

Analysis of three economic incentives for the provision of forest goods and services in Catalonia (Spain)

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Abstract

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The provision of forest goods and services is determined by their management practices. The European-Mediterranean forests face a double situation of lacking mature forests due to historical high human pressure and the generalized presence of young, low quality stands resulting from the progressive abandonment of traditional activities in the last decades. The analysis in this paper focuses on three types of economic incentives addressing these challenges in Catalonia (Spain) – the Mature Forest Reserves (MFR), the Land Stewardship (LS) and the grants for Forest Defence Groups (FDG). These instruments are assessed based on the evaluation criteria of effectiveness, efficiency, conditionality, flexibility, acceptance and equity. Assessment is based on the quantitative and qualitative information obtained from the interviews of experts and involved stakeholders. Our results show that the implementation of these instruments is in overall perceived as positive, although there is space for improvement, especially in the effectiveness dimensions. In the cases of LS and FDG the economic incentive supposes a multiplier effect of the potential impacts achieved without the instrument. Efficiency adjustments are applied once the initiative becomes consolidated in the territory. The existing governance system allows for an adequate conditionality of public schemes. Flexibility, equity and acceptance of the instruments have been attained by adapting their design and are not found problematic in the case study area.

Keywords: Evaluation of policy instruments, qualitative research

1. Introduction

Mediterranean forests provide to society multiple goods and services, including many public goods and positive externalities (e.g. biodiversity protection, landscape generation, CO₂ sequestration, microclimate regulation or erosion prevention) that play a crucial role in society's welfare and in the economic development of rural areas. Experts agree on the positive effects the active management of forests of the Northern rim of the Mediterranean has in the maintenance or improvement of some of these goods and services, e.g. Palahi *et al.* (2009), Campos *et al.* (2005).

Most of forest goods and services remain outside the market system, leading to a divergence between the social value of forests and the income their owners receive from forestry uses. Low traditional profitability jointly with social changes leads to the abandonment of forests or to their mismanagement. This situation becomes

especially relevant in the region of Catalonia, as 60% of its area is covered by forest lands and 80% of them are private-owned (Villanueva *et al.* 2005). The consequences of forest abandonment are, i.a., the increase of big wildfires or the higher vulnerability of forests to pests or storms impacts, such as the windstorms of 2009 or the snowstorms 2009 and 2010 (Plana 2010, Diari Forestal 2010). In parallel, forest areas fragmentation, simplification in species' composition or human disturbances i.a. are causing a decrease in forest biodiversity.

Numerous studies (e.g. Romero *et al.* (2006), Plana (2010)) demonstrate that the currently managed forest area as well its quality in terms of goods and services has not reached the optimum which would meet citizens' demands. In the last decade entrepreneurs, non-profit organizations and public institutions in Catalonia have responded to these demands by launching economic and market-based mechanisms. Some examples of these are

compiled in Mavsar *et al.* (2008) and Russi (2010).

However, so far there have been no attempts to assess the performance of these instruments. There is a need for analyzing the experiences that have reached certain degree of consolidation and identify success factors and shortages in their implementation. The results could serve to improve the institutional framework surrounding economic incentive instruments and their design characteristics.

In this paper, we review three instruments: the Mature Forest Reserves (MFR), the Land Stewardship (LS) and the Forest Defence Groups (FDG). More specifically, we want to answer the question of: how well the current economic incentives – addressed to internalize the value of forest goods and services – work in the Catalan context? We aim at exploring the economic rationale behind the existing mechanisms, their trajectory in terms of resources devoted, transaction costs, evolution and their evaluation by the actors who implement them.

This paper is structured in five chapters. The introductory chapter is followed by the description of the methodological research approach and presents the evaluation criteria used in this study. The third chapter presents the description of the general framework affecting forests in Catalonia, where context features and general policy objectives will be exposed followed by the review of the three instruments in focus. The paper finishes with a discussion and conclusions on instrument design and evaluation.

