Ecosystem services and their value- initial assessment

Deliverable 7.2

WP7 Performance and impact monitoring and evaluation

Summary:
This document offers the results of the identification of key ecosystem services provided by each of the Fagaceae areas involved in the project, and of the assessment of citizens' perception at project initial stage. For the identification of key ecosystem services (ES) in each of the project areas, a stakeholder consultation was performed and the contents of received questionnaires were evaluated. This resulted in ranked lists of ecosystem services based on both their considered importance and their decline risk. The ES considered most significant were incorporated in questionnaires distributed amongst citizens and visitors of the project sites, both on paper and by an online app, focused on the assessment of their valuation of these services and their willingness to actively engage in their preservation. Results showed that there is a wide awareness of the forest values and of the threat posed by invasive *Phytophthora*, amplified by climate change. They also show a wide-spread willingness of the respondents to contribute to forest conservation through compliance with hygiene measures.

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1. Executive Summary

In order to kick off the assessment of socio-economic impacts of LIFE FAGESOS, two steps were performed:

- Identification of the services offered by the forest ecosystems object of project interventions
- Assessment of citizens' perception on ecosystem services and attitudes towards protection measures.

Firstly, a stakeholder survey was set up by Van Leijen Srl to identify the key ecosystem services (ES) provided by the forest areas targeted by the project. This survey was addressed to a selected group of stakeholders, including people with special knowledge and interests rooted locally in the selected project areas. The survey was conducted by local project staff and provided a total of 50 questionnaires, collected in the following areas:

1. *Monte San Biagio (Province of Latina, Italy): cork oak forests San Vito and Valle Marina (SV)*
2. *Vallerano-Canepina (Province of Viterbo, Italy): chestnut groves (VL-CA)*
3. *Monte Arcosu (Province of Cagliari, Italy): cork oak and holm oak dehesa (MA)*
4. *La Tejera (Andalucia, Spain): holm oak dehesa (TJ)*
5. *La Almoraima (Andalucia, Spain): cork oak dehesa (AL)*

Results of this survey produced a ranked selection of the ten most important ecosystem services for each area, divided in three main categories: a) regulating services, b) provisioning services, c) cultural services. In addition, the survey collected stakeholders' perceptions of the quality trends of these ecosystem services over the past ten years and the main threats to their persistence. Finally, stakeholders were asked whether they expected a positive impact of project activities on ecosystems and the services they provide. Respondents were found very confident in positive biophysical, monetary and sociocultural impacts of the LIFE FAGESOS project. All the results of this survey and their evaluations are described in Chapter 3.

Secondly, building on the results of the first survey, EU.R.E.S performed a broader survey addressed to citizens of the surrounding areas and tourists visiting the project sites to assess their perceptions and attitudes in the initial phase of the project. EU.R.E.S conducted this investigation through a semi-structured questionnaire with open-ended and closed-ended questions aimed at getting insights on the importance they attribute to diverse ecosystem services; their knowledge on threats and their propensity to engage in environmental protection. A total of 392 questionnaires were collected, with the following distribution among the six project areas: 27,8% in Monte San Biagio (IT); 26,3% in the chestnut groves of Vallerano and Canepina (IT); 13% in Monte Arcosu (IT); 13,3% in La Tejera (ES); 11,2% in la Almoraima (ES); and 8,4% in Trancoso (PT). The interviewed sample was characterised by gender, age and education and it was further classified in residents and tourists.
The first section of the questionnaire aimed to collect opinions on the importance of management and protection of the landscape and natural environment and related responsibilities. A second section aimed to investigate the value attributed to the natural environment and to rank key ecosystem services according to their importance. The last section focused firstly on the knowledge about threats to the forest ecosystems and their possible impact on their ecosystem services; secondly on their willingness to cooperate in forest protection by observing particular hygiene measures requested by the authorities. The survey revealed a high importance attributed to manifold services provided by the six monitored Fagaceae ecosystems; a significant awareness on threats and their possible impacts; and last but not least an almost total willingness of the respondents to contribute to the conservation of forests, through compliance with hygiene measures requested by authorities. Details of this survey are given in Chapter 4 and a short evaluation of the results in Chapter 5.

2. Introduction

Decline of Fagaceae forests in the Mediterranean basin, caused by the combined action of invasive *Phytophthora* and climate change, translates into a potential reduction of the ecosystem services these forests offer to mankind. Communities living in the neighbouring areas or who visit them for various purposes and enjoy the benefits offered to them by these ecosystems are knowledgeable about these services. The LIFE FAGESOS project aims to assess the tangible and intangible damage to human communities linked to the decline of forests and the value that can be generated by counteracting their decline through the activities implemented by the project.

To do this, the project used an ecosystem services approach, starting with a targeted survey that involved selected stakeholders with specific knowledge or interest in the monitored areas. The key ecosystem services were identified for each of the areas, by structured interviews with these stakeholders.

In a second phase citizens and visitors were asked by questionnaires how they perceive the importance and the value of these services and requested to mention eventual other services they consider important. They were also asked about their knowledge of threats to these ecosystems and, at last, about their willingness to observe measures requested by the authorities to contribute to their protection.
This assessment will be repeated during the last project year, to assess any changes in the perception that could be related to the project's activities.

In the next chapter, the first phase of the activities will be described, by which key ecosystem services were identified by stakeholders.
In chapter four we report in detail the results of the survey carried out amongst citizens and visitors.
In the last chapter we draw up the main conclusions.

3. Identification of key ecosystem services in each area

3.1 Aim and methodology

To assess citizens' perception of ecosystem services in the areas object of project activities aimed at their conservation, it was necessary to understand firstly which services were offered by these ecosystems and which of them were considered of major importance. To this end, a stakeholders' survey was foreseen.

A sample of local stakeholders was interviewed with the help of structured questionnaires to identify the key ecosystem services during November 2023. A methodology was used that had been successfully applied in the LIFE THE GREEN LINK project (LIFE15 CCA/ES/000125) by Antonio J. Castro of Universidad de Almería – Centro Andaluz para la Evaluación y Seguimiento del Cambio Global, as described in par. 3.6 of this project's deliverable "Action A2: Training course materials" (15/02/2017).

In this approach, humans and the ecosystems they live in are considered in an integrated way, as social – ecological systems.[1] These social-ecological systems have different levels of resilience which determinate their capacity and functioning when disturbances appear. The resilience is defined as the capacity of a system to absorb disturbance maintaining its structure and feedbacks.[2] It also reflects the capacity of learning and

[1] Martin-López B., E. Gómez-Baggethun, C.Montes. 2009. Un marco conceptual para la gestión de las interacciones naturaleza-sociedad en un mundo cambiante. Cuaderno interdisciplinar de Desarrollo Sostenible (CUIDES) 9: 229-258.
[2] Walker, B., Holling, C.S., Carpenter, S.R. and Kinzig, A. (2004) Resilience, adaptability and transformability in social-ecological systems. Ecology and Society, 9, 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/

adaptation in a changing world. Thus, the resilience of a social-ecological system depends on its complexity and features.[3]

Within such social-ecological systems, ecosystem services are defined as the direct or indirect contributions of ecosystems to human well-being.[4] The concept communicates societal dependence on ecological life[5] and is therewith useful to design policies and strategies for the management of social-ecological systems, hence for decision-making in conservation actions and natural resource management. Three categories are handled to classify them: 1) provisioning services; 2) regulating services; and 3) cultural services (Figure 1).

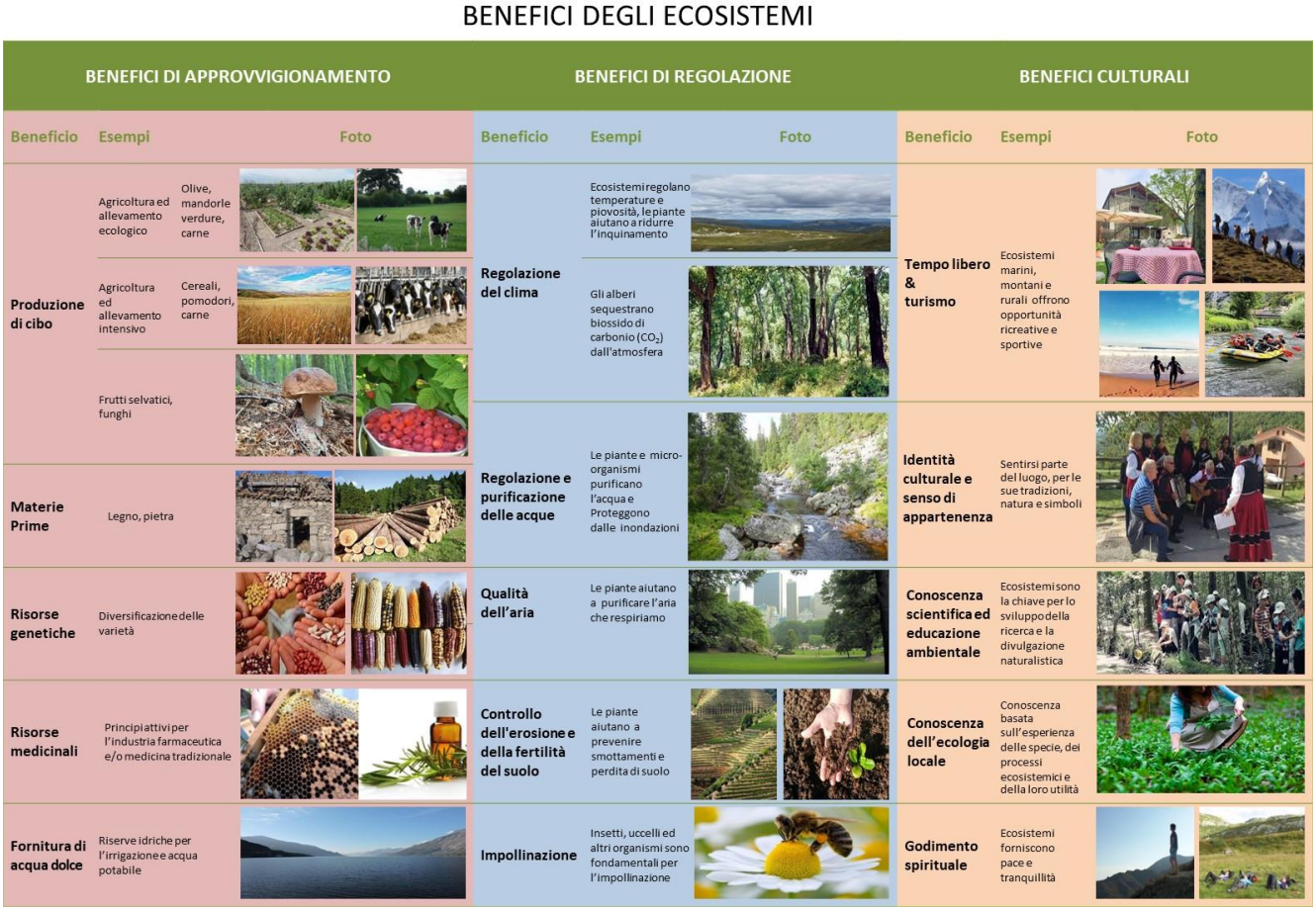


Figure 1: Ecosystem services classification and conceptual scheme (adaptation of Castro, 2017).

Evaluation of ecosystem services can focus on biophysical, socio-cultural or monetary aspects and is thus an interdisciplinary exercise that depends on a variety of sources of knowledge. Hence the need to involve stakeholders with diverse backgrounds, knowledge and interests to identify which are the most important of a determined social-ecological system.

To be considered are both the supply side (what does the ecosystem offer?) and the social demand (what do we require?). While on the one hand capacities of ecosystem services can degrade or improve, on the other hand

[3] Carpenter, S.R. and Folke, C. (2006) Ecology for transformation. Trends in Ecology and Evolution, 21, 309-315.
[4] de Groot, R. S., R. Alkemade, L. Braat, L. Hein, and L. Willemen. 2010. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. Ecological Complexity 7:260–272.
[5] Bastian, O., D. Haase, and K. Grunewald. 2012. Ecosystem properties, potentials and services—The EPPS conceptual framework and an urban application example. Ecological Indicators 21:7–16.

the demand can significantly change due to demographic developments and changing cultural habits or living standards.[6] Figure 2 sheds a light on such approach.

