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SUSTAINABILITY OF MEDITERRANEAN SPANISH FOREST MANAGEMENT THROUGH STAKEHOLDER VIEWS

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Abstract: The management of forests that considers the social and environmental aspects associated to the forest activity is called sustainable forest management (SFM). There is not an agreed definition to be applied worldwide. This study intends to find out the requirements of SFM in the Mediterranean region and takes Spain as a case study. It is also aimed to determine the sustainability of current forest management in Spain, the difficulties to achieve SFM and proposals to do so. An initial diagnosis of the situation in Spain is obtained by means of a SWOT analysis and, then, a questionnaire with forestry experts is carried out to verify and broaden the conclusions of the analysis. Results show that the key aspects of SFM are management planning, the consideration of the natural resources (biodiversity, habitats, soil and water), and the contribution to rural development. Management planning and rural development are scarcely considered currently in forest management (12% of the forest area has a management plan). The main difficulties that explain this situation are the low profitability of Mediterranean forests, the lack of economic compensation for the ecosystem services (ES) provided by forests, and the bad coordination between forestry and land planning. The way to SFM goes through the existence of fair mechanisms that pay forest owners for the ES provided and the market promotion of all forest products. For the previous to succeed, it is relevant to make society aware of the matter. Finally, it is important to increase inventory and data collection on forests to identify priorities of research and management.

Keywords: forest management, sustainability requirements, Mediterranean region, Spain, expert consultation, analysis, proposals.

Resumen: Se define la gestión forestal sostenible (GFS) como aquélla que considera los aspectos sociales y ambientales asociados a la actividad forestal. No existe una

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definición universal del concepto. Este estudio trata de identificar los requerimientos de GFS en la región mediterránea y se centra en España como estudio de caso. Se busca también determinar el nivel de sostenibilidad de la gestión forestal actual en España, las dificultades de su sistema para alcanzar los objetivos de GFS y propuestas para mejorar la gestión. Se realiza un diagnóstico inicial de la situación española por medio de un análisis DAFO (debilidades, amenazas, fortalezas y oportunidades) y posteriormente se lleva a cabo una consulta a expertos a través de un cuestionario para corroborar y ampliar las conclusiones del análisis.Los resultados muestran que los aspectos clave de GFS son la planificación de la gestión, la consideración de los recursos naturales (biodiversidad, hábitats, suelos y agua), y la contribución al desarrollo rural. La gestión forestal presente presta poca atención a la planificación de la gestión y al desarrollo rural (sólo el 12% de la superficie forestal tiene un plan de gestión). Las principales dificultades que explican esta situación son la baja rentabilidad de los bosques mediterráneos, la falta de compensación económica por la provisión de los bosques de servicios ambientales, y la poca coordinación entre la planificación forestal y la territorial. El camino hacia la GFS pasa por la existencia de mecanismos justos de pago a los propietarios forestales por los servicios ambientales provistos y la promoción en los mercados de todos los productos forestales. Finalmente, es importante aumentar y estandarizar la recolección de datos del estado de los bosques para identificar prioridades de investigación y de gestión.

Palabras clave: gestión forestal, requerimientos de sostenibilidad, región mediterránea, España, consulta a expertos, análisis, propuestas.

1. Introduction

The term sustainable development first appeared in “Brundtland Report” (WCED, 1987) as that which *meets the needs of the present without compromising the ability of future generations to meet their own needs*. Later on, the concept of sustainable forest management (SFM) was introduced at the *Earth Summit* hold in Rio de Janeiro (UNCED, 1992), with an aim to recognise the importance of sustaining other significant social and environmental values of the forests apart from wood (Wijewardana, 2008).

By the same time, environmentalist groups started to think that products coming from sustainably managed forests (mainly wood) should be labelled in a way that consumers knew that they have been produced in suitable conditions. That is how forest certification was born. The certificate allows producers to promote their products and to ask for a higher price, becoming an incentive to SFM. Nowadays, there are different forest certification schemes on a global level, the ones established in Europe are PEFC (Programme for the Endorsement of Forest Certification Schemes) and FSC (Forest Stewardship Council).

Although there is not a universally accepted definition of SFM, some common requirements can be inferred from the different sets of criteria and indicators[5] (C&I) developed by the ongoing international processes (eg., ITTO, 1992; Helsinki Process, 1995; Montreal Process, 1995) for assessing the practice of SFM (Varma *et al*, 2000). There is general agreement that seven thematic areas are involved in SFM: (1) extent of forest resources; (2) the conservation of biological diversity; (3) forest health and vitality; (4) and (5) productive and protective functions of the forest; (6) socio-economic functions; and (7) legal, policy and institutional framework (FAO, 2006).