2. Methodology

2.1. Research approach

This research combines two complementary methodological approaches: a traditional quantitative analysis of the numerical achievements of policy instrument performance, based on a set of pre-established evaluation criteria, together with a qualitative investigation based on the phenomenological theory. Quantitative approach provides limited information on the reasons for success and failure in meeting certain evaluation criteria. Qualitative approaches, on the other hand, do allow for searching an explanation to the reason behind such results. Qualitative assessment is based on the presumption that reality is what people perceive it to be (Kvale and Brinkmann, 2009). Our implicit assumption is that stakeholders' perceptions on the success or failure of policy implementation directly affect their support, advocacy and sustainability of that particular policy. Analysis based on simultaneous use of quantitative and qualitative techniques constitutes the innovativeness of the study.

For the purpose of this study we have considered economic incentives as involving a transfer of economic resources and which encourage agents towards a desired behavior, in this case the desired type of forest management, by altering financial incentives rather than by mandating them to do so (based on Stavins, 2001).

The study has been conducted in two phases. In the first phase, a bibliographic review was carried out to identify (1) the key regional problematic of forest goods and services, and (2) the publicly available information on the three instruments. Information was collected on the historical development of the instrument background normative and implementation data.

In the second phase, stakeholders were identified and face-to-face interviews with them were conducted during the summer 2010. The interviews aimed to obtain deeper information on implementation as well as to capture perceptions on their performance. The content of the interviews was semi-structured, including common and specific questions, both open-ended queries and ranking questions. The questionnaire was sent to the interviewees in advance, which allowed them to prepare the topics. The interviews were transcribed and coded. Thereafter, a comparative analysis of the performance of different instruments was performed, and the narratives of success and failure stories were contrasted against the evaluation criteria.

2.2. Evaluation criteria of environmental policy instruments

The environmental policy literature (Engel 2002, Mavsar *et al.*, 2009, Sommerville, 2009, Wunder, 2006 and Wunder, 2007) recommends the following criteria for evaluating economic instruments: economic efficiency, effectiveness, equity, acceptability, conditionality and flexibility. We have considered them as follows:

Engel *et al.*, 2008 define **effectiveness** – also called **efficacy** (Wunder, 2007) -- as the extent to which instruments are able to meet their objectives. It embraces different dimensions, being crucial the additionality – whether the instrument ensures an improvement over the 'business as usual' scenario. For that reason, a **baseline scenario** is basic to contrast trends with and without the instrument followed by a **monitoring system** demonstrating the increase in environmental services have indeed taken place. Other relevant elements to be analysed are the **perverse incentives** generated, such as **leakage**: shifting the pressure from the focus area to another (Engel *et al.*, 2008), thus not reducing the environmental damage but just displacing it.

Economic efficiency reflects the ability of the instrument to reach an optimal allocation of

resources, which in practice often means the achieving a chosen target at the lowest cost. Both direct costs imposed by the instrument and the indirect cost in terms of opportunities forgone should be computed (Mavsar *et al.*, 2009). **Transaction costs** appear in this section as a relevant component that should be minimised.

Flexibility refers to the easiness to adapt the instrument to the new conditions. It includes both external flexibility, understood as the ability to adjust to changes in markets, technology, knowledge, and social, political and environmental conditions and the internal flexibility, understood as the ability of the agents affected by the instrument to adapt to external changes (e.g. to cancel an agreement upon a unilateral decision of one of the parties) (Mavsar *et al.*, 2009).

Conditionality refers to the degree the economic reward effectively arrives to the provider of the desired good or service only after s/he demonstrates their provision (Mavsar *et al.*, 2009). It is defined not only by the items in the contract, such as terms of payment or penalties, but also by the actual enforcement system. Sommerville, 2009 stresses the relevance of this criterion as the mean to explicit to the service provider and donor the service defined and its monitoring regime.

Acceptability is the degree of agreement of target groups to the instrument imposed onto them (Mavsar *et al.*, 2009). This criterion aims at reducing the risks of policy failure due to social opposition. The dimensions taken into account here are the transparency, different levels of participation of the target groups and the progressive implementation. The indicators have been the presence of explicit contrary reactions, the increase in participating agents or the existence of pilot projects.