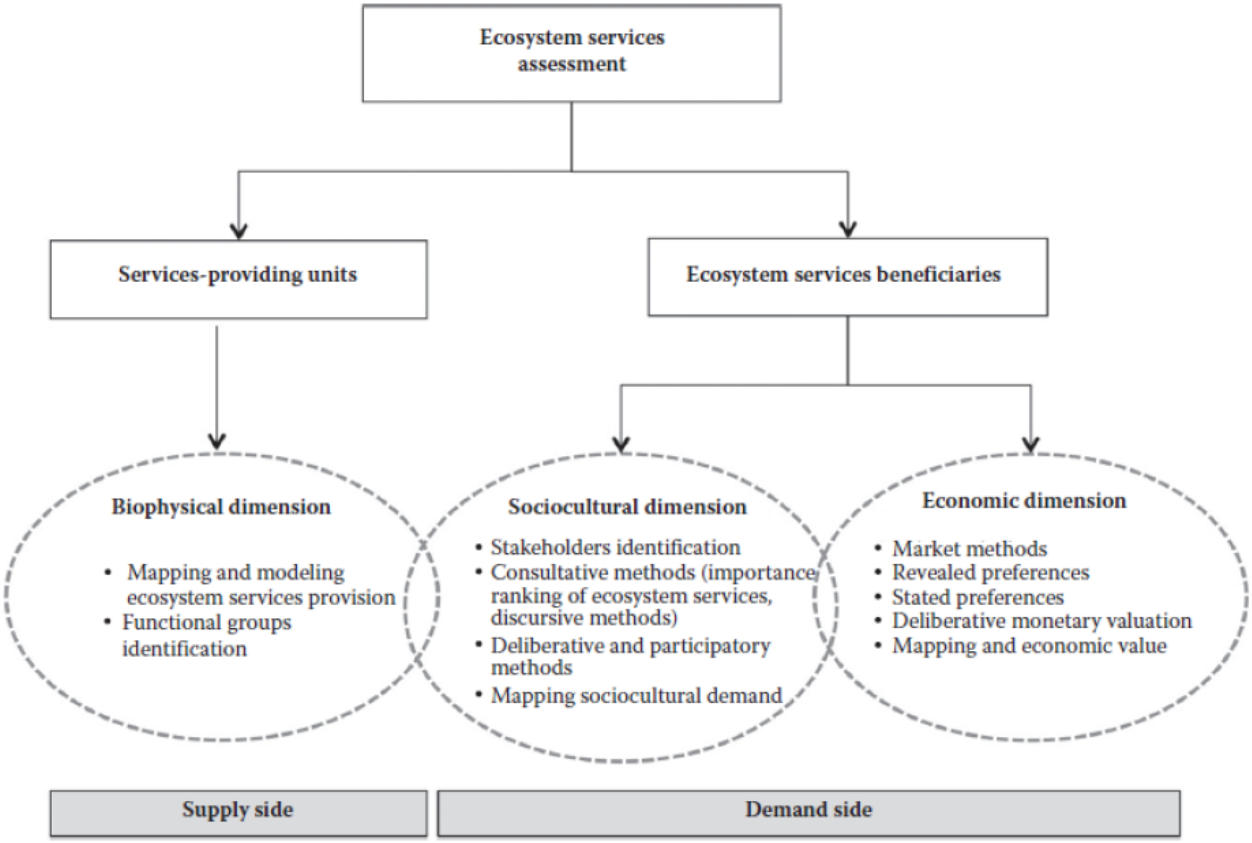


Figure 2. Conceptual framework of ecosystem services assessment linking the service-providing units and the ecosystem services beneficiaries and how they could be explored [7]

Socio-cultural evaluation gives the opportunity to involve the beneficiaries of the services in decision-making, identify the most relevant ecosystem services in a place and evaluate the future management based on the opinion of the beneficiaries.[8] Such approach not only focuses the supply side – which is the more conventional approach, but also offers information on the demand side, and therefore allows to make a trade-off based on effect community needs and conservation efforts.

In our approach, we first selected for each area/ecosystem a group of stakeholders, to support the project team in making a first selection of key ecosystem services of each of the areas concerned. This group included people with particular knowledge and/or with special interests and locally rooted, like scientists, forestry professionals, public servants, economic actors, and volunteers in civil society groups. They were requested to identify and to

[6] Burkhard, B., F. Kroll, S. Nedkov, and F. Müller. 2012a. Mapping ecosystem service supply, demand and budgets. Ecological Indicators 21:17–29; Liu, S., C. Robert, F. Stephen, and T. Austin. 2010. Valuing ecosystem services. Annals of the New York Academy of Sciences 1185:54–78.

[7] Castro, A.J., M. García-Llorente, B. Martín-López, I. Palomo, and I. Iniesta-Arandia, 2013. Multidimensional Approaches in Ecosystem Services Assessment. In: Earth Observation of Ecosystem Services, D. Alcaraz-Segura, C.M. Di Bella, and J.V. Straschnoy (Editors). Taylor & Francis Group, CRC, Boca Raton, Florida, pp. 105-124.

[8] Martín-López, B., I. Iniesta-Arandia, M. García-Llorente, I. Palomo, I. Casado-Arzuaga, D. García Del Amo et al. (2012). Uncovering Ecosystem Services Bundles through Social Preferences. PLoS ONE 7(6): e38970. https://doi.org/10.1371/journal.pone.0038970

rate ecosystem services that they consider important, personally and from a community perspective; and to indicate if they think these are at risk or not, to get an idea on their vulnerability.

The knowledge collected was then used to draw up questionnaires for a much broader survey amongst beneficiaries, both citizens and visitors, to assess the local communities' perception on ecosystem services (see chapter 4) and, by end of the project, eventual changes herein that may have been caused by the multi-actor approach of the project's actions and the communication efforts.

A questionnaire was developed for all project sites, with a small introduction on the FAGESOS project, a picture of the areas object of its activities, and an illustration on what ecosystem services are.

It was customised for each area, to facilitate the respondents, by:

- A map of the area on which the respondent was asked to answer, eventually with some pictures of this area
- A translation in own language (Italian, Spanish, Portuguese)
- Adaptation of the name of the disease syndrome occurring in the area (ink disease / mal dell'inchiostro in chestnut forests, oak decline / sindrome del deperimento / la seca in oak forests).

Project staff in each of the areas shared the questionnaire with stakeholders in the way they found most suitable: some were compiled by project staff in an interview setting; some were distributed on paper or sent by email and returned compiled by the respondent; and in Spain also the possibility was given to compile them in a dedicated online tool. We provide a snapshot of each page, from different customisations (Figure 3).

Figure 3: Snapshot of key ecosystem services questionnaire (continues)

INTRODUCCIÓN

Los servicios ecosistémicos (SE) pueden definirse como las contribuciones directas o indirectas de los ecosistemas al bienestar de los seres humanos (De Groot et al., 2010). Los servicios ecosistémicos son un concepto importante para comunicar la dependencia social de la vida ecológica (Bastian et al., 2012), y también son útiles para la toma de decisiones en acciones de conservación y gestión de recursos naturales (Harrison, 2010).

Los servicios ecosistémicos se clasifican en tres categorías:

1. *Servicios de abastecimiento*, productos obtenidos de los ecosistemas. Ejemplos: agua dulce; alimento; materias primas; recursos genéticos; medicamentos.
2. *Servicios de regulación*, beneficios obtenidos de la regulación de procesos Ejemplos: regulación y purificación del agua; mantenimiento de la calidad del aire; regulación climática; control de la erosión del suelo; fertilidad del suelo; polinización

Servicios culturales, beneficios inmateriales. Ejemplos: uso recreativo, turismo, identidad cultural y sentido de pertenencia; conocimiento científico; educación ambiental; conocimiento ecológico local; disfrute espiritual

1. Chi sei?

Per favore, spunta:

	Coltivatore privato (proprietario o gestore di un castagneto)
	Operatore forestale pubblico
	Agronomo forestale / consulente
	Rappresentante di un Comune
	Rappresentante di un'associazione forestale, nello specifico .....
	Rappresentante di un'associazione o ente della società civile, nello specifico .....
	Scienziato
	Altro, nello specifico ....

2. Lista libera dei servizi ecosistemici

Pensi che queste foreste offrano contributi o benefici importanti a sostegno del benessere umano?

	Si
	No

Quali sono i contributi o i benefici più importanti di queste foreste, secondo le tue conoscenze?

Qual è il vantaggio o il contributo più importante per te, personalmente, e perché?

3. Selezione e graduatoria

Di seguito trovate un elenco di servizi ecosistemici. Per favore:

- spunta quelli che ritieni forniti dalle foreste in questione.
- specifica ove necessario o utile quale particolare beneficio ritieni importante (es. "cibo": castagna; oppure "materie prime": sughero).
- classifica fino a 10 servizi selezionati in base alla loro importanza. 1 è il più importante, 10 il meno.
- indica se ritieni che i servizi negli ultimi 10 anni siano diminuiti, siano rimasti invariati o siano aumentati.
- Indica se ritieni che siano attualmente minacciati dal cambiamento climatico e/o dal mal dell'inchiostro e/o da altre pressioni. Puoi indicarne più di uno.

Spunta	Servizi/benefici	Specifa ove necessario o utile	Classifica 1=più importante	Negli ultimo 10 anni: 1) Ridotto 2) Rimasto uguale 3) Aumentato 4) Non lo so	Attualmente minacciato? 1) Si, dal cambiamento climatico 2) Si, dal mal dell'inchiostro 3) Si, da altre pressioni 4) Si, non so da cosa 5) No.
	Servizi di approvvigionamento				
	Cibo	...			
	Materie prime	...			
	Risorse genetiche				
	Risorse mediche				
	Acqua dolce				
	Altro, ...	...			
	Servizi di regolazione				
	Regolazione e purificazione dell'acqua				
	Qualità dell'aria				
	Regolazione del clima				
	Controllo dell'erosione del suolo				
	Fertilità del suolo				
	Impollinazione				
	Altro, ...	...			
	Servizi culturali				
	Recreazione				
	Turismo				
	Identità locale e senso del luogo				
	Conoscenze scientifiche e educazione ambientale				
	Conoscenze ecologiche locali				
	Godimento spirituale				
	Altro,...	...			

4. Valutazione delle misure per ridurre la distribuzione e l'impatto della sindrome del deperimento

Ti aspetti che lo sviluppo e l'implementazione di pratiche di gestione integrata dei parassiti e di misure d'igiene per arrestare la diffusione del deperimento possano avere uno o più dei seguenti impatti sui servizi ecosistemici attualmente forniti?

Impatti desiderati	Si / No	Spiega la tua risposta
Impatti biofisici positivi		
Impatti socio-culturali positivi		
Impatti monetari positivi		

5. Ulteriori chiarimenti

Vuoi chiarire qualcosa?

6. Contatti

Per favore, spunta:

Possiamo contattarti in una fase successiva, per coinvolgerti nella valutazione del valore economico dei servizi ecosistemici da te citati?

	Si
	No

Sei interessato a ricevere informazioni sugli eventi del progetto e sui risultati raggiunti dal progetto?

	Si
	No

Se hai risposto positivamente ad almeno una delle domande precedenti, sei pregato di fornire i tuoi dati di contatto:

Name:	
E-mail:	
Tel:	

Grazie mille per il tuo impegno!

