood ratio test (LRT) was applied to compare the simplest two level model and intermediate ones and according to this, the best model was the intermediate one (Tables 2 and 3).

The intermediate model was described as:

$$Pr(Will = Yes|x) = \gamma 0 + \gamma 1\ Prov + \gamma 2\ Origin + \gamma 3\ Familiarity + \gamma 4Cons + \gamma 5Will\_q + \gamma 6Curiosity + \gamma 7Energetic + \gamma 8Age + u0j + rij. \quad (2)$$

Table 2. Likelihood ratio test (LRT): The simplest two level model and intermediate model.

Model	df	AIC	BIC	LogLik	LRT	*p*-Value
Simplest two level model	2	300.3	307.2	−148.1		
Intermediate model	11	187.6	225.5	−82.8	130.7	<0.0001

Note: The AIC (Akaike information criterion) and the BIC (Bayesian information criterion) are the well-known model fit indices.

Source: Our elaboration.

Table 3. Parametric estimation results for the intermediate model Equation (2).

AIC	BIC	LogLik			
187.6	225.5	−82.8			
Random effects		$\sigma_1 = 0.37$	$\sigma_2 = 0.60$		
Fixed effects		Value	Standard Error	z value	*p*-value
Intercept		−2.06	1.29	−1.59	n.s.
Prov		0.99	0.27	3.56	<0.0001
Origin		−0.88	0.32	−2.73	<0.001
Familiarity		1.26	0.50	2.51	<0.01
Cons		1.81	0.57	3.18	<0.001
Will_q		0.05	0.01	3.32	<0.0001
Curiosity		0.57	0.15	3.61	<0.0001
Energetic		0.71	0.21	3.25	<0.001
Age		−0.05	0.01	−2.85	<0.001

Note: n.s. means that variable is not significant. The AIC (Akaike information criterion) and the BIC (Bayesian information criterion) are the well-known model fit indices.

Source: Our elaboration.

- *The third step: Building up the full model.*

In this case, the final step consisted of building a full model to account for the direct effect of the lower-lever predictor variables and higher-level predictor ones, including the effect of the interaction terms and random intercept effect. The final model was described as follow:

$$Pr(Will = Yes|x) = \gamma 0 + \gamma 1 Prov + \gamma 2\ Origin + \gamma 3 Familiarity + \gamma 4 Cons + \gamma 5 Will\_q + \gamma 6 Curiosity + \gamma 7 Energetic + \gamma 8 Age + \gamma 9 Forn + u0j + rij. \quad (3)$$

In order to understand if the full model was more suitable than the intermediate one, the ANOVA test was applied. In particular, the ANOVA test (Table 4) between the intermediate model Equation (2) and the full model Equation (3) showed that the willingness to consume domestic eucalyptus firewood is significantly influenced by all variables including the supply method (*Forn*) (i.e., loose firewood, firewood arranged in pallets, or firewood in 10–15 kg bags). It can be seen that the AIC values of the full model is smaller than the intermediate model one. This means that adding the supply method (*Forn*) in the model improves the quality of the regression.

Table 4. Likelihood ratio test between the intermediate model Equation (2) and the full model Equation (3).

Model	df	AIC	BIC	LogLik	LRT	*p*-Value
Intermediate model	11	187.6	225.5	−82.8		
Full Model	21	177.5	249.8	−67.7	30.008	<0.0001

Note: The AIC (Akaike information criterion) and the BIC (Bayesian information criterion) are the well-known model fit indices.

Source: Our elaboration.

Finally, the odds' ratio was calculated to show the probability increase/decrease of the willingness to consume domestic eucalyptus firewood when the considered variable increases or decreases.

The analysis was performed using R version 3.6.2 [39].

3. Results and Discussion

3.1. Descriptive Statistics

Within the sample of 282 individuals, 62% were males, average age resulted in about 43 years, 59% of respondents presented a low education level (i.e., primary or secondary school), and 57% of the sample lives in small towns.

Table 5 shows the variables used in the full model, their average values, and standard deviation while Table 6 shows the Pearson correlations among explanatory variables indicating low correlations index among variables used in the full model.