Equity deals with the different distributive consequences of the economic instrument for different interest groups, both within and across generation (Mavsar *et al.*, 2009). Wunder, 2006 observes that fairness criteria potentially jeopardize the effectiveness criteria, an issue also addressed by Russi, 2010 in her report. Adequate instrument design usually can minimise this problem.

3. Contextual setting and instruments description.

In this chapter, we briefly describe existing socio-economic, legal and institutional context of the case study area and present the three economic instruments which are the objective of the study.

3.1. Case study description

Catalonia is an autonomous community of Spain, whose government holds the competences in

natural resources management. 80% of the forest area is owned by privates, whereas municipalities constitute the main public forests owners and are located mostly in the Pyrenees. The average size of the private holdings is 20ha, while the estimated threshold for forestry to become an economic activity is 25 ha (Vayreda, 2004), consequently forestry represents mainly in a complementary income in rural areas. Low growth rates, low market prices and considerable management costs lead to low financial returns in forest activities (Solano *et al.*, 2007).

The relevant national and regional laws are presented in Table 1. The social benefits of forest are acknowledged at both levels, placing forest owners as the ultimate responsible of the management of their holdings. Owners have the duty of a rational use of their forest resources in a manner which ensures their future availability. With respect to the role of users there are different views: while the Forestry Strategy emphasizes the government responsibility, the Forestry Plan encourages individual actions. This ambiguity makes possible initiatives both from the civil society in general and public administration in its representation.

3.2. Mature Forest Reserves (MFR)

This program is running in the Catalan province of Girona since 2008, and supposes an up-scaling of the experience which started in the protected area of Montseny (Ribes i Besalú, 2009). Its main purpose is to overcome current scarcity of mature forest stands (Camprodón, 2005), that is those over their rotation age, in view of conserving the biodiversity they host. In this line a public administration launches an annual call addressed to owners of forest parcels, who satisfy certain criteria, offering them a reward for their commitment to leave the stands in natural evolution during thirty years more. Funds come from the general public budget and private donors; and beneficiaries can be both private landholders as well as municipalities. The reward they receive is meant to compensate the profit loss calculated based on the management plan approved by the Forest Ownership Center (Dip.Girona, 2010). This system fits under the definition of Payments of Environmental Services (PES) scheme according to Wunder *et al.* (2005): there are several providers (forest owners) of an environmental service (biodiversity typical from mature forests), which is defined by the land use likely to secure it; there is at least one buyer – the provincial government but also donor enterprises, the transaction is voluntary and the payment is conditional on the signature of a commitment with the public administration. The MFR scheme follows, therefore, the rationale of the PES as shown in the Figure 1.

3.3. Land Stewardship (LS)

Starting in the 1980s, some civil organizations got engaged in forest activities aimed at enhancing biodiversity and recreation, by means of land purchase or more or less formal agreements with forest owners. In 2000 these initiatives were formalized under the umbrella of the land stewardship network (XCT, 2001). They are present in the whole Catalonia region, acting in both private and public, municipal territories. Nowadays these organizations constitute an intermediary between their members and donor enterprises and the landowner. The undertaken activities range from placing bird nest boxes, to monitoring certain bio-indicators or clearing bushes. Volunteers represent most of the labor employed in such tasks, while some organizations have a technician in charge, whose salary in a few cases is covered by a public grant (DMAH, 2009). Land stewardship supposes a bottom-up initiative through which private agents intervene in areas the government is unable to reach for several reasons, such as budget constraints or landowners' acceptance. During its first stages, LS associations focused in the acquisition of full land property rights; but the high maintenance costs compelled them to redirect the strategy towards agreements with landowners, in which we will focus. Due to its volunteering character, the reward to the forest owner is not always a monetary payment but instead usually takes a form of in-kind contribution, covering at least the expenditures of the undertaken activities, as illustrated in figure 2.

