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How to make cork oak forest services visible?

Abstract

In economics, environmental assets are generally considered as special in the sense that they provide services and functions that can be considered as components of one more general function – life support. Accordingly, it is critical to recognize, demonstrate and capture their wide range of environmental, economic, social and cultural benefits which are not directly valued through price/market mechanisms and therefore are not (economically) visible.

The concept of total economic value has been increasingly used to establish new mechanisms to incorporate the complexity of these functions into their market prices. Ecological certification is one of these tools, aiming to promote the use of sustainable practices, namely through the inclusion of non-market values in the market price of resources such as, e.g., forests.

Cork oak is the most common species in Portuguese forests, supporting high levels of biodiversity and assuming an important role in the economy. This paper aims to discuss and analyze the potential contributions of actions like the Cork Oak Landscapes Program (focused in an ecological certification mechanism) to the sustainability of cork oak forests (and their ecosystems) in Portugal.

Keywords: cork oak forests, environmental valuation, total economic value, ecological certification, payments for ecosystem services, cork.
JEL Classification: Q23, Q51, Q57.

Introduction

In economics, the environment is generally considered as a special asset, providing several services and essential functions, such as: the supply of resources to consumption and production; the assimilation of waste materials; amenities and life-support services.

Some of the environmental goods and services have a market price, and are therefore easily "accountable". On the other hand, there are goods and services whose worth is hard to define, as they do not have a price "attached". How to consider these goods and services in decision-making on resources management, seeking for efficiency and sustainability? Economics has been developing some tools to include and internalize the value of these goods and services in the market, aiming to surpass the usual undervaluation and to reach the concept of *total economic value* (TEV). *Ecological certification* (EC) is one of these tools, contributing to the incorporation in the market of a broader set of environmental goods and services, promoting more accurate valuation and contributing for more efficient natural resources' management.

Cork oak forests are resources with important functions and associated values in the Mediterranean area, with particular emphasis for Portugal, as it is the country with the biggest area (nearly 1/3) in the world and where the cork oak is the most common forestry species (occupying nearly 1/4 of total Portuguese forestry area).

Cork oak forests, as well as the ecosystems where they are inserted, represent commercial value, but also important environmental and social values, which are usually forgotten or undervalued. Indeed, the management of cork oak forests has been characterized by inefficiency, and its sustainability is currently under serious threat, mainly because (almost) only the commercial value of one of the goods – the cork – is considered. To overcome some of these problems the management of cork oak forests in Portugal has, since 2004, and in the scope of the "Cork Oak Landscapes Program" of WWF, a preservation instrument: the EC.

This paper aims to contribute to a better understanding of the values of cork oak forests and associated ecosystems, namely through the exploration of the concept of TEV. Thus, there is also the aim to explore/assess the way through which the EC, as a tool to potentiate movements towards the TEV of the goods and services provided by cork oak forests, can create a dynamic of sustainability and guarantee the consideration of the whole value of the cork oak ecosystems. Indeed, one can consider that our approach is analogous to the one recently followed by *The Economics of Ecosystems and Biodiversity* initiative, where the idea is that firstly there is the need to recognize, then to demonstrate and finally to capture the values of the environmental/ecosystem goods and services into decision-making, i.e., "to make nature economically visible" (TEEB, 2010).

Therefore, it is in this context that we propose, in section 1, to present a brief description of interactions between the economy and the environment, as a contribution for the understanding of the dimensions associated with the "real" value of the goods and services provided by natural resources, as well as of the reasons behind the existence of environmental problems. Next, we introduce the concept of

TEV, mainly as a special contribution to overcome (or at least to mitigate) the undervaluation problems that environmental resources usually face. In section 2 we launch a short analysis of the importance of the cork oak forests and associated ecosystems in Portugal, as well as of the main threats they face, seeking for the presentation of a first approach to what can really constitute the TEV of Portuguese cork oak forests. In section 4 we present a brief analysis of EC as a potential tool to bring into play the TEV principles. Finally, it is important to stress that the contributions presented in previous sections seek to provide the elements that support the discussion that is explored in last section.

1. Value(s) taxonomy of the goods and services provided by natural resources

1.1. The human-environment interaction. Humans live in permanent interaction with the natural environment, in which their existence is organized in society, creating consumption and production processes. In this context, as Fisher et al. (2009, p. 644) note, humans always looked into nature to access elements and resources needed for their survival and well being. Indeed, the environment provides raw materials that are then transformed in intermediate or final products through production processes. But the environment also provides services directly to consumers, such as, e.g., the air we breathe, the nourishment from food and drinks, the protection from shelter and clothing, as well as a variety of amenities for which no substitute exists (Tietenberg, 2003, p. 17).