Table 5. Variables used in the full multilevel logistic regression model (n = 282).

No	Label Variables	Description	Mean Value (M) and Standard Deviation (SD)
1	*Will*	Willingness to consume domestic eucalyptus firewood (Yes = 1; No = 0)	M: 0.64; SD: 0.36
		1st level variables	
2	*Prov*	The degree to which consumers pay attention to provenience of firewood (i.e., if firewood comes from tropical countries or Mediterranean ones)	M: 3.53; SD: 1.35
3	*Origin*	The degree to which consumers pay attention to origin of firewood (i.e., if firewood comes from an agro-forestry plant or natural woodland)	M: 3.65; SD: 1.35
4	*Familiarity*	The familiarity with eucalyptus firewood (Yes = 1; No = 0)	M: 0.44; SD: 0.56
5	*Cons*	Consume eucalyptus firewood in the past (Yes = 1; No = 0)	M: 0.17; SD: 0.38
6	*Will_q*	The quantity of eucalyptus firewood that they were willingness to consume (quintals)	M: 14.53; SD: 31.89
7	*Curiosity*	The degree to which consumers are willing to consume eucalyptus firewood for curiosity	M: 3.00; SD: 1.63
8	*Energetic*	The degree to which consumers are willing to consume eucalyptus firewood for its energetic characteristics	M: 3.85; SD: 1.15
9	*Age*	Consumer age	M: 42.95; SD:12.21
		2nd level variable	
10	*Forn*	The eucalyptus firewood supply methods, i.e., firewood in 10–15 kg bags (1), loose firewood (2), and (3) firewood arranged in pallets	M: 1.93; SD: 0.64

Source: Our elaboration on data survey.

Table 6. Pearson correlations between explanatory variables of the full multilevel logistic regression model.

	Prov	***Origin***	***Familiarity***	***Cons***	***Will***	***Will_q***	***Forn***	***Curiosity***	***Energetic***	***Age***
Prov	1.00									
Origin	0.40	1.00								
Familiarity	0.23	0.27	1.00							
Cons	0.17	0.20	0.19	1.00						
Will	0.14	0.01 *	0.15 *	0.03 *	1.00					
Will_q	0.01 *	0.05	0.08 *	0.08	0.23	1.00				
Forn	0.05 **	0.08	0.07 *	0.04	0.10 **	0.12 **	1.00			
Curiosity	0.16	0.24	0.18	0.32	0.13	0.12	0.01	1.00		
Energetic	0.39	0.34	0.09	0.17	0.03	0.11 *	0.06 **	0.04 *	1.00	
Age	0.03	0.08 **	0.15	0.11	0.04	0.01	0.05	0.21	0.09 **	1.00

* p-value < 0.05; ** p-value < 0.01.

In the first parameter of Table 5 (*Will*), 64% of the sample was willing to consume domestic eucalyptus firewood and the theoretical average annual consumption was about 1.5 Mg·yr^{-1}. This finding may indicate that people are becoming more receptive towards eucalyptus, considering it as a suitable firewood alternative.

Moreover, generally, the sample showed attention both to provenience and to the origin of fuelwood and preferred loose firewood as the supply method.

On average, the sample could be willing to consume domestic eucalyptus firewood for its energetic characteristics, even if the respondents did not show curiosity about it. In addition, as a general trend, the sample had neither familiarity (*Familiarity*) or consumed eucalyptus firewood in the past (*Pass*).

3.2. The Full Multilevel Logistic Regression Model

The result of the full multilevel logistic regression model is given in Table 7.

Table 7. Parametric estimation results for the full model Equation (3).