3.4. Forest Defence Groups

Following the same principles as the civil protection organizations -born in urban zones to jointly respond to catastrophic situations-, rural areas have developed social networks for reacting i.a. to wildfires. Given the legal problems for landowners to participate in the fire extinction on their own properties and after the effective responses to the events happened during the 1980s, such networks were formalized in Catalonia as the Forest Defence Groups. FDG are composed mainly by forest owners and count with mandatory participation of the corresponding municipality, remaining opened to every interested person. Their main goal is fire prevention and first attack in the municipal area, with usual collaborations with neighboring towns. For that purpose the associations acquire the necessary equipment, receive training and are coordinated by professional technicians. The Catalan government opens annual calls in view of covering their actual expenses generated; such grants are in some cases complemented by other funds from local and county administrations. A few groups also have an internal membership fee for covering any extra expenditure. The system of FDG is then based on

a win-win approach: forest owners devote their resources -time, experience and physical effort- to diminish the fire risk not only in their own¹ property, but also in others' properties; and the society at large benefits from a lower risk of fire. The grants to FDG follow then the logic of cost cover charges (figure 3).

4. Discussion of the results and implications for policy design

In this section we assess the performance of the three instruments in focus using the evaluation criteria discussed above based on the quantitative and qualitative information collected about the instruments.

4.1. Effectiveness

A common feature of the three instruments is the lack of stated explicit targets in their published documentation. Together with the difficulties in finding third party evaluation reports, this situation turns the objective assessing the **effectiveness** into a complicated task. A complementary qualitative approach is, thus justified, wherein the interviewees were asked about their perceptions of the achievements of the non-stated goals. Due to the differences in the targeted environmental services and their measurement units, we have restricted the analysis to the comparison of the stated perceptions. For the MFR a numerical target was identified; while for the LS and the FDG the desirable situation involves "as much area covered as possible".

4.1.1. Effectiveness in Land stewardship

The history of the **land stewardship** as decentralized initiatives explains its focus on local problems. Steps towards coordinated action are given by the creation of the Network of LS associations and the establishment in 2006 of supra-municipal strategies, such as "river plans". Such cooperative efforts are crucial for the connectivity of impacts and thus ecological effectiveness. There are no common goals in terms of area, type of activities or impacts achieved. Success is measured by means of a biannual inventory based on questionnaires sent to the member entities of the network (Puig *et al.*, 2009). Results show an augmenting trend in the number of agreements with landowners (70 entities count with 441 agreements in 2009) as well as in the area under such schemes (over 60.000 ha).

Moreover, interviewees remarked the likely permanent effect on people's behavior of their

¹ As in other autonomous communities in Spain, the responsible of fire emergence holds the legal responsibility of the civil population involved (Source: INFOCAT Plan). In practice this means that individuals are not permitted to take part in fire extinction, even if they are landowners or only under their own responsibility

engagement in LS activities, both for the individuals who volunteer for a good purpose, and for landowners, who experience the recognition of forest values by externals. This constitutes a parallel main objective: the engagement of civil society in environmental actions, with the final intention of raising citizens' awareness. Such impacts are difficult to measure quantitatively.

The situations address by LS initiatives could be categorized as a static baseline scenario (Wunder, 2007), in which the business as usual situation would have maintained the current forest status, while the initiative allows to achieve incremental impacts.

There is a concern about the continuity of donors' and volunteers' commitment to the cause: whether a particular agreement develops into a long-lasting dialog between the landowner and the society, or on the contrary, if it concerns a punctual activity which is not followed by further actions. In such analysis it should be taken into account the duration of the case-by-case problematic; some temporary threats may require time-bound responses, while other structural issues entail periodic, recurrent actions.

