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Stakeholders' preferences and the assessment of forest ecosystem services: a comparative analysis in Italy

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ABSTRACT: Values are qualities and beliefs orientating human actions and they change according to socio-economic variables such as gender, culture, education and income. Incorporating stakeholders' values and attitudes in the forest planning is essential for reducing conflicts among forest users and ensuring successful formulation and implementation of the plans. The paper focuses on the analysis of stakeholders' attitudes and preferences to the forest ecosystem services considering three types of attitudes: biocentric attitudes, social-altruistic attitudes, and individual attitudes. The stakeholders' preferences were analysed in four case studies in Italy, characterized by different socio-economic structures and relationship between people and territory. Socio-economic attributes were tested as predictors of stakeholder preferences. A semi-structured questionnaire was used to collect opinions and preferences from altogether 327 stakeholders' involved in forest planning. Results show that different background and culture influence the priorities given to forest ecosystem services. The study suggests paying attention to the evaluation of stakeholders' preferences to forest ecosystem services when defining forest management guidelines, which could contribute to reduce the distance between communities and decision makers.

Keywords: ecosystem values; environmental attitudes; decision making process

According to the United Nations' Millennium Ecosystem Assessment (MA 2005) goods and services represent the benefits human populations derive, directly or indirectly, from ecosystem functions (Costanza et al. 1997). In literature there are many classifications and characterizations of ecosystem services (Ehrlich, Ehrlich 1981; Wallace 2007; de Groot et al. 2010). One of the most common considers four groups of ecosystem services (TEEB 2010): provisioning services (e.g. food, water, fodder, timber), regulating services (e.g. climate regulation, rainfall interception, air quality regulation, erosion control, water purification, pest and disease control), supporting services (e.g. soil formation, photosynthesis, nutrient cycling, natural diversity) and cultural services (e.g. aesthetic landscape, natural area tourism, cultural and environmental heritage). Some of these ecosystem services (ESs) have a target market, while others – for example biodiversity, water regulation, natural hazards mitigation – are without market (Costanza et al. 2008; Fontana et al. 2013). Besides, many ESs are characterized by both publicness and international scale (MA 2005). Publicness, or non-exclusiveness of public services, means that their benefits accrue to all, while the international scale refers to the fact that these services benefit people from more than one country (Montero, Perrings 2011). Air quality regulation and climate regulation are public services provided by forests, involving the world as a whole, while others (i.e. aesthetic landscape, tourism, erosion control, pro-

Fig. 1. Hierarchical cognitive structure used in the preference-based approach (modified by Nordlund, Westin 2011)

tection against natural hazards) are public services at a national or local scale.

In literature two approaches to valuing ESs are described (Kumar 2010; Buonocore et al. 2014): biophysical approach and preference-based approach. The biophysical approach uses a "cost of production" or "donor-side" perspective that derives values from physical costs (embodied labour, land requirement, energy or material input) invested to produce a given good or service. The preference-based approach relies on models of human behaviour and rests on the assumption that values arise from individuals' subjective preferences. This approach is based on a three-level hierarchical cognitive structure (Nordlund, Westin 2011): values, beliefs and attitudes (Fig. 1). It is important to specify that values are conceptions of a condition or state that a person or a cohort actor considers desirable. Values are significant factors that are able to direct social actions, attitudes and beliefs, where beliefs refer to thoughts and opinions concerning an attitude object and attitudes refer to a positive or negative evaluation of an attitudinal (mental) object (Eagly, Chaiken 1993). It is important to highlight that from the valuation literature it emerges that there is a variability in the valuation of ecosystem services, and the same service when provided in different local context can vary substantially in its economic value (Zhang et al. 2007). People appear to value ecosystem services quite differently in different biophysical and sociocultural contexts (Costanza et al. 2006). The importance of the context is based on the influence that it is able to impose on individuals and groups.