AIC	**BIC**	**LogLik**				
177.5	249.8	−67.7				
Random effects		$\sigma_1 = 0.23$	$\sigma_2 = 0.48$			
Fixed effects		Value	Standard Error	z value	*p*-value	Odds' Ratio
Intercept		−5.73	6.08	−0.94	n.s	-
1st level variables						
Prov		2.44	1.44	1.68	<0.05	3.03
Origin		−2.74	1.73	−1.58	n.s.	-
Familiarity		7.75	2.34	3.31	<0.0001	5.9
Cons		9.18	2.72	3.37	<0.0001	5.5
Will_q		−0.04	0.09	−0.49	n.s.	-
Curiosity		1.34	0.74	1.80	<0.05	1.3
Energetic		3.12	1.08	2.88	<0.001	2.1
Age		−0.16	0.08	−1.89	<0.05	−0.1
2nd level variable						
Forn		1.38	2.76	0.50	<0.0001	2.2

Note: n.s. means that variable is not significant. The AIC (Akaike information criterion) and the BIC (Bayesian information criterion) are the well-known model fit indices.

Source: Authors' elaboration.

The parameters *Familiarity*, *Cons*, *Energetic*, and *Forn* resulted to be the most significant in the full model, followed by *Prov*, *Curiosity*, and *Age*. All variables showed a positive sign except *Age*.

Unfortunately, there are not many studies focused on the willingness to consume domestic eucalyptus firewood which could help us to evaluate the findings of the present work, which represent a novelty in this field.

Our findings show that consumers who pay attention to the supply method (*Forn*), i.e., loose firewood, firewood arranged in pallets, or firewood in 10–15 kg bags, are 2.2 times more likely to consume domestic eucalyptus firewood than other consumers.

The knowledge of the existence of eucalyptus (*Familiarity*) as a firewood alternative resulted in an important factor in the consumers' willingness, indeed, those who reported to know it, asserted to be more willing to consume it in the future. In particular, consumers that showed familiarity with eucalyptus firewood are 5.9 times more likely to consume it than other people. Our findings are in line with current literature [40] where familiarity is a key attribute that influences consumer behaviour and, consequently, decision making [41]. In fact, familiarity showed a significant influence on the acceptability of a given product [42]. Moreover, increasing familiarity, through further information, about new products could improve their accepting rate [43] and this aspect resulted to be a key

concerning firewood [44]. Johnson et al., (1984) suggested that familiarity involves a process of looking for information and processing both new and already existing goods [45]. In addition, Fischer et al., (2008) showed that the more information the consumers gather, the more products they are willing to purchase [46]. This is an important aspect, taking into consideration that firewood consumption is linked with information received [23], and in general the familiarity with a given product, through available information, could increase the likelihood of consuming it in the future [47].

More recently, Seo et al., (2013) highlighted that familiarity with a product is linked to both level of information [41] and, in accordance with Ryynänen et al., (2018), to previous experience [41,48]. Our findings confirmed this assertion, considering that previous experience with eucalyptus firewood showed an important role in the consumers' willingness. Indeed, respondents who reported previous experiences with eucalyptus firewood (*Cons*) were more willing to consume it again. In particular, people who had previous experiences with eucalyptus firewood are 5.5 times more likely to consume it than other people. Our results are in line with literature about consumer behaviour, where previous experience with an innovative product enhances consumer acceptance [49] and people with previous experiences resulted in having a higher probability to willingly consume it again in future [25].

In our case, the geographic provenience of firewood (*Prov*) (i.e., if firewood comes from tropical countries or Mediterranean ones) also seemed to be one of the reasons that could push people to consume eucalyptus firewood. Indeed, respondents who pay attention to the geographic provenience of firewood are 3.03 times more likely to consume it than other consumers. These findings are also in line with previous literature [50] where the provenience of wood was a key factor that influenced the consumer behaviour. Moreover, according to Paletto et al., (2017) the geographic provenience of wood is one of the most relevant factors in the enhancement strategies for local fuelwood [29]. The consumer relies on the image of place of production (negative or positive) as a quality standard [24]. In this framework, attention towards geographic provenience of firewood could imply benefits for Italian local economies [29], especially in Southern Italy where eucalyptus is usually located [2].

Moreover, curiosity towards a new product also demonstrated a certain importance in the respondents' choice. In particular, those who showed a positive attitude about new products (*Curiosity*) resulted to be 1.3 times more willing to consume domestic eucalyptus firewood. Similar results were reported by Palmieri et al., (2020), which showed that willingness to consume a new product is linked to consumers' curiosity towards new products [25].

