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Determining Urban and Rural Perceptions of Forest Ecosystem Services

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Research Article

Abstract – To ensure the sustainability of forest ecosystem products and services, changing people's perspectives and increasing their awareness of these resources and services is crucial. Determining people's perceptions and opinions regarding ecosystem services is critical to this context. This study aims to assess the knowledge levels and views of individuals living in both urban and rural areas of Kastamonu province in Turkey regarding forests and the ecosystem services they provide. Data for the research were collected through 97 face-to-face surveys conducted in urban and rural settings. Differences in participants' opinions based on their place of residence were analyzed using Kruskal-Wallis and Mann-Whitney U tests. The study results reveal that when people think of forests, the top three associations in terms of importance are nature and wildlife (41.8%), clean air (15.5%), and wild food (7.6%). Regarding the importance of forest ecosystem services, the ranking is as follows: regulatory services (39.2%), supporting services (28.2%), provisioning services (25.1%), and cultural services (7.5%). To ensure the sustainable use and continuity of forest ecosystem services, voluntary payment tendencies per capita are approximately 846 TL/person for the general population, 413.8 TL/person (24,8 $) for rural residents, and 1443.3 TL/person (86,4 $) for urban dwellers in Kastamonu. The total voluntary payment tendency for Kastamonu amounts to 318414942 TL (19066762 $).

Keywords – *Forest, ecosystem services, perception, willingness to pay, Kastamonu, ,Türkiye*

Orman Ekosistem Hizmetlerine İlişkin Kentsel ve Kırsal Algıların Belirlenmesi

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Araştırma Makalesi

Öz – Orman ekosistem ürün ve hizmetlerinin sürekliliğinin sağlanması için öncelikle insanların bu kaynak ve hizmetlere bakış açısını değiştirmek ve farkındalıklarının artırılması gerekmektedir. Bu kapsamda insanların ekosistem hizmetlerine karşı algı ve görüşlerinin belirlenmesi önemlidir. Bu çalışmada Kastamonu ili kent merkezi ve kırsalında yaşayan insanların ormanlar ve orman ekosistem hizmetleri ile ilgili görüş ve düşünceleri ile bu hizmetler hakkındaki bilgi düzeyleri belirlenmeye çalışılmıştır. Araştırmanın verileri Kastamonu İli kent ve kırsalında, yüz yüze yapılan toplam 97 anketden elde edilmiştir. İkamet yerlerine göre katılımcıların görüşlerinde farklılık olup olmadığı Kruskal-Wallis ve Mann-Whitney U testleri ile analiz edilmiştir. Çalışma sonuçları orman dendiğinde insanların önem düzeyine göre sıraladığı ilk üç olgunun doğa ve canlılar (%41,8), temiz hava (%15,5) ve yabani yiyecekler (%7,6) olduğunu göstermiştir. Orman ekosistem hizmetlerinde ise atfedilen öneme göre yapılan sıralama ise, düzenleyici hizmetler (%39,2), destekleyici hizmetler (%28,2) ve tedarik hizmetleri (%25,1) ve kültürel hizmetler (%7,5) şeklindedir. Kırsal alanda en çok önem verilen orman ekosistem hizmetleri doğa ve canlılar (%69), temiz hava (%13,8), yabani yiyecekler (%3,5) ve yaşam alanı olması (%3,5) iken kentsel alanlarda ise doğa ve canlılar (%51,3), temiz hava (%20,5) ve rekreasyon-ekoturizm (%10,3)'dir. Orman ekosistem hizmetlerinin sürdürülebilir kullanımı ve devamlılığının sağlanması ve geliştirilmesi amacıyla Kastamonu halkın gönüllü ödeme eğiliminin kişi başına ortalama 846 TL (50,7 $), kırsal alandakilerin kişi başı ortalama ödeme eğilimi 413,8 TL (24,8 $) ve kent merkezinde yaşayanların ise 1443,3 TL'dir (86,4 $). Kastamonu geneli için toplam gönüllü ödeme eğilimi ise 318414942 TL'dir (19066762 $).

Anahtar Kelimeler – *Orman, ekosistem hizmetleri, algı, ödeme istekliliği, Kastamonu, Türkiye*

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1. Introduction

Natural resources are non-human-made assets that form based on specific conditions in the natural environment. They have utilized various purposes since the beginning of time and are using them today. Forests are among the most crucial of these resources. Forest resource utilization, which comprises approximately one-third of the world's land area (4 billion hectares), has diversified over time. In the past, it was mainly in the form of wood raw material production and food supply. However, it now includes non-wood forest products, recreation, ecotourism, hunting and wildlife, protection of soil and water resources, carbon storage, and air purification.(Siry et al., 2005; Geray et al., 2007). There have been many factors that are effective in this change. Population growth and resulting demand pressure (Şen and Toksoy, 2006) have been significant factors in this change, as well as economic, social, and cultural development and societal change (Korkmaz, 2012)

Over many years, people have reduced and damaged forest ecosystems spatially and structurally through overuse and destruction (Pehlivan, 2023). In order to halt and prevent this damage, it is necessary to have an understanding of these complex structures. The forest ecosystem approach introduces a way to measure these complex relationships (Costanza et al., 2014). This approach aims to improve understanding of the benefits ecosystems provide to people by measuring not only direct benefits but also indirect benefits. Forest ecosystems services (ES) into four categorise: provisioning, regulating, supporting, and cultural services. (MEA, 2005).

Understanding the complex structure of forests and the products and services they provide is essential for sustainable forest ecosystem management. To achieve this, management systems should allow stakeholders to influence decision-making processes (Owubah et al., 2001). However, moving towards stakeholder-inclusive decision-making processes can lead to more sustainable forest management. Central authorities have managed forests historically through processes in which they made decisions, and public participation was ignored. However, decision-makers and policy-makers must now create new tools that prioritize local people's and society's benefits to increase sustainable ecosystem utilization (Obonyo et al., 2008; Şen et al., 2019).

Environmental and ecosystem problems have had a lasting impact on human life and will continue to do so (Özer, 2001; Atmış, 2004). Therefore, identifying and solving these problems is becoming increasingly important (Saygı, 2016). Numerous studies have been conducted on these issues since the adoption of the ecosystem services approach and the recognition of the relationship between ecosystem services and society. Approximately 95% of these studies aim to determine the economic value of forest ecosystem services by attributing a monetary value to them. They focus on investigating the economic and/or biophysical aspects of ecosystems. However, it is crucial to investigate the socio-cultural dimension of these systems (Lele et al., 2013).

As human impact on nature has become more destructive, there has been a growing awareness of the need to protect ecosystems and resources. In recent years, environmental awareness has significantly increased due to improved education and social communication tools. In this context, decision and policy makers must understand the society's perspectives on forest ecosystems and their knowledge of ecosystem products and services. For this reason, research on society's preferences and opinions regarding ecosystem services has been increasing (Lin et al., 2021).

However, it is important to note that societies attribute varying meanings and values to ecosystems due to economic, social, and cultural characteristics, as well as geographic conditions. For instance, in Spain, regulatory services are perceived as the most important forest ecosystem services (Martín-López et al., 2012). In the United States of America, cultural services are highly valued, while in Taiwan, protection against soil and water erosion and other regulatory services are prioritised (Lin et al., 2008). Therefore, to ensure sustainable forest management and the maintenance of ecosystem services, it is necessary to gather information

about the individuals who directly or indirectly use these services at a local scale (Lin et al., 2021). Many issues need to be investigated and determined, from people's knowledge of ecosystem services to their perceptions of these systems and the services they provide, as well as their awareness, perspectives, and willingness to protect them. In particular, studies on different societies can provide information about the social dynamics shaped around ecosystem services (López-Santiago et al., 2014).

In recent years, studies have been conducted with various focuses to determine people's perceptions of forest ecosystem services in countries worldwide (Asah et al., 2014; Muhamed et al., 2014; Ranacher et al., 2017; Cuni-Sanchez et al., 2019; Gouwakinnou et al., 2019; Bezák et al., 2020; Rodríguez-Morales et al., 2020; Saha et al., 2021; Hegetschweiler et al., 2022; Hassen et al., 2023; Pour et al.,, 2023; Purwestri et al., 2023; Anand and Bhattacharya, 2024; Atanga et al., 2024; Balasubramanian and Dwivedi, 2024; Wang et al., 2024). Similarly, in Turkey, there have been a limited number of studies aimed at determining people's perception of forests and forest resources (Pak and Berber, 2011; Birben et al., 2018; Çoban and Yücel, 2018; Birben and Ünal, 2020; Pak et al., 2021; Ünal ande Birben, 2021).

Despite the numerous studies conducted in this field around the globe, including in Turkey, the existing research still needs improvement. The characteristics of the population in each settlement are not homogeneous. People's opinions vary across countries, regions, cities and even villages. Furthermore, it is necessary to conduct further studies with different perspectives and in more local areas since each study should be evaluated based on the characteristics of its study area.

