Annals of Silvicultural Research
43 (1), 2019: 04-14

https://journals-crea.4science.it/index.php/asr

Research papers

Collection: "4th Italian National Congress of Silviculture" - Torino, 5-9 November 2018

Comparison between people's perceptions and preferences towards forest stand characteristics in Italy and Ukraine

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Received 21/11/2018- Accepted 24/01/2019- Published online 26/06/2019

Abstract - Understanding people's perceptions and preferences towards forest stand characteristics can bring many benefits to forest managers in the short term. This study aims to identify and compare people's perception and preferences of forest stand characteristics in Trentino province (Italy) and Rakhiv region (Ukraine). These regions were chosen as study areas for two main reasons: both are in mountain areas and local communities are strictly dependent on the forest resource. Data were collected through a questionnaire administered to a sample of local people. The collected data were statistically analysed to highlight the preferred type of forests related to different stand characteristics. The results of comparative analysis confirmed the importance of socio-demographic characteristics in shaping respondents' preferences. The results show that respondents in both case studies prefer mixed forests with a random distribution of trees with different diameter sizes. However, respondents from Trentino province prefer open forests, while respondents from Rakhiv region prefer closed one. The present study increased the level of knowledge about people's preferences in Italy and Ukraine for different forest stand characteristics. This information can be used by decision makers (forest managers and planners) to improve the recreational attractiveness of forest stands.

Keywords - analysis of perceptions; participatory forest management; questionnaire survey; Trentino province (Italy); Rakhiv region (Ukraine).

Introduction

In the last century, the multifaceted phenomenon of climate change and increasing human pressure on natural resources questioned previous forest management paradigms and now it requires holistic and critical thinking and decision-making in actions (Rockström et al. 2009, Steffen et al. 2015, Waters et al. 2016). In conditions of increasing likelihood and impact of environmental risks (e.g., extreme weather events, failure of climate-change mitigation and adaptation, major biodiversity loss and ecosystem collapse, major natural disasters) (The Global Risks Report, 2018), the adaptive complexity in forest management and silviculture (Fahey et al. 2018) has become an objective to mitigate, adapt and promote a forest ecosystem resilience to perturbations. The adaptive complexity in silviculture has coincided with a recognition among scientists and practitioners of the necessity of applying a multi-functional forest management planning (Paletto et al. 2012a) based on public participation (Cantiani 2012, Paletto et al. 2015, Pelyukh et al. 2018) because it can increase the social acceptance of the decisions and reduce conflicts among forest users.

In this context, it is important to understand and analyze people's perceptions and preferences, and local knowledge to support decision makers in the sustainable forest management and maintenance of forest resources use in an effective way (Lewis and Sheppard 2005, Šišák 2011, Zahvoyska 2014, Nijnik et al. 2017). People's preferences for forest stand characteristics can be defined as the degree to which a person prefers a feature rather than other features (Sheppard and Meitner 2005). In the last two decades, some studies have provided insight into individual values towards main forests stand characteristics, such as tree species composition, horizontal and vertical stand structure, canopy cover and deadwood distribution (Tahvanainen et al. 2001, Tyrväinen et al. 2003, Edwards et al. 2012, Paletto et al. 2013, Jankovska et al. 2014, Pastorella et al. 2014, Pelyukh and Zahvoyska 2018).

Moreover, being aware of people's perceptions and preferences regarding the forest stand characteristics is important for designing and implementing management decisions (Jensen and Koch 1998, Lee 2001, Cantiani et al. 2002, Heer et al. 2003, Edwards et al 2012, Zahvoyska and Bas 2013). This aspect is particularly significant in fragile mountain areas characterized by a strong relationship between society and natural resources such as the Alps and the Carpathians. The Italian Alps and the Ukrainian Carpathians are characterized by a strong link between local communities and forests (Notaro and Paletto 2011, Soloviy and Melnyko-

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http://dx.doi.org/ 10.12899/asr-1786

vych 2014, Melnykovych et al. 2018).

Understanding the people's beliefs and perceptions about forest stand characteristics is a key factor in the success and attractiveness of planned activities (Mill et al. 2007, Zahvoyska et al. 2017). Given these considerations, the aim of the present study is to increase knowledge about people's preferences for different forest stand characteristics to overcome the current knowledge gap and provide key information for decision makers which could help in increasing recreational attractiveness of forest stands.