Perman et al. (2003, p. 400) distinguish four types of services provided by the environment, corresponding to what is generally considered as the economic functions of the environment. The first is the provision of resources (raw materials and energy), used either as inputs to the production system or for direct consumption. Secondly, the environment can assimilate the waste and surplus of the consumption and production processes. Actually, the environment has a natural capacity to sink waste through dissipation in the sea, rivers, soils and atmosphere; nonetheless this is a limited capacity and when these limits are broken it creates what is commonly designated as contamination. Amenities and life supporting services are the third and fourth economic functions associated with the environment. The former are related with the benefits one can enjoy from the ecosystems and from the existence of the environment, such as the welfare provided by a pleasant landscape or breathing 'pure air'. The later are related with ecosystem functions such as water cycle regulation, absorption of CO_2, fauna, flora and soil conservation.

Although the human-environment interdependence, there is a fundamental question that has been contributing to extend the undervaluation of the environmental goods and services, namely: distinct logics between human action (guided by an economic dynamic of efficiency and optimal use of the resources) and the environment (that follows natural cycles of growth and regeneration, related with ecological and biological dynamics, which are independent of the human will). In brief, the challenge of the relationship between human activity and natural resources depends on the exploitation process, i.e., it depends on the human beings capacity to use the resources in a sense of balance between the natural cycle of growth and regeneration and the economic dynamic of exploitation. The first step to this balance is the correct valuation of the environmental goods and services.

1.2. Total economic value (TEV). The economic value of any environmental good or service results from all of its features: the use that is given to it, the indirect value it provides, and simply because of its existence. Accordingly, the concept of total economic value (TEV) has been largely developed as a guideline to the creation of market intervention tools able to incorporate the complexity of the functions inherent to these environmental goods and services in their market price.

There are different options concerning the (de)-composition of TEV, but the one that has been assuming a more consensual character is the one that presents the TEV as the sum of use value and non-use value.

The concept of use value is considered, e.g., by Perman et al. (2003, pp. 402-403), as the value obtained with the use of the good or service. This use value can be divided into: *directuse*, *indirect use*, and *option* values. The direct use value is the value obtained through the direct (current or planned) consumption of the environmental resource; the indirect use value is related with the benefits associated with the existence of the service, such as, e.g., the ecological functions (Ortiz, 2003, p. 83); and the option value is related with the individuals willingness to pay to guarantee the preservation of the resource for future use.

Other authors, as, e.g., Tietenberg (2003, p. 37), consider the decomposition of TEV into *use*, *option* and *nonuse* values. Accordingly, the use value reflects the direct use of the environmental resource, while the option value reflects the value people place on a future ability to use the environment even if one is not currently using it, and nonuse value reflects situations in which people are willing to pay for preserving resources that they will never use.

Correspondingly, Perman et al. (2003, p. 403) defines the existence value as the value that "arises from knowledge that the service exists and will continue to exist, independently of any actual or prospective use by the individual". In addition, it comes up the concept of legacy value, which corresponds to the valorization of the resource existence in the perspective of preservation for future generations use.

In summary, and independently of the organization assumed by the several authors, the TEV results from the sum of: *direct use value* (*DUV*), *indirect use value* (*IUV*), *option value* (*OV*), *existence value* (*EV*) and *legacy value* (*LV*), i.e.:

$$TEV = UV + NUV \Leftrightarrow$$

$$\Leftrightarrow TEV = (DUV + IUV + OV) + (EV + LV).$$

Therefore, the valuation of environmental goods and services[1] should be assumed as an incentive for the creation of tools to promote environmental protection, directed towards the revision of the valuation gaps, as well as to approximate the "real" value given to the environmental goods and services to the concept of TEV, hence seeking for a more efficient and sustainable use of the resources.

Once we have briefly analyzed the human-environment interactions from an economic point of view, as well as the need for an economical valuation of the environmental goods and services, we now have the analytical tools necessary for the application and analysis of cork oak forests in Portugal.

2. The Portuguese context – the importance of cork oak forests

The analysis of forest management in Portugal, namely regarding the use of tools for conservation and sustainability, is particularly pertinent for the cork oak tree, namely due to the following characteristics (1) it is the most common forestry species in the country; (2) it represents an important pillar of the Portuguese economy, specially through cork harvesting and general forestry, as well as industrial processing of cork; (3) the sustainability of the economic activity associated with the exploration of cork oak forests, as well as of their valuable ecosystems, are in a situation of serious threat.

In order to substantiate this importance of the cork oak in Portugal, and particularly the pertinence of its choice to study the need for sustainable forest management, we will start by introducing the main features of cork oak forests around the Mediterranean and then in Portugal. Following, we will present a brief explanation of the main problems and threats for these forests, and then conclude the section with a proposal for a possible definition of the corresponding TEV.

2.1. The cork oak in the Mediterranean. The cork oak (*Quercus Suber L.*) is an endemic specie of the Mediterranean, perfectly adapted to the climate and soil conditions, and supporting high levels of forest biodiversity, including endemic plants and endangered species. Besides having green foliage all over the year, these trees have the single feature that their bark – the cork – renews itself after harvesting, therefore making their commercial exploitation environmentally friendly, as not a single tree is cut down (Pereira et al., 2008).