This study aimed to elucidate discrepancies in opinions between urban and rural areas about forest and forest ecosystem services. This phenomenon has yet to be previously observed in previous studies. Additionally, the study sought to determine the level of knowledge of people in urban and rural settlements who benefit from forest ecosystem services. Furthermore, the ecosystem services that the population prioritises and their willingness to pay to protect these systems were identified.

The findings of this study will provide valuable insights for local administrations, forest managers, and other stakeholders engaged in participatory planning and related matters. Moreover, the results will contribute to the existing literature on these topics.

2. Materials and Methods

2.1. Study Area

The study area selected for this research is Kastamonu province, located in Turkey's Western Black Sea region (Figure 1). Kastamonu is a mountainous region, with 65% of its land covered by forests. Among these forests, 26.2% (180551 hectares) are classified as sparse closed forests, while 73.8% (695763 hectares) are considered normally closed forests (KFRD, 2023). All of these forests are state-owned and managed by the State Forest Enterprise. The total certified forest area is 295,948.1 hectares (Şen, 2021). Within the study area are two national parks: Küre Mountains National Park and Ilgaz Mountains National Park. Küre Mountains National Park holds the Platinum Wildlife Certificate (Şen and Güngör, 2018; Öztürk and Ayan, 2015). Kastamonu province comprises 20 districts and 1,054 villages, making it the province with the highest number of villages in Turkey. Regarding the total population, Kastamonu has 376,377 inhabitants, with approximately 60% residing in rural areas (TÜİK, 2020). The abundance of villages and the extensive forested areas within the city contribute to significant interactions between people and forest ecosystem services.

Figure 1. Geographical location of Kastamonu (HGM, 2023)

2.2. Research Data

The study's primary data was collected through questionnaires (Table 1) and secondary sources. The aim of questionnaire was to determine the level of awareness among urban and rural residents of Kastamonu province regarding forest ecosystem services, as well as their perceptions and opinions of these services. The questionnaire aimed to determine the participants' demographic characteristics, forest utilization, knowledge of forest and forest ecosystem services, willingness to pay for ecosystem service protection, and perceptions. The questionnaire was administered face-to-face. The face-to-face survey method is widely accepted due to its high response rate, quickness in obtaining answers, and the ability to make observations (Ayyıldız and Toksoy, 2002). The questionnaire was administered in July 2022.

Table 1
Research survey

Q1	Place of survey	( ) Urban	( ) Rural
Q2	Gender	( ) Female	( ) Male
Q3	Education	( ) Primary school ( ) Secondary school ( )Master/Dr	( ) High school ( ) University
Q4	Age		
Q5	Profession	( )Unemployed ( )Civil Servant ( )Labourer	( )Farmer ( ) Retired ( ) Housewife ( ) Trade ( ) Tradesman
Q6	Monthly Income		
Q7	What are the first three things that come to your mind when you think of forest?	1)	2) 3)
Q8	What are the three most important benefits you derive from forests?	1)	2) 3)
Q9	Do you know the difference between the products and services provided by forests?	( ) Yes	( ) No

Table 1
Research survey (continues)

	The rest of the questions will be answered after the information on forest ecosystem services is provided.			
Q10	Please indicate the three most important products provided by the forest ecosystem.	1)	2)	3)
Q11	Please indicate the three most important services provided by the forest ecosystem.	1)	2)	3)
Q12	How much would you be willing to pay to maintain or improve your utilisation of forest ecosystem services?			
Q13	Are you afraid to go into the woods?	( ) Yes	( ) No	
	If yes, why?			
Q14	Do you think that charging for the services provided by forest ecosystems contributes positively to the conservation and sustainability of forests?	( ) Yes	( ) No	
Q15	Do you think the forestry organisation works effectively enough to protect and develop forests?	( ) Yes	( ) No	
	If no, why?			
Q16	Do you think the existing laws are sufficient for the protection, development and sustainability of forests?	( ) Yes	( ) No	
	If not, what should be done?			

2.3. Method

In the initial phase of the study, the requisite sample size for the survey was established. The survey's sample size was determined based on the population of the study area, which is 376,377 people (TUIK, 2020). The Formula 1 was used to calculate the sample size (Orhunbilge, 2000; Serper, 2000).

$$n = \frac{N*t^2*P*Q}{(d^2(N-1)+(t^2*P*Q)} \quad (2.1)$$

Here, n represents the number of people to be surveyed, Z represents the confidence coefficient (95% → 1.96), N represents the main mass subject to sampling (376377), P represents the probability of the presence of the characteristic to be measured in the main mass, Q represents 1-P, and E represents the accepted sampling error (10%). To calculate the maximum number of questionnaires, the Q value was taken as 0.5. The sample size was determined to be 97 individuals. 39 surveys were conducted in the city centre, while 58 surveys were conducted in rural areas, based on the ratio of urban and rural population.

In the study, the responses of the participants were evaluated according to various groups formed. In this context, the respondents were categorised as rural or urban according to their place of residence. The respondents were categorised into five groups according to their level of education: primary school, secondary school, high school, university and postgraduate graduates. In addition, four income groups were formed according to the multiples of the minimum wage (MW): 0-1 MW, 1.1-2 MW, 2.1-4 MW and 4+ MW.

It was analysed whether the respondents' perceptions on forest and forest ecosystem services differed according to the groups. To determine significant differences between groups, the Kruskal-Wallis test (significance level of $p<0.05$) was employed. In cases where there were significant differences between groups, the Mann-Whitney U (MWU) test was used to determine which groups differed from each other (Orhunbilge, 2000). When comparing three or more groups, the Bonferroni correction method was applied. The significance of the Bonferroni correction method was determined as 3 in the MWU test. Therefore, the adjusted p-value was calculated as 0.05/3=0.02, resulting in a p-value of 0.02 for higher group numbers. The statistical analysis was performed using SPSS 23 software.

3. Results and Discussion

The opinions and perceptions of urban and rural people on forest ecosystem services, as determined by a survey, are presented below under subheadings.

Demographic characteristics of the participants

Tables 2 and 3 present the demographic characteristics of the participants and the survey results, respectively.

Table 2
Matrix of participants' place of residence, gender, and education ınformation

	Rural				Urban				Total	
	Male	%	Female	%	Male	%	Female	%	f	%
Primary school	15	15,5	24	24,7	2	2,1	5	5,2	46	47,4
Middle school	4	4,1	2	2,1	3	3,1	2	2,1	11	11,3
High school	9	9,3	2	2,1	7	7,2	5	5,2	23	23,7
University	-	-	1	1,0	8	8,3	6	6,2	15	15,5
Master's/PhD	-	-	1	1,0	-	-	1	1,0	2	2,1
Total	28	28,9	30	30,9	20	20,6	19	19,6	97	100,0

Table 3
Matrix of participants' place of residence, monthly income, and occupation

	Rural								Urban						Total	
	Monthly income															
	0-1 MW	%	1,1-2 MW	%	2,1-4 MW	%	4,1+ MW	%	0-1 MW	%	1,1-2 MW	%	2,1-4 MW	%	f	%
Employee	-	-	2	2,1	-	-	-	-	4	4,1	3	3,1	3	3,1	12	12,4
Farmer	1	1,0	22	22,7	15	15,5	2	2,1	-	-	-	-	-	-	40	41,2
Officer	-	-	1	1,0	-	-	-	-	-	-	-	-	2	2,1	3	3,1
Retired	1	1,0	7	7,2	1	1,0	-	-	2	2,1	4	4,1	1	1,0	16	16,5
Housewife	1	1,0	4	4,1	-	-	-	-	1	1,0	7	7,2	4	4,1	17	17,5
Trader	-	-	-	-	1	1,0	-	-	1	1,0	4	4,1	3	3,1	9	9,3
Total	3	3,1	36	37,1	17	17,5	2	2,1	8	8,3	18	18,6	13	13,4	97	100,0

When analysing Tables 2 and 3, it was found that 59.8% of the participants reside in rural areas, and 50.8% of them are women. The age of the participants ranges from 23 to 87. Specifically, 13.4% (13 people) were in the 23-30 age group, 17.5% (17 people) were in the 31-40 age group, 26.8% (26 people) were in the 41-50 age group, 16.5% (16 people) were in the 51-60 age group, 17.5% (17 people) were in the 61-70 age group, and 8.2% (8 people) were in the 71-87 age group. The participants' income ranged from 3800 TL (253 USD) to 70000 TL (4667 USD). Only 2.1% of the respondents held master's or doctorate degrees, while almost half (47.4%) were primary school graduates. 41.2% of the respondents were farmers, with 55% of these farmers earning between MW 1.1-2 per month and 37.5% earning between MW 2.1-4 per month.

Perceptions and opinions of participants regarding forests.