Materials and methods

Study area

People's perceptions and preferences regarding forest stand characteristics were investigated in two study areas (Fig. 1): Trentino province (Italy) and Rakhiv region (Ukraine). These regions were chosen as study areas for two reasons: both are located in mountain areas and local communities are strictly dependent on the forest goods and ecosystem services. The Trentino province (46° 04' 00"N; 11° 07' 00'E) - located in the Italian Alps (North-East of Italy) - has a population of 539,175 inhabitants and a total land area of 6,207 km^2 (density of 86.9 inh./km^2). The altitude of Trentino is between 65 m and more than 3000 m a.s.l. with around 70.0% of total land area located above 1500 m a.s.l. The main town in this Italian province is the Trento municipality characterized by a population of 114,236 inhabitants (density of 723 inh./km^2) divided into 12 districts. In

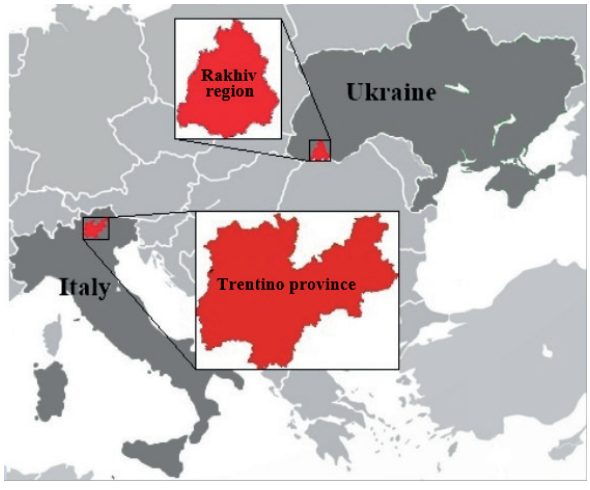

Figure 1 - The geographical location of study areas.

the Trentino province, the forest area covers 63.0% of total land area (390,463 ha) and most forests are public (76.0%), while private forests cover the remaining 24.0%. The main forest types are Norway spruce (*Picea abies* (L.) Karst.) forests with 32.0% of forest area, followed by European beech (*Fagus sylvatica* L.) forests with 14.0% and European larch (*Larix decidua* Mill.) forests with 13.0% (Odasso et al. 2018). The forest management is based on the close-to-nature principles and all public and common forests are managed through a forest unit management plan. The total growing stock is estimated in 60,000,000 m^3 of which 475,392 m^3 yr^{-1} are harvested annually (around 50% of annual volume increment) (Gandolfo and Comin 2017).

Rakhiv region (48° 3' 24.72"; 24° 11' 48.75") is located in the South-East of the Transcarpathian oblast, in the Ukrainian Carpathians. The altitude of Rakhiv region is between 500 m and 2,061 m a.s.l., the climate is temperate-continental in the lower parts, cold and wet in the upper ones. Rakhiv region occupies 1,892 km^2, with a population of 93,053 inhabitants (population density of 49 inh./km^2). Population of Rakhiv region mostly live in the rural area (57.8% of the total) and characterized by a high economic and socio-cultural dependence on forest resources. Forests in the Rakhiv region cover 125,800 ha (66.5%) represented mainly by highly productive stands of Norway spruce (*Picea abies* (L.) Karst.), European beech (*Fagus sylvatica* L.), Silver fir (*Abies alba* Mill.) and in mixture with valuable species such as Sycamore maple (*Acer pseudoplatanus L.*), Elm (*Ulmus glabra* Huds.), European ash (*Fraxinus excelsior* L.) and others (Oliynyk et al. 2015). 78.5% of the total forest area belongs to different categories of protection zones and 21.5% belongs to the commercial forest category. The forest management is based on the close-to-nature principles although clear cutting is also carried out. All forests in the territory of Rakhiv region are managed through a forest unit management plan which is renewed every 10 years. The average growing stock of forests is 370 m^3 ha^{-1}. The current annual increment of Rakhiv region forests is 6.0 m^3 ha^{-1} yr^{-1}.

Survey

In this study, people's perceptions and preferences towards forest stand characteristics were collected through a questionnaire survey. A structured questionnaire was administered to a sample of the population in both study areas.

The questionnaire was structured in 10 questions and divided into two thematic sessions. The questionnaire was divided into thematic sections in order to avoid the fatigue of respondents (Nielsen et al. 2007). The first thematic session focused on the personal information of respondents such as gender, age, level of education, place of residence (location). The second thematic session dealt with people's perceptions regarding forest stand characteristics as well as the recreational attractiveness of

Table 1 - Survey questions about forest stand characteristics.

