

THE MEDITERRANEAN FORESTS: PROBLEMS AND MANAGEMENT MODELS

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ABSTRACT

The following paper presents a detailed insight about the situation of the forest management in the diversity within the Mediterranean Forests, and their response to different problems, in order to allow the development and application of a forest management model. Therefore, a survey was carried out in several partners' areas of the PROTECT project (An Integrated European Model to Protect MEDiterranean Forests from Fire). The results provided a comparative analysis between different areas located in the Mediterranean Basin, and the analysis shows that there are several management systems that may be improved with experiences from other countries. Also, there are some common problems which need solutions in the different areas, namely forest fires. This general information also provided a good background for carefully applying and adapting different forests' management models, both ecological and economically sustainable, in the PROTECT partners, where the problems and agents to be considered are different, giving conditions for the adaptation and development of a common model.

Keywords: Mediterranean Forests, Forest Management, Fire Prevention, Forest Sustainability

JEL Classification: Q28, Z18, Z13

1. INTRODUCTION

The forests are sensitive and important ecosystems for human life and for human survival: they contribute to carbon fixation and biodiversity preservation, while being essential for the subsistence of different species (Gonzalez-Duque and Panagopoulos, 2010). The role of forests in improving and maintaining the value of landscape has long been recognized, and it is nowadays even more emphasized in the forest laws of many countries. For instance, landscape and microclimate amelioration by forests is especially important in the densely populated urban and suburban areas of the Mediterranean basin (Corona and Mariano, 1992, cited by Scarascia-Mugnozza *et al.*, 2000).

In this context, the Mediterranean area is rich in diversity regarding not only the fauna and flora (Scarascia-Mugnozza *et al.*, 2000) but also the several ways of life activities and culture resulting from the many millenniums of human activity within it. In fact, the history of forests in the Mediterranean area is a history of not only forest degradation and eventual deforestation but also temporary natural expansion (Scarascia-Mugnozza *et al.*, 2000). Therefore, it is rare to find a clear separation between economic activity and the natural environment: the dynamics of a Mediterranean forest have always been intimately linked to the human societies that have grown up around them (IAMF, W.D); and, due to

ancient civilization and continuous human activities, Mediterranean ecosystems are now very different from their origin.

However, Mediterranean regions have received only passing attention by foresters and environmental specialists. It is recognized that, apart from the FAO (Food and Agriculture Organization) initiative of drawing up a Mediterranean forests action program, approved at the March 1992 session of *Silva Mediterranea* in Faro, Portugal, little attention has been given to Mediterranean forests at the international level (Palahi, *et al.*, 2008).

Nevertheless, the many strengths and weaknesses of the Mediterranean forest need a specific study for a correct management. The drought-prone environment, the difficult socioeconomic conditions and the history of over-exploitation of the Mediterranean forests are indisputable weaknesses; however, the rich biological diversity, the attractiveness of the environment and the high production potential for specific products are clear strengths that should not be underestimated (Scarascia-Mugnozza *et al.*, 2000).

Besides these general problems, there are some specific forest management problems to be solved, as well as a necessity to protect the forest from some of its most important enemies: floods, droughts and forest fires, which are the traditional triad of natural hazards in the Mediterranean. The “extremes” of the hydrological cycle show patterns of occurrence that are still difficult to discern. However, forest fires remain a recurrent threat during the summer season, and their incidence has increased significantly during the last decades (Badia *et al.* 2002). Therefore, forest fires represent a major agent promoting changes at the landscape level and increasing land degradation risk, and it is the most important natural threat to forests and wooded areas under the dry summer conditions of Mediterranean climates (Odeja *et al.* 2001). They cause extensive damage to forested ecosystems (Maheras, 2002), and, over the last years, wild fires have become issues of great importance in the southern European countries and efforts have been made to control their negative effects (Maheras, 2002). Even if in some countries, according to the national burnt area statistics, the problem seems to be under control and of steady or decreasing magnitude, in regions like the western Iberian Peninsula, namely the Portuguese area, the trend is worryingly opposite (Pelizzari *et al.*, 2008). It is also a fact that, according to some research, in contrast to elsewhere where a high percentage of fires are of natural origin, the Mediterranean area is characterized by fire provoked by humans. The natural causes represent only a weak percentage, probably because of the absence of climatic phenomena such as the dry storms (Alexandrian *et al.* 1999).