The information organized based on the responses obtained from participants regarding their initial perceptions of forests before forest ecosystem services are shown in Figure 2**.**

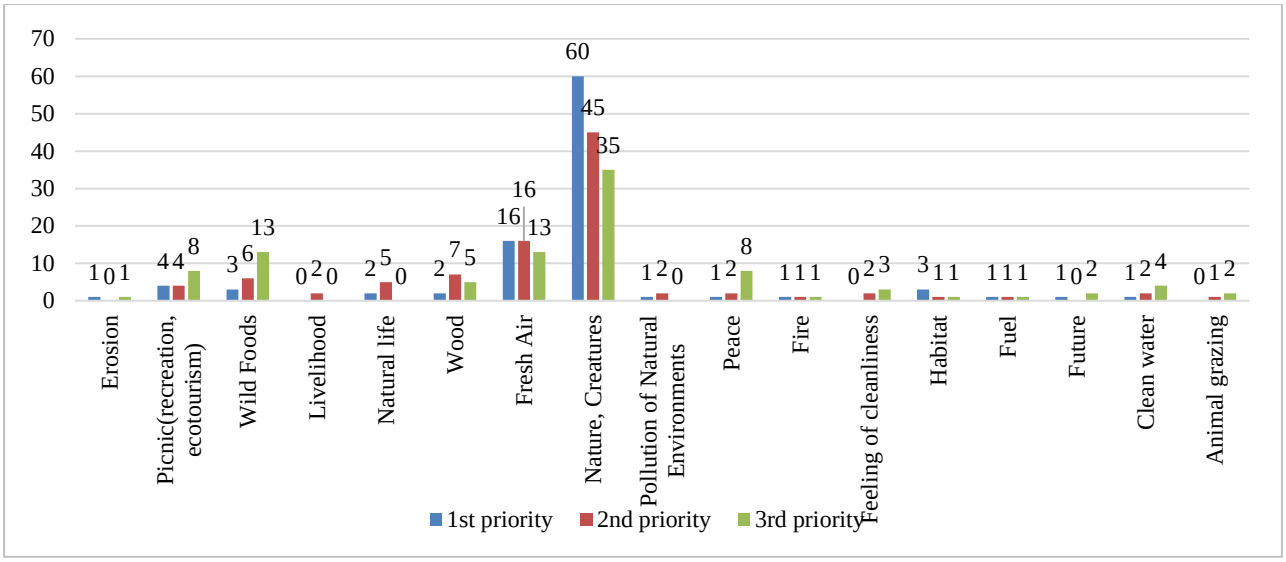

Figure 2. Participants' top three associations with forests

Upon analysing Figure 2, the top three items that come to mind are nature and living creatures, with a rate of 61.9%, fresh air, with a rate of 16.5%, and picnic/recreation/ecotourism, with a rate of 4.1%. It is important to note that these statements are objective evaluations and not subjective opinions. The three most frequently mentioned statements in total were nature and living creatures, with a rate of 48.1%, clean air, with a rate of 15.5%, and wild foods, with a rate of 7.6%.

Approximately 62% of the respondents associate forests with nature and living things, indicating a positive evaluation beyond the mere presence of plants and trees. Furthermore, the mention of seventeen distinct items that come to mind when urban and rural residents of Kastamonu think of forests indicates that these individuals have various forms of interaction with forests. The mention of harmful and damaging phenomena such as erosion, wood sourcing, the feeling of cleanliness, prospects, habitat, and fire indicates the various physical and imaginary connections that people establish with forests. Similarly, in a study conducted in the centre of Çankırı, which borders Kastamonu province, approximately 60% of respondents associated forests with trees and greenery. The second one is a source of fresh air, with a rate of 30.2% (Birben et al., 2018).

Figure 3 displays the survey results regarding the three most significant benefits of forests, as perceived by the respondents.

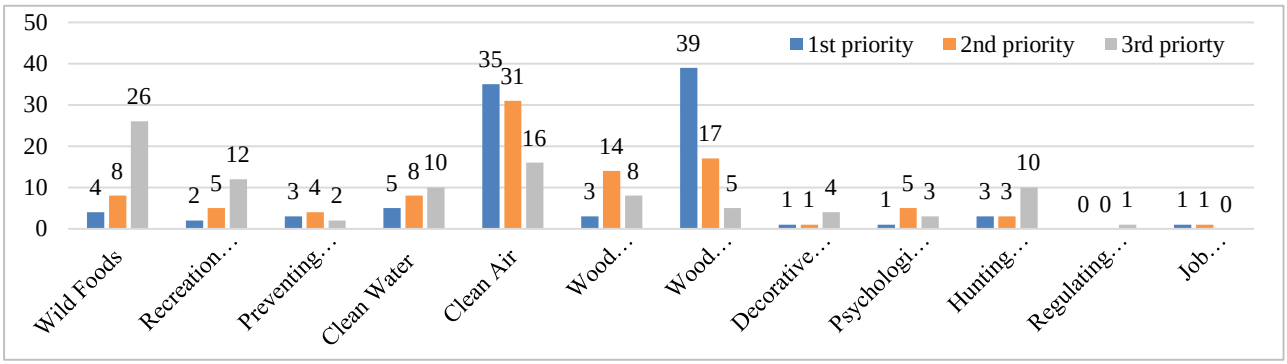

Figure 3. Respondents' top three forest benefits

Figure 3 shows that the participants identified firewood (40.2%), clean air (36.1%), and clean water (5.2%) as the top three benefits from forests. Clean air (28.2%), firewood (21%), and wild food (13.1%) were the most frequently mentioned benefits.

Although local people primarily benefit from forests for wood and fresh air, they also mention grazing, clean water, wild foods, and recreation. In Artvin, people's reasons for visiting the forest, such as picnics, fresh air, and psychological relaxation, are similar to these results. However, a significant proportion of people (18%) state that they visit forests compulsorily due to the lack of other places to go, meaning a lack of social opportunities (İnanç, 2019). Similar benefits of forests are also mentioned in a study conducted in Ankara (Birben and Ünal, 2020).

The study analysed whether participants' views on forests (Q7-1, 2 and 3, Q8-1, 2 and 3, Q13, Q15 and Q16) differed based on settlement, education, and income status using Kruskal-Wallis and MWU tests. Table 4 displays the groups that exhibit statistically significant differences based on the analysis results.

Table 4
Difference analysis of the participants' views on forests according to their settlements

	Residential area	N	Mean Rank	Sum of Ranks	MWU	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Q7-1	Rural	58	53,48	3102,00	871,000	1651,000	-2,196	**0,028**
	Urban	39	42,33	1651,00				
Q8-1	Rural	58	56,53	3278,50	694,500	1474,500	-3,408	**0,001**
	Urban	39	37,81	1474,50				

Table 4 shows that participants' opinions differ significantly depending on whether they live in urban or rural areas. Specifically, this relates to their responses to the first thing that comes to mind when they think of forests and the most important benefits they provide. The discrepancy in responses can be attributed to the differing circumstances of those residing in rural and urban areas. Those in rural communities cite factors that impact their daily lives, whereas those in urban settings highlight how they utilize their leisure and entertainment time.

Figure 4 displays the opinions of individuals residing in rural and urban areas regarding this matter. There was no statistically significant difference in opinions between participants regarding forests based on their education and income levels.

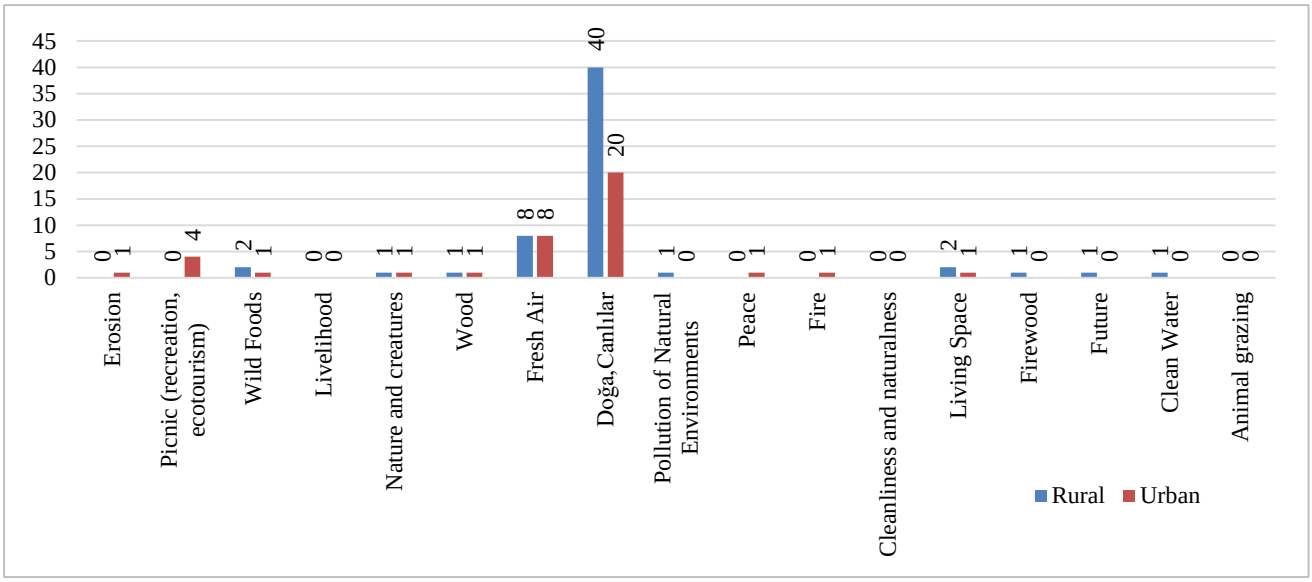

Figure 4. The degree of importance given by participants to forests and their benefits according to their settlements

There was no statistically significant difference in opinions between participants regarding forests based on their education and income levels.