Figure 3 (continuation): Snapshot of key ecosystem services questionnaire

3.2 Results

3.2.1 Questionnaires received

Total received: 50

- 11 Municipal representatives
- 7 Cultivators/farmers
- 5 Public forestry operators
- 9 Forestry agronomists/consultants
- 3 Civil society representatives
- 1 Forestry associations
- 9 Scientists
- 5 Others (Restaurant holder, environmental police, retired person, student, regional research body)

Monte San Biagio (Province of Latina, Italy): cork oak forests San Vito and Valle Marina (SV)

Total received: 8

- 5 municipal representative
- 1 private farmer (horses)
- 1 forestry agronomist/consultant
- 1 civil society representative

Vallerano-Canepina (Province of Viterbo, Italy): chestnut groves (VL-CA)

Total received: 11

- 1 forestry agronomist/consultant
- 3 chestnut farmers
- 2 civil society representatives
- 1 scientist (ecology)
- 1 forestry association
- 2 municipal representatives
- 1 restaurant holder

Monte Arcosu (Province of Cagliari, Italy): cork oak and holm oak dehesa (MA)

Total received: 11

- 5 forestry agronomists/consultants
- 1 public forestry operator
- 2 scientists
- 1 student
- 1 retired person
- 1 representative of a regional research body

La Tejera (Andalucia, Spain): holm oak dehesa (TJ)

Total received: 9

- 5 scientists
- 3 private cultivators

1 public forestry operator

La Almoraima (Andalucia, Spain): cork oak dehesa (AL)
Total received: 11

1 scientist
2 forestry agronomists
3 public forestry operators
4 municipal representatives
1 environmental police

Trancoso (Centro, Portugal): chestnut orchards (TM)
Total received: 0

Of all respondents, 39 (78%) were available to be involved in the forthcoming assessment of the economic value of the ecosystem services. 44 (88%) Confirmed their interest in receiving information on project events and on the results achieved by the project. Herewith, the interest in the matter at stake appears high amongst the interviewed sample, confirming the validity of the selection.

3.2.2 Ranking of ecosystem services

Here below we report the ranking according to the importance attributed to the services in each of the areas by the interviewed stakeholders, limited to the 10 most important services out of the 17 suggested (Table 1).

Equal scores are jointly represented:

Table 1: Key ecosystem services ranking for each ecosystem type.
Yellow: regulating services - Blue: cultural services - Green: provisioning services

RANKING	SV	VL-CA	MA	TJ	AL
1	Soil erosion control	Food	Raw materials	Soil erosion control	Soil erosion control
2	Climate regulation	Air quality	Soil erosion control	Food	Raw materials & Soil fertility
3	Air quality	Raw materials	Climate regulation	Raw materials	
4	Tourism	Soil erosion control	Air quality	Fresh water	Water regulation
5	Raw materials	Cultural identity	Scientific knowledge	Soil fertility	Recreative use
6	Recreative use	Climate regulation	Genetic resources	Water regulation	Climate regulation
7	Pollination	Tourism	Recreative use	Cultural identity	Tourism
8	Food	Soil fertility	Local ecology & Cultural identity	Recreative use	Air quality & Pollination
9	Cultural identity	Spiritual knowledge		Spiritual & scientific knowledge	
10	Soil fertility	Water regulation	Tourism & Water regulation		Fresh water

Regulating and provisioning services cover the top-three in all areas, while cultural services are however well represented. The differences amongst the targeted sites and their main destinations are reflected in the ranking.

Regulating services

A high importance is given by the stakeholders to regulating services, covering about half of the top-ten ranking.

Soil erosion control is in all places amongst the first 4 positioned, in three occasions even considered the most important service of the forest's ecosystem.

Climate regulation and air quality are ranked within the top ten everywhere, except in La Tejera.

Soil fertility is ranked top ten everywhere, except in Monte Arcosu.

Water regulation is considered of rather high importance in Almoraima, and to a lesser extend in La Tejera, Vallerano-Canepina and Monte Arcosu, while it didn't reach the top ten in San Vito.

Pollination is only mentioned in San Vito and La Almoraima.

Cultural services

The cultural identity and sense of belonging provided by the ecosystems is considered important in all areas, although in La Almoraima it just didn't reach the top-ten.

Tourism is ranked within the top ten everywhere, except in La Tejera. It is highest ranked in San Vito, which is the only site of which no agricultural use is made and which is located in a municipality that highly depends on its touristic attractiveness.

The same applies for recreation, which is only not ranked top-ten in Vallerano-Canepina. This is curious as high value is attributed to cultural identity and spiritual knowledge, which are typical attributes of local communities which enjoy the ecosystem they are surrounded with.

Spiritual knowledge has been attributed some importance only in Vallerano-Canepina and in La Tejera. While in La Tejera this may relate to comments on the scenic beauty of the site, in Vallerano-Canepina a general sense of wellbeing was reported.

Scientific knowledge was attributed top-ten relevance only in Monte Arcosu and in La Tejera, probably influenced by the high share of scientists in the stakeholder group (in Monte Arcosu several of the agronomists are employed by a regional research body).

Knowledge of the local ecology is evidently of minor importance to our group of stakeholders, reaching top-ten ranking only in Monte Arcosu.

Provisioning services

Provisioning services are important for all sites: especially food and raw materials cover the first positions in the four sites were agriculture activity takes place.

As far as raw materials concern, the comment section provided interesting insights on the different productions in the various ecosystems:

- MA: ranked as most important service, cork is the primary product obtained from Monte Arcosu, although also biomass is mentioned.
- AL: also in Almoraima, cork and biomass are primary services offered by the dehesa.
- VL-CA: though less important than chestnuts, wood is an important product in the forests' provision of income. It concerns mainly construction wood, but also firewood is collected.
- TJ: biomass and cork are of economic importance. Currently no cork can be collected due to a municipal decree, as long as *Phytophthora* is highly impacting the forest.
- SV: ranked lower than in the other sites, due to its protected status and absence of current commercial use of cork or wood, anyhow wood and cork are mentioned, probably indicating that their fruition would be considered beneficial.

Food is important in Vallerano-Canepina, in La Tejera and to a lesser extent in San Vito:

- VL-CA: In Vallerano-Canepina chestnuts are the primary economic resource of the ecosystem.
- TJ: In La Tejera Iberian pig meat, chestnuts, mushrooms are mentioned as important.
- SV: In San Vito cork oak fruits are mentioned, as an important feed for hunted pigs and wild boars; and also mushrooms.

Though not included in the first 10 ranked, also respondents on Monte Arcosu and La Almoraima highlighted the importance of food:

- In Monte Arcosu, in particular mushrooms and berries for infusions and distillates (the famous Mirto) are mentioned, also contributing to the local identity;
- In La Almoraima the provision of mushrooms and wild and cattle meat, the latter by the montanera, i.e. the grazing of Iberian pigs in the pasture, among forests of cork oaks and holm oaks, its fruit, the acorn, being the fundamental food before slaughter.

Fresh water was considered only relevant in the Spanish sites of La Tejera and Almoraima, reflecting the higher impact of drought phenomena in this area.
Genetic resources were considered relevant only in Monte Arcosu. Maybe this can be attributed to the high professional profile of the stakeholder group, being less informed people generally less aware of this.
Medicinal plant resources did not reach the top-ten in any site, although they obtained some relevant score in La Tejera and in La Almoraima.

3.2.3 Trends and threats

We can set off the ecosystem services that were considered most important by our stakeholders to their perception of the trend in their quality over the last 10 years and their fear of being threatened by climate change, by *Phytophthora* infection or by other causes (Table 2).

To account for the trends, we considered the majority opinion expressed by the respondents, and where there was no clear majority we noted “no agreement” .
To account for the threats, we noted all the threats that were mentioned more then once, but if the number of people replying that no threats existed was equally high, we noted “no agreement”. Where the supposed origin of the threat is mentioned in equal numbers, a “+” is inserted, otherwise a declining importance is intended.
In areas with chestnut groves, phythophthora-induced decline syndroms are called ink disease.
In areas with oak ecosystems, phythophthora-induced decline syndroms are called oak decline.
Respondents could choose between the following causes of the threats: climate change, oak decline/ink disease, other pressures, or “I don’t know by what”.

Table 2: Ecosystem services trends and threats in the ecosystem types present in the project's demonstrative areas (continues).

SV	Trend	Threatened by
Soil erosion control	Decreased	oak decline, climate change + other
Climate regulation	no agreement	climate change, oak decline
Air quality	Same	oak decline, climate change
Tourism	no agreement	oak decline, other pressures
raw materials	Decreased	oak decline
Recreative use	no agreement	oak decline, other
Pollination	Same	oak decline, climate change
Food	Decreased	climate change, oak decline
Cultural identity	Same	oak decline, other
Soil fertility	Same	oak decline, climate change + other

VL-CA	Trend	Threatened by
Food	no agreement	climate change, ink disease
Air quality	Same	climate change, other pressures
Raw materials	Same	climate change, ink disease
Soil erosion control	no agreement	climate change, other
Cultural identity	no agreement	no agreement
Climate regulation	Decreased	climate change
Tourism	Increased	no
Soil fertility	Decreased	other pressures
Spiritual knowledge	Increased	no
Water regulation	no agreement	climate change

In San Vito, only soil erosion control, raw materials and food are perceived as being worsened during the last 10 years, while all other services were considered to have remained the same or were perceived in contrasting ways. However, all of them are felt as being threatened. In most cases, multiple threats are perceived, whereas only for raw materials (wood and cork) only oak decline is mentioned. Soil erosion control and fertility, tourism, recreative use and cultural identity are considered to be threatened also by other pressures, amongst which we presume garbage dumping is to be considered.

In the chestnut forests of Vallerano-Canepina decreasing services were only perceived in climate regulation and soil fertility: the first corresponds to a threat by climate change, while soil fertility was felt threatened by other pressures, like the use of mineral fertilizers, pesticides and frequent tillage.
Cultural services increased and were not felt as being threatened. Air quality and raw materials remained equal, while on all other services no consensus was found amongst respondents. Ink disease was considered to be threatening only for provisioning services (chestnut and wood), while climate change was at stake in all cases that a threat was perceived.

Table 2 (continuation): Ecosystem services trends and threats in the ecosystem types present in the project's demonstrative areas.

TJ	Trend	Threatened by
Soil erosion control	Decreased	oak decline
Food	Decreased	oak decline
Raw materials	Decreased	oak decline
Fresh water	Decreased	climate change, oak decline
soil fertility	no agreement	oak decline
Water regulation	no agreement	oak decline
Cultural identity	Increased	oak decline
Recreative use	Increased	oak decline, climate change
Spiritual knowledge	Increased	oak decline
Scientific knowledge	Increased	no agreement

AL	Trend	Threatened by
Soil erosion control	Decreased	oak decline
Raw materials	Decreased	oak decline
Soil fertility	Decreased	oak decline
Water regulation	Decreased	climate change, oak decline
Recreative use	Increased	no agreement
Climate regulation	Decreased	oak decline, climate change
Tourism	Increased	oak decline
Air quality	Decreased	climate change + oak decline
Pollination	Decreased	oak decline
Fresh water	Decreased	climate change

In La Tejera, a decrease in ecosystem services is particularly felt with regard to provisioning and regulating services, although stakeholders had contrasting opinions on soil fertility and water regulation. On the contrary, cultural services were broadly considered to have increased.
Nonetheless, also the latter were feared to be affected by oak decline in the future, and a direct threat of climate change was only acknowledged for recreative use and fresh water supply.

In Almoraima a similar perception is shown, with a worsening of provisioning and regulating services and an improvement of cultural services. Oak decline is perceived as threatening to all services, while climate change is only said threatening to water regulation, climate regulation and air quality.

MA	Trend	Threatened by
Raw materials	Same	oak decline, climate change, other
Soil erosion control	Same	oak decline, climate change
Climate regulation	Same	climate change, oak decline
Air quality	Same	climate change + oak decline
Scientific knowledge	Increased	climate change + oak decline, other
Genetic resources	no agreement	oak decline, climate change, other
Recreative use	Increased	oak decline, climate change, other
Local ecology	Increased	climate change + oak decline, other
Cultural identity	Same	oak decline, other, climate change
Tourism	Increased	climate change + oak decline, other
Water regulation	Same	climate change + oak decline

Table 2 (continuation): Ecosystem services trends and threats in the ecosystem types present in the FAGESOS demonstrative areas.

In Monte Arcosu, like in La Tejera and Almoraima, cultural ecosystem services are perceived as having increased over the years. On the contrary, regulating and provisioning services are all considered to have remained equal over the years. All services are felt to be threatened, generally by a combination of oak decline, climate change and other pressures. No information is provided on which other pressures are at stake, but forest fires could be amongst them.

3.2.4 Expected impact on ecosystem services

Lastly, we asked the stakeholders if they did expect project activities to have any valuable impact on the ecosystems and the services they provide. We referred in particular to the development and implementation of integrated pest management practices and hygiene measures to halt the spread of phythophthora related diseases. Respondents replied as shown in Table 3.