Question	Type of question	Answer option
1.What kind of tree species do you prefer in a forest?	Single choice question	1. Broadleaf forest with less than 20.0% conifer trees 2. Conifer forest with less than 20.0% broadleaf trees 3. Mixed forest
2.Which kind of forest structure do you prefer?	Single choice question	1. Regular distribution of trees in the space; trees with similar diameters and heights 2. Random distribution of trees in the space; trees with similar diameters and heights 3. Random distribution of trees in the space; trees with a variety of diameters and heights
3.Do you prefer open or closed forest?	Single choice question	1. Open forest (10.0–40.0% canopy cover) 2. Closed forest (more than 40% canopy cover)
4.In your opinion, what kind of recreational resources do you find important in a forest?	Specifying level of importance using 10-point Likert scale (1 = very low importance, 10 = very high importance)	1. Paths 2. Picnic benches and tables and barbecues 3. Fitness trails and sports equipment 4. Panoramic views 5. Food vendors 6. Unspoiled nature 7. Parking areas 8. Places of historical and religious interest
5.What goods and services do you look for in a forest?	Specifying level of importance using (1 = very low importance, 10 = very high importance)	1. Hiking and trekking 2. Hunting activities 3. Sporting activities 4. Cultural heritage 5. Relaxation 6. Landscape contemplation 7. Naturalness 8. Timber and firewood harvesting 9. Harvesting of nonwood forest products (edible nuts, berries, fruits, mushrooms, herbs, spices and condiments, aromatic plants)

a forest.

People's perceptions of forest stand characteristics were tested considering three main macro-characteristics: tree species composition, forest structure and canopy openness (Tab. 1).

The following two questions focused on perceptions of recreational infrastructures in a forest and forest goods and services. To rate the importance, we proposed our respondents to use a 10-point Likert scale format (from 1 = very low to 10 = very high value) (Likert 1932). All questions were short, simple and realistic to minimize the time needed to fill in the questionnaire and thus motivate respondents to do so.

The survey was focused on local people (residents) because its main objective was to investigate the preferences of individuals belonging to the same community and living in the mountain area. Therefore, tourists were not considered in this study.

In the Trentino province, the questionnaire was administered to a sample of residents of the Trento municipality. The respondents were asked to return the completed questionnaire within six weeks and were given three options - return by mail, hand deliver to a prearranged collection center, or have collected (by appointment) by survey staff - to maximize the number of completed questionnaires. The questionnaire was administered in the Trentino province from November 2005 to June 2006 (8 months).

In the Rakhiv region, the questionnaire was administered to a sample of respondents in the period from 16 to 30 April 2018 (two weeks). The sample of respondents was sized considering the main social-demographic characteristics of the Rakhiv region such as the gender, age, residence. The questionnaire was administered face-to-face to respondents by a single interviewer. This administration system was chosen because the face-to-face administration could provide a higher response rate, higher quality of data acquired and a better opportunity to explain the questions unclear to respondents (De Leeuw 1992, Goyder 1985).

Data analysis

The collected data were statistically processed by study areas considering the following variables: gender, age, level of education, location, and study area. To test the differences among the groups the χ^2 test was used. The data collected using Likert scale response format were statistically compared using the Kruskal-Wallis and Mann–Whitney non-parametric tests to highlight the influence of socio-demographic characteristics of respondents on their answers.

The non-parametric Kruskal-Wallis test assesses for statistically significant differences on a contin-

Table 2 - Socio-demographic characteristics of respondents in the two study areas.

Characteristics	Trentino province (Italy)		Rakhiv region (Ukraine)		Total	
	n	%	n	%	n	%
Gender:	346		308		654	58.0
Male	232	67.0	147	47.7	379	42.0
Female	114	33.0	161	52.3	275	
Age:	344		308		652	
18-35 years old	48	14.0	57	18.5	105	16.1
36-55 years old	139	40.4	123	39.9	262	40.2
56-75 years old	120	34.9	99	32.2	219	33.6
>75 years old	37	10.7	29	9.4	66	10.1
Level of education:	341		308		649	
None	4	1.2	2	0.7	6	0.9
Elementary school	109	32.0	22	7.1	131	20.2
High school	158	46.3	123	39.9	281	43.3
University or post-University degree	70	20.5	161	52.3	231	35.6
Residence:	318		308		626	
Urban area	244	76.7	122	39.6	366	58.5
Rural area	74	23.3	186	60.4	260	41.5

uous dependent variable by a grouping by values of the independent variable (with three or more groups). In this research, the non-parametric Kruskal-Wallis test was applied to determine the statistically significant differences based on respondents' age and level of education.