In 2005 the European Commission used the local capital concept for indicating a set of material and immaterial elements available in a local context. On the basis of this definition, the local capital is a dynamic concept which changes depending on the spatial and local context (EC 2005). Local capital can be assessed in four dimensions: (*i*) natural capital is a local resource and represents the common good available for a local area; (*ii*) human capital is related to the level of education of local inhabitants; (*iii*) social capital refers to the links among people and between people and the environment relevant in creating the local identity; (*iv*) cultural capital is a system of shared models of behaviour, mutual trust, common morals, cognitive codes and common language and representations, including a concept of cultural heritage (Capello et al. 2008). Some studies showed that the four dimensions of local capital influence inhabitant's values, beliefs and attitudes, that in turn they modify their perceptions about available ESs (Pretty, Ward 2001; Pellizzoni, Osti 2008). As the identification of ESs is motivated by the benefits they provide for human well-being, understanding people's values and needs is particularly important (Menzel, Teng 2010). Moreover, the analysis of stakeholders' perceptions of ecosystem services is a useful tool for identifying ESs synergies and trade-offs (Palomo et al. 2011). Incorporating preferences and knowledge of social actors in environmental policy agendas allows to increase social acceptability and reduce conflicts among users (Allen et al. 2013). Finally, the knowledge of stakeholders' values, beliefs, attitudes and preferences could facilitate the predisposition of a more effective participative forest management approach (Fig. 2).

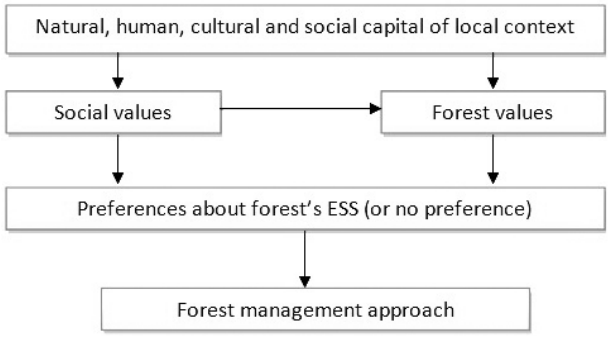

Fig. 2. The influence of local context on stakeholders' values and preferences

However, only few studies of ecosystem services have addressed stakeholders' perspective in the valuation of ecosystem services (Pereira et al. 2005; Lamarque et al. 2011).

Starting from these preliminary considerations, the paper focuses on a comparative analysis of stakeholders' preferences in four case studies in Italy, characterized by different socio-economic contexts. The main objective of the paper is to investigate what variables influence stakeholders' preferences related to forest ESs: local context or interests. A secondary objective is to understand if the rational choice theory is an adequate model to explain the preferences of different groups of interests.

Fig. 3. Location of study areas in Italy

MATERIAL AND METHODS

Study areas. The research has been conducted in four case studies, characterized by a similar spatial scale (land area ranges from 36,000 to 72,000 ha) but with socio-economic differences. Besides, the case studies are located in different regions of Italy: Non Valley in Northern Italy (Trentino-Alto Adige region), Alto Agri and Matese in Southern Italy (Basilicata and Molise regions) and Arci-Grighine in Sardinia Island (Fig. 3).

Non Valley is located in the north-west of the Province of Trento, in the Italian Alps and the altitude of the Valley is between 400 m and 2,500 m a.s.l., characterized by a cool, temperate and mild continental climate. The land area of the valley is 59,674 ha, with a population of 39,134 inhabitants corresponding to 14,393 households. Non Valley is a rural district characterized by an important role of the primary sector, which employs around 20% of the local workforce. The cultivation of the apple trees (6,828 ha) represents a priority for the development of the area. The pasture area covers 11% of the total area, while the forest area accounts for 65% (80% are public and common forests and 20% are private forests). Non Valley is characterized by a high level of citizens' participation in community life and a high social capital.

Matese district, located in the Campobasso province (Molise region), covers about 36,500 ha, with a population of 21,022 inhabitants. The present population is the result of a slow population decline (1951 to 2009 trend: –35.5%), which was started in the 50s' and has continued until today. The main land uses in the Matese district are: forests (44.1%), agricultural lands (29.2%) and grasslands (15.9%). Privately-owned forests amount to approximately 66%, whereas the remaining 34% is owned by public administrations. The agricultural sector plays an essential role in the economic structure of the district, involving 27% of the active population. Conversely, the industrial sector is extremely weak, as well as the tourist sector, which has not shown a significant development so far, as demonstrated by the very scarce presence of factories operating in this productive sector.

Arci-Grighine district, located in the Centre-East area of Sardinia Island, has a total surface of 55,183 ha. The population is 26,207 inhabitants with a density of about 0.47 inhabitants·ha^{-1}. The district comprises 21 municipalities. The forest surface covers 51.2% (28.253 ha) of the territory of Arci-Grighine; other land uses are agricultural land (33.9%), grassland (10.0%) and agro-pastoral land (4.9%). In Arci-Grighine the rural sector plays quite an important role, based primarily on the cork production and breeding. From the cultural point of view, the population of Arci-Grighine district has a strong sense of community and link with the territory (Paletto et al. 2010).