Table 3. Answers about the expected FAGESOS impacts on the ecosystems present in the LIFE FAGESOS demonstrative areas.

	Biophysical_impact			Sociocultural_impact			Monetary_impact		
	yes	no	no answer	yes	no	no answer	yes	no	no answer
SV	8			8			8		
VL-CA	10		1	11			11		
MA	11			11			10		1
TJ	8	1		6	1	2	8	1	
AL	7	2	2	6	3	2	7	3	1
total:	44	3	3	42	4	4	44	4	2

Respondents are very confident in positive impacts of the LIFE FAGESOS project:
88% expects positive biophysical and monetary impacts, while 84 % expects positive sociocultural impact.

At San Vito all respondents have positive expectations. This can probably be attributed both to the high number of Municipal respondents and to the participatory approach by which the Municipality took the initiative for the

LIFE FAGESOS project, involving citizens in an online event concerning the issues at stake, during which the project idea was launched, explained and enriched; and closely collaborating with local associations.

Also in the other two Italian sites none of the respondents answered negatively, although 2 people expressed on one item that they lack the knowledge to answer.

Most doubts are instead expressed by the stakeholders of Almoraima, achieving 78% respectively 67% of positive replies on these impacts. Respondents that did not reply or answered negatively accuse the following reasons:

- Lack of detailed information on which treatments will precisely be carried out
- Presumed short persistence of biological products, with limited long-term effects
- Concerns about visitors' compliance with the hygiene measures requested due to their scepticism about their effectivity
- Expectation that products like cork, montanera, mushrooms, vines and heather won't anyhow represent a significant source of income

In La Tejera, negative answers were explained by referring to the fact that lost trees cannot be recovered; by doubts on long-term impacts if project activities would last only a limited time, hence delivering only testimonial effects without impacts on socioeconomic developments; and by reminding that yet now extensive livestock farming for montanera is not the main economic activity.

3.3 Evaluation

Notwithstanding the rather complex character of regulatory services, both more and less expert stakeholders highly valued them.

Provisioning services are considered relevant in all areas, even where no economic use of them is made.

Cultural ecosystem services and socio-cultural impacts are not only depending on ecosystem health but evidently many other factors contribute to them. This may clarify why often their trend is positively assessed, and a variety of threats is often mentioned. It would be interesting to obtain more information on this from citizens' and tourists' perspective.

The willingness of visitors to comply with hygiene measures is considered a concern, which makes it highly interesting to assess their attitude to such measures, as foreseen in the forthcoming questionnaire described in the next chapter.

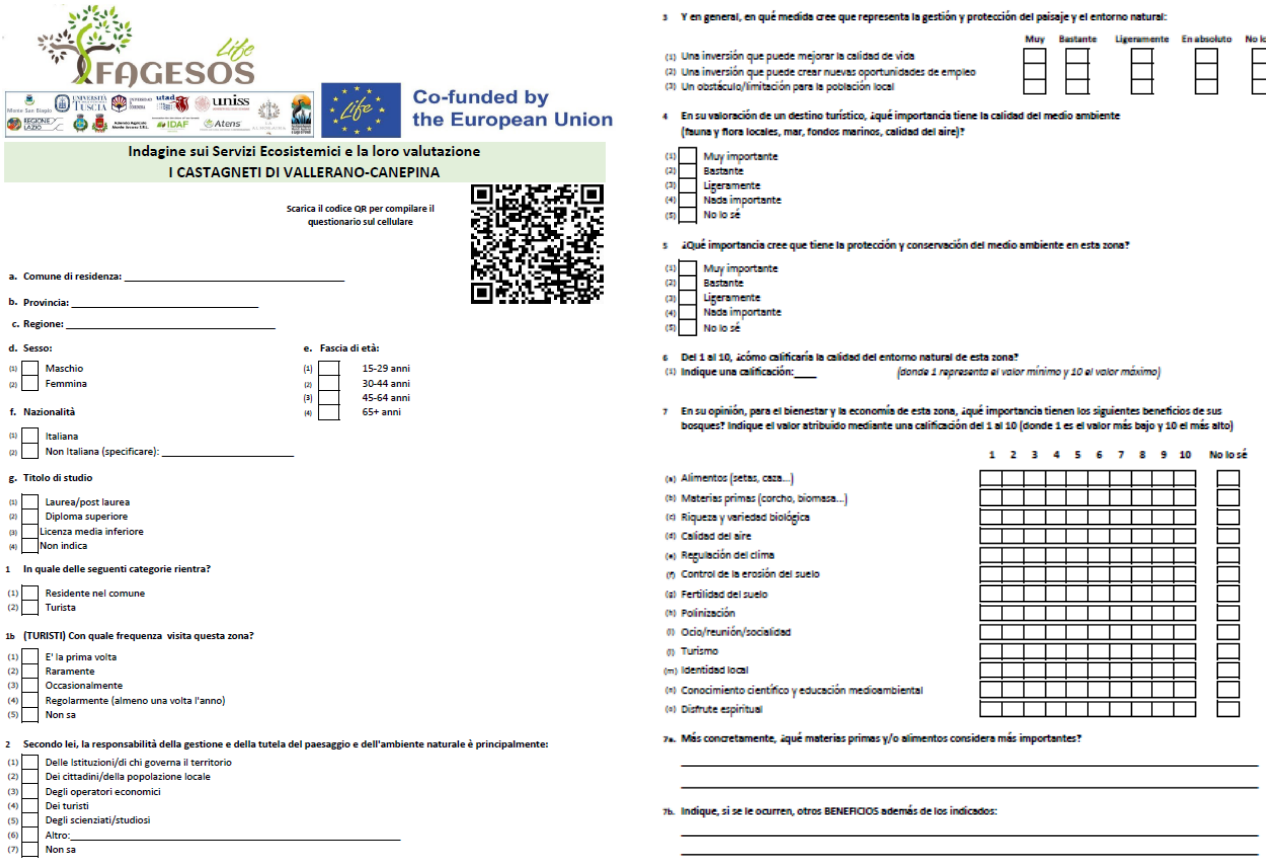
4. Assessment of citizen's perception at project initial stage

4.1 Aim and methodology

The aim of this activity is firstly to know citizens' and visitors' perceptions on the importance and value of ecosystem services provided by the Fagaceae forests targeted in the project and their willingness to contribute to their preservation; and secondly to evaluate if changes occur in perceptions or willingness during the implementation of the project.

Citizens and visitors were asked by questionnaires how they perceive the importance and the value of the identified services and to mention other services they consider important. They were asked about their availability to contribute to safeguarding the forests by observance of hygiene measures or other activities.
The survey was performed between December 2023 and February 2024, and will be repeated during the last project year, evaluating eventual changes in perception, and evaluating the impact that implementation and communication activities may have had on citizens' willingness to actively contribute to safeguarding the forests.

A semi-structured questionnaire with open-ended and closed-ended questions was made available in the languages of each of the targeted areas and distributed both in paper and by the online tool https:// it.research.net (Figure 4). The online tool was reachable with links, that were published on social media; and by a QR code that was displayed on the paper version. Partners involved in the works of each of the areas actively distributed the questionnaire amongst citizens.
We display here below the pages of the questionnaire in different languages and an example of publicity.



FAGESOS Life

Co-funded by the European Union

Indagine sui Servizi Ecosistemici e la loro valutazione
I CASTAGNETI DI VALLERANO-CANEPINA

Scarica il codice QR per compilare il questionario sul cellulare

a. Comune di residenza: _____

b. Provincia: _____

c. Regione: _____

d. Sesso:
(1) ☐ Maschio
(2) ☐ Femmina

e. Fascia di età:
(1) ☐ 15-29 anni
(2) ☐ 30-44 anni
(3) ☐ 45-64 anni
(4) ☐ 65+ anni

f. Nazionalità
(1) ☐ Italiana
(2) ☐ Non Italiana (specificare): _____

g. Titolo di studio
(1) ☐ Laurea/post laurea
(2) ☐ Diploma superiore
(3) ☐ Licenza media inferiore
(4) ☐ Non indica

1 In quale delle seguenti categorie rientra?
(1) ☐ Residente nel comune
(2) ☐ Turista

1b (TURISTI) Con quale frequenza visita questa zona?
(1) ☐ E' la prima volta
(2) ☐ Raramente
(3) ☐ Occasionalmente
(4) ☐ Regolarmente (almeno una volta l'anno)
(5) ☐ Non sa

2 Secondo lei, la responsabilità della gestione e della tutela del paesaggio e dell'ambiente naturale è principalmente:
(1) ☐ Delle Istituzioni/di chi governa il territorio
(2) ☐ Dei cittadini/della popolazione locale
(3) ☐ Degli operatori economici
(4) ☐ Dei turisti
(5) ☐ Degli scienziati/studiosi
(6) ☐ Altro: _____
(7) ☐ Non sa

3 Y en general, en qué medida cree que representa la gestión y protección del paisaje y el entorno natural:

	Muy	Bastante	Ligeramente	En absoluto	No lo sé
(1) Una inversión que puede mejorar la calidad de vida	☐	☐	☐	☐	☐
(2) Una inversión que puede crear nuevas oportunidades de empleo	☐	☐	☐	☐	☐
(3) Un obstáculo/limitación para la población local	☐	☐	☐	☐	☐

4 En su valoración de un destino turístico, ¿qué importancia tiene la calidad del medio ambiente (fauna y flora locales, mar, fondos marinos, calidad del aire)?
(1) ☐ Muy importante
(2) ☐ Bastante
(3) ☐ Ligeramente
(4) ☐ Nada importante
(5) ☐ No lo sé

5 ¿Qué importancia cree que tiene la protección y conservación del medio ambiente en esta zona?
(1) ☐ Muy importante
(2) ☐ Bastante
(3) ☐ Ligeramente
(4) ☐ Nada importante
(5) ☐ No lo sé

6 Del 1 al 10, ¿cómo calificaría la calidad del entorno natural de esta zona?
(1) Indique una calificación: ___ *(donde 1 representa el valor mínimo y 10 el valor máximo)*

7 En su opinión, para el bienestar y la economía de esta zona, ¿qué importancia tienen los siguientes beneficios de sus bosques? Indique el valor atribuido mediante una calificación del 1 al 10 (donde 1 es el valor más bajo y 10 el más alto)

	1	2	3	4	5	6	7	8	9	10	No lo sé
(a) Alimentos (setas, caza...)											
(b) Materias primas (corcho, biomasa...)											
(c) Riqueza y variedad biológica											
(d) Calidad del aire											
(e) Regulación del clima											
(f) Control de la erosión del suelo											
(g) Fertilidad del suelo											
(h) Polinización											
(i) Ocio/reunión/socialidad											
(j) Turismo											
(m) Identidad local											
(n) Conocimiento científico y educación medioambiental											
(o) Disfrute espiritual											

7a. Más concretamente, ¿qué materias primas y/o alimentos considera más importantes?
_____
_____

7b. Indique, si se le ocurren, otros BENEFICIOS además de los indicados:
_____
_____

A Phytophthora invasora da floresta

8 A Phytophthora invasora das florestas é patógeno responsável por doenças de carvalhos e castanheiros perenes causando a doença da tinta que provoca perda de vigor das árvores, colocando em risco muitas árvores da área. Está consciente deste problema?