The Mann-Whitney U test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. In this study, the non-parametric Mann-Whitney U test was used to determine the statistically significant differences by gender and location.

All statistical analysis of collected data was carried out using XLStat 2012.

Results

A total of 654 questionnaires were collected in the two study areas: 346 in the Trentino province and 308 in the Rakhiv region. The response rate was very different in the two study areas due to the administration system adopted: 100% in Rakhiv region and 35% in Trentino province. The main socio-demographic characteristics of the respondents by study areas are reported in Table 2.

Regarding the gender, 379 respondents are men (58.0%) and 275 respondents are women (42.0%). The percentage of women in the Rakhiv region is higher than the one in the Trentino province (52.3% vs. 33.0%). Most respondents from Trentino province live in the urban area of Trento municipality

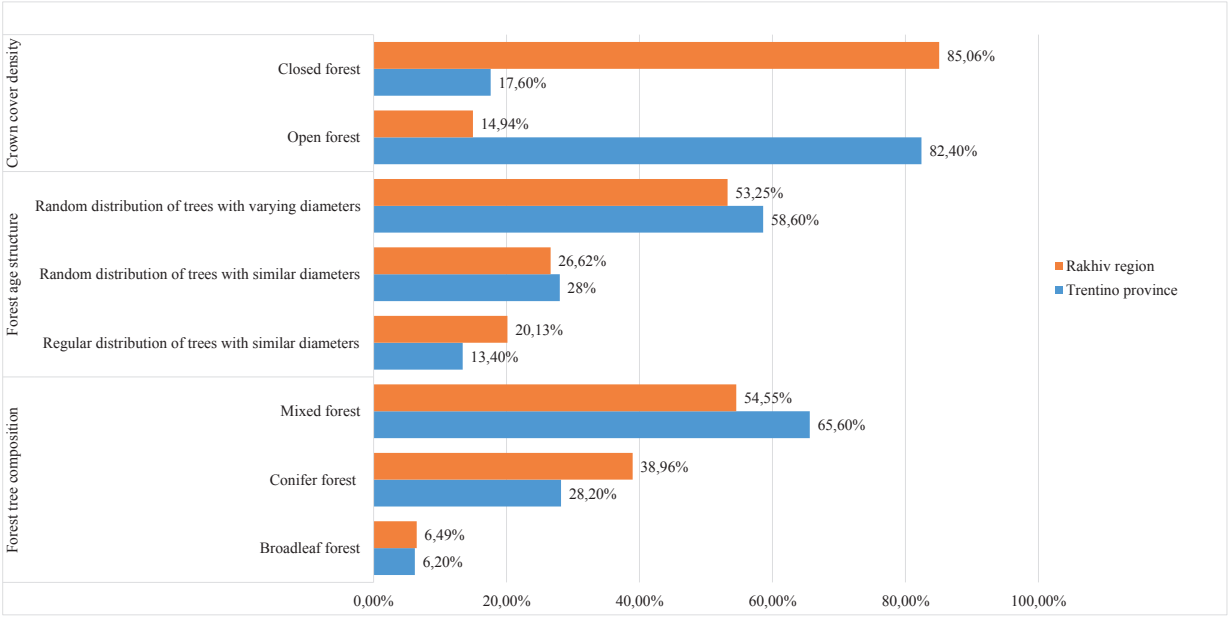

Figure 2 - Perception of forest stand characteristics by respondents from Trentino province and Rakhiv region respondents.

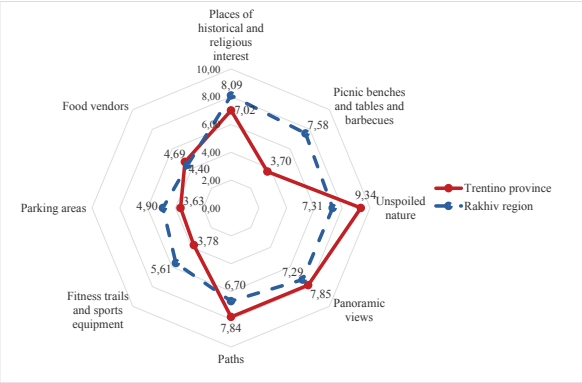

Figure 3 - Stated preferences concerning importance of recreational resources in forests by Trentino province and Rakhiv region respondents
Note. Values present the mean of scores on a 10-point scale.

(76.7%), while the most respondents from Rakhiv region (60.4%) live in the rural area. The results concerning age of respondents show that the mean values are close for the two study areas. In both case studies, the majority of respondents have an age between 36 and 55 years old (40.4% in Trentino province and 39.9% in Rakhiv region).