It is well known that the combustion of wood in fireplaces involves a very low level of technology, with an equally low energy conversion efficiency. For this reason, it is not surprising that the consumer described by the sample showed a marked interest in technical aspects related to the quality of the wood to be burned. In fact, energetic density of firewood (*Energetic*) was another factor that had an important influence on respondents' choice. Technical aspects such as energetic density could shape the respondents' behaviour. In particular, people who pay attention to the energetic aspect of firewood are 2.1 times more likely to consume it than other people. Vásquez Lavin et al., (2020) also reported that technical aspects such as heating value and moisture of firewood were considered very important for what concern consumer's choice [51]. Similar results were confirmed by other studies [23] where energetic density of firewood played an important role in consumer choices. This aspect could be very interesting, taking into account that eucalyptus firewood has similar heating value to other fuelwood species, for example oak [22].

Another significant variable in our model was the consumer's age. Indeed, respondents' age resulted to be an important driver and was negatively associated with willingness to consume domestic eucalyptus firewood. According to our results, younger people showed a higher willingness to consume eucalyptus firewood than older ones. In fact, young people are 0.1 times more likely to consume it than older people. Similar results were found by some authors [25], where age exerted a negative effect on the probability to willingly consume a given new product. On the other hand, this aspect cannot be generalized because other authors reported that respondents' age had no significant influence on preference [50].

4. Conclusions

Italy is one of the world's major importers of firewood and medium rotation eucalyptus plantations could represent a source of biomass for the firewood market. Although, excluding some areas of Southern Italy, the eucalyptus is a wood species not extensively used as firewood. People's willingness to consume a product depend on several parameters including the different supply methods of a product.

This study aimed to understand consumer willingness to consume domestic eucalyptus firewood and their motivations by considering the preferred supply method.

Although the sample of this research cannot be considered representative of the entire Italian population, as happens in many studies about consumer behaviour, the results obtained gave interesting hints to understand the process of consumer decision-making. In fact, further studies are necessary to better understand the Italian consumers' propensity towards eucalyptus fuelwood acceptance, in terms of their individual preferences, attitudes, or concerns.

This research suggested that factors such as age, previous experience, familiarity, supply method, attitude towards new product, provenience, and technical characteristics of firewood, i.e., energetic density, play an important role in shaping individual behaviour concerning eucalyptus firewood consumption. In summary, the owners of eucalyptus plantations should address themselves towards informed young people, curious, who already know eucalyptus as fuelwood species, and who pay attention to the supply method, provenience, and technical characteristics of firewood (i.e., heating value). Our results are interesting, taking into consideration that eucalyptus plantations are less environmentally impactful than other crops, therefore developing a eucalyptus fuelwood value chain could reduce the environmental impacts linked to firewood production.

Even if the conclusions of the present work cannot be over-generalised, the present findings could open new spaces for domestic eucalyptus firewood, considering that the quantity and quality of information could shape the probability that people would be willing to consume it. In conclusion, a growing eucalyptus demand as sustainable firewood alternative would be an interesting opportunity for farmers to enter the sector and target themselves to specific market niches.

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References

1. Bayle, G.K. Ecological and social impacts of eucalyptus tree plantation on the environment. *J. Biodivers. Conserv. Bioresour. Manag.* **2019**, *5*, 93–104. [CrossRef]
2. Sgroi, F.; Di Trapani, A.M.; Foderà, M.; Testa, R.; Tudisca, S. Economic assessment of Eucalyptus (spp.) for biomass production as alternative crop in Southern Italy. *Renew. Sustain. Energy Rev.* **2015**, *44*, 614–619. [CrossRef]
3. Boothroyd-Roberts, K.; Gagnon, D.; Truax, B. Hybrid poplar plantations are suitable habitat for reintroduced forest herbs with conservation status. *SpringerPlus* **2013**, *2*, 507. [CrossRef]
4. Burrows, W.H.; Henry, B.K.; Back, P.V.; Hoffmann, M.B.; Tait, L.J.; Anderson, E.R.; Menke, N.; Danaher, T.; Carter, J.O.; McKeon, G.M. Growth and carbon stock change in eucalypt woodlands in northeast Australia: Ecological and greenhouse sink implications. *Glob. Chang. Biol.* **2002**, *8*, 769–784. [CrossRef]