Alto Agri district in Basilicata region has a surface of 72,550 ha and the population of 33,739 inhabitants. The population density, which is less than 46.5 people per km^2, is the result – similarly like for the Matese district – of slow depopulation started in the 50s' and continued down to nowadays. The forest area is equal to 58.4% of the entire territory, while other main land uses are pastures and meadows. The social capital of the district is quite low, with a weak social network basically due to an insufficient level of association and to the pivotal role of institutions that are key actors in the decisional process (Paletto et al. 2012).

Research survey. In the survey 327 stakeholders of the forest sector were considered globally for the four study areas, identified through a preliminary stakeholder analysis for each case study. Stakeholder analysis identifies, characterizes and classifies the stakeholders in order to determine the extent of their future involvement in the decision-making process (Grimble, Wellard 1997). Stakeholder analysis was applied in two consequential steps (Reed et al. 2009): (1) stakeholder identification and (2) analytical categorization of the stakeholders.

In the first step, all the stakeholders affecting and/or affected by the policies, decisions, and ac-

Table 1. Distribution of stakeholders into groups of interest in the case studies

Case study	Public administrations	Associations/NGO	Actors		Total
			forest-wood chain	tourism sector	
Non Valley	25	7	13	6	51
Matese	14	5	16	4	39
Arci-Grighine	43	17	55	9	124
Alto Agri	30	23	41	19	113
Total	112	52	125	38	327

NGO – Non-Governmental Organizations

tions of the forest sector were identified. During the second step, stakeholders were categorized into groups of interest. The groups of interest can be considered as clusters of stakeholders (organizations, associations or individuals) who are members of the existing network in forestry-related issues and representatives for different interests related to forest ESs valorization. These groups are key social actors in the collective action because they perform a number of crucial functions such as the articulation and aggregation of interests, the diffusion of information, the making of a political élite.

In the present study, four groups of interests were identified: (*i*) public administrations (i.e. municipalities, regional or provincial forest service, Chamber of Commerce, industry, handicraft and agriculture), including also public forest owners, (*ii*) associations and Non-Governmental Organizations (NGO) (i.e. hunting and environmental associations), (*iii*) forest-wood chain actors (private forest owners, forestry companies, farmer entrepreneurs), and (*iv*) actors of the tourism sector (i.e. tourism promotion bodies, hotel owners).

With the stakeholder analysis 51 stakeholders were identified in Non Valley, 39 in Matese district, 124 in Arci-Grighine district and 113 in Alto Agri district. The distribution of the stakeholders into the groups of interest is reported in Table 1. The large differences in stakeholder number and distribution in the case studies are due to different socio-economic characteristics and to a dissimilar relevance of the forest resource in the four contexts. Matese is the smallest study area and has a limited number of stakeholders, while the low number of stakeholders in Non Valley can be explained by the prevalence of public forest owners, and the limited presence of small private forest owners. Alto Agri and Arci-Grighine show a more similar number and distribution of stakeholders, with a high number of forest-wood chain actors (private forest owners and farmers) and associations.

Semi-structured questionnaires were used to identify individual preferences attributed by stakeholders to forest ESs (see Appendix). The initial questionnaire was pre-tested for question effectiveness and clarity on a sample of stakeholders and modified. The final questionnaire was administered through personal interviews to a total of 327 stakeholders.

Respondents were asked questions about the importance of the various ESs. They had to express, on a five-point Likert scale, ranging from "very low importance" to "very high importance", their opinion about the importance of each ecosystem service. The forest ESs considered were: timber production, firewood production and non-wood products (NWP) for the provisioning services; natural hazard mitigation and water and air quality for the regulating services; biodiversity for the supporting services; recreation, aesthetic (landscape) and gaming for the cultural services.

The collected data were processed from the statistical point of view using XLStat 2012 (Microsoft Ltd., New York, USA). Since the normal distribution in the various groups could not be guaranteed and the number of observations was limited, the non-parametric Kruskal-Wallis test was used for statistical analysis, assessed at the $\alpha = 0.01$ level. In particular, the statistical differences between groups of interest and between local contexts were tested.