The results concerning the level of education indicate a quite high degree in both study areas: 46.3% in Trentino province and 39.9% in Rakhiv region have a high school diploma and 20.5% in Trentino province and 52.3% in Rakhiv region have a university or post-university degree.

In both study areas, respondents assigned a higher preference for mixed forests (65.6% in Trentino province and 54.6% in Rakhiv region) (Fig. 2). In addition, women showed a greater preference for mixed forests (71.6% in Trentino province and 57.8% in Rakhiv region) than men (62.7% in Trento province and 51.0% in Rakhiv region). However, the χ^2 test shows no statistical differences between male and female in both case studies.

Investigating people's preferences for tree species composition, the results show that Italian young people (18–35 years old) preferred broadleaf forests (14.6%) more than other age groups (5.9% for ages 36–55, 3.4% for ages 56–75, and 5.4% for ages over 75), while Ukrainian young people showed the smallest preference regarding these forests (3.5%). The highest preference for broadleaf forests in Rakhiv region was expressed by respondents 36-55 years old (13.8%). Interesting that in both regions elder people preferred conifer forests (43.2% in Trentino province and 55.2% in Rakhiv region). A statistically significant difference for tree species composition among the age groups was observed in both Trentino province (χ^2 test: p=0.003, α=0.05) and Rakhiv region (χ^2 test: p=0.001, α=0.05).

The majority of the respondents expressed a preference for a random distribution of trees in the space with varying diameters (58.6% in Trentino province and 53.2% in Rakhiv region) (Fig. 2). Again, for both regions a statistically significant difference between men and women was identified, with women showing a stronger preference for uneven-aged forests in Trentino province (χ^2 test: p=0.045, α=0.05) and Rakhiv region (χ^2 test: p=0.005, α=0.05).

The results concerning the preference regarding open vs. closed forest (canopy openness) show that Italian respondents (82.4%) prefer open forest (less than 40.0% of canopy cover), while Ukrainian respondents (85.1%) prefer closed forest (more than 40.0% of canopy cover) (Fig. 2). Taking into consideration the gender, the results also show a great difference between the two study areas. Italian women show an even higher preference for open forests than men (χ^2 test: p=0.048, α=0.05). Ukrainian men prefer closed forest higher than women (χ^2 test: p=0.344, α=0.05). The χ^2 test showed no statistically significant differences concerning canopy openness preference for age and location.

According to respondents' assessment of recreation infrastructures using a 10-point Likert scale, the most important recreational aspects for residents in the Trentino province are unspoiled nature (mean=9.34), panoramic views (7.85), and paths (7.85), while for residents in the Rakhiv region the most important recreational aspects are places of historical and religious interest (mean=8.09), picnic benches/tables and barbecue areas (7.58), and unspoiled nature (7.31) (Fig.3).

Respondents from both study areas indicate that the less important aspects are: fitness trails and sports equipment (mean value of 3.78 in Trentino province and of 5.61 in Rakhiv region), parking areas (3.63 and 4.90) and food vendors (4.69 and 4.40). Observing the data by socio-demographic characteristics of respondents, the results concerning the recreational infrastructures show small differences within the same study area (Tab. 3). In Rakhiv region, the people living in rural areas assigned a higher importance to unspoiled nature rather than people living in urban areas. In the Trentino province, paths are considered more important by women and older people (56-75 years old, and more than 75 years old) than by men and young people.

Regarding goods and ecosystem services provided by forests to society, respondents in Trentino province ranked naturalness (mean=8.86), hiking and relaxation (8.84 each) as the most important, while respondents in Rakhiv region assigned the highest values to relaxation (mean=8.69), cultural

Table 3 - Top three highly preferred recreational resources in forests for respondents from the two study areas (mean value).