5. Du, H.; Zeng, F.; Peng, W.; Wang, K.; Zhang, H.; Liu, L.; Song, T. Carbon storage in a Eucalyptus plantation chronosequence in Southern China. *Forests* **2015**, *6*, 1763–1778. [CrossRef]
6. Pettenella, D.; Masiero, M. *Una Nuova Economia del Legno-Arredo tra Industria, Energia e Cambiamento Climatico*; Gargiulo, T.Z.R., Ed.; FrancoAngeli: Monza, Italy, 2007.
7. Deidda, A.; Buffa, F.; Linaldeddu, B.T.; Pinna, C.; Scanu, B.; Deiana, V.; Satta, A.; Franceschini, A.; Floris, I. Emerging pests and diseases threaten eucalyptus camaldulensis plantations in Sardinia, Italy. *iForest Biogeosci. For.* **2016**, *9*, 883–891. [CrossRef]
8. Pari, L.; Bergonzoli, S.; Suardi, A.; Scarfone, A.; Alfano, V.; Mattei, P.; Lazar, S. Produttività dell'eucalipto Un impianto quinquennale in Italia centrale. *Sherwood-Foreste ed Alberi Oggi* **2019**, *241*, 70–72.
9. Mughini, G.; Rosso, L. Selezioni di cloni di eucalitto per la destinazione da biomassa. *Sherwood-Foreste ed Alberi Oggi* **2017**, 45–52.
10. Mughini, G. Suggestions for sustainable Eucalyptus clonal cultivation in Mediterranean climate areas of central and southern Italy. *For. Riv. Selvic. Ed. Ecol. For.* **2016**, *13*, 47–58. [CrossRef]
11. Pierobon, F.; Zanetti, M. Life cycle environmental impact of firewood production—A case study in Italy. *Appl. Energy* **2015**, *150*, 185–195. [CrossRef]
12. Caserini, S.; Fraccaroli, A.; Monguzzi, A.; Moretti, M.; Angelino, E. *Stima dei Consumi di Legna da Ardere per Riscaldamento ed Uso Domestico in Italia [Estimation of the Domestical Firewood Consumption in Italy]*; Agenzia Nazionale per la Protezione dell'Ambiente e per i Servizi Tecnici (APAT), Agenzia Regionale per la Protezione dell'Ambiente (ARPA): Milano, Italy, 2008; p. 60.
13. Mairota, P.; Manetti, M.C.; Amorini, E.; Pelleri, F.; Terradura, M.; Frattegiani, M.; Savini, P.; Grohmann, F.; Mori, P.; Terzuolo, P.G.; et al. Opportunities for coppice management at the landscape level: The Italian experience. *iForest Biogeosci. For.* **2016**, *9*, 775–782. [CrossRef]
14. Medeiros, G.; Florindo, T.; Talamini, E.; Fett Neto, A.; Ruviaro, C. Optimising Tree Plantation Land Use in Brazil by Analysing Trade-Offs between Economic and Environmental Factors Using Multi-Objective Programming. *Forests* **2020**, *11*, 723. [CrossRef]