Perceptions and opinions of participants regarding forests ecosystem services.

As part of the study, respondents' knowledge of the difference between forest products and services was analysed. Of the participants, 60.8% (59 people) stated that they knew the difference, while the remaining 39.2% did not. Of the participants, 60.8% (59 people) stated that they knew the difference, while the remaining 39.2% did not.

Figure 5 shows the participants' views on the importance of forest ecosystem services, which they ranked in the top three.

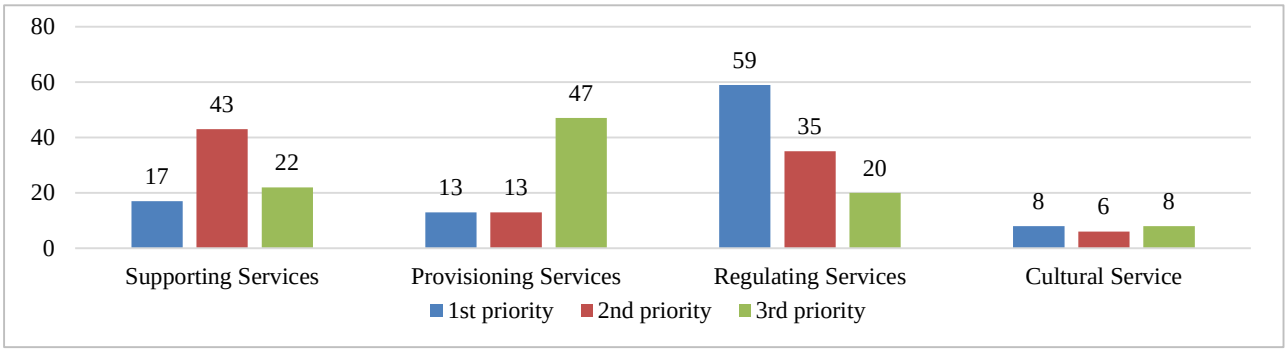

Figure 5. Ecosystem services that participants consider most important

Figure 5 shows the order of importance attributed to forest ecosystems by the respondents: regulatory services (60.8%), supportive services (17.5%), provisioning services (13.4%), and cultural services (8.3%).

Figure 6 displays the respondents' views on the three most significant products and services offered by forest ecosystems, while Figure 6 illustrates the evaluations of urban and rural residents on this matter.

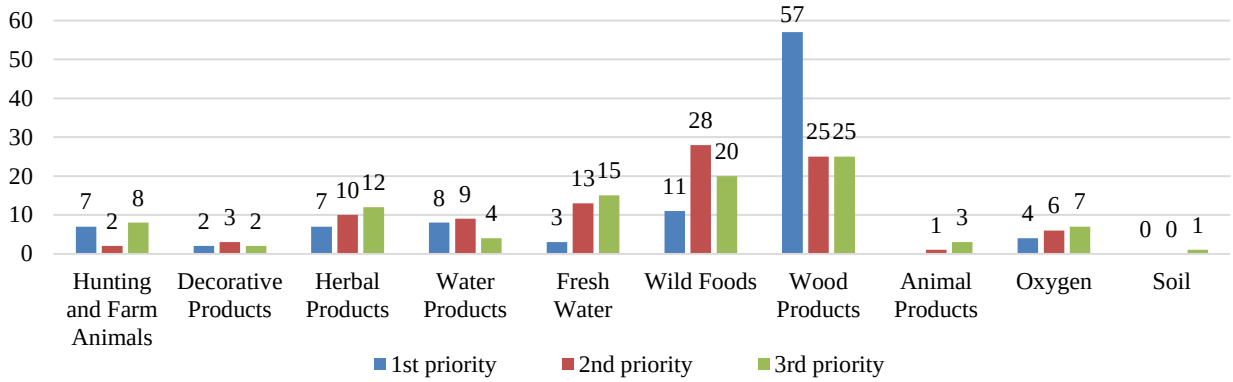

Figure 6. Participants' opinions about the three most important products provided by forest ecosystems

Upon analysing Figure 6, it becomes apparent that the most significant products provided by forest ecosystems are wood products (58.8%), wild foods (11.3%), and aquatic products (8.3%). The top three products mentioned by participants overall were wood products (36.8%), wild foods (20.3%), and freshwater production (10.7%).

Similarly, in a study conducted in Indonesia, local communities identified provisioning services as the most important ecosystem service, followed by regulatory services and subsequently cultural services (Muhamad et al., 2014). In a study across Austria, Germany, Finland, and Slovenia, the most crucial ecosystem services were categorized as follows: regulatory services such as air quality, water quality, and climate change mitigation; supporting services including water cycling and soil health; and provisioning services (such as food and water supply) (Ranacher et al., 2017). A study in the Czech Republic revealed that society places the highest value on provisioning services, followed by regulatory services and cultural services (Purwestri et al., 2023). These findings emphasize the multifaceted nature of ecosystem services and their importance for human well-being and sustainable development.

The forest ecosystem services mentioned by rural Kastamonu residents are tangible and intangible. These include natural life, wild foods, clean air, living creatures, a living space, clean water, and prospects. In contrast, urban residents cited reasons for temporarily leaving the city, such as access to natural environments, clean air, and opportunities for outdoor activities like picnics and recreation. They also mentioned the availability of wild foods, such as mushrooms and blackberries, and the peace of mind that comes with being in a more tranquil setting (Figure 7).

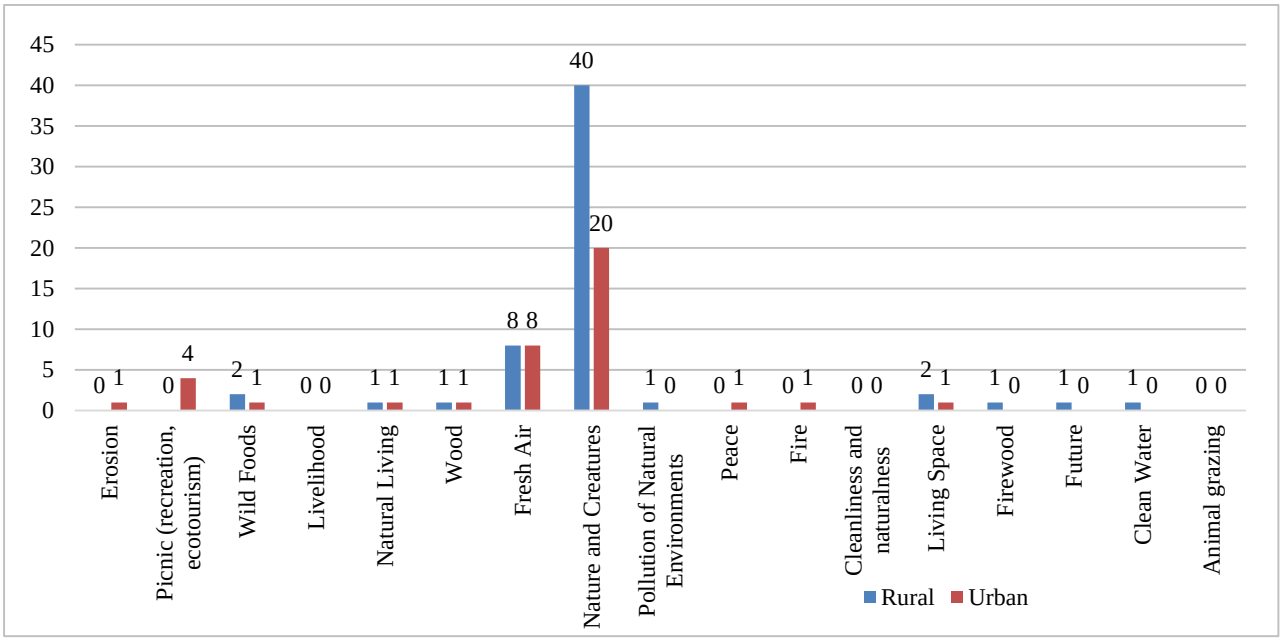

Figure 7. The three most important products and services provided by forest ecosystems according to settlements