Differences between groups of interest. In order to investigate the influence of stakeholders' group of interest on the preferences for forest ESs and to explain and foresee stakeholders' behaviours, we applied the theory of collective action (Ostrom 1998) and the rational choice theory (Goode 1997). The theory of rational choice helps us to understand human self-interested, short-term maximizers, but it is not able to explain the choice of cooperation. Ostrom (1998) integrated this theory with a behavioural approach able to explain social dilemmas as referring "to a large number of situations in which individuals make independent choices in an interdependent situation" or

"better than rational" cooperative situations, as environment choices.

Consequently, we hypothesized that public administrations should have the purpose to maximize the common good favouring those functions that enhance the well-being of citizens (i.e. air and water quality, direct protection of forest against avalanches, landslides and rockfalls). Conversely, the forest-wood chain actors and the tourism sector actors have the objective to maximize personal utility (maximization of short-term self-interest yields outcomes). The difference between these two groups is that for the first group the best action is the enhancement of the timber, firewood and non-wood forest products (NWFP production), while for the second group the profit maximization condition can be obtained making lucrative some recreational services (i.e. recreation in forest and landscape contemplation) provided by the forest (Notaro et al. 2012). With regard to environmental associations and NGOs, two possibilities can occur: hunting associations have the purpose to maximize the cultural services, because they include gaming, while environmental associations should prefer the supporting and regulating services. The hypothetical payoff functions for the above-mentioned groups of interest can be expressed in the following way (Eq. 1).

Set of possible actions:

$$A = (a_1, a_2, a_3, a_4) \quad (1)$$

where:

a_1 – valorization of provisioning services (timber, firewood and NWP)

a_2 – valorization of regulating services (air and water quality, natural hazard protection)

a_3 – valorization of supporting services (biodiversity)

a_4 – valorization of cultural services (recreation, landscape, gaming)

Hypothetical pay-off function for the public administrations (u – utility) (Eq. 2):

$$u(a_2) > u(a_3) > u(a_1) \geq u(a_4) \quad (2)$$

Hypothetical pay-off function for the forest-wood chain actors (Eq. 3):

$$u(a_1) > u(a_2) \geq u(a_3) \geq u(a_4) \quad (3)$$

Hypothetical pay-off function for associations and NGOs (Eq. 4):

$$u(a_4) \geq u(a_2) \geq u(a_3) > u(a_1) \quad (4)$$

Hypothetical pay-off function for the tourism sector actors (Eq. 5):

$$u(a_4) > u(a_2) \geq u(a_3) \geq u(a_1) \quad (5)$$

Differences between local contexts. According to Ostrom (1998), the "trust that individuals have in others, the investment others make in trustworthy reputations, and the probability that participants will use reciprocity norms" depend upon local context and capital. All these variables are able to modify the levels of collaboration and to increase or decrease attitudes and behaviours of cooperation. Individuals are concerned about the well-being of their local community, and the local-interest mechanism suggests that local contexts can exert influence on attitudes. Social interaction is one of the main mechanisms through which local contexts influence individual attitudes (Johansson Sevä 2009).

Books and Prysby (1991) described the local context in terms of structure and interaction patterns that go beyond the mere aggregation of individual characteristics and attitudes. The local context can influence individual, social-altruistic and biocentric attitudes, in a self-transcendence or self-enhancement perspective (Schultz, Zelezny 1999). Individual interest is based on self-enhancement in the sense of power, success, ambitions, while social-altruistic attitude is based on human goals or human benefits (protecting the environment is important for the future generations). Finally, biocentric attitude transcends self-interests and society interests for beauty, ethic, loyal and other values (e.g. aesthetic landscape).

Taking into account these theoretical principles, in order to analyse the influence of local context on stakeholders' preferences attributed to forest ESs, three categories of attitudes were considered (Table 2): biocentric, social-altruistic and individual attitudes. ESs strictly linked to the environment – e.g. biodiversity and landscape – are expression of biocentric attitudes, while preferences to the common good such

Table 2. Classification of forest ESs in categories of attitudes

Category of attitudes	Forest ESs
Biocentric	natural diversity landscape
Social-altruistic	water and air quality protection against natural hazards
Individual	timber production firewood production NWP recreation gaming

ESs – ecosystem services, NWP – non-wood products

Table 3. Mean values for the forest ESs by groups of interest in four case studies