However, the relative importance of the different topics to be covered by SFM may vary according to the natural and human influences on each type of forest (eg., Castañeda, 2000; Barbati et al., 2007). This fact is especially important in the Mediterranean area as indicated in

[5] Through C&I it has been possible to derive a global understanding of what constitutes SFM. They provide means to translate the principles of sustainability into measurable goals and achievements (Wijewardana, 2008).

the work carried out by Osem *et al* (2008) in Israel, which shows the need of considering the forest specific characteristics when assessing the practice of SFM in Mediterranean forests. The present study searches for the requirements[6] of SFM in the Mediterranean region and looks into the particular situation of Spain. The research includes a review of the structure and development of forest management in Spain in order to, by means of a questionnaire to experts, ascertain its level of sustainability, the difficulties to achieve SFM, and proposals for improvement. The development of Spanish forest management is characterized by some particular features:

Decentralization. Forestry regulation in Spain corresponds to the autonomies (regional governments). The central government is in charge of the basic legislation and the coordination among the regional forestry departments (MARM, 1999). The decentralized model allows different forest policies, according to the natural and political situations in each region. But, it also results in an uneven development of forest management. For example, in terms of managed area, while *Catalunya* and *Navarra* have the largest area of forest management units (FMUs) under a management[7] plan with 40% and 43% respectively, *Comunitat Valenciana* has 1.56%. There is also an uneven application of budget and schedule. For instance, the regional forestry programme of *Castilla-La Mancha* was approved in 1994 with a budget of 12 million euros and a validity of 60 years; whereas in *Murcia* it was approved in 2003 with a budget of 227 million euros, and 10 years of validity. (MARM, 2008).

Forestry and land planning policies. There is little coordination between policies. The principles of forest management are included in the wording of land planning, but there is a lack of models and procedures to implement them. The resolutions derived from forest policy are usually integrated into land planning policy as elements of environmental planning (location and planning of protected areas), therefore promoting conservation rather than active management (Montiel and Galiana, 2005).

Property structure. Most of the forest area is private (65%) and the FMUs are normally small-sized (less than 3ha). This fact discourages many owners to manage their lands since they cannot plan a regular time and space harvesting to assure constant revenues (Tolosana *et al*., 2004).

Socio-economic conditions. There has been a depopulation of rural areas a few decades ago, leaving the forests without any management (Marraco, 2004). The main forest product is timber, which together with firewood accounts for a 47.1% of total forest production in Spain (Tolosana *et al*., 2004). Most of the timber produced goes to low added value industries like packing cases. On the other hand, nearly 80% of timber used by furniture and carpentry industries is imported and when not, it comes mainly from plantations (15% of the Spanish forest area), so that Spanish forests hardly provide raw materials for higher added value sectors (Plana and Meya, 1999). To end with the economic scenario, the average price of a m^3 of wood in Spain to be paid to the forest owner in the year 2005 was of 46.49€, which is very low for a small property (MARM, 2010a).

The Spanish situation is also affected by Mediterranean conditions. Mediterranean forests represent 1.5% of the planet forests. In addition around 80% of these forests are concentrated in the Mediterranean Sea region, and the rest is split among small areas of Australia, South Africa, California and Chile. Their special attributes can be summarized as follows (EFI, 2010; Fabbio *et al*, 2003; Madrigal, 2003; Scarascia-Mugnozza *et al*, 2000):

[6] A series of SFM requirements is obtained by looking through the standards for Spain of PEFC (developed by AENOR, 2007a; 2007b) and FSC (GTC-FSC, 2007). They are summarized in *Table 2*, in the next section (*Methodology*).

[7] Forest management in Spain is developed through plans and programmes specific for the different management scales: national level: National Forestry Programme; regional level: regional forestry programme; subregional/county level: forest resources management plan; forest management unit (FMU): forestry management plan. This sentence refers to the last one.

Adaptation to unfavorable conditions. Mediterranean climate is characterised by a pronounced biseasonality with dry and hot summers and moist and cool autumns and winters, occasional heavy rains, happening normally in autumn, a large year-to-year variability of total precipitation and strong and dry winds that favour the spread of forest fires. Vegetation is adapted to the ecological conditions for individuals to grow and reproduce. The plants are provided with small leafs and deep root systems. In order to better resist fire, broadleaved species include high sprouting ability and thick barks, and conifers produce many seeds in fire resistant cones and can adapt to diverse ecological conditions.