In 2006, cork oak landscapes covered an area of nearly 2 277 700 hectare (ha), in Portugal, Spain, Italy, France, Morocco, Algeria and Tunisia (ANF, 2006). Analyzing the world distribution of cork oak forests (ANF, 2006), one can note that Portugal has the biggest area (736 700 ha), followed by Spain (506 000 ha), Algeria (414 000 ha) and Morocco (350 000 ha). France, Tunisia and Italy have the lowest areas (92 000 ha). This reveals that Portugal has nearly 1/3 of the world cork oak forest area and therefore the environmental services and functions related to this species have special importance in this country.

2.2. Cork oak forests in Portugal. In 2005, there were 3 168 900 ha of forests in Portugal, especially in the NUTS II of Alentejo (37.9%) and Centro (26.8%) (INE, 2007). As identified in Table 1, below, among the most common species in Portugal we can find the preponderance of cork oak and pine trees.

Table 1. Forestry species in Portugal (2005)

Species	Área (ha)	%
Maritime pine	717,4	22.6
Stone pine	83,9	2.6
Cork oak	736,7	23.2
Eucalyptus	649,8	20.5
Oak	118,0	3.7
Chestnut	29,2	0.9
Holm oak	388,4	12.3
Conifers	15,1	0.4
Broadleaves	116,9	3.7
Woody plants	18,1	0.5
Young trees	295,4	9.3
Total	3 168,9	100

Source: INE (2007).

Indeed, the cork oak is the most common species, representing nearly 1/4 of the Portuguese forest.

The Ministry of Economy and Innovation (MEI, 2007) studied the importance of the cork industry

[1] Methods for the valuation of environmental goods and services can be seen, e.g., in Farber et al. (2002), Duraiappah (2006), and Boyd and Banzhaf (2007).

considering data related to production, employment, entrepreneurship and international trade. Honório (2008) analyzes these data, comparing it with other forest industries in Portugal and in the European Union (EU), concluding that the Portuguese forest industry represents 4,2 million (euro) per year of value added, from which nearly 800 thousands (Euro) from cork oak forests. Moreover, cork oak forests (wood and cork) represent 0.51% of the Portuguese GDP and 0.33% of the European GDP. Regarding employment, industries related with forest exploitation in Portugal represent nearly 190 000 jobs and, from these, almost 60 000 in the cork oak (wood and cork) industry; it also reveals that the relative weigh of this sector in job creation is higher than in the EU (Honório, 2008). Moreover, this author also shows that the cork industry was responsible for approximately 3% of the Portuguese exports (against 0.04% in the EU). From these data becomes clear that this sector assumes particular importance in the Portuguese economy.

However, it is also important to highlight that cork oak forests have been submitted to several threats in the past few decades, putting into pressure their survival and sustainability, and indicating the risk of losing some of the associated environmental services and functions.

2.3. Problems and threats of the cork oak forests. As expressed by Sousa et al. (2007) the degradation of cork oak forests has several causes, either natural or related with human action. Among the natural causes that contribute to cork oak and corresponding ecosystem's degradation are, e.g., climate changes that interfere with the biological cycle of trees development, as well as with the action of biotic factors (as diseases and pest infestation). On the other hand, human action has been contributing to these forests degradation due to mismanagement of settlements and pollution. Thus, among the main causes one can find: (1) the increase of (population and tourist) flows that damage the landscapes and intensify the use of natural resources; (2) the fragmentation of the (big) forests in order to build roads, houses or developing business in the travel and tourism industry; (3) deforestation for agriculture and grazing, or due to the abandonment of agricultural practices; (4) forest fires; (5) changes in the international demand for cork products[1].

All these factors threaten the preservation of cork oak forests and the value that is associated with it. We also admit that the fact that cork oak forest's management relies (almost) exclusively on the valuation of cork and/or wood, may constitute (in a scenario of financial unsustainability of these goods) one of the main reasons why there has been abandonment (instead of preservation) of this type of forests. Accordingly, we believe that the actual application of the concept of TEV to cork oak forests might contribute to create conditions to surpass (or at least mitigate) these threats.

2.4. The TEV of cork oak forests. The TEV of a natural resource is the result of all of its features. Actually, the cork oak is a tree with special features: (1) lives between 150 and 200 years; (2) the cork harvesting cycle is 9-12 years long (and, therefore, each tree may generate the extraction of cork for 16 times); and (3) is the only tree not cut during the exploitation process (Cork Information Bureau, 2008b). Moreover, as other forest species, provides environmental services such as, e.g., soil conservation, regulation of the hydrologic cycle, carbon sequestration and biodiversity preservation. Accordingly, all these characteristics provide a broad set of goods and services related to cork oak forests and embody a high TEV.

Therefore, one can argue that the value of cork oak forests is the result of the economic value of cork's exploitation as well as of other agriculture and wood products, but also of environmental and socio-cultural values.