Case study	Firewood	Timber	NWP	Protection	Gaming	Biodiversity	Air and water quality	Landscape	Recreation
Non Valley									
Public administrations	3.16	2.96	2.44	3.40	2.40	3.36	3.36	3.52	2.92
Associations	3.00	2.71	1.86	**3.86**	2.57	3.71	3.43	3.71	2.43
Forest-wood chain actors	3.23	3.46	2.08	3.77	2.38	3.54	3.31	**3.85**	2.85
Tourism sector actors	2.17	2.00	2.50	3.17	1.67	3.50	2.33	**3.67**	3.00
Matese									
Public administrations	**3.77**	1.38	3.38	3.14	2.77	3.69	3.69	-	3.38
Associations	2.80	1.60	3.00	3.60	2.60	**4.00**	**4.00**	-	3.20
Forest-wood chain actors	**3.81**	1.63	3.25	3.41	2.63	3.50	3.50	-	2.56
Tourism sector actors	**3.75**	2.25	3.00	3.25	3.50	3.00	3.00	-	2.50
Arci-Grighine									
Public administrations	3.74	1.05	2.73	2.40	**3.93**	3.26	3.67	3.21	2.81
Associations	3.29	1.18	2.66	2.71	**3.88**	2.88	3.41	3.53	2.18
Forest-wood chain actors	3.51	1.15	2.57	1.95	**3.82**	2.98	3.27	3.29	2.49
Tourism sector actors	3.67	1.00	2.67	2.11	**4.00**	3.00	3.44	3.78	3.11
Alto Agri									
Public administrations	3.68	1.87	3.18	2.60	**3.70**	3.37	3.63	3.00	2.83
Associations	**3.61**	2.17	3.13	2.04	**3.61**	2.65	3.09	2.57	2.87
Forest-wood chain actors	3.45	2.02	3.01	2.46	**3.54**	3.05	3.45	2.78	2.73
Tourism sector actors	**3.53**	1.74	3.03	1.84	3.47	2.47	3.32	2.26	2.79

in bold – maximum value per group of interest

as water and air quality and protection against natural hazards indicate social-altruistic attitudes. Finally, ESs that generate individual pleasure/benefit such as production of timber, firewood, NWP, recreation and gaming indicate individual attitudes.

RESULTS AND DISCUSSION

Differences between groups of interest

Stakeholders' preferences to forest ESs were analysed for every group of interest considering the data of the four case studies (Table 3). Results show that the same group of interest has different priorities in diverse local contexts; for example in Arci-Grighine and Alto Agri associations and NGO assign the highest value to gaming, while in Non Valley and Matese these groups of interest consider regulating services as the most important forest ESs (i.e. protection against natural hazards and biodiversity). Public administrations – which theoretically should pursue the common good – and tourism sector actors – who should support the regulating services – show an ambivalent attitude: in Non Valley the two groups prefer cultural aspects such as landscape, while in the other three districts preferences are oriented towards firewood production or gaming. Actors of the forest-wood chain assign the highest value to firewood only in

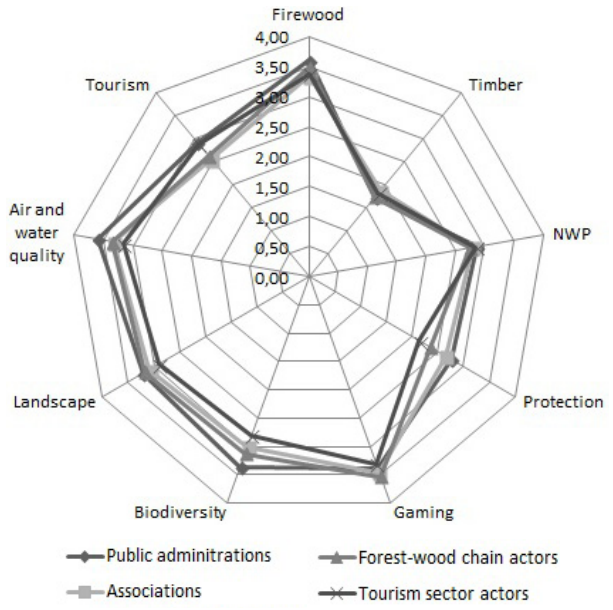

Fig. 4. Mean values distribution of the forest ESs by groups of interest

Matese district, while gaming is considered as a priority in Arci-Grighine and Alto Agri.