4.1.2. Effectiveness in Forest Defence Groups

There are 297 constituted **Forest Defence Groups** covering the 90% of the forest territory of Catalonia. Their degree of activity fluctuates from county to county. Extracting the impacts from FDG results difficult with the existing indicators (e.g. number of machinery, area burnt, or length of roads repaired); they describe the fire suppression activities, where their synergic action with professional firemen is mixed. In general, data on the benefits from a preventive silviculture – e.g. reduction of fire-caused tree mortality or success of natural post-fire regeneration- is missing, and specifically those capturing the FDGs' contribution. Thus, quantitative analysis is complicated. Then again, interviewees score the performance of FDGs as positive. Without the economic incentives given to FDGs, they are likely to continue in few areas due to the inherent owners' interest in fire prevention and the social network created in the rural territory; nevertheless, it is expected that they would restrain their actions to their own properties, thus diminishing the multiplier effect: it has been remarked that “with little money a big difference is achieved”. This situation corresponds to the static baseline scenario proposed by Wunder (2007). The main threat of a **perverse incentive** in Mediterranean areas is the incitement to incendiary, but up to now there have not been detected any correlation between the economic incentives given to FDG and fire occurrence. The existence of free-riders, however, has been identified, that is of landowners who do not take part in the FDG and do benefit

from the reduced fire risk in their surrounding area.

4.1.3. Effectiveness in Mature forest reserves

International standards of sustainable forest management certification indicate a minimum of 10% of the area to be kept in natural evolution (FSC Spain, 2007). Based on this premise, the promoters of the **Mature forests reserves** aim at reaching around 1% of the provincial forest area, whose composition should include at least one representative stand of each forest ecosystems. In a three years' period, 37% of the objective has been achieved, therefore the overall effectiveness is perceived as high. **Monitoring** of impacts is nevertheless unequal, given the different availability of prior studies: while in one county there is a very active naturalistic group which has produced several comprehensive reports based on their regular inventories, most of the remaining area lacks from this information.

The **appropriateness** of stand selection could be questioned given the lack of a total number of mature forests. For that reason an ongoing project is identifying and mapping “singular forests” in Catalonia (CREAF, 2008), including under this term the mature forests. The limitations of this study, however, are the difficulties of obtaining the relevant information from private forests, who may be afraid of their expropriation or declaration as “integral reserves”. The system of MFR resolves by providing incentives to landowners to provide such data for a possible reward. The promoters of MFR solve the issue of ecological adequacy by adapting the international parameters of mature forests to the call ranking standards, allowing for a prioritization of the candidates. The **baseline scenario** shows a decrease in the forest diversity based on the market forces: the dimensions of mature trees make them attractive for timber uses, while those with rotten and twisted trunks are usually eliminated in order to diminish the competence to commercially interesting ones. The fact that the stand in question is included in the management plan and has an economic study enables to deduce owner's intention to harvest such stand. This assumption solves the controversial matter of **asymmetric information** directly related to the additionality of the instrument.

Another questioned dimension of the ecological effectiveness is the connectivity issue: will the network of mature forest stands create a sufficient habitat to maintain the key species? Managers do not see this as an issue but further supporting scientific basis becomes essential for justifying the foreseen diversity losses in the “intervention” scenario versus the actual improvements in biodiversity “natural evolution” status. Yet, the elevated costs of monitoring have been

highlighted compared to the actual compensation costs, as the establishment of new agreements takes place prior to the monitoring.

A common outcome has been the absence of **perverse incentives**. The MFR prevents them by the logic of inverse depreciation: the value of one's forests increases with the time. The periodicity of the instrument discourages the harvesting, given that ageing forest augments the eligibility for later calls.

4.1.4. *The question of additionality*

We find support to the finding of Sommerville *et al.*, 2009 that it is extremely difficult to demonstrate **additionality** due to the methodological and practical challenges of estimating baselines as well as measuring the service itself. In the three instruments we find that the economic incentive relies on a proxy, this is, the measurable action which is supposed to be correlated to the increase forest service. A scientific basis on the cause-effect of the action is, however, needed. Table 2 compiles examples found in reports and in the interviews. This proxy-approach is mandatory under schemes with blurrily defined objectives -such as in the case of the broad concept of "biodiversity"-, while meaningful numerical target -as the increase of the population of certain species- or qualitative target -satisfaction of ecotourists- is sometimes possible to state. This is desirable in terms of assessment accuracy. Targets may be imposed from upper instances (international agreements, e.g.) or, preferably, they may emerge from social participatory processes with special input from locals and experts.