Species richness. Another remarkable feature is the presence of a high diversity of plant and animal species, the Mediterranean area harbors around 25000 plant species whereas in the rest of Europe around 6000 plant species can be found. 50% of the Mediterranean flora is endemic to the region as a result of a long time evolution in specific and highly variable climatic and ecologic conditions.

Anthropogenic influence. Due to diversity of vegetation types and land-use forms, the Mediterranean landscape consists of a mosaic of patches, increasing its values in the region. This is the result of the addition and superposition of new elements without elimination of the old ones, thus creating every time new landscape configurations. Such an anthropogenic mosaic-like design is a further source of biodiversity. Another consequence of the different forms of exploitation throughout the years is the disappearance of many climax forest types. The remaining ones, incorrectly called natural, correspond to altered woods in different stages of regressive succession from the original forests.

Fragility. Mediterranean forests are quite fragile due to heterogeneity, instability and low profitability: heterogeneity is caused by diversity of species (trees, scrubs and herbs) and habitat conditions (climate, soils); instability results from summer drought, heavy rains, poor soils, and forest fires; and low profitability is derived from low productivity of Mediterranean forests.

Ecosystem services. Mediterranean ecosystems provide a variety of other products apart from wood. These products include food (fungus, pine fruits), resins, cork or aromatic plants (*Lavandula sp*, rosemary, etc.). The forests in this region also provide environmental and social services (both these services and the products mentioned are known as ecosystem services – ES), like protecting soil from erosion, preventing landslides, stabilising slopes, reducing water runoff, improving and conserving the beauty of the landscapes, and serving as spaces for recreation. Such services arecrucial for the development of rural areas and for the welfare of urban populations.

2. Methodology

A questionnaire is used as a consultation method in this study. Its main purposes are to explain the meaning of SFM, to analyse the situation in Spain, and to get proposals for improvement. The items considered in the questionnaire are based on the findings of a SWOT (strengths, weaknesses, opportunities and threats) analysis of current forest management in relation to the objectives of SFM. The resulting matrix is shown in *Table 1*; it includes strategies to overcome some of the weaknesses and threats.

The respondents of the questionnaire are either experts in forest management or environmental sciences. They are selected from six groups: university, central and regional governments, research centres, forest management enterprises, forest associations and forest certification systems. The group “university” refers to teachers from forestry faculties all over Spain. “Central and regional governments” include forestry planners and decision-makers who work in the authorities either central, for all Spain, or regional. Concerning “research centres”, the term covers organisms where a study on the functioning and management of forests is carried out. In “forest management enterprises” there are self-employed people, forest owners or companies who develop a lucrative business in the fields of environmental consulting and exploitation of forest resources. “Forest association” consists of private organisations that stand up for

the interests of forest owners and forestry professionals. And finally, “forest certification systems” comprises people associated to or who work for the systems that promote forest certification and establish the standards for that, the ones existing in Spain are FSC and PEFC. Further details regarding the rate of answer and the structure of respondents according to the six groups mentioned are given in the results section.

STRENGTHS	WEAKNESSES	SWOT Analysis for SFM	
S_1: Basic forest management criteria stated in the Spanish forest management guidelines (MA, 1971): *forest cover maintenance, profitability and best use of multiple products and functions* **S_2:** Guidelines for forest protection from forest fires and pests that establish the Spanish forest management guidelines **S_3:** Guidelines for landscape and biodiversity conservation that establish the Spanish forest management guidelines	**W_1:** Lack of interaction between forestry and land planning instruments **W_2:** Lack of economic compensation for the positive externalities **W_3:** Low productivity of Mediterranean forests **W_4:** Small size of forest private property **W_5:** A lot of legislation not well connected and sometimes contradictory		
ST_3: Make guidelines of SFM which should be flexible and able to be developed in the different conditions of each region	**ST_1:** Establish coordination between forest planning instruments and land planning instruments **ST_2:** Create information systems to improve monitoring and assessment of forests **ST_5:** Reinforce the paper of central and local governments in forest management issues through legislation or compensating for the externalities **ST_6:** Economic incentives and marketing strategies to encourage the management and make forest products and so raise social awareness	**T_1:** Increase of management costs due to implementation of sustainability criteria **T_2:** Socio-economic context: lack of social awareness, market characteristics or low added value of forest products **T_3:** Political context: short-term objectives and forestry subordinated to urban planning **T_4:** Little communication and coordination among stakeholders and management organs	THREATS
ST_1: Establish coordination between forest planning instruments and land planning instruments **ST_4:** Improve the practical and theoretical formation in SFM for forest workers, professionals and students	**ST_2:** Create information systems to improve monitoring and assessment of forests **ST_3:** Make guidelines of SFM which should be flexible and able to be developed in the different conditions of each region **ST_5:** Reinforce the paper of central and local governments in forest management issues through legislation or compensating for the externalities **ST_7:** Research increase in fields such as SFM guidelines, economic valuation of resources and results assessment	**O_1:** Promotion of SFM from Europe and Spanish Government: European Forestry Strategy (Council of the European Union, 1999), Spanish National Forestry Programme (MARM, 2002), Spanish National Forestry Strategy (MARM, 1999) and Spanish Forestry Law (Gobierno de España, 2003). **O_2:** The support of rules for the protection of natural resources and landscape at any scale: Habitats Directive (Council of the European Communities, 1992), Spanish law on natural resources and biodiversity (Gobierno de España, 2007), or Valencian regional law on land planning and landscape protection (Generalitat Valenciana, 2004) **O_3:** European regulations to promote rural development: EAGGF (Council of the European Communities, 1999a*)* and general provisions on the Structural Funds (Council of the European Communities, 1999b)	OPPORTUNITIES