The Kruskal-Wallis non-parametric test shows significant differences between groups of interest only in protection against natural hazards ($K_{obs.}$ = 8.556, $K_{crit.}$ = 7.815, P < 0.036). This means that only for the hydrogeological protection function different groups of stakeholders have significantly different preferences. In particular, this result can also be observed from the graphic point of view with special regard to the differences between the actors of the tourism sector and public administrations/associations (Fig. 4). Presumably this difference in the perception of protection against natural hazards on the part of stakeholders of the tourism sector can be explained by the particular role of tourism sector actors in the mountain context. They probably overestimate, also by reason of their economic interest, the recreational function of forests underestimating the forest's role in protection from natural hazards.

Results evidence that the real payoff functions for each group of interests are different from those theoretically expected (hypothetical pay-off functions). The real pay-off function for public administrations shows a clear preference to the supporting services (mean = 3.42), followed by regulating services (mean = 3.23) and cultural services (mean = 3.02) at the same level of importance. In accordance with the hypothetical pay-off function public administrations rank the provisioning services (mean = 2.73) as the least important forest ecosystem services because the benefits are private benefits and not a public good.

The real pay-off function for public administrations is as follows (Eq. 6):

$$u(a_3) > u(a_2) \geq u(a_4) > u(a_1) \quad (6)$$

Forest-wood chain actors show a pay-off function different from the hypothetical pay-off function: supporting services (mean = 3.26) have the highest value, followed by cultural services (mean = 3.11) and regulating services (mean = 2.85). Forest-wood chain actors, who hypothetically have the objective to maximize personal utility, rank the provisioning services as the least important forest service.

The real pay-off function for the forest-wood chain actors is as follows (Eq. 7):

$$u(a_3) > u(a_4) \geq u(a_2) > u(a_1) \quad (7)$$

Associations show a pay-off function similar to that of public administrations, with the highest value (mean = 3.31) of supporting services. Also for this group the provisioning services (mean = 2.67) are considered to be the least important. The real pay-off function for the associations is as follows (Eq. 8):

$$u(a_3) > u(a_2) \geq u(a_4) > u(a_1) \quad (8)$$

Actors of the tourism sector confirm their preference to cultural services (mean = 3.03) and supporting services (mean = 2.82). However, this group ranks provisioning services (mean = 2.68) higher with respect to the other groups. The real pay-off function for the tourism sector actors is as follows (Eq. 9):

$$u(a_4) > u(a_3) \geq u(a_1) > u(a_2) \quad (9)$$

The first consideration arises from the results concerning the fact that the groups of interest cannot be considered as rational actors. Probably, respondents' answers are influenced more by individual preferences, rather than by the objectives and interests of the categories they belong to (organizations, associations). If we consider the forest-wood chain actors, from the theoretical point of view they should maximize their personal utility (profit) and consequently enhance the provisioning services (i.e. timber production). On the contrary, they have quite different preferences and rank provisioning services as the least important. The behaviour of the other three groups of actors seems more rational and there is a greater correspondence between real and hypothetical pay-off functions.

Table 4. Mean values of categories of forest ESs in four case studies

Category of forest ESs	Non Valley	Matese	Arci-Grighine	Alto Agri
Regulating services	3.38	3.55	2.93	2.86
Supporting services	**3.47**	**3.58**	3.21	2.96
Provisioning services	2.66	2.83	2.54	2.87
Cultural services	2.94	2.84	**3.29**	**3.02**