The needs and awareness of ecosystem services may vary depending on each region's unique socio-economic and geographical characteristics. Different areas have different preference rankings for ecosystem services. For instance, a study conducted in Northwest Spain found that cognitive, cultural ecosystem services, such as the provision of drinking water, sports, climate regulation, socialisation, mythological features, and sense of place, were the most valued (Rodríguez-Morales et al., 2020). The study conducted in Madhupur Sal (Shorea provisioning) forest, the largest natural Sal forest belt in Bangladesh, revealed that rural people value the control of soil erosion, mental peace, and maintenance of soil fertility as the most critical ecosystem services (Saha et al., 202). A study conducted in Taiwan found that the public ranked 'soil conservation' as one of the top three most important forest ecosystem services due to the belief that forests play a crucial role in stabilising soil and preventing landslides. The second most important service was 'climate regulation', followed by 'carbon sequestration'. In the same study, people stated that the forest ecosystem's least significant services are timber,

non-wood products, and cultural services (Lin et al., 2021). A study conducted in the rural Ateva conservation forest in Africa revealed that rural households widely used timber, firewood and food due to their importance in terms of livelihoods (Atanga et al., 2024). This finding is consistent with the results of our study.

The study analysed whether participants' views on forest ecosystem services (Q9, Q10-1, 2 and 3, Q11-1, 2 and 3, Q12 and Q14) differed based on their settlement, education, and income status using Kruskal-Wallis and MWU tests. Tables 5, 6, and 7 demonstrate statistically significant differences among groups in the analysis results.

Table 5
Difference analysis of participants' opinions on forest ecosystem services according to settlements

		N	Mean Rank	Sum of Ranks	MWU	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Q9	Kırsal	58	36,22	2101,00	390,000	2101,000	-6,448	0,000
	Kent	39	68,00	2652,00				
Q10-1	Kırsal	58	55,97	3246,50	726,500	1506,500	-3,339	0,001
	Kent	39	38,63	1506,50				
Q10-2	Kırsal	58	55,08	3194,50	778,500	1558,500	-2,655	0,008
	Kent	39	39,96	1558,50				
Q10-3	Kırsal	58	53,57	3107,00	866,000	1646,000	-1,982	0,047
	Kent	39	42,21	1646,00				
Q11-1	Kırsal	58	43,76	2538,00	827,000	2538,000	-2,554	0,011
	Kent	39	56,79	2215,00				

As shown in Table 5, there are significant differences between urban and rural settlements in terms of participants' knowledge levels about forest ecosystem services, their opinions on the three most important forest ecosystem service products, and their opinions on the most important forest ecosystem service. Figure 8 illustrates the views of urban and rural residents on this matter.

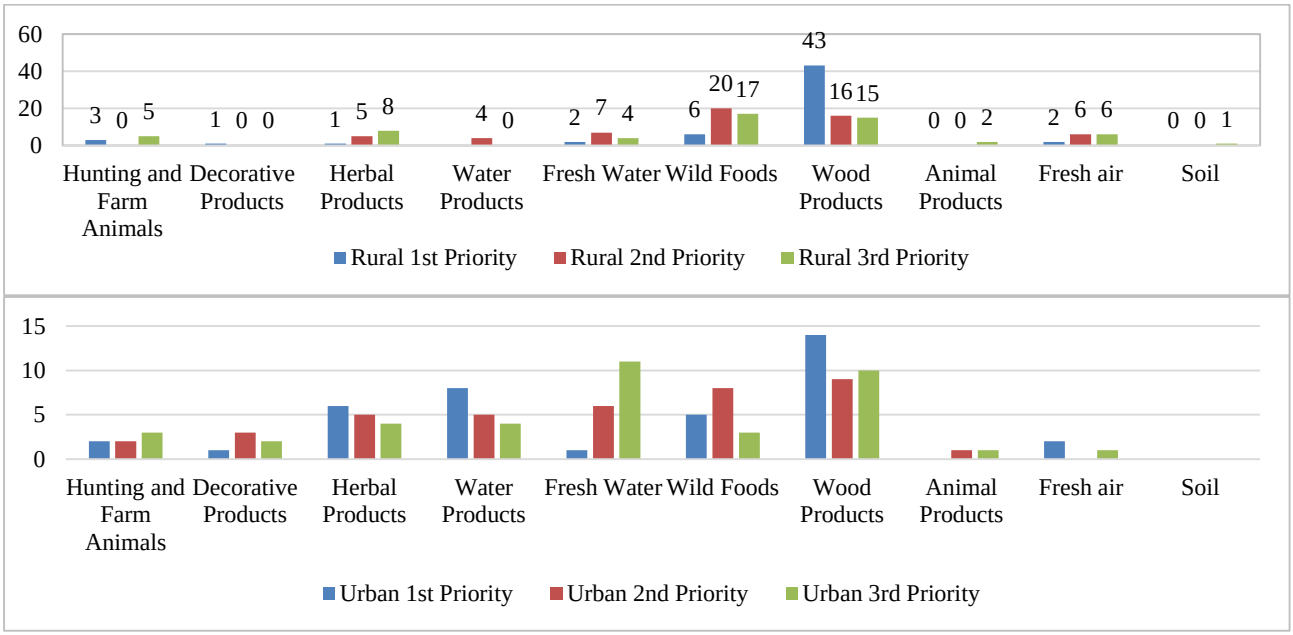

Figure 8. Participants' top opinions on forest ecosystem services and benefits by settlement

Figure 8 shows that in rural areas, the most commonly utilised ecosystem services are wood products, wild foods, clean air (oxygen), and plant products, with fresh drinking water also being frequently mentioned. In urban areas, wood products are the most commonly used ecosystem service. Similar to the findings of the

study, research conducted in Spain also identified disparities in the perceived significance of ecosystem services between urban and rural areas. According to this study conducted in Xalo Mountain, Spain, local people valued drinking water as the most important ecosystem service, while those living in the city valued sports activities the most (Rodríguez-Morales et al., 2020). A study of ecosystem services provided by urban green spaces in India found that urban dwellers perceived the provision of ecosystem services, such as enhancement of aesthetic beauty and improving mental health, to be of greater importance than the improvement of wildlife habitats, the collection of fresh water, the regulation of water flow and runoff, and the collection of firewood, fruit, honey and medicinal plants (Anand and Prodyut, 2024).

The order of importance attributed to forest ecosystem services is an indicator of the utilisation rate of these services. Since both urban and rural residents indicates a product or service with need, the demand for these products and services will also be high. Consequently, it is imperative to exercise greater caution in utilising forest-derived products and services, adhere to the principles of planning, and maintain a balance between conservation and utilisation. Only through this approach can the sustainability of forest ecosystem services be guaranteed.

Table 6
Difference analysis of participants' views on forest ecosystem services according to their education levels

	Education groups	N	Rank Averg.	Chi Square	df	Asymp. Sig.	Groups	MWU	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Q9	Primary school	46	37,42	24,661	4	,000	İlkokul-Lise	310,500	1391,500	-3,212	0,001
	Middle school	11	50,36				İlkokul-Üni.	127,500	1208,500	-4,211	0,000
	High school	23	57,46								
	University	15	68,00								
	Master's/PhD	2	68,00								
Q10-1	Primary school	46	55,53	8,709	4	,069	İlkokul-Lise	244,500	1897,500	-2,733	0,006
	Middle school	11	44,41								
	High school	23	46,72								
	University	15	34,77								
	Master's/PhD	2	57,00								

Table 6 shows a difference in knowledge about forest ecosystem services between primary school graduates and high school/university graduates. Additionally, there are statistically significant differences in opinions about the most essential product provided by forest ecosystem services between primary and high school graduates.

Table 7
Difference analysis of participants' perspectives on forest ecosystem services based on their income levels.

	Income levels	N	Rank Averg.	Chi Square	df	Asymp. Sig.	Groups	MWU	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
S9	0-1 MW	11	68,00	12,685	3	,005	0-1 AÜ-1,1-2 AÜ	187,000	1672,000	-2,407	,016
	1,1-2 MW	54	50,04				0-1 AÜ- 2,1-4 AÜ	77,000	542,000	-3,064	,002
	2,1-4 MW	30	42,13				0-1 AÜ- 4+ AÜ	0,000	3,000	-3,464	,001
	4+ MW	2	19,50								
S10-1	0-1 MW	11	28,86	10,198	3	,017	0-1 AÜ-1,1-2 AÜ	146,500	212,500	-2,920	,003
	1,1-2 MW	54	53,85				0-1 AÜ- 2,1-4 AÜ	102,000	168,000	-2,000	,046
	2,1-4 MW	30	46,58								
	4+ MW	2	65,00								

Upon analysing Table 7, it is evident that the participant's level of knowledge regarding forest ecosystem services varies significantly between those with a monthly income of 0-1MU and others. The opinions of other income groups are similar. There are statistically significant differences between primary and high school graduates regarding the most crucial product provided by forest ecosystem services.