Tab 1. Initial diagnosis of management in the Mediterranean Spanish forests with a view to achieve SFM, shown by a SWOT analysis. Main strategies (STi) are proposed as a result of reinforcing the strengths (Si) and opportunities (Oi) and to overcome the weaknesses (Wi) and threats (Ti).

The questionnaire is completed in the year 2010 during the months of March, April and May, sent and answered back by e-mail. It covers four topics that give rise to the four following questions:

Topics	Items	Acronyms	Description
Requirements	Forest management planning	MP	Existence of planning documents with management objectives and procedures
	Soil protection	SP	Measures to avoid soil erosion and degradation
	Biodiversity and habitat protection	B&HP	Steps to protect endangered species and their habitats
	Water resources conservation	WRC	Surface and underground water quality and quantity conservation
	Contribution to rural development	RD	Forestry as a rural economic sector that contributes to local economy
	Forest fires prevention and extinction	FF	Existence of firebreaks and appropriate forest structure to avoid the spread of the forest fires
	Improving quality of life	LQ	Leisure activities, job opportunities and public participation procedures
	Forest knowledge improvement	FKn	Data and cartography storage systems to improve management and research
	Landscape management	LM	Landscape conservation, management and improvement
	Pests treatments	PT	Biological pest control as far as possible
Difficulties	Lack of SFM guidelines	Lgu	Forest regulations do not specify how to carry on SFM
	Not coordination forest-land planning	NcoF&LP	Scarce interaction between forest and planning regulations
	Not compensation for externalities (refers to ecosystem services)	NCE	Lack of payment for ecosystem services provided: landscape, hydrology
	Small property size	SPr	Many private properties have less than 1 ha, so that management costs are higher
	Low productivity	LoPr	Low growth annual rate
	Higher costs of applying SFM	HC	SFM has more requirements than conventional management
	Human or natural origin hazards	HoNHz	Forest fires and floods
Proposals	SFM guidelines	SFMGu	Definition of management procedures according to sustainability criteria
	Government paper reinforcement	GR	In regulating forestry and mechanisms to achieve SFM
	Training of workers and professionals	TW&P	In SFM objectives and procedures
	Knowledge and information systems	Kn&IS	Public systems that report forests state to standardise working procedures
	Coordinate forest and land planning	CoF&LP	Consistent planning legislation that considers forestry
	Environmental impact assessment (EIA) process	EIAP	Environmental assessment for approval of forest plans and programmes

Tab 2. Requirements of sustainable forest management (SFM), difficulties and proposals to achieve it, included in the questionnaire held to check opinion of forestry experts on sustainability of Mediterranean forest management.

1. Requirements of SFM: *how much do you think that the following aspects define the concept of SFM?*
2. Introduction of the requirements in current forest management: *how much do you think that the requirements listed in the previous question are currently considered in forest management?*
3. Difficulties for approaching SFM: *how much do you think that the following aspects make difficult the development of SFM?*
4. Proposals for advancing towards SFM: *how much do you think that the following proposals contribute to the development of SFM?*

A set of items related to the topic is given to the respondents in each question as it is displayed in *Table 2*. In the first one, they are asked to order the requirements according to their importance for the implications of SFM. In the others they have to score the items in a value scale ranging from 1 to 5. Each question includes a section for comments where respondents can also add items that have not been considered; this section is especially relevant for the proposals.