in bold – maximum value per case study

Differences between local contexts

Stakeholders' preferences to the different categories of forest ESs in the four case studies are reported in Table 4. In Non Valley and Matese district supporting and regulating services are ranked as the most important categories of ESs, with comparable values (mean = 3.38 and 3.55 for regulating services, mean = 3.47 and 3.58 for supporting services). Instead, in Arci-Grighine and Alto Agri cultural services (Arci-Grighine mean = 3.29, Alto Agri mean = 3.02) have the greatest importance. In all case studies except Alto Agri, stakeholders consider provisioning services as the category of less important forest ESs. The analysis of the mean values of the particular forest ESs shows interesting differences between the four case studies (Fig. 5). In Non Valley stakeholders rank as the most valuable forest ESs landscape (mean = 3.65, SD = 0.52), protection against natural hazards (mean = 3.53, SD = 0.64) and biodiversity (mean = 3.47, SD = 0.61). Firewood production is considered the most important forest ecosystem service in Matese district (mean = 3.66, SD = 0.58) followed by biodiversity (mean = 3.58, SD = 0.68) and air and water quality (mean = 3.58, SD = 0.68), while gaming is considered the most important forest ESs in Alto Agri (mean = 3.58, SD = 0.75) and Arci-Grighine districts (mean = 3.85, SD = 0.44). It is interesting to analyse together the values assigned to timber and firewood production in the four case studies, based on the features of local forests (forest system and forest type). In three out of the four case studies (Matese, Alto Agri and Arci-Grighine) coppice is the prevalent forest system, while in Non Valley high forests prevail. Moreover, forest species composition has a high influence on individual preferences. These considerations can explain why the stakeholders of Non Valley attribute high values to timber production (strictly related to the presence of high forests), while the stakeholders of other case studies assign a higher value to firewood production (related to the presence of coppices). Forest protection against natural hazards shows a high level of importance in two case studies (Non Valley and Matese) and a medium-low level of importance in the other two case studies (Arci-Grighine and Alto Agri).

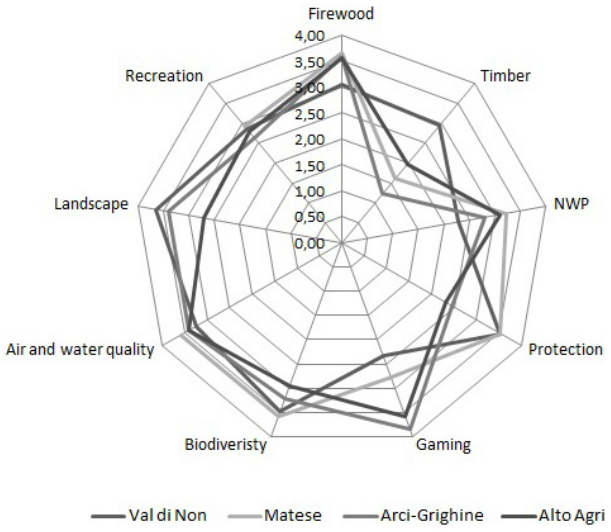

Fig. 5. Mean values distribution of the forest ESs in the four case studies

The Kruskal-Wallis non-parametric test shows significant differences between the study areas in most of the forest ESs: biodiversity ($K_{obs.}$ = 15.521, $K_{crit.}$ = 7.815, P = 0.001), timber production ($K_{obs.}$ = 97.567, $K_{crit.}$ = 7.815, $P < 0.0001$), firewood production ($K_{obs.}$ = 11.526, $K_{crit.}$ = 7.815, P = 0.009), protection against natural hazards ($K_{obs.}$ = 62.939, $K_{crit.}$ = 7.815, $P < 0.0001$), gaming ($K_{obs.}$ = 102.399, $K_{crit.}$ = 7.815, $P < 0.0001$), NWP ($K_{obs.}$ = 34.706, $K_{crit.}$ = 7.815, $P < 0.0001$) and landscape ($K_{obs.}$ = 41.038, $K_{crit.}$ = 5.991, $P < 0.0001$). There are not any statistically significant differences for air and water quality. This is probably due to the fact that these ESs are considered global or international environmental public goods (Montero, Perrings 2011); consequently, all over the world stakeholders assign high levels of importance to these ESs provided by the forests. Similar considerations are valid also for biodiversity, but in the four case studies it did not occur because of two reasons: (*i*) in Italy forest biodiversity changes from context to context (i.e. Mediterranean maquis and forests of Southern Italy have a

Table 5. Mean values of individual, social-altruistic and biocentric attitudes in four case studies

Case study	Individual attitudes	Social-altruistic attitudes	Biocentric attitudes
Non Valley	2.70	**3.40**	**3.60**
Matese	2.80	**3.40**	3.50
Arci-Grighine	2.90	2.80	3.20
Alto- Agri	**3.00**	2.80	2.80

in bold – maximum value per case study

greater species diversity than the Alpine forests) and as a result of forest management, (*ii*) the importance attached to this ecosystem service is closely linked to the cultural background of individuals.

Finally, results of stakeholders' attitudes for each case study (Table 5) show that Non Valley and Matese district have the highest mean values for biocentric attitudes (mean = 3.60 and mean = 3.50, respectively). Individual attitudes (mean = 3.00) have the highest mean value in Alto Agri and biocentric attitudes (mean = 3.20) in Arci-Grighine.