Characteristics		Trentino province (Italy	Rakhiv region (Ukraine)
Gender:	Male	Unspoiled nature (9.35) Food vendors (7.87) Paths (7.55)	Historical and religious interest (8.20) Picnic benches, table and barbecues (7.39) Unspoiled nature (7.34)
	Female	Unspoiled nature (9.33) Paths (8.40) Food vendors (7.81)	Historical and religious interest (8.09) Picnic benches, table and barbecues (7.58) Unspoiled nature (7.31)
Age:	18-35 years old	Unspoiled nature (9.50) Food vendors (7.67) Paths (7.00)	Historical and religious interest (8.08) Picnic benches, table and barbecues (7.6) Unspoiled nature (7.31)
	36-55 years old	Unspoiled nature (9.37) Food vendors (8.04) Paths (7.72)	Historical and religious interest (8.09) Picnic benches, table and barbecues (7.58) Unspoiled nature (7.31)
	56-75 years old	Unspoiled nature (9.22) Paths (8.23) Food vendors (7.68)	Historical and religious interest (8.09) Picnic benches, table and barbecues (7.58) Unspoiled nature (7.31)
	>75 years old	Unspoiled nature (9.42) Paths (8.28) Food vendors (8.00)	Historical and religious interest (8.09) Picnic benches, table and barbecues (7.57) Unspoiled nature (7.30)
Level of education:	None	Unspoiled nature (10.00) Food vendors (9.75) Paths (8.50)	Historical and religious interest (7.5) Parking area (6.5) Unspoiled nature and food vendors (5.5)
	Elementary school	Unspoiled nature (9.24) Paths (8.04) Food vendors (7.76)	Historical and religious interest (8.64) Unspoiled nature (7.64) Panoramic view (6.82)
	High school	Unspoiled nature(9.43) Paths (7.82) Food vendors (7.81)	Historical and religious interest (7.3) Picnic benches, table and barbecues (7.8) Unspoiled nature (7.31)
	University or post-University degree	Unspoiled nature (9.26) Food vendors (7.91) Paths (7.44)	Picnic benches, table and barbecues (7.63) Panoramic view (7.47) Unspoiled nature (7.29)
Residence:	Urban area	Unspoiled nature (9.33) Paths (7.87) Food vendors (7.81)	Historical and religious interest (8.09) Picnic benches, table and barbecues (7.58) Unspoiled nature (7.31)
	Rural area	Unspoiled nature (9.27) Food vendors (8.17) Paths (7.99)	Historical and religious interest (8.28) Unspoiled nature (7.47) Picnic benches, table and barbecues (7.40)

heritage (8.20) and harvesting of non-wood forest products (8.11) (Fig. 4).

Respondents from Trentino province estimated the importance of harvesting of timber, firewood, and nonwood forest products, sporting and hunting activities lower than respondents from Rakhiv region. The least important for respondents from both study areas is hunting activities (mean=0.66 and 4.49).

Observing the data by socio-demographic characteristics of respondents, the results concerning the ecosystem services provided by forests show small differences within the same study area (Tab. 4). The non-parametric Kruskal–Wallis test found no statistically significant differences regarding age in both case studies. Concerning the level of education, a statistically significant difference was found for naturalness (p=0.009, α=0.01) and nonwood forest products (p=0.001, α=0.01) in the Trentino province. In the Rakhiv region a statistically significant difference was found for the level of education with regard to three forest goods and services: sporting activities (p<0.0001, α=0.01), cultural heritage (p=0.002, α=0.01) and landscape contemplation (p=0.004, α=0.01). Results in both study areas show that unlike those with a tertiary education, people with lower levels of education assigned a higher value to all services.

The non-parametric Mann–Whitney test found a statistically significant difference for gender in answers of Trentino province respondents: women expressed a preference for hiking and trekking (p=0.002, α=0.01); men expressed one for hunting activities (p=0.000, α=0.01) and in Rakhiv region: men expressed a preference for hiking and trekking (p= 0.003, α= 0.01), hunting activities (p= <0.0001, α= 0.01), relaxation (p= <0.0001, α= 0.01) and landscape contemplation (p= <0.0001, α= 0.01).

With regard to the location, a statistically significant difference was observed in answers of Rakhiv region respondents: rural inhabitants preferred forest goods and services related to the direct use such as hunting activities (p=0.005, α=0.01), cultural heritage (p=0.002, α=0.01), timber and firewood harvesting (p<0.0001, α=0.01) and harvesting of non-wood forest products (p<0.0001, α=0.01).

Table 4 - Top three highly preferred forest goods and services for respondents from the two study areas (mean value).