The data are analysed according to multicriteria decision making methods (MCDM). Multi Criteria Analysis techniques are commonly used tools in the field of SFM for weighing a set of requirements and comparing management alternatives by stakeholders (Jalilova et al., 2012; Sheppard and Meitner, 2007; Wolfslehner et al., 2005). The methods applied in this study are used for similar purposes by different authors (Gómez-Orea, 2002; Mendoza and Prabhu, 2000). As a result, different values of relative relevance are obtained for each of the items in each question.

3. Results and discussion

Respondents

The response rate to the questionnaire was moderately low at 27%: 67 answers out of 245 potential respondents. The percentage of respondents belonging to each of the groups stated in the methodology is the following: 33% from "universities" (22 answers), 37% from "central and regional governments" (25 answers), 15% from "research centres" (10 answers), 16% from "forest management enterprises" (11 answers), 9% from "forest associations" (6 answers), and 24% from "forest certification systems" (16 answers). The sum of percentages is higher than 100, this is explained because many of the respondents have a varied profile so that they are included in more than one group. The higher percentage of matches occurs between "forest certification systems" and "forest management enterprises", and "forest certification systems" and "central and regional governments". The previous means that some of the people associated to a certification system work normally in an enterprise or in a public organism.

Concerning age and sex, 21% are women and 79% men. Most of the respondents are older than 40 years, which is an expected value given that the questionnaire is for experts. The percentage of respondents in each age group is: 1.5% less than 30 years old, 28% between 30 and 40 years old, 37% between 40 and 50 years old, and 33.5% more than 50 years old.

Requirements of sustainable forest management and their introduction into current management

According to the experts, the key requirement of SFM is management planning (MP) (*Figure 1*), followed by the protection of natural resources -soil, biodiversity and habitat protection, and water resources (SP, B&HP, WRC). Rural development (RD) is also one of the most important requirements, although it is a topic that concerns many sectors apart from forestry, the improvement of social and economic local conditions is perceived as a central issue in SFM. Apart from these requirements, experts suggest that SFM should also consider the adaptation of forest ecosystems and their management to climate change and promote educational and cultural aspects of forests such as the traditional uses.

On the opposite side, pests treatments (PT) emerges as the least important requirement for SFM. This low valuation can be explained by the perception of pest control as a matter of a higher planning level that goes beyond the role of the forest manager, reinforced by the existing laws on vegetation health which lay the major responsibility of pest control in the authorities (Gobierno de España, 2002).

Forest fires prevention and extinction (FF) is not considered as a key requirement in SFM according to the consulted experts despite the high incidence of forest fires in Spain[8]. Forest fires are a major problem in the Mediterranean region. The accumulation of fuel due to abandonment of forest activity and summer droughts, combined with the negligence in the use of fire and vandalistic acts from local population and tourists, are good circumstances for forest fire occurrence (Martín *et al*, 1998). Forest abandonment is a major trend in European

[8] The average number of fires per year in Spain for the period 2000 - 2009 is 6500 (including attempts - <1ha - and disasters - >1ha). The average forest area affected by fires per year in Spain for the same period is 27514ha (MARM, 2010b).

Mediterranean countries. The lack of activity derives in an enrichment of the understorey and the amount of tree branches, making the forest vulnerable to the spread of fire (Fabbio *et al*, 2003). However, like happens for pests treatments (PT), the result can be associated to the belief of forest fires as a problem that is mainly managed at a higher scale than the FMU.