CONCLUSIONS

The findings of this research firstly indicate that in the various study areas the groups of interest cannot be considered as rational actors. It seems that answers to the questionnaire are influenced more by individual preferences and attitudes rather than by interests and opinions of the stakeholders' categories. In this study group dynamics, social organizations seem to have a lower influence on stakeholders' preferences related to forest ESs. We can affirm that in our study the differences between groups of interest are not able to explain the differences between stakeholders' preferences. For this reason, the classical theory of rational choice appears to be useless, as well as the capability of the behavioural approach to clarify the differences between stakeholders' environmental preferences in different local contexts. Consequently, not always the representatives of interest groups behave rationally, as explained by the rational actor theory.

In order to more deeply investigate the relationships between stakeholders' categories and preferences related to forest ESs, it may be interesting to develop a new research with different stakeholder groups.

For example, different behavioural approach between hunters and environmentalists could be a compelling field of research. Other studies could give a different perspective to explain the preferences of different groups of interests.

As far as the influence of local contexts is concerned, findings evidence that the local context has a greater influence on preferences to forest ESs. We can affirm that in our case studies, stakeholders' preferences depend on the local context. We used the behavioural approach of the theory of rational choice for saying that the local context (that influences values and beliefs) is able to address attitudes and preferences in a biocentric, social-altruistic or individual way, in an environmental dilemma.

As far as the method of survey is concerned, quantitative surveys are very good vehicles for assessing preferences and opinions in a study context (Babbie 2010). In the present research the questionnaire-based survey was useful since the preferences expressed by stakeholders were explicit and therefore measurable.

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Appendix – Questionnaire

CRA
Consiglio per la Ricerca e la sperimentazione in Agricoltura

FONDAZIONE CASSA DI RISPARMIO DI TRENTO E ROVERETO

Questionnaire

1. SECTION "PERSONAL INFORMATION"

Interview date _____

Age of the interviewee (years)

- ❑ 18–34
- ❑ 35–49
- ❑ 50–64
- ❑ more than 65

Gender

❑ Male

❑ Female

Level of education

- ❑ Elementary and technical school degree
- ❑ High school degree
- ❑ University and post-university degree

Name and address of the organization/association:_____

Role of the interviewee in the organization/association:_____

From how many years are you working in the organization/association?_____

2. SECTION "ORGANIZATION INFORMATION"

How many employees are there in the organization? (specify the number)

1) Managers:_____
2) Technical employees:_____
3) Administrative employees:_____
4) Workers: _____

Please classify the employees of the organization on the basis of level of education:

1) University degree graduate:_____
2) High school graduate:_____
3) Technical school graduate:_____
4) Non-graduate:_____

Are there temporary employees are in the organization? ❑ YES ❑ NO

If YES, what type of contract do they have? ❑ Seasonal ❑ Training _____years

How many employees participating in training courses?

Never	*Once a year*	*More than once a year*
❑	❑	❑

3. SECTION "FOREST AND ECOSYSTEM SERVICES"

What ecosystem services do you look for from a forest? 5-point Likert scale (1 = very low importance, 5 = very high importance)

	1	2	3	4	5
Timber production	☐	☐	☐	☐	☐
Firewood production	☐	☐	☐	☐	☐
Non-wood products	☐	☐	☐	☐	☐
Natural hazards protection	☐	☐	☐	☐	☐
Tourism and recreation	☐	☐	☐	☐	☐
Landscape	☐	☐	☐	☐	☐
Gaming	☐	☐	☐	☐	☐
Water and air quality	☐	☐	☐	☐	☐
Biodiversity	☐	☐	☐	☐	☐

Which activities do you prefer when you are in a forest? (put in order of preference)

Walking and picnic	❑
Relax and landscape contemplation	❑
Sports activities	❑
Mushrooms and berries	❑
Gaming	❑
Fishing	❑
Common use rights (e.g. bote rights)	❑

How often do you visit the forest? (single preference)

Never	❑
Two-three times a year	❑
At least once a month	❑
At least once a week	❑
More than once a week	❑

In your opinion, what is important to find in a forest? (multiple preferences)

Paths	❑
Picnic benches and tables, and barbecues	❑
Fitness trails and other sports equipment	❑
Panoramic views	❑
Refreshment points	❑
Unspoilt nature	❑
Parking areas	❑
Places of historical and religious interest	❑