(1) ☐ Sim, estou ciente disso
(2) ☐ Sim, vagamente, já ouvi falar disso
(3) ☐ Não, não sei e nem ouvi falar
(4) ☐ Não sabe

9 Se a floresta fosse irreparavelmente danificada, a perda de quais benefícios diria que seriam mais graves? (escolher apenas 3 respostas)

(1) ☐ Alimentação (cogumelos, caça...)
(2) ☐ Matérias-primas (cortiça, madeira...)
(3) ☐ Riqueza biológica e biodiversidade
(4) ☐ Qualidade da área
(5) ☐ Regulação do clima
(6) ☐ Controlo da erosão do solo
(7) ☐ Fertilidade do solo
(8) ☐ Polinização
(9) ☐ Recreação/encontros/sociabilidade
(10) ☐ Turismo
(11) ☐ Identidade local
(12) ☐ Conhecimento científico e educação ambiental
(13) ☐ Ambiente relaxante
(14) ☐ Todos
(15) ☐ Nenhum
(16) ☐ Outro _____
(17) ☐ Não sabe

10 Na sua opinião, que outras ameaças podem impactar negativamente os benefícios oferecidos pelas florestas nesta área? *(Múltiplas respostas são possíveis)*

(1) ☐ As alterações climáticas
(2) ☐ O comportamento dos visitantes
(3) ☐ Gestão pelas autoridades
(4) ☐ A falta de atenção dos moradores
(5) ☐ Não sabe
(6) ☐ Outro: _____

11 Se as autoridades lhe pedissem para tomar medidas de higiene ao visitar a floresta, você estaria disposto a fazê-lo?

(1) ☐ Sim, certamente
(2) ☐ Sim, se não exigir muito esforço
(3) ☐ Não, a natureza deve salvar-se a si
(4) ☐ Não, não acho que o problema exija isso
(5) ☐ Não sabe

12 O questionário está concluído. Agradecemos sua preciosa colaboração!
Se desejar receber os resultados do projeto e/ou participar em novo inquérito, dentro de um ano (através do preenchimento de um questionário online), indique o seu e-mail

e-mail: _____

LIFE Fagesos
14 febbraio ·

We are happy to share our partner's survey! Feel free to share it with your Spanish-speaking friends and colleagues so they can participate too!

#LIFEFagesos #LIFEProgramme #LIFEAmplifiers #Collaboration #Community

IDAF
13 febbraio ·

Os dejamos unas encuestas sobre los servicios de los ecosistemas del encinar y el alcornocal, pilares del proyecto LIFE Fagesos

Puedes acceder a través de estos enlaces o a través del QR que te dejamos.
Encinar: https://it.research.net/r/LA_TEJERA
Alcornocal: https://it.research.net/r/LA_ALMORAIMA

¡No te quitarán más de 3-4 min cada una!

Agradecemos tu participación

Vedi traduzione

Figure 4. Snapshots of the questionnaire distributed to assess citizens' perception on ecosystem services in the LIFE FAGESOS demonstrative areas.

4.2 The sample survey: results

4.2.1 The respondents

The sample survey was carried out between December 2023 and February 2024, through a semi-structured questionnaire with open-ended and closed-ended questions to detect the perceptions of citizens, tourists, and visitors on the importance of ecosystem services and to detect their propensity to engage in environmental protection.

A total of 392 questionnaires were collected and distributed in 27,8% of cases (109 in absolute values) in Monte San Biagio; 26,3% of cases (103 questionnaires) in the chestnut groves of Vallerano and Canepina; 13% of cases in Monte Arcosu (51 questionnaires); 13,3% in La Tejera (50 questionnaires); 11,2% in la Almoraima; and 8,4% in Trancoso (44 and 33 questionnaires, respectively).

Table 4: Distribution of questionnaires in the LIFE FAGESOS demonstrative areas

	A.V.*	%
Monte San Biagio	109	27,8
Vallerano-Canepina	103	26,3
Monte Arcosu	51	13,0
La Tejera	52	13,3
La Almoraima	44	11,2

Trancoso	33	8,4
Totale	392	100,0

* Absolute Values

Regarding the characteristics of the respondents, there is a prevalence of males (59,4%) over females (40,6%) and respondents aged 45-64 (39,9%), followed by the 30-44 age group (38,3%), 15-29-year-olds (11,9%) and the over-64s (9,8%). Concerning educational qualification, 56,9% of respondents were college graduates; 35,1% were high school graduates, and a marginal 7,9% possessed a middle school/elementary school certificate (Table 5).

Table 5: Gender, age and education of the respondents to the sample survey

Gender		Age		Education	
	%		%		%
Male	59,4	15-29 years	11,9	Undergraduate/Postgraduate degree	56,9
Female	40,6	30-44 years	38,3	High school diploma	35,2
Total	100,0	45-64 years	39,9	Middle/Elementary school certificate	7,9
		65+ years	9,8	Total	100,0
		Total	100,0		

Three-quarters of the respondents are residents (294 in Absolute Values, or 75% of the total), compared with 21,9% of tourists and 3,1% of visitors for other reasons (study or work) (Table 6).
The 98 tourists and visitors were asked how often they visited the surveyed area. The results show that the tourism that affects these sites is predominantly local/regional. In fact, by cross-referencing the residence of tourists and visitors with the municipality of residence, there is a high prevalence of "domestic" tourism in most cases, with tourists residing in neighbouring areas and, however, in the same region.
For this reason, 42,9% say they regularly visit the areas of interest (at least once a year), 36.7% occasionally visit; 12,2% rarely visit and only 8,2% have visited the surveyed areas for the first time.

Table 6: Respondents relationship with the demonstrative areas of the project

	A.V.*	%	How often do you visit this area?	
Residents	294	75,0		
Tourists	86	21,9	It’s the first time	8,2
Visitors for other reasons	12	3,1	Rarely	12,2
Total	392	100,0	Occasionally	36,7
			Regularly (at least once a year)	42,9
			Total	100,0

* Absolute Values

4.2.2 The responsibility of institutions and the importance of caring for the natural environment

Moving on to analyse the respondents' evaluations of the responsibility for landscape management and protection, we focused only on those respondents who were able/willing to express an opinion on the matter (18.7% did not provide an answer on the matter). It emerges that a high majority of respondents (65,7%) attribute responsibility to the institutions that govern the territory. The indications referring to other social or economic "actors" are much lower: in fact, there is a consistent deviation between the second and first categories. 27% of respondents also give responsibility to citizens and local people, whose behaviour and lifestyles could contribute to the preservation of their territory.

Although the references to tourists (0,3%) or scientists and scholars (1,3%) are marginal, and to economic actors even 0%, 5,7% of respondents distribute the responsibility for the management and preservation of landscape and the natural environment among all subjects.

Table 7: opinions about responsibility for management and protection of the ecosystems

According to you, the responsibility of landscape and natural environment management and protection is mainly attributed to:

	A.V.*	V.%	Valid %**
Institutions / Who governs the territory	207	52,8	65,7
Citizens / Local people	85	21,7	27,0
Tourists	1	0,3	0,3
Scientists / Scholars	4	1	1,3
Economic actors	0	0	0
Everyone	18	4,6	5,7
Doesn't know / Doesn't answer	77	18,7	--
Total	392	100,0	100,0

* Absolute Values

** % over all respondents to this question (excluding Doesn't know / Doesn't answer)

Awareness of the importance of landscape and natural environment appears to be widely and across-the-board shared (Figure 5). It turns out that the percentage of respondents who do not recognize the benefits of environmental protection for quality of life and for the economic and employment sphere is marginal.

Almost all respondents (98,1%) believe that protecting the landscape and environment represents an investment that can improve the quality of life "a lot" (81,8%) or "quite a lot" (16,3%), compared with a marginal 1,8% of contrary opinion. Still, environmental protection represents an investment that can create job opportunities for 95,3% of the interviewees (60,2% think that it can happen "a lot" and 35,1% "quite a lot"). Consistently, only 13,4% of respondents believe that landscaping can be a hindrance and a limitation for local people, compared to 86,5 percent who, on the other hand, believe that locals could benefit from it.

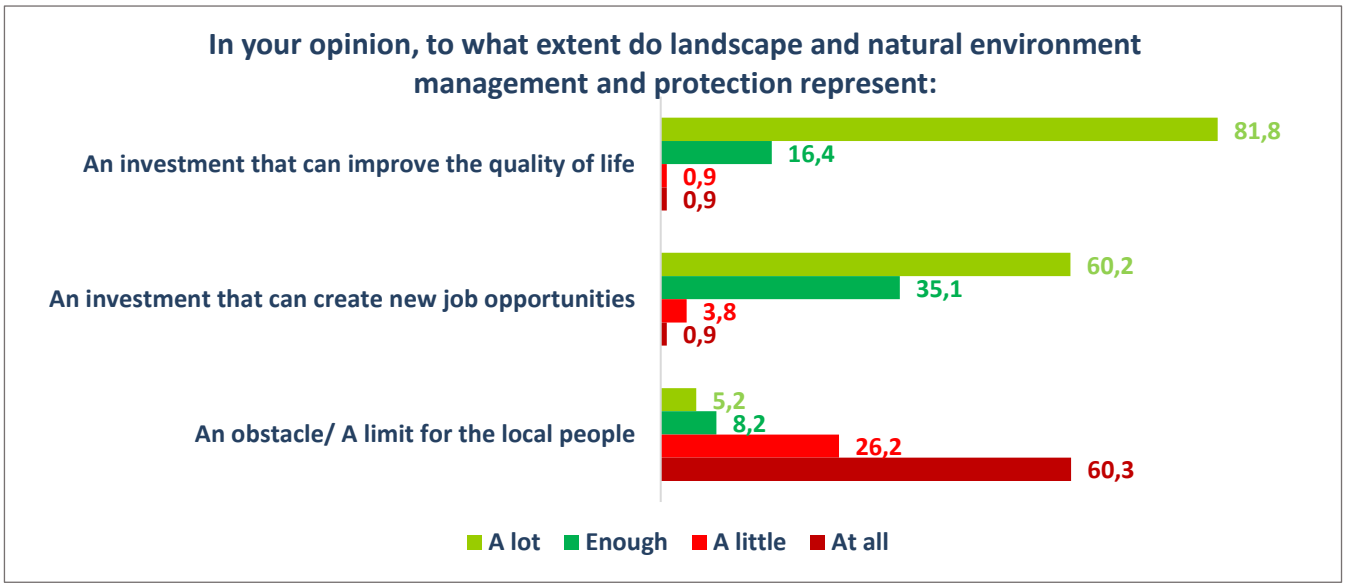


Figure 5. Response distribution about meaning of management and protection for the ecosystems present on the FAGESOS demonstrative areas.

4.2.3 The value and importance of Ecosystem Services

Overall, the rating given by residents and tourists to the quality of the environment of the different sites monitored is more than positive (Table 8, Figure 6): the average rating (expressed through a grade from 1 to 10) stands at 7,32. Monte Arcosu records the best rating (8,12), followed by Trancoso (7,88). The rating for the La Tejera site turns out to be in line with the overall average (standing at 7,32), while Vallerano-Canepina (7,19), La Almoraima (7,17) and Monte San Biagio (6,97) note a slightly lower rate.

Table 8: Environmental quality score for the ecosystems present in the LIFE FAGESOS demonstrative areas.

Area	Average score
Monte San Biagio	6,97
Vallerano-Canepina	7,19
Monte Arcosu	8,12
La Tejera	7,32
La Almoraima	7,17
Trancoso	7,88
Totale	7,32

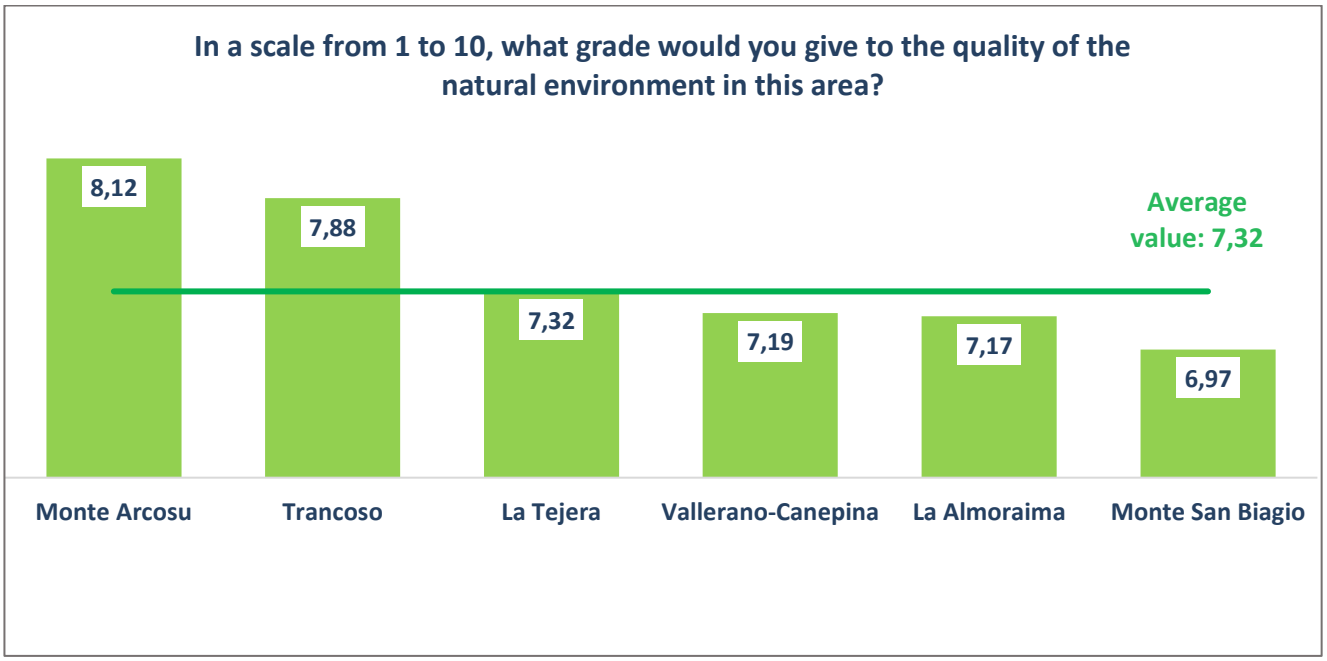


Figure 6. Environmental quality score for the ecosystems present in the LIFE FAGESOS demonstrative areas.