15. Garcia-Gonzalo, J.; Pais, C.; Bachmatiuk, J.; Barreiro, S.; Weintraub, A. A progressive hedging approach to solve harvest scheduling problem under climate change. *Forests* **2020**, *11*, 224. [CrossRef]
16. Luwesi, C.N.; Obando, J.A.; Shisanya, C.A. The Impact of a Warming Micro-Climate on Muooni Farmers of Kenya. *Agriculture* **2017**, *7*, 20. [CrossRef]
17. Simioni, F.J.; de Almeida Buschinelli, C.C.; Moreira, J.M.M.Á.P.; dos Passos, B.M.; Girotto, S.B.F.T. Forest biomass chain of production: Challenges of small-scale forest production in southern Brazil. *J. Clean. Prod.* **2018**, *174*, 889–898. [CrossRef]
18. Cuong, T.; Chinh, T.T.Q.; Zhang, Y.; Xie, Y. Economic Performance of Forest Plantations in Vietnam: Eucalyptus, Acacia mangium, and Manglietia conifera. *Forests* **2020**, *11*, 284. [CrossRef]
19. Mastronardi, L.; Romagnoli, L.; Mazzocchi, G.; Giaccio, V.; Marino, D. Understanding consumer's motivations and behaviour in alternative food networks. *Br. Food J.* **2019**. [CrossRef]
20. Botti, S.; McGill, A.L. The locus of choice: Personal causality and satisfaction with hedonic and utilitarian decisions. *J. Consum. Res.* **2011**, *37*, 1065–1078. [CrossRef]
21. Palmieri, N.; Perito, M.A.; Lupi, C. Consumer Acceptance of Cultured Meat: Some Hints from Italy. *Br. Food J.* **2020**. [CrossRef]
22. Mughini, G.; Gras, M.; Salvati, L.; Filippelli, S.; Tanchis, U. Velino and Viglio: Two eucalypt hybrid clones for Italy. *Sherwood-Foreste ed Alberi Oggi* **2012**, *187*, 41–45.
23. Palmieri, N.; Suardi, A.; Pari, L. Italian consumers' willingness to pay for eucalyptus firewood. *Sustainability* **2020**, *12*, 2629. [CrossRef]
24. Palmieri, N.; Perito, M.A. Consumers' Willingness To Consume Sustainable and Local Wine in Italy. *Ital. J. Food Sci.* **2020**, *32*, 222–233.
25. Palmieri, N.; Perito, M.A.; Macrì, M.C.; Lupi, C. Exploring consumers' willingness to eat insects in Italy. *Br. Food J.* **2019**, *121*, 2937–2950. [CrossRef]
26. Aguilar, F.X.; Cai, Z. Conjoint effect of environmental labeling, disclosure of forest of origin and price on consumer preferences for wood products in the US and UK. *Ecol. Econ.* **2010**, *70*, 308–316. [CrossRef]
27. Wöhler, M.; Andersen, J.S.; Becker, G.; Persson, H.; Reichert, G.; Schön, C.; Schmidl, C.; Jaeger, D.; Pelz, S.K. Investigation of real life operation of biomass room heating appliances—Results of a European survey. *Appl. Energy* **2016**, *169*, 240–249. [CrossRef]