4.2. *Efficiency*

In respect to the **efficiency** of the systems, we point out the little information available on resources required for the functioning of the initiatives, with the exception of the public systems (FDG grants and MFR), in which final amounts that owners receive are mandatorily published in official gazettes. Therefore intermediate costs should be estimated based on the information provided in the interviews. Traditional rejection to reveal actual opportunity costs hampers the calculations of efficiency; however this is partially solved by assuming that candidates signing an agreement implicitly approve the methodology of cost calculation. The question about asymmetric power relationships is responded by the limited owner's dependence on the forestry incomes and the voluntary character of his/her engagement (in all three cases).

In the case of the MFRs, efficiency is enhanced along with the consolidation of the scheme: in an initial attempt to attract pioneer participants, more generous compensations were offered, which have

developed into current adjusted amounts. There is a concern about the convenience of such payments versus government purchase of the stands; however, assumingly the land price exceeds the expected forestry revenue due to the associated non tangible values, such as the landlord value. We also include here a reference to the concern of **moral hazard** in MFR, raised by some stakeholders: the potential situation when the agent (forest owner) may become dissatisfied with the signed agreement with the principal (donor) and therefore would lobby for further compensation, even threatening with cutting the stand. Such incomppliance is not feasible due to the existing governance system backing the agreement, which would force the landowner to pay the corresponding penalty; this is, to return to the donor the proportional amount corresponding to the remaining years. It is not contemplated the possibility of a revision of the basic prices used for the compensation calculation, so that in the hypothetical case of increase in timber prices, they should be high enough to compensate the penalty for the contract cancellation.

FDG and LS initiatives are considered as highly efficient, given the voluntary work in which they are based on. Agents dealing with both instruments state that whatever the degree of environmental impact achieved, it is met with the least resources possible. In any case, the efficient budget use becomes crucial in periods of crisis: public support can be reduced or even eliminated, this highlights the relevance of private initiatives to count with in a diversified donors' portfolio.

4.3. *Conditionality*

Conditionality is treated by the technicians as accomplishment of the stipulated provisions. In public schemes (MFR and FDG) this is ensured by the institutional control setting, composed i.a. by rural agents and public forest engineers; this criterion is thus scored at the maximum. Up to now, the character of LS as an informal contract among privates means that any breach should be solved through a dialogue. LS institutions acknowledge the need for improving this aspect and as a matter of fact they are currently exploring the ways to formalise such agreements, for instance by their inclusion in the official property registry

4.4. *Flexibility*

The strongest point of the MFRs instrument is the fact that following the budgeting dynamics of both public and private donors -annual allocations- the commitment achieved with the landowner will last for a multi-year period afterwards. This annual approach provides the system with **flexibility** for adjusting the terms of future calls to new changes; however, it also prevents it from reviewing such

terms in already signed commitments. The same restrictions linked to public grant systems apply for the FDG, with the difference that the length of owners' commitment is limited to the relevant season, this is, less than one year. On the other hand, the LS enjoy the flexibility typical to private schemes, through which both parts establish the degree of formalism as well as the review terms during the negotiation phase.

4.5. Equity and acceptance

For none of the three instruments analyzed **equity** and **acceptance** were named as problematic, this enlightens the positive frame in which they were developed. Interviewees have remarked the role of LS in former **conflicts**: the non-governmental platform created by the LS may potentially act in areas in which existing or former conflicts between landowners and government authorities preclude any governmental action.

The fairness criterion has been taken into account in all the instruments during the design phase. In terms of equal opportunities and dissemination, government-driven instruments must be based on competitive calls and the ranking criteria must be publicly explained and published in the official means. Some could argue about the ranking criteria depending on experts' assessment; but as a matter of fact, the lack of negative reactions allows confirming interviewees' positive evaluation.