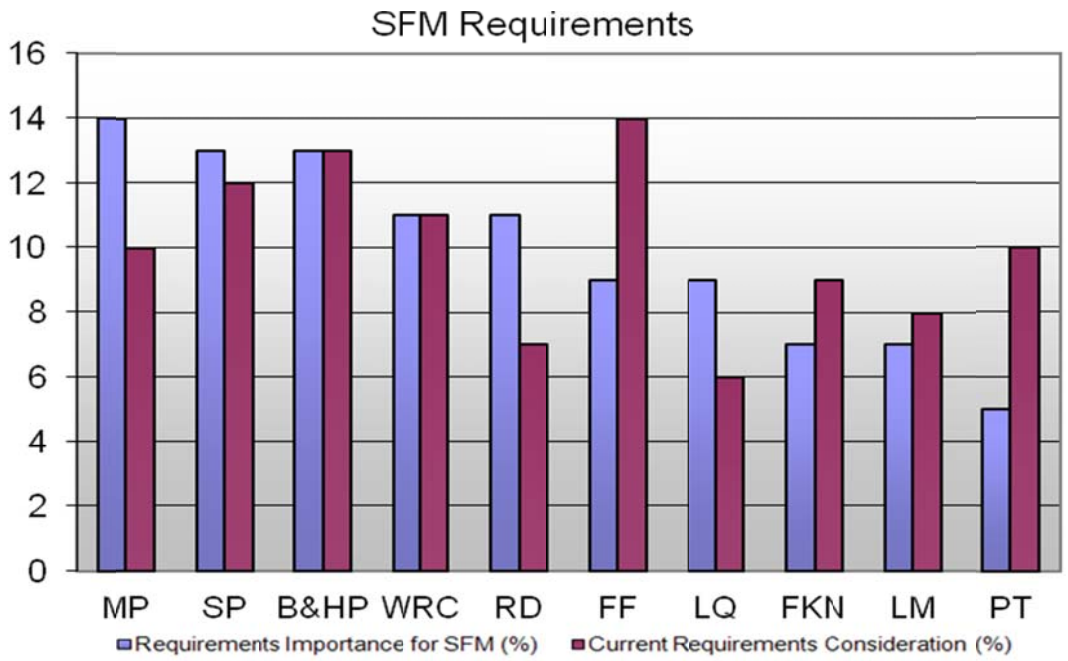

Fig 1. Comparison between the SFM requirements relative importance and their consideration in current forest management according to the experts' opinion. MP: Management Planning; SP: Soil Protection; B&HP: Biodiversity&Habitats Protection; WRC: Water Resources Conservation; RD: Rural Development; FF: Forest Fires; LQ: Life Quality Improvement; FKN: Forest Knowledge Improvement; LM: Landscape Management; PT: Pests Treatments.

With regard to landscape management (LM), it is deemed as one of the least important requirements of SFM. This result agrees with the scarce consideration given by the promoters of SFM in their certification standards[9]. But, at the same time, this fact contrasts with the increasing importance of landscape in the European agenda (Council of Europe, 2000) and with the landscape qualities of the Mediterranean region due to historical modification of the natural environment that has evolved into a mosaic of vegetation types and land uses with ecological and cultural importance (Scarascia-Mugnozza *et al*, 2000).

Concerning the level at which SFM requirements are being considered, forest fire prevention and extinction (FF) emerges as the most introduced requirement, followed by the protection of natural resources (SP, B&HP, WRC), management planning (MP) and pests treatments (PT) (*Figure 1*).

When comparing the results obtained from these first two questions (*Figure 1*), we find out that the introduction of the requirements mentioned in the current forest management does not necessarily correspond with the valuation relative to its importance. In this regard, three situations are identified. Firstly, there are a set of requirements whose importance is much higher than their level of current introduction. This situation is especially noticeable for management planning (MP), which is the most important requirement for SFM but only 12% of the forest area in Spain has a forestry management plan (MARM, 2008). Rural development (RD) and life quality improvement (LQ) are also seen as being under-considered in comparison

[9] Through the revision of the standards of the certification associations established in Spain, it can be seen that PEFC (AENOR, 2007a; 2007b) slightly considers landscape when assessing at regional level, and not at FMU; FSC (GTC-FSC, 2007) establishes that an environmental impact assessment (EIA) has to be carried out before the forest activity takes place, which has to take into account landscape an any other impacts caused by the activity, but does not have any specific principle or criterion for landscape.

with their perceived importance. Secondly, there are those requirements whose level of current introduction is much higher than its importance such as forest fire prevention and extinction (FF) and pests treatments (PT); this also explains why they do not get high relevance scores, they are not observed as a priority. Finally, the third situation corresponds to those requirements whose importance is consistent with its level of introduction, like the protection of natural resources (SP, B&HP and WRC), forest knowledge improvement (FKN) and landscape management (LM).

Difficulties and proposals for the implementation of sustainable forest management

The relevance of the difficulties provided in the questionnaire according to the experts' answers is shown in *Figure 2*. The main ones have an economic origin. Management does not happen because it is not profitable. Lack of profitability is firstly due to the small size of most forest private properties (SPr). Secondly, it is due to the low productivity (LoPr), typical of fragile and unstable ecosystems like the Mediterranean ones (Scarascia-Mugnozza *et al*, 2000).