The study of forest ecosystem services relies on human perspectives. Individuals value and protect resources acquired through their efforts (Akgün, 1997). Consequently, to ensure the preservation and long-term viability of forests and their ecosystems, firstly, we must assess the viewpoints and opinions of those who utilize and benefit from these services. Subsequently, conducting studies on this topic can enhance awareness of the importance of these services. Thus, we can motivate people to protect the ecosystems that supply these essential products and services, thus mitigating harm caused by human activities.

Numerous studies indicate that the perception of ecosystems as sources of specific services varies depending on several factors, including formal education, gender, ethnicity, age, cultural traditions, individual needs, access to ecosystem services, land ownership, and household income (Lewan and Söderqvist, 2002, Gunawan et al., 2004, Martín-López et al., 2012, Mathys et al., 2023). The results of this study reveal that, in general, individuals living in urban areas and those with relatively higher education levels possess more knowledge about forest ecosystem services. This is mainly attributed to approximately 70% of urban residents having completed high school or higher education, the widespread availability of communication tools facilitating access to written and visual information, and the influence of social media on increasing awareness levels. A similar positive effect on perceiving ecosystem services was identified in a study conducted in Indonesia (Muhamad et al., 2014). Similarly, Pak and Berber (2011) indicate that the residents of Artvin exhibit a high level of awareness regarding the benefits provided by forest ecosystem services. In contrast, a study conducted in Çankırı suggests that the public has a significantly lower awareness of the products and services offered by forests (Birben et al., 2018). In the West Java region of Indonesia, participants perceive approximately 50% of the specified provisioning services, while they can perceive only 16.72% of other ecosystem services (Muhamad et al., 2014). A study conducted in Iran also found that education level significantly influences the perception of regulating services (Pour et al., 2023). Similarly, a study in Bangladesh revealed that participants with higher education levels, higher annual family income, and more education related to agriculture tend to perceive ecosystem services more comprehensively than others (Saha et al., 2021).

The forest is not an area where everyone can freely go due to its structure. This situation poses a barrier to people interacting more with forests. The responses to the question asked to determine this aspect, which affects participants' relationships with forests, are shown in Table 8.

Table 8
Participants' fear of forests and their reasons

		Frequency	Percent	Valid Percent
State of fear	No	86	88,7	88,7
	Yes	11	11,3	11,3
	Total	97	100,0	100,0
The reason for fear	Wild animals	10	10,3	90,9
	Dark and dense trees	1	1,0	9,1
	Missing	86	88,7	
	Total	97	100,0	

As observed in Table 8, approximately 89% of participants do not fear entering the forest. Among those who express fear, 90.9% fear wild animals, while 9.1% cite the forest's darkness and density as reasons for their fear. Although some of Kastamonu's population admits to being afraid of venturing into the forest, the fact that 89% have close interactions with forests indicates a significantly high rate of benefiting from them. A

study conducted in Eskişehir also reported an approximate 70% rate of utilizing forests in some way (Pak and Berber, 2011), while residents of Artvin city centre mention a minimum monthly visit rate of 56% to the urban forest (İnanç, 2019).

In the study, the participants' opinions regarding the efforts of forestry organizations in forest conservation were obtained. The information is presented in Table 9.

Table 9
Opinions about the adequacy of forest administration in conservation activities

		Frequency	Percent	Valid Percent
Are conservation activities sufficient?	No	10	10,3	10,3
	Yes	87	89,7	89,7
	Total	97	100,0	100,0
If no, why?	Lack of control	10	10,3	90,9
	Failure to comply with the rules of ethics and morality	1	1,0	9,1
	Missing	86	88,7	
	Total	97	100,0	

According to the data obtained from the Table 9, 89.7% of participants approve of the forestry administration's activities aimed at forest conservation. Among those who find these efforts insufficient and ineffective, approximately 91% express that inspections are inadequate, while 9% believe that certain employees have deviated from their professional ethics. The results of a study conducted in Sivas show that the opinions of forest villagers towards the work carried out by the forest organization are generally positive (Alkan and Kılıç, 2018). However, in a study conducted in Artvin in 2008, forest villagers stated that they did not like the forestry activities carried out (Toksoy et al., 2008). We can say that over time, forest villagers and the public have better understood the work carried out by the forestry organization, resulting in a change in negative perceptions in this context.

The information obtained from the question regarding participants' opinions on the adequacy of laws for the sustainable management of forests is presented in Table 10.

Table 10
Opinions about the adequacy of laws for sustainable forest management

		Frequency	Percent	Valid Percent
Are the laws sufficient?	No	13	13,4	13,4
	Yes	84	86,6	86,6
	Total	97	100,0	100,0
What should be done?	The deterrence of laws should be increased	13	13,4	100,0
	Missing	84	86,6	
	Total	97	100,0	

As seen from Table 10, 86.6% of participants believe that the existing laws are sufficient for achieving the preservation, enhancement, and continuity of forests, i.e., sustainable forest management. Among those who consider the laws inadequate, all of them express the need to enhance the deterrent effect of these laws. In a study conducted in the Eastern Black Sea region 2008, it was noted that forest villagers in Trabzon, Giresun, Artvin, and Rize were dissatisfied with the government's forestry policies. Only residents of Gümüşhane expressed satisfaction with the state's forestry policy (Toksoy et al., 2008).

61.9% of participants (60 individuals) believe that fees could be charged to those who benefit from the services provided by forest ecosystems for their conservation and continuity. Furthermore, 77.3% of participants stated their willingness to pay a fee for the sustainability and enhancement of the forest ecosystem services they utilize. The amount they are willing to pay varies between 10 TL (0.6 USD) and 30,000 TL (1794.3 USD), with an average payment preference of 846 TL (50.6 USD) for Kastamonu province. In rural areas, the willingness to pay ranges from 50 TL (3 USD) to 24400 TL (24.4 USD), while in cities it varies between 10 TL (0.6 USD) and 30000 TL (1796.4 USD). The average willingness to pay for those living in rural areas is 413.8 TL (24.8 USD), and 1443.3 TL (86.4 USD) for urban centres. In Kastamonu, this amounts to 318,414,942 TL (19,043,955.9 USD).

Various figures have been determined to conserve and enhance ecosystem services in different regions. For instance, in the European-Mediterranean region, a voluntary payment of 120 Euros per person is requested to sustain ecosystem services such as preventing forest fires, ensuring quality product production, maintaining biodiversity, and preserving cultural landscapes (Bernues et al., 2014). Similarly, a European study found that individuals are willing to pay 38 Euros per person for cultural ecosystem services (Huber and Finger, 2020). In a study conducted in China's Tibetan Plateau, people exhibited a willingness to pay an average of 1080.95 Chinese Yuan per person annually for water conservation, soil retention, carbon fixation, pollution decomposition, biodiversity conservation, and aesthetic existence. Specifically for water production, the average payment tendency was 172.40 Chinese Yuan per person annually. These findings underscore the importance of ecosystem services and highlight the need to invest in these areas for a sustainable future (Liu, 2020). A study conducted in South Korea revealed a strong preference for biodiversity as a primary ecosystem service in both national/public and private forests. Furthermore, the study found that residents would pay an average of 21.80–24.34 USD per household per year to improve this service (Son et al., 2024).

4. Conclusion

The Kastamonu public has sufficiently developed awareness regarding forest ecosystems, as revealed by our study results. Furthermore, both urban and rural populations in Kastamonu value the benefits of ecosystem services and are primarily aware of the distinction between products and services. The most highly prioritized forest ecosystem services are regulatory, and individuals are willing to make voluntary payments to enhance and sustain these services.

Within the forest ecosystem products and services utilized by rural communities are wood, food, clean water supply, clean air, and plant-based products including medicinal and aromatic plants. They particularly use them in their daily lives. In urban centres, wood products, clean water production, decorative items, hunting, plant-based products (including medicinal and aromatic plants), and aquatic products take precedence.

The Kastamonu public generally believes that the efforts of forest management and the existing laws are largely sufficient for the sustainable management of forests. However, they also emphasize the need to enhance the deterrent effect of penalties.

Greater integration into sustainable forest management planning is necessary to enhance forest ecosystem services. Significant additional efforts are required to support the sustainability of these services. This study will provide decision-makers with a reference for increasing awareness and ensuring the sustainability of forest ecosystem services.

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Author Contributions

Author Beyzanur Baykalı: She collected the data and contributed to the writing of the manuscript.