Characteristics		Trentino province (Italy	Rakhiv region (Ukraine)
Gender:	Male	Naturalness (8.79) Relaxation (8.73) Landscape contemplation (8.66)	Relaxation (8.69) Cultural heritage (8.20) Nonwood forest products (8.13)
	Female	Hiking and trekking (9.29) Naturalness (9.29) Relaxation (9.07)	Relaxation (8.64) Nonwood forest products (8.38) Cultural heritage (8.33)
Age:	18-35 years old	Landscape contemplation (8.96) Naturalness (8.83) Relaxation (8.75)	Relaxation (8.68) Cultural heritage (8.19) Nonwood forest products (8.15)
	36-55 years old	Naturalness (8.81) Landscape contemplation (8.76) Relaxation (8.74)	Relaxation (8.68) Cultural heritage (8.19) Nonwood forest products (8.13)
	56-75 years old	Naturalness (9.19) Relaxation (9.10) Hiking and trekking (9.05)	Relaxation (8.68) Cultural heritage (8.19) Nonwood forest products (8.12)
	>75 years old	Naturalness (8.97) Hiking and trekking (8.73) Landscape contemplation (8.67)	Relaxation (8.69) Cultural heritage (8.20) Nonwood forest products (8.14)
Level of education:	None	Landscape contemplation (9.00) Nonwood forest products (8.25) Naturalness (8.00)	Cultural heritage (8.50) Relaxation (8.00) Timber and firewood harvesting (7.50)
	Elementary school	Naturalness (9.04) Hiking and trekking (8.87) Landscape contemplation (8.82)	Relaxation (9.45) Cultural heritage (9.32) Landscape contemplation (8.86)
	High school	Naturalness (9.09) Relaxation (9.00) Hiking and trekking (8.92)	Relaxation (8.61) Nonwood forest products (8.40) Cultural heritage (8.13)
	University or post-University degree	Hiking and trekking (8.71) Relaxation (8.64) Naturalness (8.56)	Relaxation (8.64) Nonwood forest products (7.88) Cultural heritage (8.1)
Residence:	Urban area	Hiking and trekking (8.94) Naturalness (8.94) Relaxation (8.81)	Relaxation (8.68) Cultural heritage (8.19) Nonwood forest products (8.13)
	Rural area	Landscape contemplation (8.93) Naturalness (8.92) Relaxation (8.85)	Nonwood forest products (8.78) Relaxation (8.76) Cultural heritage (8.45)

Discussion

In the international literature, studies on people's preferences towards tree species composition, conducted in different cultural and environmental contexts, show a high heterogeneity in the preferences. However, a common point for all studies is that European people prefers mixed forests (Gundersen and Frivold 2008, Paletto et al. 2013, Pastorella et al. 2014, Giergiczny et al. 2015, Grilli et al. 2016, Filyushkina et al. 2017) and willingness to pay for visiting mixed forests is higher compared to pure conifer forests or broadleaf forests (Grilli et al. 2014). The results of our study confirm that people from both study areas prefer mixed forests.

Ribe (1989), Gundersen and Frivold (2008), Tahvanainen et al. (2011), Edwards et al. (2012) showed that forest age structure is an important forest characteristic. Gundersen and Frivold (2008), analyzing the results of 53 surveys of the Finnish, Swedish, and Norwegian residents' preferences towards forest landscapes, found that the tree size (diameter and height) is an important forest stand characteristic too. Edwards et al. (2012) investigating public opinions on the forest stand characteristics revealed that the most important characteristic for choosing a resting place was the size of trees, and therefore their age: respondents prefer old-growth forests with few trees.

The results of the present survey also show that respondents from both study areas prefer the random distribution of trees in the space with different tree size. These results are in accord with recent studies indicating that respondents prefer uneven-age forests than even-age ones (Nielsen et al. 2007, Filyushkina et al. 2017).

The canopy openness affects the recreational attractiveness in forests. Closed forests have a low recreational value for respondents due to the low possibility for visual and physical penetration of the forest stand. This is confirmed by Ribe (1989), who believes that the low recreational attractiveness of young forests is due to their high stand density. The semi-open forest provides a better visual penetration and sense of safety than high dense forests (Heyman 2012, Kaplan and Kaplan 1989). Comparison of the results from the two study areas shows that closed forests are preferred by respondents from Rakhiv region more than by respondents from Trentino province. This result may be explained by the fact that in the Ukrainian Carpathians, illegal cutting is frequent (Soloviy et al. 2011). Therefore,

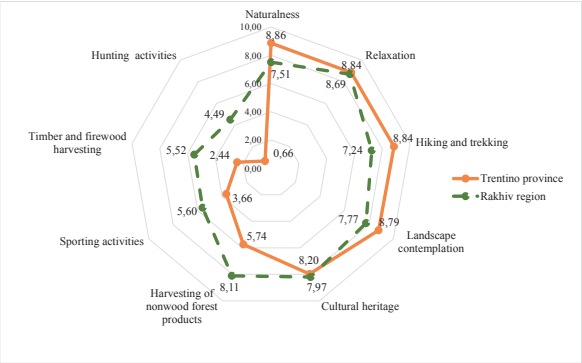

Figure 4 - Stated preferences concerning importance of forest goods and services by Trentino province and Rakhiv region respondents
Note. Values present the mean of scores on a 10-point scale.

local people often associated the low forest stand density with illegal actions or overharvesting .