2.4.1. Direct use value – commercial value. The main economic value from the exploration of cork oak forests comes from its nuclear product – the cork. However, cork oak ecosystems provide a set of other goods and services with high value. From these we can highlight the fruits and leaves of the tree, which feed livestock breeding in *Montados*, as well as the remains of culling and pruning that provide a source of energy to industry or domestic use. In the cork oak ecosystems there are also a rich fauna with economic value in the market of aromatic and medicinal herbs (MADRP, 2000, pp. 41-42). As an example, we present in Table 2 some figures estimated by Rêgo et al. (2008, p. 9) concerning annual income generated by cork oak forests, where there is clear relevance of cork.

Table 2. Income generated by cork oak forests

Production	Annual value
Cork	500 €/ha
Pasture and mast	70 €/ha
Hunting	15 €/ha
Firewood	11 €/ha
Herbs and mushrooms	8 €/ha

Source: Rêgo et al. (2008).

2.4.2. Indirect use value – environmental value. Cork oak ecosystems are recognized by the scientific community due to the environmental services and functions they guarantee and are considered as one of the most important natural treasures in Portugal (Rêgo et al., 2008). Actually, cork oak forests guarantee a very rich biological diversity and constitute a natural habitat for endangered species, and also contribute to mitigate environment degradation.

Among the main services provided by cork oak forests, the Cork Information Bureau (2008) and MADRP (2000, p. 48) emphasize: (1) carbon sequestration, reducing CO_2 accumulation in the atmosphere and the greenhouse effect (through the singular cellular structure of the Cork Oak tree); (2) oxygen's release (through the photosynthesis process); (3) soil conservation and protection of slopes against erosion, as well as water retention; (4) creation of mild microclimates (through the reduction of winds speed, the regulation of extreme temperature's amplitude and control of atmospheric humidity); (5) creation of conditions for feeding and shelter wildlife and wild flora, promoting the biological diversity; and (6) positive impact on landscape and human welfare (through the provision of amenities and leisure spaces).

Besides these important services, the longevity of the cork oak trees and their single way of exploitation (namely the extraction of the bark – the cork – which renews itself after harvesting) keeping the tree alive, guarantees the stability and sustainability of the ecosystem. In this context, the cork oak can be considered as one of the best examples of balanced conservation and development anywhere in the world (Oliveira and Oliveira, 2000).

2.4.3. Option value and nonuse value – social and cultural value. It is also important to note that cork oak forests and the associated biodiversity are usually located in poor rural areas, where the activities and revenues generated in this context (e.g.: cork harvesting and general forestry, other agriculture and wood products, as well as cattle raising, hunting and ecotourism) assume particular significance and play an important role in poverty alleviation. This means that these activities proportionate an additional value – they allow for the maintenance of populations in the rural areas of the country (APCOR, 2009). Indeed, cork oak and corresponding ecosystems can be considered as a tool to combat desertification. Accordingly it is also important to become aware that the cork oak, and particularly the activities and rituals associated with cork harvesting, constitute an important cultural and affective heritage for local rural populations, providing relevant elements of recognition with these communities.

2.4.4. TEV. In summary, we can argue that the complexity and the scope of the environmental goods and services provided by cork oak forests and associated ecosystems are hard to assess. Nonetheless, as previously expressed, the concept of TEV can be a potential tool for more appropriate assessment and valuation. Accordingly, a proposal of the components to be considered in order to define a possible frame of the TEV of cork oak forests is presented in Figure 1.