The lack of compensation for the positive externalities (NCE) that forests provide to society is an additional difficulty if considered the fact that there is an increased demand for services like recreation and landscape in urban societies of northern Mediterranean countries (Scarascia-Mugnozza *et al.,* 2000). The problem is that it is difficult to give market values to these services and, considering the generally low profitability of Mediterranean forests stated before, this results in a diminished interest of forest owners in managing their lands. The recovery of forest management requires the creation of mechanisms to pay for these externalities[10] (Merlo and Rojas, 2000).

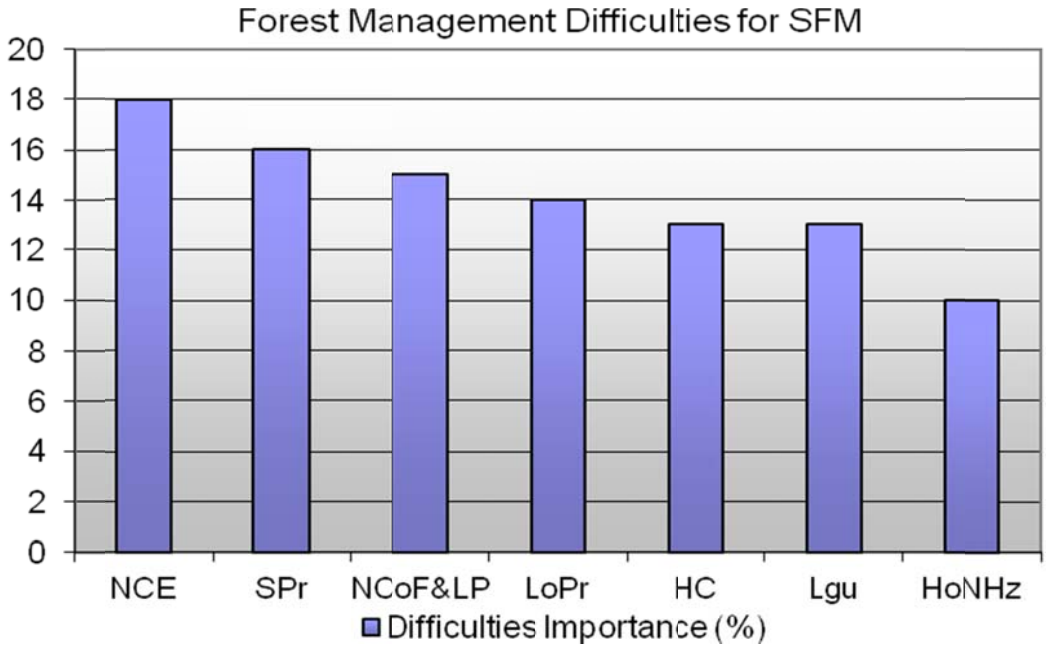

Fig 2. Relative relevance of the difficulties that current forest management presents towards the implementation of sustainable forest management (SFM) according to the experts answers. NCE: Not Compensation for Externalities; SPr: Small Property Size; NCoF&LP: Not Coordination Forest-Land Planning; LoPr: Low Productivity; HC: Higher Costs of Applying SFM; Lgu: Lack of SFM Guidelines; HoNHz: Human or Natural Origin Hazards.

[10] An externality is an unwished byproduct (positive or negative) from an economic activity that has an effect on a person different from the user or consumer of the outputs of that economic activity. In forest management refers to the ecosystem services (ES) derived from forests: landscape, spaces for recreation, soil erosion prevention or habitat conservation.

Another relevant difficulty is the lack of coordination between forest planning and land planning (NCoF&LP). Forestry and land planning programmes are in charge of different departments and, till the present, there has been neither a good communication nor a will of coordination. It is worth to encourage the interaction between both policies considering the essential role the territorial compound plays in Mediterranean forests (Montiel and Galiana, 2005).

Other difficulties suggested by the experts are mentioned next. There is a lack of social awareness, which results in low valuation of the forest and scarce demand of its products. The economic context of the forest sector involves difficulties such as lack of enterprises, low added value of forest products, and the global economic crisis; this last one is a difficultydue to the reduction of resources, so that the available ones go to other sectors but the environment. The political context consisting of short-term objectives and the fact that the forest sector is subordinated to urban planning implies another barrier. Moreover, there is an amount of stakeholders and management organs that are not well communicated. Finally, there is a lot of legislation which is not always well connected, it is contradictory and sometimes very protectionist.

To overcome the difficulties and improve the management, some proposals are suggested. They are based on the fact that to achieve SFM it is required that both production capacity and provision of ES are preserved. Flexible management procedures need to be identified together with a good comprehension of dynamics and functional processes of forests (Fabbio *et al*, 2003). The proposals refer to four main topics: economic proposals; forest research and inventory; payment for environmental services (PES); and awareness and training. These four blocks are a mix of the proposals of the questionnaire with the highest scores and the ones suggested by the experts.