Author Gökhan Şen: Planned and designed the study, performed statistical analyses and wrote the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

References

Akgün, M. (1997). Kutadgu Bilig'te İnsan ve Kamil İnsan. Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 3(3), 1-11. Access address: https://dergipark.org.tr/en/download/article-file/114969

Alkan, H. and Kılıç, M. (2018). Orman köyleri perspektifinde ormancılık ve salma hayvancılık ilişkileri. 1st International Symposium on Silvopastoral Systems and Nomadic Societies in Mediterranean Countries (pp.14-21). Isparta, Türkiye. Access address: https://www.researchgate.net/publication/335602008_ISNOS-MED-2018-Proceedings#page=26

Anand, & Bhattacharya, P. (2024). Assessing resident's perception towards ecosystem services of urban green spaces in Delhi, India. International Journal of Sustainable Development & World Ecology, 31(2), 150-162. https://doi.org/10.1080/13504509.2023.2261013

Asah, S.T., Guerry, A.D., Blahna, D.J. and Lawler, J.J. (2014). Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. Ecosystem services, 10, 180-186. https://doi.org/10.1016/j.ecoser.2014.08.003

Atanga, R. A., Kainyande, A., Tankpa, V., & Osunmadewa, B. (2024). Perceived Status Of Ecosystem Services Emanating From A Forest Reserve: Evidence From Atewa Range Forest Reserve In Ghana. Environmental Management, 1-17. https://doi.org/10.1007/s00267-023-01933-7

Atmış, E. (2004). Ormanlar üzerindeki kent kökenli baskılar ve kent duyarlılığı, I.Ulusal Kent Ormancılığı Kongresi (pp.401-413). Isparta, Türkiye.

Ayyıldız, H. and Toksoy, D. (2002). Üniversite öğrencilerinin sosyal-kültürel özellikleri ve gelir-harcama yapısı: Karadeniz Teknik Üniversitesi Orman Fakültesi örneği. Pazarlama Dünyası, 16(6), 50-57.

Balasubramanian, K., & Dwivedi, P. (2024). Using mental model approach for ascertaining socio-cultural perceptions of forest-based ecosystem services among female forest landowners in Georgia, United States. Forests, Trees and Livelihoods, 1-23. https://doi.org/10.1080/14728028.2024.2312880

Bernues, A., Rodríguez-Ortega, T., Ripoll-Bosch, R. and Alfnes, F. (2014). Socio-cultural and economic valuation of ecosystem services provided by Mediterranean mountain agroecosystems. PloS one, 9(7), e102479. https://doi.org/10.1371/journal.pone.0102479

Bezák, P., Mederly, P., Izakovičová, Z., Moyzeová, M. and Bezáková, M. (2020). Perception of ecosystem services in constituting multi-functional landscapes in Slovakia. Land, 9(6), 195. https://doi.org/10.3390/land9060195

Birben, Ü. and Ünal, H.E. (2020). Kentlinin ormana bakışı: Ankara il merkezi örneği. Bartın Orman Fakültesi Dergisi, 22(3), 1037-1052. https://doi.org/10.24011/barofd.768769

Birben, Ü., Ünal, H.E. and Karaca, A. (2018). Orman kaynaklarına ilişkin toplumsal algının incelenmesi (Çankırı kent merkezi örneği). Türkiye Ormancılık Dergisi, 19(1), 76-82. https://doi.org/10.18182/tjf.394139

Çoban, A. and Yücel, M. (2018). Kent planlamasında ekosistem hizmetlerinin rolü. Düzce Üniversitesi Bilim ve Teknoloji Dergisi, 6(2), 444-454. Access address: https://dergipark.org.tr/en/download/article-file/451870

Costanza, R., De Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S.J., Kubiszewski,I., Farber, S. and Turner, R.K. (2014). Changes in the global value of ecosystem services. Glob. Environ. Chang., 26, 152-158. https://doi.org/10.1016/j.gloenvcha.2014.04.002

Cuni-Sanchez, A., Imani, G., Bulonvu, F., Batumike, R., Baruka, G., Burgess, N. D. and Marchant, R. (2019). Social perceptions of forest ecosystem services in the Democratic Republic of Congo. Human Ecology, 47, 839-853. https://doi.org/10.1007/s10745-019-00115-6

Geray, U., Şafak, İ., Yılmaz, E., Kiracıoğlu, Ö. and Başar, H. (2007). İzmir ilinde orman kaynaklarına ilişkin

işlev önceliklerinin belirlenmesi, Ege Ormancılık Araştırma Müdürlüğü Yayın No:46, Teknik Bülten No:35, İzmir.

Gouwakinnou, G.N., Biaou, S., Vodouhe, F.G., Tovihessi, M.S., Awessou, B.K. and Biaou, H.S. (2019). Local perceptions and factors determining ecosystem services identification around two forest reserves in Northern Benin. Journal of Ethnobiology and Ethnomedicine, 15(1), 1-12. https://doi.org/10.1186/s13002-019-0343-y

Gunawan, B., Takeuchi, K., Tsunekawa, A. and Abdoellah, O. S. (2004). Community dependency on forest resources in West Java, Indonesia: the need to re-involve local people in forest management. Journal of Sustainable Forestry, 18(4), 29-46. https://doi.org/10.1300/J091v18n04_02

Harita Genel Müdürlüğü (HGM), 2023. Kastamonu fiziki il haritası. Access address: https://www.harita.gov.tr/urun/kastamonu-fiziki-il-haritasi/380

Hassen, A., Zander, K.K., Manes, S. and Meragiaw, M. (2023). Local People's perception of forest ecosystem services, traditional conservation, and management approaches in North Wollo, Ethiopia. Journal of Environmental Management, 330, 117118. https://doi.org/10.1016/j.jenvman.2022.117118

Hegetschweiler, K. T., Wartmann, F. M., Dubernet, I., Fischer, C., & Hunziker, M. (2022). Urban forest usage and perception of ecosystem services–A comparison between teenagers and adults. Urban Forestry & Urban Greening, 74, 127624. https://doi.org/10.1016/j.ufug.2022.127624

Huber, R. and Finger, R. (2020). A Meta-analysis of the willingness to pay for cultural services from grasslands in Europe. Journal of Agricultural Economics, 71(2), 357-383. https://doi.org/10.1111/1477-9552.12361

İnanç, S. (2019). Artvin kent ormanı ve halkın beklentileri. Turkish Journal of Biodiversity, 2(2), 57-61. Access address: http://dergipark.gov.tr/biodiversity

Kastamonu Forestry Regional Directorate (KFRD), (2023). State of forest. Access address: https://www.ogm.gov.tr/kastamonuobm/ormanlarimiz/orman-varligi?View={7c5f9d58-8f6c-4b4b-aa76-4d4bedfaf3bf}&SortField=Kapal_x0131__x0020_Normal_x0020_&SortDir=Asc

Korkmaz, M. (2012). Orman işletmelerinde iktisadilik düzeyinin TOPSIS yöntemi ile analizi. SDÜ Orman Fakültesi Dergisi, 13(1), 14-20. Access address: https://core.ac.uk/download/pdf/148739778.pdf

Lele, S., Springate-Baginski, O., Lakerveld, R., Deb, D. and Dash, P. (2013). Ecosystem services: origins, contributions, pitfalls, and alternatives. Conserv. Soc., 11 (4), 343-358. Access address: https://www.jstor.org/stable/26393131

Lewan, L. and Söderqvist, T. (2002). Knowledge and recognition of ecosystem services among the general public in a drainage basin in Scania, Southern Sweden. Ecological Economics, 42(3), 459-467. https://doi.org/10.1016/S0921-8009(02)00127-1

Lin, J.C., Chiou, C.R., Chan, W.H. and Wu, M.S. (2021). Public perception of forest ecosystem services in Taiwan. Journal of Forest Research, 26(5), 344-350. https://doi.org/10.1080/13416979.2021.1911023

Lin, J.C., Wang, P.J., Chen, L.C. and Lin, Y.J. (2008). An analysis of forest ecosystem services cognition by people with different environmental attitudes. Taiwan J. For. Sci. 23: 51–62. Access address: https://www.cabidigitallibrary.org/doi/full/10.5555/20083309561

Liu, Y. (2020). The willingness to pay for ecosystem services on the Tibetan Plateau of China. Geography and Sustainability, 1(2), 141-151. https://doi.org/10.1016/j.geosus.2020.06.001

López-Santiago, C.A., Oteros-Rozas, E., Martín-López, B., Plieninger, T., Martín, E.G. and González, J. (2014). Using visual stimuli to explore the social perceptions of ecosystem services in cultural landscapes: the case of transhumance in Mediterranean Spain. Ecology and Society, 19(2). http://dx.doi.org/10.5751/ES-06401-190227