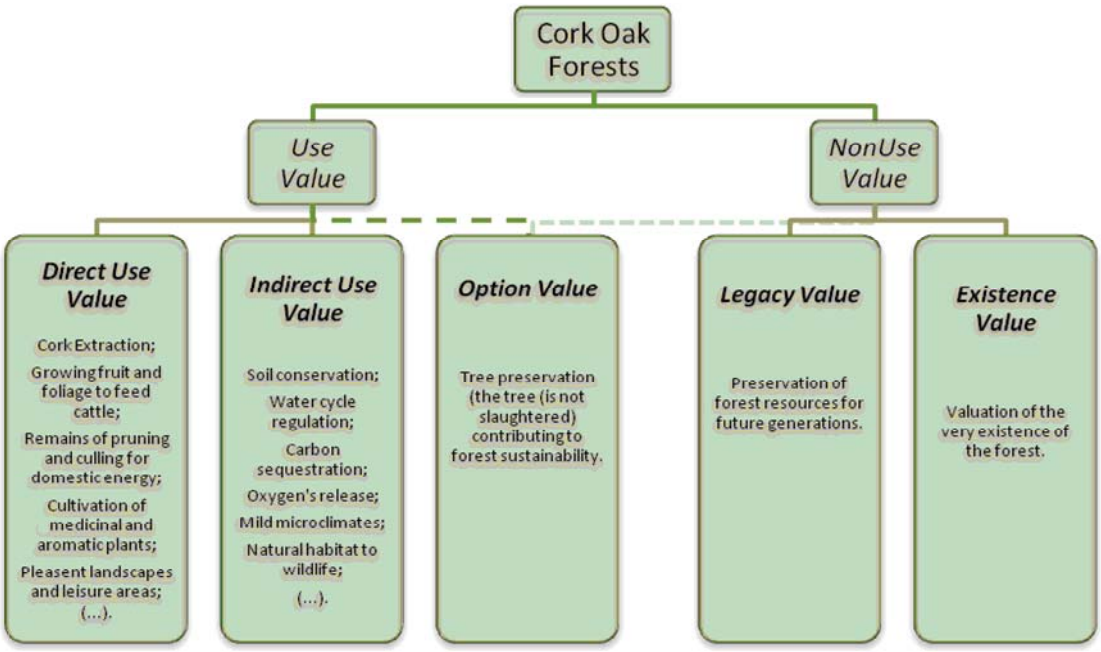

Fig. 1. TEV of cork oak forests

Thus, the concept of TEV can be considered as a guideline to the importance of the valuation of environmental goods and services. In this context, Pagiola (2008, pp. 3-4) argues that valuation assumes particular relevance in creating tools for conservation, namely by internalizing the externalities (in this case positive) from the provision of environmental goods and services. EC is one of these tools, as will be discussed in next section.

3. EC as a tool to promote the sustainability of cork oak forests

In this section we propose to briefly analyze the EC as a possible tool to apply the principles inherent to the concept of TEV. Considering the experience in the use of this instrument regarding cork oak forests, we also present a brief description of the "Cork Oak Landscapes Program" and of the corresponding EC mechanism in Portugal.

4.1. EC. The EC is a tool for environmental preservation, which came up in the context of fighting illegal logging (mainly in tropical forests). Actually, several NGO's and Governmental Agencies working in the wood sector have been using this mechanism, whose main idea is to endow consumers with information on the origins, as well as on the industrial and commercial routes, of the wood products, giving them the capability to positively differentiate these products. Following this logic, forest certified products have the guarantee that result from a production process (including activities from the forest to the international trade centers) that is economic, social and environmentally sustainable.

Theoretically, as Kiker and Putz (1997, pp. 38) note, among the goals of EC one can highlight the following: (1) to increase general consumer awareness of the relationship between the forest industry and the environment; (2) to increase consumer acceptance and confidence in the product; (3) to modify consumer and manufacturer behaviors; (4) to guarantee product differentiation and increase the market share of certified products; (5) to promote and demonstrate that forest management provides sustainable economic, ecological and social benefits.

Indeed, the spirit of EC is the one of product differentiation, which can only result from the information that (directly or implicitly) comes with the certificate. As noted by Kiker and Putz (1997, p. 38), the expectation is that "consumers will respond by purchasing the certified products and thereby provide greater financial returns to the forest managers using ecologically and socially sound timbering practices". Accordingly, the willingness to pay has an essential role in the whole certification process. The consumer perception of economic, social and environmental issues will influence either the market or the certification process. Kiker and Putz (1997, pp. 40-41) note that:

To the degree that consumers are willing to pay a higher price for the certified product, the timbering firm will receive high per unit revenues for their timber, and to the degree that the volume of timber is sufficient and operations costs are contained, net revenues will increase. Essentially the forest management firm is being compensated for enhancing environmental service flows and social benefits.

Besides the market price mechanism, the EC can also move forward by environmental law, namely by establishing rules that make access to markets dependent on certification.

Fundamentally, the logic inherent to EC, and which we propose to represent in a simplified manner in Figure 2, is the one of compensating producers by the reinforcement of forest ecosystem services and social benefits.

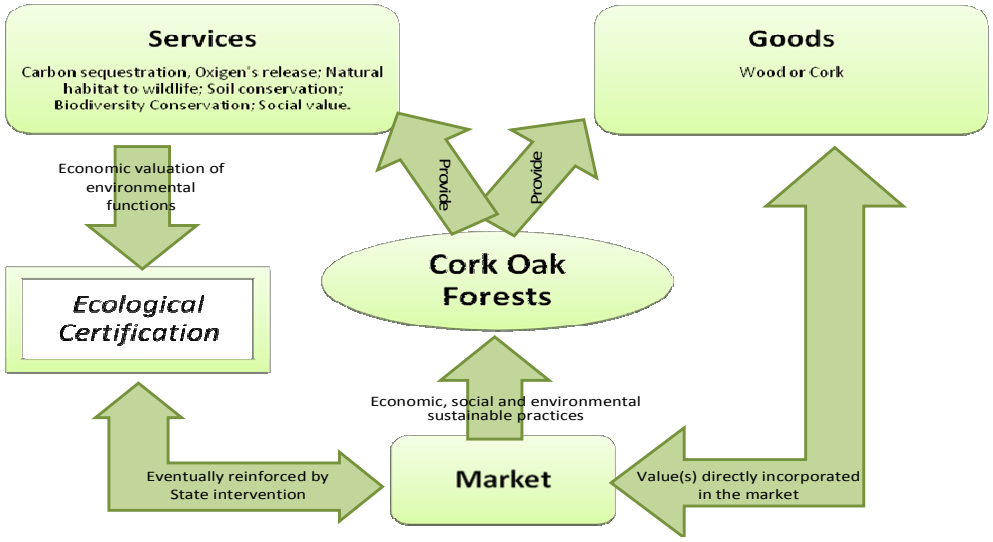

Fig. 2. Ecological certification as a tool to make services (economically) visible