The positive contribution of the various Ecosystem Services identified in the six sites to the well-being and economy of the area appears to be widely recognized and shared by citizens and tourists (Figure 7). Indeed, respondents rated (through a vote from 1 to 10) the level of importance of the benefits of forests to the well-being and economy of the area. The results show that all ES were rated excellent, with votes from 8,2 to 9.

Although green spaces and forests are altered and threatened by pressure factors typical of anthropic settings, as well as by pests and changing climate impacts, they serve multiple environmental, social, ecological, cultural, and economic functions: that is what makes them one of the focal components of sustainability.

Primarily, green areas are mitigating pollution, improving air quality, combating soil erosion, regulating climate, and ensuring biodiversity. However, the benefits also affect the social and economic spheres, as natural benefits foster social relations, community cohesion, and economy of the area.

Dwelling on the grades assigned to the ESs, “air quality” ranks first in respondents' positive evaluations with a grade of 9 out of 10. This is closely followed by the ability to control soil erosion (rating: 8,8) and to promote pollination (8,8).
The forest also performs a crucial function as a climate regulator, enriching biological diversity and ensuring soil fertility (qualities rated 8,7).
Although benefits more directly related to human presence are highly valued, they receive slightly lower ratings: "supporting local identity" registers a rating of 8,6; "supporting tourism" and "scientific knowledge and environmental education" are rated 8,5. "Enabling recreation, meeting and sociability" and "providing food" receive a rating of 8,4, and finally, "providing raw materials" and "spiritual enjoyment" have a rating of 8,2.

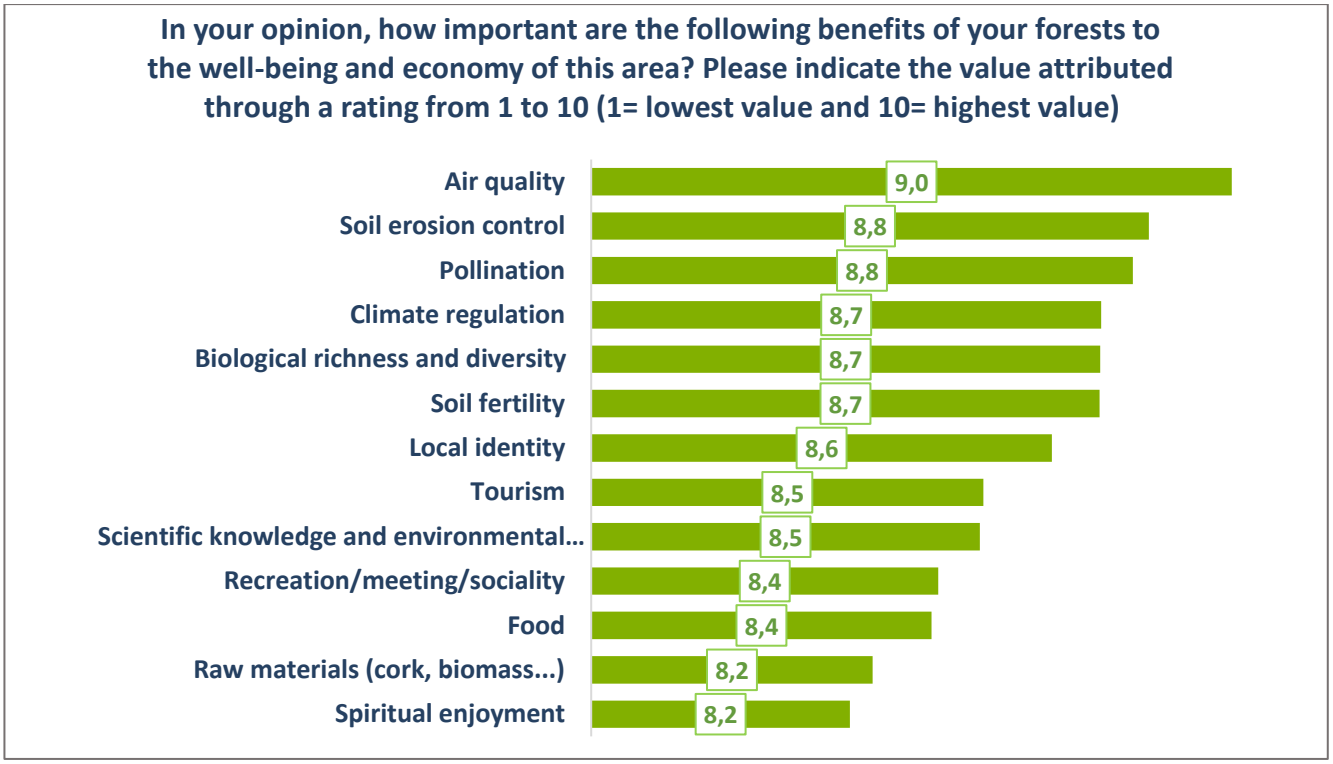


Figure 7. Contribution to well-being and economy of the identified ecosystem services in the project’s demonstrative areas.

Looking in detail at the assessments of the different territories, the very positive ratings recorded for all ES are confirmed (Table 9).
It's interesting to point out some territorial specificities: for example, in Monte San Biagio, in addition to the rating to air quality (9), a very high rating is given to climate regulation and soil erosion control (rating: 9); in the chestnut groves of Vallerano and Canepina the added value provided by food (especially chestnuts, with a rate of 8,8) is particularly appreciated. Monte Arcosu respondents especially value the soil erosion control function and the biological richness and diversity of the site (rating: 9,3); La Tejera's interviewees give high value to the soil erosion control function (rating: 8,6), while La Almoraima respondents assign the highest ratings to the biological richness and diversity and raw materials (both with a rating of 9). Finally, Trancoso respondents value air quality (9,1) and spiritual enjoyment (rating: 8,7) the most.

Table 9: Ecosystem services *quality* score for each demonstrative area of the LIFE FAGESOS project.

Area	Monte S.Biagio	Vallerano-Canepina	Monte Arcosu	La Tejera	La Almoraima	Trancoso	To-tale
Air quality	9,4	8,9	9,2	8,4	8,8	**9,1**	9,0
Soil erosion control	9,0	8,5	**9,3**	**8,6**	8,9	8,7	8,8
Pollination	8,8	8,9	9,0	8,4	8,6	8,8	8,8
Biological richness and diversity	8,7	8,5	**9,3**	8,3	**9,0**	8,8	8,7
Climate regulation	**9,0**	8,6	8,6	8,5	8,6	8,9	8,7
Soil fertility	8,9	8,8	8,9	8,3	8,4	8,6	8,7
Local identity	8,8	8,8	8,6	8,4	8,1	8,6	8,6
Tourism	8,8	8,5	8,1	8,3	8,4	8,3	8,5
Scientific knowledge and environmental education	8,6	8,4	8,6	8,2	8,6	8,0	8,5
Food (mushrooms, myrtle, chestnuts...)	8,2	**8,8**	8,3	7,8	8,2	8,5	8,4
Recreation/meeting/sociality	8,6	8,3	8,4	8,3	8,1	7,9	8,4
Raw materials (cork, biomass...)	8,0	8,1	8,6	7,9	**9,0**	8,4	8,2
Spiritual enjoyment	8,4	8,4	8,0	7,6	7,5	**8,7**	8,2

More specifically, interviewees indicated which raw materials and/or foods were the most important to the area, in their opinion. The results emphasize the specificities of each site, as shown below (Table 10).

In Monte San Biagio mushrooms are the most mentioned product (11 times), followed by fruits, vegetables (10 mentions), and sausages (9).

Table 10. Ranking of the most important raw materials/food in each area.

Ranking of the most important raw materials / food			
Monte S.Biagio			
	N. mentions		**N. mentions**
Mushrooms	11	Wheat	2
Fruits	10	Honey	2
Vegetables	10	Flours	1
Sausage	9	Wildlife	1
Water	7	Wild herbs	1
Cheese	7	Legumes	1
Cork	6	Grapes	1
Timber	4	Pollination	1
Olives	3	Pigs	1
Trees	2	Oil	1
Meat	2	Bread	1

In the Vallerano-Canepina chestnut groves the product considered most important is chestnut (42 mentions), followed by hazelnut (21 mentions) and timber (10 mentions).

Ranking of the most important raw materials / food			
Vallerano-Canepina			
	N.mentions		N. mentions
Chestnuts	42	Local products	2
Hazelnuts	21	Fruits	2
Timber	10	Water	1
Mushrooms	5	Grapes	1
Olives	4	Walnuts	1
Wheat	4	Berries	1
Vegetables	3	Legumes	1
Honey	3	Pasta	1
Oil	2	Climate regulation	1
Wine	2	Pine nuts	1

In Monte Arcosu the top 3 products are cork (13 mentions), mushrooms (10 mentions) and timber (9 mentions).

Ranking of the most important raw materials / food			
Monte Arcosu			
	N.mentions		N.mentions
Cork	13	Acorn	2
Mushrooms	10	Fruits	1
Timber	9	Pasture	1
(Medical) herbs	4	Regulation	1
Water	2	Biomass	1
Livestocks	2	Milk	1
Wild game	2	Legumes	1
Wheat	2	Myrtle	1
Vegetables	2	Organic crops	1
Wild honey	2	Organic wheat flours	1

In La Tejera, the products considered most important are acorns (with 9 mentions), mushrooms and game (with 8 mentions), and livestock (mentioned 6 times)

Ranking of the most important raw materials / food			
La Tejera			
	N. mentions		N. mentions
Acorn	9	Biomass	2
Mushrooms	8	Silk	2
Game	8	Water	2
Livestocks	6	Wild game	2
Cork	4	Asparagus	2
Hunting	4	Biodiversity	2
Timber	4	Fruits	2
Iberian jamón	3	Honey	2

La Almoraima interviewees place cork (with 17 mentions) as the most important raw materials and food, followed by timber and mushrooms (both with 6 mentions) and honey, biodiversity and game (4 mentions)

Ranking of the most important raw materials / food			
La Almoraima			
	N. mentions		N. mentions
Cork	17	Water	2
Timber	6	Fruits	2
Mushrooms	6	Air	2
Honey	4	Acorn	1
Biodiversity	4	Truffles	1
Game	4	History	1
Livestocks	3	Pine cones	1
Medical herbs	3	Landscape	1
Hunting	2	Silk	1

Trancoso interviewees list chestnuts (13 mentions), mushrooms (8 mentions), and timber (5 mentions) as the most important food and materials.

Ranking of the most important raw materials / food			
Trancoso			
	N. mentions		N. mentions
Chestnuts	13	Wild plants	2
Mushrooms	8	Fruits	2
Timber	5	Biodiversity	1
Game	3	Wheat	1
Dried fruit / nuts	2	Honey	1

Finally, respondents indicated whether there were any other benefits besides those proposed in the questionnaire and listed above.