In terms of **rural development** it could be argued that the MFR initiative is activity capping (Wunder, 2007) and therefore restrict possibilities of rural development in the area; however, the scale of the initiative is very limited in comparison to the forest area, also to produce significant leakage. The fact of having forestry as a secondary activity rules out the possibility of transforming forest owners in rent-seekers.

5. Conclusions

Theoretical review and interviews permit classifying the Mature Forest Reserves programme under the label of government-driven payment for environmental services, as defined by Wunder et al., 2005. Land stewardship and Forest Defence Groups are examples of local bottom-up initiatives in which the interchange of certain amount of economic resources may multiply the environmental services produced.

The three instruments analyzed show that the experience in applying economic incentives in Catalonia is perceived as positive but with space and prospective for their improvements.

A key feature for enhancing effectiveness would be designing a flexible but sound evaluation system simultaneously to the instrument design; this will allow setting a better defined objective

and clearer assessment methodology.

Shortage in continuous funding for privately managed programmes can be resolved by reducing dependence on public funds while reinforcing the demand for such goods and services through informational, marketing campaigns among the general public. This said, government support to bottom-up initiatives -coming from forest owners and civil organisations- has been viewed as crucial, mainly by facilitating legal adaptations and providing the seed money for covering initial fixed costs.

Our analysis recognises there is a potential to extend these economic incentives to new geographical areas and to other forest services, however their success requires a previous, sound scientific base for its design and a decisive support from policy-makers in order to start the pilot projects.

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² BOE stands for the Boletín Oficial del Estado, this is, the Official state gazette of Spain

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³ DOGC stands for the Diari Oficial de la Generalitat de Catalunya, this is, the oficial gazette of the autonomous community of Catalonia

Table 1 - Main normative shaping the forest context in Catalonia. Based on Górriz (2010)

Level	Title	Reference	Main points
National (Spain)	Spanish Forestry Law	BOE, 2003 & 2006	It acknowledges the social benefits from forests and places the public authorities as stewards of their conservation, enhancement and rational use, whether they are privately or publicly owned. It also gives landowners the right and duty to manage their holdings according to the regional specific norms. It contemplates the Land stewardship schemes.
	Spanish Biodiversity Law	BOE, 2007	
	Spanish Forestry Strategy	MIMAM, 1999	It implements the forestry law, setting the overall goal of government administration as to maximise the social utility of the resource”
	Spanish Forestry Plan 2002-2032	MIMAM, 2002	It encourages individual actions, promoting the co-responsibility of society in the conservation and management of forests
Catalonia	Protected Areas law	DOGC 1985	It sets the typology of protection of habitats, including i.a. “integral reserves”.
	Catalan Forestry law	BOE 1988	Forest owners should manage their forests ensuring the persistence of the resource. It contemplates i.a. the Forest Defence Groups as well the possibility of establishment of payments for using forest resources.
	Law of the Forest Ownership Center	DOGC 1999	Establishment of a public agency promoting sustainable forest management through e.g. technical assistance, approval and monitoring of planning and implementation or management of subsidies.
	Law of Rural agents	DOGC 2003	Establishment of the policy body for monitoring in rural areas

Table 2 - Contrast proxies-objectives in the instruments analysed

Instrument	Proxy	Objective
Mature forests reserves	- area of a given forest typology of a particular age conserved during certain period	conservation of biodiversity linked to mature forests
	- number of constituted groups active during fire season	reduction of arsons (by dissuasive surveillance)
Forest Defence Groups	- area treated with bush removal and tree pruning	reduction of fire risk (including impacts)
	- length of forest roads repaired	reduced fire spread by rapid intervention
	- amount of available water points and machinery	
Land Stewardship	- area and number of LS agreements;	conservation of biodiversity of the concrete areas and improvement of recreational use
	- number of activities: nr. of planted trees / nr. of settled nest-boxes / nr. of restored landscape elements / etc.	