Many studies have highlighted that people's preferences towards forest stand characteristics depend on many variables, which are partly shaped by the influence of cultural, regional and socio-economic factors (Ribe 1989, Gobster 1999). People's preferences can be influenced by affiliation to certain social groups (Lindhagen 1996, Misgav 2000, Roovers et al. 2002, Tyrväinen et al. 2003), age (Jensen 1999, Kaplan and Kaplan 1989), gender (Tyrväinen et al. 2003), recreational activity (Ribe 1989, Lindhagen 1996, Roovers et al. 2002. Tyrväinen et al. 2003). Ecological knowledge occupies an important position among factors that affect people's preferences. Psychological research (Kaplan and Kaplan 1989, Jensen 1993, Gobster 1999, Daniel 2001, Carlson 2001) confirms that people with a sufficient level of knowledge about forest ecosystems - people with higher education, people who often visit the forest or people who take an active part in forest management - are more likely to give higher preferences to those forest stand characteristics that will characterize it as a natural one. We found that the main factors that influence people's preferences are gender and age, while the level of education, and place of residence have a secondary importance in explaining the different perceptions.

In addition, comparison of the results from the two study areas shows that gender is an important factor that influences people's perception. In both cases, women prefer forests with the highest level of naturalness (mixed forest with uneven-aged structure). These results are in line with those of previous studies (Brown and Reed 2000, Buckingham-Hatfield 2000, Tarrant and Cordell 2002, Kumar and Kant 2007, Paletto et al. 2012b), which investigate relationship between gender and nature (including forest value) and confirm that women prefer environmental and aesthetic values while for men economic and recreational values of forest are more important.

All forest goods and services are highly appreciated by male and female of both regions. This may be due to the strong relationship that exist between local communities and forest resources in Italian Alps (Notaro and Paletto 2011) and Ukrainian Carpathians (Soloviy and Melnykovych 2014).

The majority of Rakhiv region population lives in rural areas; therefore, a special role in their well-being has harvesting of firewood and non-wood forest products (Soloviy and Melnykovych 2014, ENPI EAST FLEG II 2015, Melnykovych et al. 2018). Probably, for this reason the respondents from Rakhiv region assessed these groups of forest goods and services much higher than respondents from Trentino province.

Conclusion

Our study shows preliminary results about people's preferences towards forest stand characteristics in two mountain areas in Italy and Ukraine. In the future steps, the sample will be increased in both case studies in order to have a balanced number of respondents for each socio-demographic characteristic (gender, age, level of education and residence). Currently, a weakness of the sample is that most of the Trentino respondents live in the urban areas, while most of Rakhiv region respondents live in the rural areas.

In summary, the results of this survey show that people from the Trentino province prefer open mixed forests with an irregular structure, while people from the Rakhiv region prefer closed mixed forests with an irregular structure. In addition, forests with places of historical and religious value have a high importance for Ukrainian respondents.

People from both study areas like to have facilities in the forests, but at the same time would like these forests to be little frequented by other visitors, to have a greater feeling of forest naturalness. Our study also confirms previous findings and contributes additional evidence that suggests the importance of socio-demographic characteristics in shaping respondents' preferences. A statistically significant difference concerning tree species composition was identified in both regions for different age groups: while younger people prefer mixed forests, the elder people prefer conifer forests.

The results of this survey can support forest managers in at least two major aspects. Firstly, to understand local people's values towards different forest stand characteristics and integrate these values into multi-functional forest management planning. Secondly, to avoid possible conflicts between

local community and forest enterprises through detection of their interests in recreational attractiveness of forest stands. These two aspects are fundamental for implementing policy and management strategies aimed at sustainable forest management in the Italian Alps and Ukrainian Carpathians.

Acknowledgements

This article is based upon a research conducted under the COST Action "Climate-Smart Forestry in Mountain Regions" CLIMO CA15226, coordinated by Prof. Roberto Tognetti. The results of present study were presented at the IV Congresso Nazionale di Selvicoltura, Torino (Italy) 5-9 November 2018. The authors thank Isabella De Meo, Maria Giulia Cantiani and Federica Maino for their support in the Italian case study. Authors would like to thank the reviewers for their thoughtful comments and efforts towards improving our manuscript.

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