However, producers and certifiers have no certainty on the price that consumers will be willing to pay, and therefore if it will be enough to afford the required return. In order to prevail over this and to reduce the costs and the administrative requirements of the certification process (comparatively to a situation of individual certification) the EC process is usually developed through a group of forest managers. This is the case of the EC of cork oak forests in Portugal[1], which has been implemented under the scope of the "Cork Oak Landscapes Program", through the activity of the group "APFCertifica", and whose main elements will be summarily presented in the next sub-section.

4.2. The Cork Oak Landscapes Program. Considering the cork oak as a valuable resource, as well as the perceptible trends for degradation of their ecosystems, the *World Wide Fund for Nature* (WWF)[2] set in motion in 2004 the *Cork Oak Landscapes Program*. The main objective of this Program is to contribute for the protection, preservation and sustainable management of the cork oak forests in the Mediterranean. For this, the Program considers four pillars (WWF, 2009): (1) cooperation and knowledge exchange; (2) the promotion of demand for products produced in sustainable processes; (3) the definition of environmental conservation politics agreed at the European Union level; and (4) the implementation of pilot-projects through EC and environmental management good practices. The later has been carried out mainly through the process of *Group Certification of Responsible Forest Management* under the scope of *Forest Stewardship Council* (FSC)[3] *Certification*, called *APFCertifica* and guided since 2007 by the *Associação de Produtores Florestais do Concelho de Coruche e Limítrofes* (APFC).

This *FSC Certification* is a guarantee that the production of the certified products respect the economic, social and environmental functions of the forests. This can differentiate and add value to the derived products (particularly cork) in competitive markets and therefore encourage the sustainable management of Portuguese cork oak forests among the members of the Group *APFCertifica* (FSC, 2009). This certification process is open to forest producers, members of the APFC, who commits to manage their property following the FSC and *APFCertifica* principles and criteria, for the duration of at least of 5 years (the validity of the certificate) (APFC, 2008).

4.3. The EC as a vehicle of payments for ecosystem services (PES). The growing awareness concerning global problems, the valuation of environmental goods and services, the need to preserve the planet and to promote sustainable development, have been increasing the demand for certified forest products, especially in Europe.

Therefore, in Portugal, the EC can assure some competitive advantage to the Portuguese forest industry in a global market. Actually, the key EC objective is to promote responsible management, safeguarding the economic, social and environmental impact of forest areas, and this is achieved through a 'more complete' valuation of the environmental goods and services. However one may question whether the EC, alone, and particularly in the context outlined above – in which the Portuguese experience with the Cork Oak Landscapes Program focuses on the commercialization of (certified) cork – may be sufficient to 'capture', among all the components of *TEV*, those that can ensure its sustainability.

For this discussion we believe that it is useful to add that the concept of EC (under the frame of Cork Oak Landscapes Program), can (and should) be analyzed, from the theoretical point of view, under the scope of a mechanism for environmental preservation known as *Payments for Environmental/Ecosystem Services* (concept widely identified by the acronym *PES*). Indeed, it is relevant to mention that the *Millennium Ecosystem Assessment* (2005) refers to ecosystem, or environmental, services as the "benefits people obtain from ecosystems", from both ecosystems direct use (e.g., for timber) and when ecosystems are not used directly (but play an important socioeconomic role). The issue is that payments for the direct uses of forests are made when timber or non-timber forest products are bought, while PES schemes refer to the non-use services provided by forests.

Roughly, the PES are based on the idea that the beneficiaries of environmental services who wish to preserve them, should make direct, contractual and conditional payments to the local owners and users

[1] In Portugal the EC mechanism is also being used by the *Group Portucel*, regarding the production of eucalyptus to supply their manufactures of pulp, paper and paper products.

[2] The *World Wide Fund for Nature* (WWF) is an independent conservation organization, created in 1961. This global organization acts locally through a network of over 90 offices in over 40 countries around the world, and it has been developing an important role in environmental conservation and species protection.