Martín-López, B., Iniesta-Arandia, I., García-Llorente, M., Palomo, I., Casado-Arzuaga, I., Del Amo, D.G. and González, J.A. (2012). Uncovering ecosystem service bundles through social preferences. PLoS One. 7(6): e38970. https://doi.org/10.1371/journal.pone.0038970

Mathys, A. S., Van Vianen, J., Rowland, D., Narulita, S., Palomo, I., Pascual, U., ... and Sunderland, T. (2023). Participatory mapping of ecosystem services across a gradient of agricultural intensification in West Kalimantan, Indonesia. Ecosystems and People, 19(1), 2174685. https://doi.org/10.1080/26395916.2023.2174685

Millennium Ecosystem Assessment (MEA). (2005). Ecosystems and Human Well-Being. Island press, 5-563. Access address:

https://www.unioviedo.es/ranadon/Ricardo_Anadon/docencia/DoctoradoEconomia/Millenium%20Eco%20Assesment%2005%20Oppor%20Business%20Industry.pdf

Muhamad, D., Okubo, S., Harashina, K., Gunawan, B. and Takeuchi, K. (2014). Living close to forests enhances people's perception of ecosystem services in a forest–agricultural landscape of West Java, Indonesia. Ecosystem Services, 8, 197-206. https://doi.org/10.1016/j.ecoser.2014.04.003

Obonyo, E., Mogoi, J. and Ongugo, P. (2008). Property rights and forest management: Whose reality counts? A ppolicy brief. Virginia Tech. Sustainable Agriculture and Natural Resource Management (SANREM) Knowledgebase. Access address: https://vtechworks.lib.vt.edu/server/api/core/bitstreams/898641a0-886e-4c4a-b9d9-f8ad22ff295a/content

Orhunbilge, N., 2000. Sampling methods and hypothesis testing (pp. 178–267). Istanbul, Turkey: Avcıol Basım ve Yayın. ISBN: 975-404-511-9.

Owubah, C.E., Le Master, D.C., Bowker, J.M. and Lee, J.G. (2001). Forest tenure systems and sustainable forest management: the case of Ghana. Forest Ecology and Management, 149(1-3), 253-264. https://doi.org/10.1016/S0378-1127(00)00557-0

Özer, M.A., 2001. Derin Ekoloji. Çağdaş Yerel yönetimler, 10(4): 61-79. Access address: https://www.researchgate.net/profile/Mehmet-Oezer-10/publication/348010287_Derin_Ekoloji/links/5fece32592851c13fed7d3f2/Derin-Ekoloji.pdf

Öztürk, S. and Ayan, S. (2015). Management alternatives in national park areas: The case of Ilgaz Mountain National Park. – eco.mont - Journal on Protected Mountain Areas Research, 7: 37-44. Access address: https://www.austriaca.at/buecher/files/eco.mont_%28Journal_on_Protected_Mountain_Areas_Research%29/eco.mont_Vol._7_No._1/ecomont-13-08-%C3%96tzt%C3%BCrk-Ayan.pdf

Pak, M. and Berber, H. (2011). Orman kaynaklarının işlevlerine ilişkin toplumsal bilinç düzeyinin incelenmesi: Eskişehir ili örneği. Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi, 12(2), 161. Access address: https://ofd.artvin.edu.tr/en/download/article-file/25761

Pak, M., Özkazanç, O. and Okumuş, A. (2021). Ormanların fonksiyonlarına ilişkin toplumsal bilinç düzeyinin incelenmesi (Kahramanmaraş ili örneği). Turkish Journal of Forest Science, 5(2), 462-477. https://doi.org/10.32328/turkjforsci.958038

Pehlivan, Ş.Y. (2023). Pazarı olmayan orman ekosistem hizmetlerinin ekonomik değerinin belirlenmesi. Anadolu Orman Araştırmaları Dergisi, 9(1), 141-148. https://doi.org/10.53516/ajfr.1265836

Pour, M.D., Barati, A.A., Azadi, H., Scheffran, J. and Shirkhani, M. (2023). Analyzing forest residents' perception and knowledge of forest ecosystem services to guide forest management and biodiversity conservation. Forest Policy and Economics, 146, 102866. https://doi.org/10.1016/j.forpol.2022.102866

Purwestri, R.C., Palátová, P., Hájek, M., Dudík, R., Jarský, V. and Riedl, M. (2023). Public perception of the performance of Czech forest ecosystem services. Environmental Sciences Europe, 35(1), 89. https://doi.org/10.1186/s12302-023-00802-8

Ranacher, L., Lähtinen, K., Järvinen, E. and Toppinen, A. (2017). Perceptions of the general public on forest sector responsibility: A survey related to ecosystem services and forest sector business impacts in four European countries. Forest Policy and Economics, 78, 180-189. https://doi.org/10.1016/j.forpol.2017.01.016

Rodríguez-Morales, B., Roces-Díaz, J. V., and Kelemen, E. (2020). Perception of ecosystem services and disservices on a peri-urban communal forest: are landowners' and visitors' perspectives dissimilar? Ecosyst Serv, 43: 101089. https://doi.org/10.1016/j.ecoser.2020.101089

Saha, S., Hasan, S.S., Haque, M.E. and Ahamed, T. (2021). Perception based assessment of ecosystem services of Madhupur Sal Forest in Bangladesh. European Journal of Agriculture and Food Sciences, 3(1), 39-44. https://doi.org/10.24018/ejfood.2021.3.1.194

Saygı, S. (2016). Çağdaş sanatta doğa algısı ve ekolojik farkındalık. Sanat – Tasarım Dergisi, 7, 7-13. https://doi.org/10.17490/Sanat.XXX

Şen, G. (2021). The Effectiveness of the forest certification process in preventing forest crimes and adapting to climate change. Şen, G and Güngör, E. (Edts). In book: Conservation of Natural Resources in the Context of Climate Change (pp.1-7) Publisher: Duvar Publishing.

Şen, G. and Güngör, E. (2018). Analysis of land use/land cover changes following population movements and agricultural activities: a case study in northern Turkey. Appl Ecol Env Res. 16(2):2073–88.

http://dx.doi.org/10.15666/aeer/1602_20732088

Şen, G. and Toksoy, D. (2006). Türkiye'de nüfus orman ilişkisi. Ormancılıkta Sosyo-Ekonomik Sorunlar Kongresi (pp.108-117). Çankırı, Türkiye. Access address: https://www.researchgate.net/publication/338745384_Turkiye'de_Nufus_Orman_Iliskisi

Şen, G., Çelik, M. Y. and Ulusoy, T. (2019). A New financing model for carbon emission reduction projects: the use of carbon emission reduction purchase agreements (ERPA) in the private pension system. Alinteri Journal of Agriculture Sciences, 34(2):111-120. https://doi.org/10.28955/alinterizbd.664754

Serper, Ö., 2000. Applied statistics II (4th ed.). Bursa, Turkey: Ezgi Kitabevi.

Siry, J.P., Cubbage, F.W. and Ahmed, M.R. (2005). Sustainable forest management: global trends and opportunities. Forest Policy and Economics, 7, 551- 561. https://doi.org/10.1016/j.forpol.2003.09.003

Son, Y. G., Lee, Y., & Jo, J. H. (2024). Residents' Willingness to Pay for Forest Ecosystem Services Based on Forest Ownership Classification in South Korea. Forests, 15(3), 551. https://doi.org/10.3390/f15030551

Toksoy, D., Ayaz, H. and Şen, G. (2008). Artvin ili orman köylerinin sosyo-ekonomik özellikleri. Artvin Çoruh Üniversitesi, Orman Fakültesi Dergisi, 9 (1-2): 1-11 Access address: https://ofd.artvin.edu.tr/en/download/article-file/25678

Toksoy, D., Sen, G., Özden, S. and Ayaz, H. (2008). The forestry organization and its relationship with local people in the Eastern Black Sea Region of Turkey. New Mediterr, 4, 47-53. Access address: https://newmedit.iamb.it/share/img_new_medit_articoli/239_47toksoy.pdf

Türkiye İstatistik Kurumu (TÜİK) Nüfus ve Demografi. 2020. Access address: https://data.tuik.gov.tr/Kategori/GetKategori?p=Nufus-ve-Demografi-109

Ünal, H.E. and Birben, Ü. (2021). Public Perception of Forest in Forest Villages: The Case of Hanönü Forest District Directorate in Kastamonu Province. Anadolu Orman Araştırmaları Dergisi, 7(2), 95-106. https://doi.org/10.53516/ajfr.959223

Wang, Y., Sun, J., Liu, C. ve Liu, L. (2024). Çin'in dağlık bir bölgesinde algılanan ekosistem hizmetleri ile kırsal kesimde yaşayanların refahı arasındaki bağlantıyı araştırmak. Uygulamalı Coğrafya , 164 , 103215. https://doi.org/10.1016/j.apgeog.2024.103215