Although in some cases respondents indicated benefits yet listed previously, the results appear particularly interesting, because they stress how the potential of nature can enhance the economy of territories (through tourism, employment, agricultural development...). Natural products also can improve the quality of life and safeguard the environment. Also interesting is the reference to the psycho-physical benefit provided by forests, especially to mental well-being, health, enjoyment of the beauty of landscapes, and heritage for future generations.

Table 11. Free listing of other benefits provided by the targeted ecosystems in the demonstrative areas of the LIFE FAGESOS project

Additional benefits of forests (beyond those mentioned) in the territories	
Monte San Biagio	✓ Air ✓ Beauty ✓ Enhancement of sports facilities in the area, also for tourism ✓ Investing in this huge natural resource and enjoying it ✓ Natural territory, with a lot of plant life and fauna ✓ Outdoor sports activities ✓ Oxygen ✓ Rural heritage of the farming tradition ✓ Sports ✓ Traffic, parking, accessibility ✓ Tourism

Vallerano-Canepina	✓ Climate regulation, habitat for endangered animals ✓ Cultural preservation ✓ Cultural/artistic initiatives ✓ Doing things in a more organic way ✓ Employments ✓ Health ✓ Life and health ✓ Local economy ✓ Mental wellness ✓ Possible reconstitution of a harmonious natural environment ✓ Preservation for the future generations ✓ Social farming ✓ The benefits of farming ✓ Water/s ✓ Wild game ✓ Wood
Monte Arcosu	✓ Biodiversity and cultural histories related to the landscape ✓ Education ✓ Education and knowledge of the history of the area ✓ Extensive livestock activities ✓ Improved reputation of the area and re-education in respect for nature ✓ Presence of wildlife ✓ Reserved spaces for wildlife
La Tejera	✓ Biodiversity support ✓ Carbon ✓ Carbon absorption ✓ Carbon sequestration, carbon neutrality ✓ Environmental services ✓ Free time ✓ Fruit and seedling collection regulated for miniature bonsai landscaping activities. ✓ Health ✓ Keeper of biodiversity and genetic resources ✓ Mushrooms ✓ Regulation of the water cycle ✓ Regulatory services in the water cycle ✓ Soil and air quality ✓ Specialized tourism to see specific species. Water quality.
La Almoraima	✓ Aquifer conservation, rainfall activator, landscape quality, regional genetic conservation, medical research. ✓ ARTE SUREÑO ✓ CO_2 stabilization ✓ Health ✓ Landscape (unique environment) ✓ Mushrooms ✓ Population ✓ Preventive forestry, firefighting, forest pest control ✓ Quality of life ✓ Seeing beautiful landscapes makes beautiful eyes. ✓ Stop the depopulation of rural areas. ✓ Value for self. For the existing.

	✓ Water cycle regulation ✓ Water for the city (tank) ✓ Water resources, environmental temperature regulator and CO_2 well ✓ Workdays in forestry and farm maintenance. Conservation of mule trains. Firewood from dry wood.
Trancoso	✓ Environment ✓ Biodiversity ✓ Economy and population sustainability ✓ Richer ecosystems ✓ Provides a stronger local economy ✓ Landscape, soil rain retention, carbon sequestration ✓ Heritage for future generations ✓ Quality of the region ✓ Tourism

4.2.4 Invasive forest *Phytophthora*: awareness and perception of threats and impacts

Invasive forest *Phytophthora* are pathogens responsible for decline syndrom of evergreen oaks and ink disease of chestnut trees. They are causing root rot and decay in the forests, dehesas and chestnut orchards observed by this project, endangering a copious number of trees.

Although the topic is very technical, almost all the respondents know about it (Figure 8). Three-quarters of the interviewees (72,4%) are precisely aware of the phenomenon; 16,3% of the respondents have a vaguer knowledge about the pathogen, having only heard about it. Only 11,3% of the respondents have never heard of it or do not know what to answer.

Such widespread knowledge of the phenomenon is determined, on one hand by the actual presence of this pathogen in the areas observed and its visible damage. On the other hand, it may depend on the characteristics of the sample, which mostly consists of residents of the neighbouring municipalities and of local visitors and tourists who reside in the region: all groups of people who are, therefore, aware of this threat to their natural territorial assets.

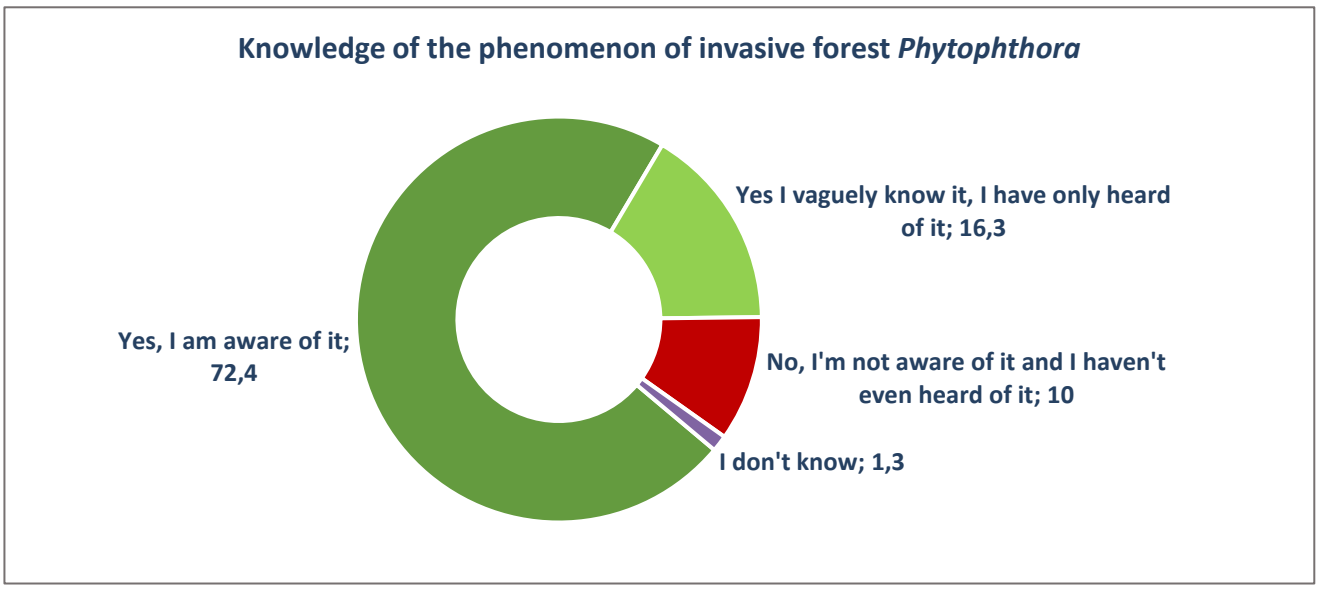


Figure 8. Knowledge amongst respondents on the phenomenon of invasive forest *Phytophthora*

If the forest were to be irreparably damaged by a pathogen such as a forest *Phytophthora* or other exogenous event, respondents recognize that it would generate significant harms that would be difficult to compensate for (Figure 9 and Table 12). The biggest harm the respondents acknowledged with the highest percentage of choices (48,1%) is the lack of biodiversity. One-third of interviewees (33%) also believe that the most serious loss would affect raw materials or the worsening of air quality (32,1%). For 31,4% of the respondents, the worst-case scenario would affect forest food (chestnuts, mushrooms, berries, etc...), while 31,1% of respondents are unable to identify just one aspect due to the vastity of the extent of the forest damage.

Climate regulation (27%) and soil erosion control (26,1%) are two of the most quoted damage too, followed by the loss of local identity (17,6%) and of soil fertility (13,5%) and pollination (13,2%).

Finally, among the effects of forest damage that are considered less serious, we find the loss of tourism (9.7%); the loss of a source of meeting and sociability (5,7%), the loss of scientific knowledge and environmental education (5%), and the loss spiritual enjoyment (3,8%).

Only 0,3% of respondents believe that irreparable damage to the forest would have no negative effect.

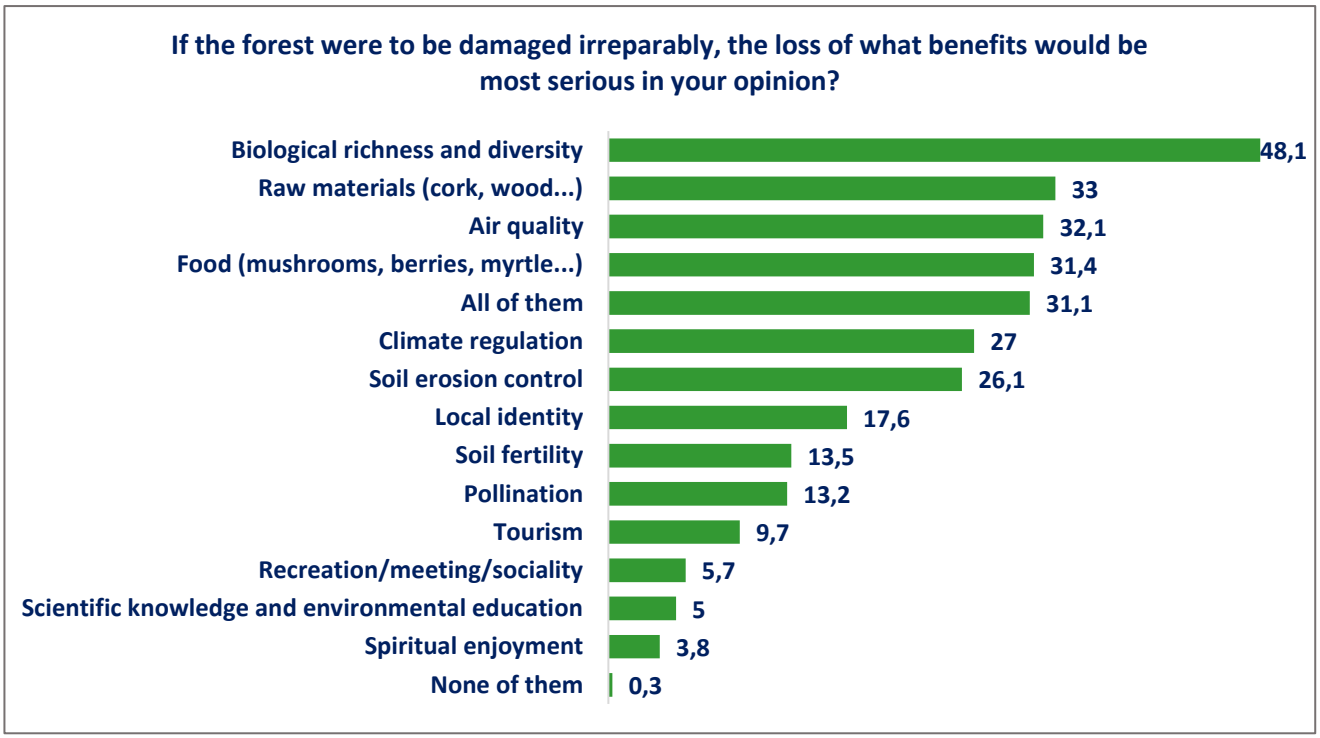


Figure 9: Perception of most serious benefits losses in case of irreparable forest damage

Table 12. Overall perception of most serious benefit losses in case of irreparable forest damage

If the forest were to be damaged irreparably, the loss of what benefits would be most serious in your opinion?

	A.V.	%
Biological richness and variety	153	48,1
Raw materials (cork, biomass...)	105	33,0
Air quality	102	32,1
Food (mushrooms, berries, myrtle, chestnuts...)	100	31,4
All of them	99	31,1
Climate regulation	86	27
Soil erosion control	83	26,1
Local identity	56	17,6
Soil fertility	*43*	*13,5*

Pollination	42	13,2
Tourism	31	9,7
Recreation/meeting/sociality	18	5,7
Scientific knowledge and environmental education	16	5,0
Spiritual enjoyment	12	3,8
None of them	1	0,3

The total is higher than 100 because 3 answers were possible

The assessment of the severity of loss in the case of forest damage depends on the ES present and valued in each territory (Table 13). The loss of biological richness and diversity is considered the most severe damage of all by the absolute majority of respondents from La Tejera (59%), La Almoraima (56,7%), Monte Arcosu (55,6%) and Trancoso (53,8%).