[3] FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible (i.e., environmentally appropriate, socially beneficial and economically viable) management of the world's forests. FSC certification provides a credible link between responsible production and consumption of forest products, enabling consumers and businesses to make purchasing decisions that benefit people and the environment as well as providing ongoing business value. FSC is nationally represented in more than 50 countries around the world. In Portugal the representative of FSC is the *Associação para uma Gestão Florestal Responsável* (AGFR), created in 2007. The creation of this association involved the participation of several entities related with the wood industry and environmental preservation, namely: the *Confederação dos Agricultores de Portugal* (CAP); the Group *Portucel-Soporcel*; the *Instituto Superior de Agronomia* (ISA); the *Liga para a Protecção da Natureza* (LPN); the *QUERCUS*; and the *União da Floresta Mediterrânica* (UNAC).

of the ecosystems that provide these benefits; and the local owners and users of the ecosystems, in return, adopt practices that ensure the conservation and preservation of the ecosystems and resources (Engel et al., 2008). More precisely, Wunder (2005, p. 3) identifies five criteria to define PES: (1) is a voluntary transaction, (2) where a well-defined environmental service, or the use of soil/ecosystem that ensures it; (3) is purchased by at least one buyer; (4) to at least one seller/service provider; (5) if, and only if, the seller ensure the provision of the environmental service.

Actually the concept of PES is at the heart of a new approach for environmental conservation which aims the balance between the 'producers' and the beneficiaries of environmental goods and services. This is based in a trade-off logic in the use of ecosystems, aiming to reconcile different interests through a compensation mechanism – in order to provide an incentive for 'suppliers' of environmental services to manage natural resources in a sustainable way, and allow those who depend on these environmental goods and services to 'invest' in their supply. Briefly, the logic behind PES can be represented as in Figure 3, below.

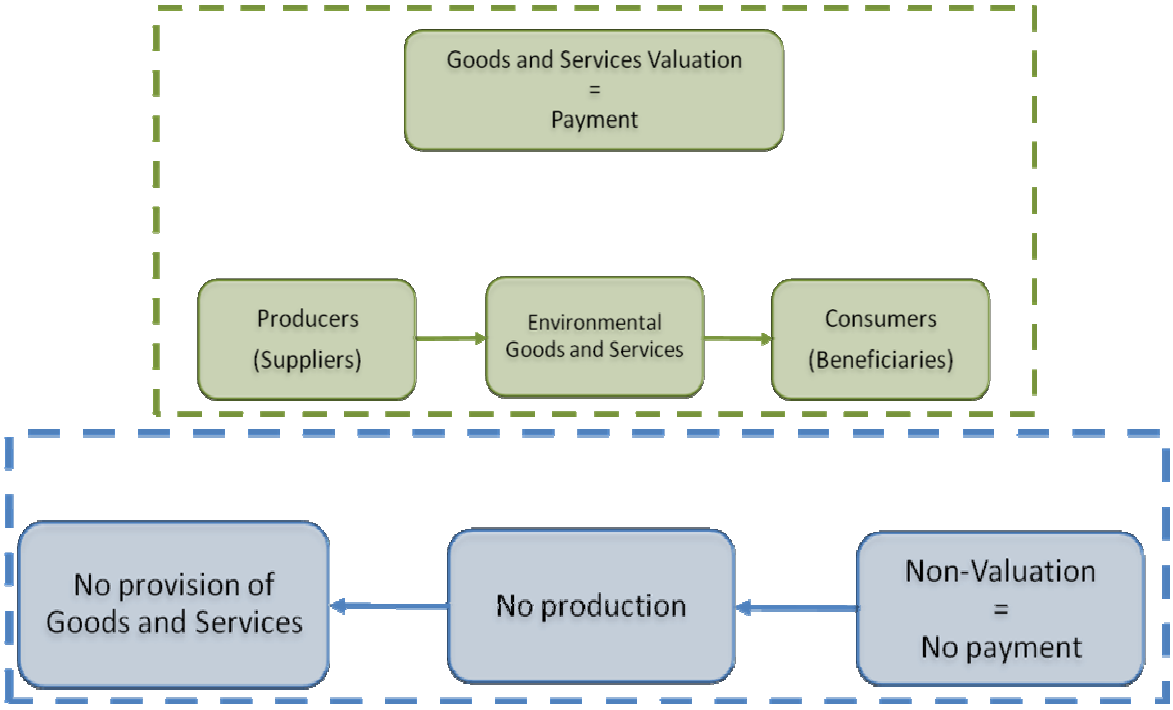

Fig. 3. PES "mechanism"

In this context, PES has been attracting increasing interest as an instrument for the valuation of environmental goods and services and for creating a market for them, namely by acting as a mechanism of transference/incorporation of "external" environmental values in incentives for the local actors that provide such services.

Therefore, in a broad sense, the EC under the Cork Oak Landscapes Program might be considered as a PES, since it combines the features that define this mechanism: it is a voluntary transaction, in which an environmental service or use that provides it, is purchased by a buyer, to a seller, ensuring the provision of the service. Indeed, what happens in this EC is that the beneficiaries (consumers) of the environmental goods and services of the cork oak forests ecosystems counterbalance, through the payment of a higher price for the certified products (principally cork), the forest producers to guarantee they ensure the maintenance of the ecosystems that provide these goods and services[1]. This is a particular feature that an only happen in the case of cork oak forests commercial exploitation, since this mainly corresponds to the extraction of their bark (the cork, which renews itself after harvesting), therefore preserving (non-using) this resource and the associated biodiversity (as not a single tree is cut down).