28. Adapa, S. Factors influencing consumption and anti-consumption of recycled water: Evidence from Australia. *J. Clean. Prod.* **2018**, *201*, 624–635. [CrossRef]
29. Paletto, A.; Notaro, S.; Pastorella, F.; Giacovelli, G.; Giovannelli, S.; Turco, R. Certificazione forestale in Calabria: Attitudini, preferenze e disponibilità a pagare delle imprese di seconda trasformazione del legno. *For. Silvic. For. Ecol.* **2017**, *14*, 107. [CrossRef]
30. Jensen, K.L.; Jakus, P.M.; English, B.C.; Menard, J. Consumers' willingness to pay for eco-certified wood products. *J. Agric. Appl. Econ.* **2004**, *36*, 617–626. [CrossRef]
31. Altamore, L.; Ingrassia, M.; Columba, P.; Chironi, S.; Bacarella, S. Italian Consumers' Preferences for Pasta and Consumption Trends: Tradition or Innovation? *J. Int. Food Agribus. Mark.* **2020**, *32*, 337–360. [CrossRef]
32. Ceschi, S.; Canavari, M.; Castellini, A. Consumer's Preference and Willingness to Pay for Apple Attributes: A Choice Experiment in Large Retail Outlets in Bologna (Italy) Consumer's Preference and Willingness to Pay for Apple Attributes: A Choice Experiment in Large Retail Outlets in Bol. *J. Int. Food Agribus. Mark.* **2018**, *30*, 305–322. [CrossRef]
33. Ingrassia, M.; Sgroi, F.; Tudisca, S.; Chironi, S. Study of Consumer Preferences in Regard to the Blonde Orange Cv. Washington Navel "Arancia Di Ribera PDO". *J. Food Prod. Mark.* **2017**, *23*, 799–816. [CrossRef]
34. Marinda, P.A. Child–mother nutrition and health status in rural Kenya: The role of intra-household resource allocation and education. *Int. J. Consum. Stud.* **2006**, *30*, 327–336. [CrossRef]
35. Shi, S.; Li, H.; Ding, X.; Gao, X. Effects of household features on residential window opening behaviors: A multilevel logistic regression study. *Build. Environ.* **2020**, *170*, 106610. [CrossRef]
36. Ruscone, M.N. *Utilizzo dell'ICC Come Indicatore dell'Esistenza di Una Struttura Gerarchica*; Università Cattolica del Sacro Cuore, Dipartimento di Scienze Statistiche: Milano, Italy, 2012; pp. 1–28.
37. Iezzi, E. Modelli multilivello a scelta binaria: I vantaggi di una loro applicazione ai dati sanitari. *Politiche Sanit.* **2009**, *10*, 69–78.
38. Bacci, S.; Chiandotto, B. Mobilità Dei Laureati per Motivi di Lavoro: UN' Analisi Multilivello. *Stat. Appl.* **2007**, *19*, 5–40.
39. R Development Core Team. *R: A Language and Environment for Statistical Computing*; R Foundation for Statistical Computing: Vienna, Austria, 2019.
40. Hiser, J.; Nayga, R.M.; Capps, O. An exploratory analysis of familiarity and willingness to use online food shopping services in a local area of Texas. *J. Food Distrib. Res.* **1999**, *30*, 78–90.
41. Seo, S.; Kim, O.Y.; Oh, S.; Yun, N. Influence of informational and experiential familiarity on image of local foods. *Int. J. Hosp. Manag.* **2013**, *34*, 295–308. [CrossRef]
42. Tan, H.S.G.; van den Berg, E.; Stieger, M. The influence of product preparation, familiarity and individual traits on the consumer acceptance of insects as food. *Food Qual. Prefer.* **2016**, *52*, 222–231. [CrossRef]
43. Jang, S.C.S.; Kim, D.H. Enhancing ethnic food acceptance and reducing perceived risk: The effects of personality traits, cultural familiarity, and menu framing. *Int. J. Hosp. Manag.* **2015**, *47*, 85–95. [CrossRef]
44. Van Kempen, L.; Muradian, R.; Sandóval, C.; Castañeda, J.P. Too poor to be green consumers? A field experiment on revealed preferences for firewood in rural Guatemala. *Ecol. Econ.* **2009**, *68*, 2160–2167. [CrossRef]
45. Johnson, E.J.; Russo, J.E. Product familiarity and learning new information. *J. Consum. Res.* **1984**, *11*, 542–550. [CrossRef]
46. Fischer, A.R.H.; De Vries, P.W. Everyday behaviour and everyday risk: An approach to study people's responses to frequently encountered food related health risks. *Health. Risk Soc.* **2008**, *10*, 385–397. [CrossRef]
47. Iannuzzi, E.; Sisto, R.; Nigro, C. The willingness to consume insect-based food: An empirical research on italian consumers. *Agric. Econ.* **2019**, *65*, 454–462. [CrossRef]
48. Ryynänen, T.; Heinonen, V. From nostalgia for the recent past and beyond: The temporal frames of recalled consumption experiences. *Int. J. Consum. Stud.* **2018**, *42*, 186–194. [CrossRef]
49. Verbeke, W. Profiling consumers who are ready to adopt insects as a meat substitute in a Western society. *Food Qual. Prefer.* **2015**, *39*, 147–155. [CrossRef]
50. Aguilar, F.X.; Vlosky, R.P. Consumer willingness to pay price premiums for environmentally certified wood products in the US. *For. Policy Econ.* **2007**, *9*, 1100–1112. [CrossRef]

51. Vásquez Lavin, F.; Barrientos, M.; Castillo, Á.; Herrera, I.; Ponce Oliva, R.D. Firewood certification programs: Key attributes and policy implications. *Energy Policy* **2020**, *137*, 111160. [CrossRef]