More than half of the residents/tourists of the Vallerano-Canepina chestnut groves (54,5%) believe that the most menacing damage would be the loss of food, especially chestnuts. The result is understandable in the light of the irreplaceable source of wealth for the area this food represents.

On the other hand, for citizens and tourists of Monte San Biagio, the most perilous damage would be the worsening of air quality. In Monte Arcosu, damage to raw materials (especially cork, the main strength of these forests) is also particularly relevant. Indeed, 53,3% of respondents have chosen this answer.

Table 13. Perception of most serious benefit losses in case of irreparable forest damage per project area.

If the forest were to be damaged irreparably, the loss of what benefits would be most serious in your opinion?

In % of total respondents	Monte S.Biagio	Vallerano-Canepina	Monte Arcosu	La Tejera	La Almoraima	Tran-coso	Totale
Biological richness and variety	44,4	38,6	**55,6**	**59,0**	**56,7**	**53,8**	48,1
Raw materials (cork, wood...)	31,1	17,0	**53,3**	38,5	50,0	30,8	33,0
Air quality	**48,9**	35,2	22,2	10,3	13,3	34,6	32,1
Food (mushrooms, berries, myrtle...)	24,4	**54,5**	15,6	20,5	23,3	30,8	31,4
All of them	23,3	34,1	**35,6**	33,3	33,3	34,6	31,1
Climate regulation	**30,0**	21,6	28,9	28,2	**30,0**	26,9	27,0
Soil erosion control	24,4	11,4	**40,0**	35,9	**46,7**	19,2	26,1
Local identity	18,9	**25,0**	11,1	7,7	16,7	15,4	17,6
Soil fertility	13,3	8,0	15,6	**20,5**	16,7	15,4	13,5
Pollination	10,0	13,6	15,6	12,8	**20,0**	11,5	13,2
Tourism	**14,4**	11,4	4,4	5,1	6,7	7,7	9,7
Recreation/meeting/sociality	**8,9**	4,5	2,2	5,1	6,7	3,8	5,7
Scientific knowledge and environmental education	4,4	1,1	6,7	5,1	**13,3**	7,7	5,0
Spiritual enjoyment	**5,6**	3,4	4,4	2,6	3,3	0,0	3,8
None of them	0	0	0	0	3,3	0	0,3

The total is higher than 100 because 3 answers were possible

In addition to the threat of pathogens (such as forest *Phytophthora*), respondents indicated other threats that could negatively impact forests and the benefits these natural areas provide.

73,6% of interviewees believe that climate change is, above all else, the greatest menace to forests. However, a large majority believe that humans are one of the threatening elements of woods. Among the threats are identified the lack of attention by inhabitants (56%); inadequate management by authorities (53,5%) and visitor behavior (43,7%).

Finally, 5,7% of respondents recognize additional dangers, such as forest depopulation, inappropriate agricultural practices, indiscriminate use of plant protection products, destruction of undergrowth, and neglect.

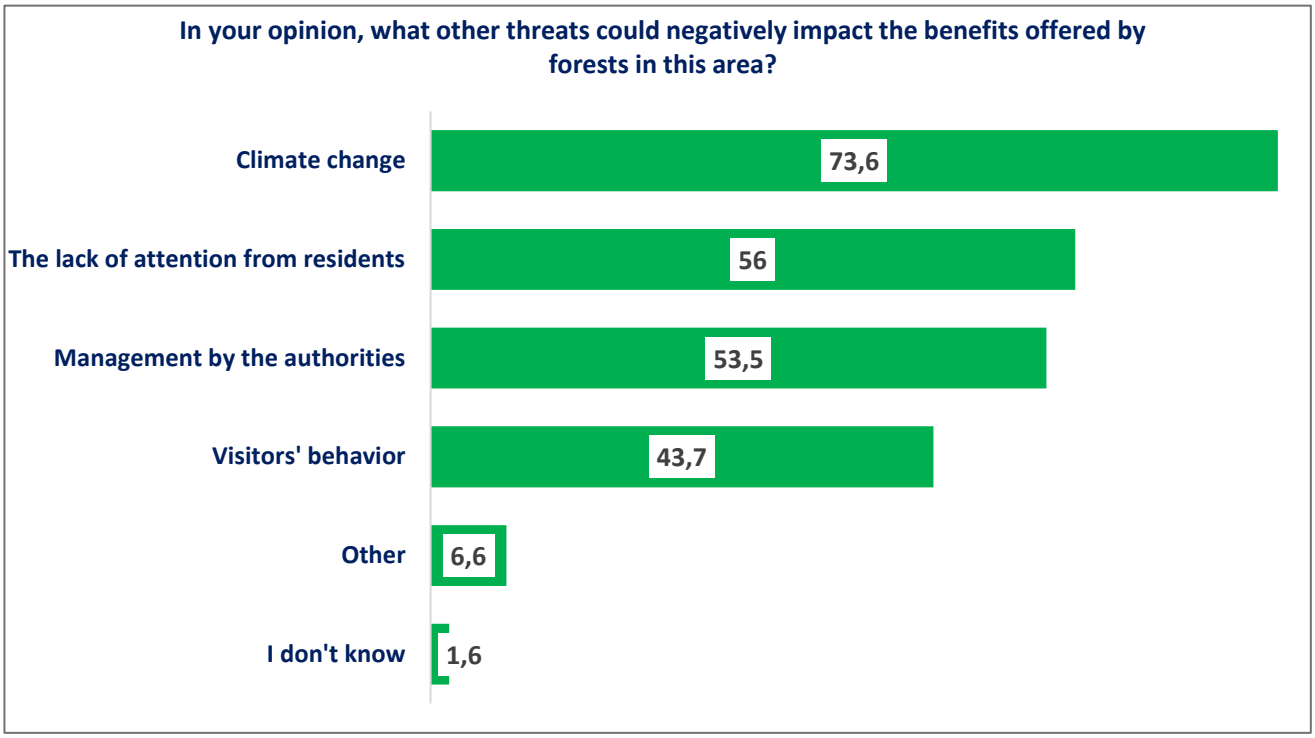


Figure 10: Respondents' perception of other threats to the benefits offered by the ecosystems of the project's demonstrative areas.

Table 14. Overall perception of other threats to the benefits offered by the ecosystems of the project's demonstrative areas.

In your opinion, what other threats could negatively impact the benefits offered by forests in this area?

	A.V.	%
Climate change	234	73,6
The lack of attention from residents	178	56,0
Management by the authorities	170	53,5
Visitors' behavior	139	43,7
I don't know	5	1,6
Other	18	5,7

The total is higher than 100 because 3 answers were possible

Once again, the previously noted indications register significant deviations according to the reference site. For example, in Monte San Biagio even 63.3 percent of respondents recognize the lack of attention of inhabitants as the main threat to their forests, even more than climate change (which registers 60 percent of mentions). On the other hand, a firm call for the accountability of the authorities comes from respondents in La Almoraima (in 76.7 percent of cases). 68.9 percent of respondents in Monte Arcosu identify the behavior of visitors as a threat to their forests instead, and only slightly lower percentages are shown in La Tejera and almoraima. These latter values appear to be much higher compared to the ones from Vallerano-Canepina (29.5 percent) and Monte San Biagio (37.8 percent) interviewees.

Table 15. Perception of other threats to the benefits offered by the ecosystems of each of the project's demonstrative areas.

In your opinion, what other threats could negatively impact the benefits offered by forests in this area?

	Monte San Biagio	Vallerano-Canepina	Monte Arcosu	La Tejera	La Almoraima	Trancoso
Climate change	60	70,5	73,3	92,3	86,7	88,5
Visitors' behavior	37,8	29,5	68,9	61,5	63,3	19,2
Management by the authorities	46,7	42	60	64,1	76,7	61,5
The lack of attention from residents	63,3	47,7	64,4	69,2	40	42,3
I don't know	1,1	4,5	0	0	0	0
Other	2,2	10,2	2,2	7,7	6,7	3,8

The total is higher than 100 because 3 answers were possible

Finally, respondents indicated whether they would be willing to cooperate in forest protection by observing particular hygiene measures requested by the authorities. Almost all interviewees were totally willing (91,8% answered in fact: yes, definitely), while an additional 7,5% would be willing only if it did not require too much effort. Only 0,6% couldn't answer on this issue, while no respondent would object to cooperating to help protect the forests through their own behavior.

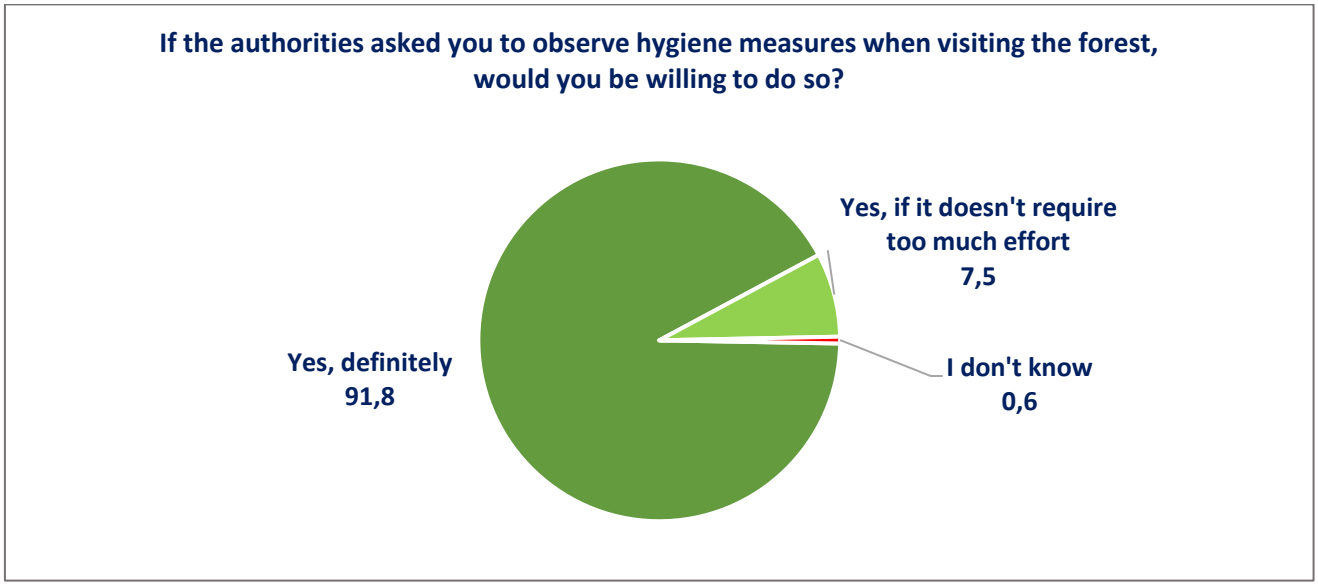


Figure 11. Willingness of respondents to adhere to authorities' requests to observe hygiene measures when visiting the forests

5. Conclusions

Consistent with the purposes of this first phase of the project, interviews among citizens, visitors, and tourists in the six monitored forests confirmed full awareness of the importance and value of Ecosystem Services provided by forests.

Indeed, there appears to be widespread recognition of the contribution, value, and importance of the Ecosystem Services provided by fagaceae forests in many terms.

First, their relevance in naturalistic terms emerges because of the regulation of atmospheric gases, climate, water, and erosion, prevention of hydrogeological disruption; and regulation of pollination and habitats for biodiversity.

Secondly, Ecosystem Services are fundamental to culture (on aesthetic, recreational, educational, spiritual, artistic, and identity levels) and to the provision of food, raw materials, freshwater, and preservation of biological variability.

Along with the awareness of the value of forests, it's interesting to mention the full knowledge of their fragility: in fact, the vast majority of respondents are aware of the threat from pathogens represented by forest *Phytophthora*, as well as recognizing the menace from climate change, in addition to that of anthropogenic origin (institutions, citizens and visitors).
In the light of all this, the total willingness found among the interviewees to contribute to forest conservation through compliance with requested hygiene measures appeared hence to be consistent.