Accordingly, one might consider that the EC brings into the market components of the TEV of the cork oak forests that were not previously considered, encouraging their more efficient management at economic, social and environmental levels. Thus, if there

[1] Regarding the analysis of PES as a mechanism for environmental preservation and the payment method, Wunder (2005) argues that the designation of "payment" corresponds to a generic term that has a clear monetary association, but there are some experiences (particularly in Latin America) both of payments in cash and in kind. Pagiola (2006) argues that if on the one hand, payments in cash are more flexible, on the other the truth is that there are no guarantees that the money will be applied in the preservation of the goods and services. Engel et al. (2009) states that, regarding PES, the payment is normally in cash, but that other means are also acceptable.

is a price-premium for certified products, the EC can be regarded as a PES whose economic incentive's mechanism is the additional income for the 'producers' of the environmental services (which is provided by the sale of certified products and market's assurance, and not through a direct payment in cash).

Conclusions

The economic value of any environmental good or service results from all of its features: the use that is given to it, the indirect value it provides, and simply because of its existence. Regarding cork oak forests and the associated ecosystems, the complexity and complementarity of the several environmental goods and services provided are difficult to measure, mainly because many of them are not 'traded' in the market and therefore are not (economically) visible.

In this context, the current situation regarding cork oak forests management in Portugal is characterized by: (1) the general ignorance of the TEV of the goods and services provided by these natural resources; (2) the lack of processes/mechanisms for taking benefit of all its value; and (3) the fact that in this management prevails the (almost) exclusive valuation of cork. Accordingly, if there is no perception of the 'real' value provided by these resources, it will be very difficult (if not impossible) to achieve a situation in which the "correct" price (i.e., for the productand associated goods and services) is paid in the market. Thus, we are facing an undervaluation problem, which has been threatening the sustainability of cork oak forests and their ecosystems in Portugal.

The solution must go by the recognition, either by producers and users/consumers, of the total value (TEV) of the cork oak forests and associated biodiversity. In this context, demonstration, through strategies to inform, improve awareness and dissemination of the concept of TEV (applied to these resources), as well as the use of the EC mechanism for its promotion, are crucial. Indeed, this can contribute for capturing the values of cork oak ecosystems, in a situation where the beneficiaries (consumers) of environmental goods and services of cork oak forests compensate, through the payment of a higher price for certified products, the forest "producers" and so these could ensure the maintenance of the ecosystems that provide those goods and services. In this sense, it was emphasized that the management of cork oak forests in Portugal already counts with an instrument - the EC (under the Cork Oak Landscapes Program) - with capability to incorporate in the market components of the TEV of the cork oak forests that are not usually considered. Actually, the EC allows consumers to express their preferences and values in the market, through their willingness to pay more for a product that meets specific criteria of production and distribution, and therefore incorporating in the market price a value closer to its TEV. In turn, this may ensure forest managers the financial means essential to implement sustainable practices from the economic, social and environmental points of view.

It is also important to stress that the importance of cork and of its market in the scope of the promotion of cork oak forests and corresponding biodiversity sustainability presents a paradoxical nature. On the one hand, as noted above, the centrality (almost exclusivity) of cork in the exploitation of cork oak forests has led to inefficient allocations regarding the use of this natural resource. On the other hand, regarding the EC under the Cork Oak Landscapes Program, it can be stated that, although the 'consciousness' that cork is not the only good/service provided by cork oak forests, in pragmatic terms it has been assuming a kind of key-vehicle to "capture" the value of cork oak and their ecosystems, namely through the trade of certified cork products. Thus, by promoting the preservation of cork exploitation (according to appropriate forest management practices), one will be also contributing to the sustainability of cork oak forests and of their valuable ecosystems.

However, concerning perspectives for the future, there will be the need to find ways to create, promote and/or expand 'markets' associated to other goods and services assured by cork oak forests, particularly those related with leisure/tourism in these spaces. Indeed, it is assumed that one possible way to raise consciousness and sensitivity on the idea that 'there is something beyond cork' will be to confront the potential 'consumers' with the fruition of some of these goods and services.

Finally, it is relevant to note that the work here presented here has, essentially, a conceptual nature. In fact, to assess the real impact of EC in cork oak forests management it would be appropriate to quantitatively analyze the value of the cork oakproducts, before and after the EC process, in order to appraise whether this mechanism has took effection prices and/or on the behavior of consumers and producers. However, attending to the nature of this paper, it was not possible to collect and process such type of information. Nonetheless, we not only emphasize the awareness of such limitation, as we take the opportunity to express our willingness and openness to develop such kind of work in future opportunities.

Acknowledgments

The authors are grateful to Rita Pinto for her inventiveness and valuable collaboration in early stages of this research. The usual disclaimers apply.

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