The economic proposals receive a high emphasis because Mediterranean forests need to be more profitable, so that management takes place. In this sense the actions have to come from both the public and the private sides, because forestry is a combination of actions from the FMU (private side), which acts as an enterprise that generates revenues to its owners, and the authorities (public side), since it provides societal benefits (ES). More precisely, concerning the private side, the development of marketing strategies for the forest products which are underexploited (forest fruits or aromatic plants), and the search of new markets (bioenergy is suggested). The public side should focus on developing policies that consider the interaction between forestry and land planning and which provide subsidies. It is necessary to adopt a policy tools mix that allows the use of regulatory and voluntary approaches. Voluntary approaches are based on financial incentives, market means and persuasion-communication measures. The mix would require involvement of central and local authorities, and a great degree of people participation.

In reference to forest research and inventory, the increase of economic resources for forest research with the objectives of improving the efficiency (mechanisation, silvicultural treatments) and increasing data on the forest ecosystem is proposed. A starting point for this is the creation of *forest knowledge* as well as *local and regional information systems* in order to easily identify necessities by monitoring and assessing the development of the management. Some authors point out the importance of quality data availability: *lack of information in a usable form and efficient transfer of data to appropriate users have been barriers to utilizing the best available knowledge in Mediterranean ecosystem management and to identifying priorities for research* (Ribeiro *et al*, 2004).

An important proposal is the implementation of PES. These are mechanisms which are getting extended and consist of an agreement between the ES producer (the forest owner in this case) and the group of people benefiting from it. If the group of people benefiting from the ES is big enough, then a public organism pays for it; if it is a specific group, its members pay for the ES (CMAAUV, 2010).

Experts recommend the need to raise social knowledge and awareness on forests and environmental issues in order to increase forest products demand and people's willingness to pay for the ESs provided. This can be achieved through promotion in the media and education

in high schools. It is also suggested by the experts to include training and formation programs in good practices for forest workers and professionals.

No specific proposal is made by the respondents to improve connection and harmonization between forest management and land planning. However, it seems important to find a way since authors like Montiel and Galiana (2005) suggest to reinforce this component in the regional forest programmes in order to minimize some of the problems introduced, like for example the source conflicts that originate forest fires. In their own words: c*onflicts found in Mediterranean forests are more closely related to land use planning than to the harmony of forest uses and functions*. The coordination between forest management and land planning would help to increase contribution of forestry to rural development since the last one is a topic covered not just by the forest sector but by others like agriculture or industry.

4. Conclusions

SFM is a central topic in forestry discussions. It is the management of forests according to principles of sustainability in order to maintain and enhance long-term health of forest ecosystem, while providing economic, social and cultural opportunities for the benefit of present and future generations. But the approach to the matter is not universal, it is important to define principles and criteria for every region as well as for each particular management unit.

The research intended to prospect the requirements of SFM in the Mediterranean region, to analyse the situation of forest management in Spain, and to find out ways so that forestry happens according to sustainable practices. By means of a review and an expert consultation the objectives are met.

The results indicate that the most important requirements of SFM are *forest management planning*, *conservation of natural resources* (biodiversity, habitats, soil and water resources), and *contribution to rural development*. But the introduction in current management of these requirements does not correspond to their relevance for the implications of SFM: few FMUs have a forestry management plan, *contribution to rural development* is also scarcely considered; on the other hand, *forest fires* and *pest treatments* have a medium relevance compared to their degree of introduction, which is high.

There are several reasons that explain the situation described above. Mediterranean forests have little profitability, because of their low productivity and in the private forests the small size of the properties. Mediterranean forests provide society with ES that are not economically compensated to the owners. Additionally, the lack of coordination between forestry and land planning leaves the sector as a marginal issue that is subordinated in most cases to urban planning. All this has led to a progressive abandonment of forest management. If added the fact that SFM implies higher costs than traditional management, it is highly difficult that it takes place widely in Spain given the current situation.

Some actions can be proposed in order to change the present situation. The core of the proposals are economic, they focus on looking for new markets, PES mechanisms, and subsidies. To achieve this, steady and flexible policies to build new management models in coordination with land planning are required. It is also important to reach a higher social awareness and interest in forest issues and products; publications, newsletters, conferences, school education and professional training can play an important role in completing this. Another important matter is the generation and access to information that reports on forests state, which shows the issues where research is needed and the management priorities.

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