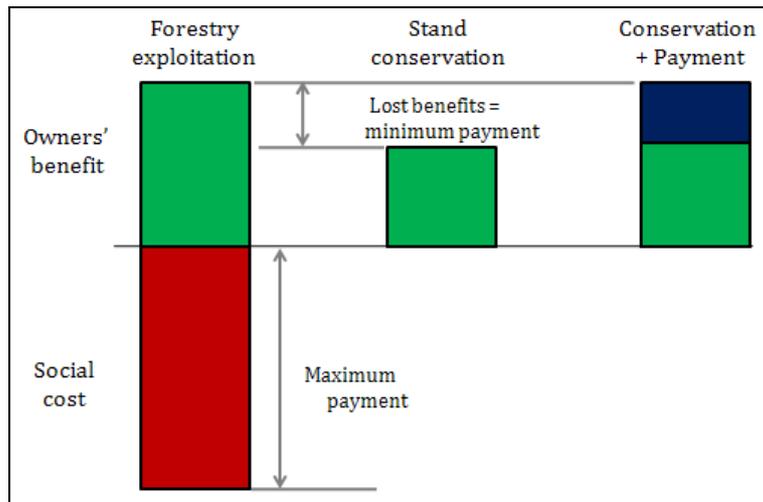


Figure 1. Logic of PES. Adapted from Pagiola *et al.*, 2004

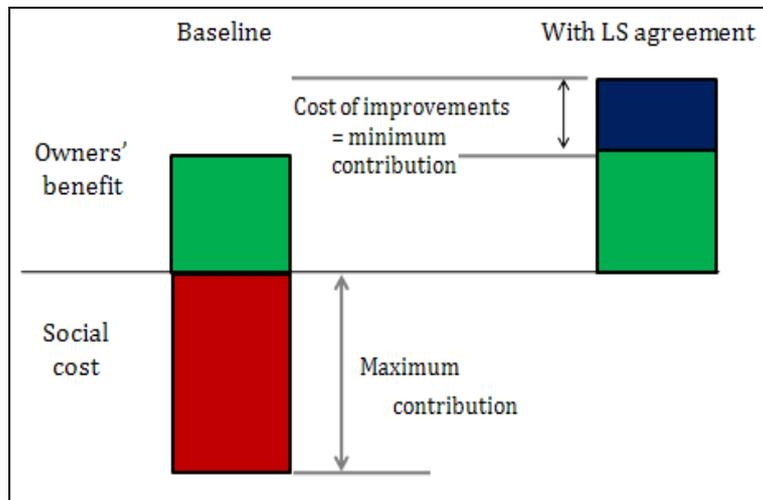


Figure 2. Rationale of Land stewardship. Adapted from Pagiola *et al.*, 2004

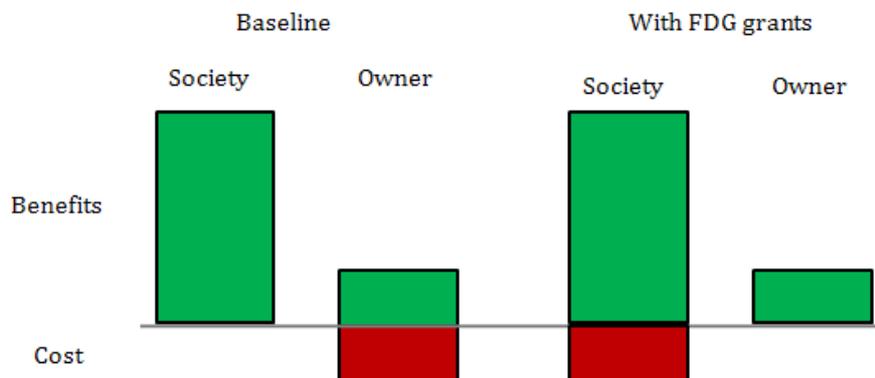


Figure 3. Rationale of cost covering of Forest Defence Groups