The political and socio-economic interest that Europe is directing to the Mediterranean and the European research policy (Noronha, 2011), aiming to study sound conservation strategies and a locally-tailored sustainable management of the regional forest and landscape resources, renewed the interest in Mediterranean forests (Scarascia-Mugnozza *et al.*, 2000). Also, the measures of the common agriculture policy have led to some intensification of agriculture and to an increase of the forest area, which also led to a higher importance of the forest and forest management within the agro-forestry farms.

In this context, the PROTECT project (An Integrated European Model to Protect MEDiterranean Forests from Fire) has several relevant objectives, as follows: 1) To jointly develop European prevention methods and instruments to efficiently map, assess and monitor risks; 2) To set up a common Action Plan for the strategic and operational management of awareness raising & training activities; 3) To consequently adapt or introduce prevention plans in the different territories; 4) To develop and introduce a sustainable economic and environmental forest maintenance model to prevent/reduce the outburst and deployment of forest fire by appropriate forest cleaning and reuse of biomass; 5) To improve European cooperation among civil protection experts by the creation of a European network consisting of various actors situated in the different territories (PROTECT, 2008).

These tasks are being carried out by 3 Working groups (WP). In WP2 an economic and eco-compatible sustainable model for forest maintenance is a relevant task being developed. This will be an ecological and economically sustainable forest management model, where the valorisation of the biomass is essential to not only promote ecological sustainability but also economic sustainability. This is quite relevant because fragile and unstable ecosystems, like the Mediterranean ones, are often unable to produce large quantities of woody biomass per unit area; consequently, intensive management is often incompatible with the other roles of forests such as soil conservation and landscape improvement (Scarascia-Mugnozza *et al.*, 2000).

This model needed an important amount of data and the detailed knowledge of the forests' situation within the different areas participating in this study: forests' characteristics, management models, forest uses and outputs and fire prevention.

Therefore, and with respect for the PROTECT project's objectives, a survey was developed in the project partners. This allowed the acquisition of general information necessary for the model framework design, but it also permitted us to analyse some of the practices carried out in some countries which may be applied and followed according to the main, positive achievements carried out in other areas.

The remainder of this study is organized as follows. In section two a description of the Mediterranean Forests and the localization of the participants in this study is made; in section three the methodological approach is discussed; in section four the results are presented and some discussion is made regarding the main findings of this study, namely regarding the main improvements of the work for forest management for the different situations. Finally, in section five, the main conclusions of this study are presented.

2. THE MEDITERRANEAN FORESTS AND THE STUDY AREAS

2.1. The Mediterranean Forests

The Mediterranean Floristic Region has a high diversity of species, as recognized by different authors (Scarascia-Mugnozza *et al.*, 2000; Palahi *et al.*, 2008; Boydak *et al.*, 1997). During the last few thousand years most of the original Mediterranean woodland has been eradicated, used for timber or replaced by agriculture. Coastal areas are the most damaged, especially in the last century, because of urban areas' development and tourism. Today, therefore, in the Mediterranean basin the forests are in a unique mosaic of terrestrial, freshwater and marine ecosystems, as a result of a distinct regional climate imprinted on a dynamic topography (Palahi, 2008).

Despite the strong anthropic influence on Mediterranean environment, the Mediterranean area is still home to considerable biodiversity, including thousands of endemic species (Palahi *et al.*, 2008).

The floristic composition is related to the influence of the pedological conditions and other physical factors. For instance, in a siliceous substrate derived from the granite we find *Quercus suber*. The main formations are the Scrublands, Savannas and grasslands, the Evergreen woodlands and the mixed Forests.

Scrublands occur in the driest areas, especially near the seacoast around the Mediterranean. They are dense evergreen sclerophylle shrubs and small trees, the most common plant community in such areas. In some places scrublands are the mature vegetation type, while in other places they are the result of degradation of a former forest or woodland by logging or overgrazing, or disturbance by major fires. Typical species are *Pistacia lentiscus*, *P. terebinthus*, *Juniperus Sabina*, *Rosmarinus officinalis*, *Arbutus unedo*, *Rhamnus alaternus*.

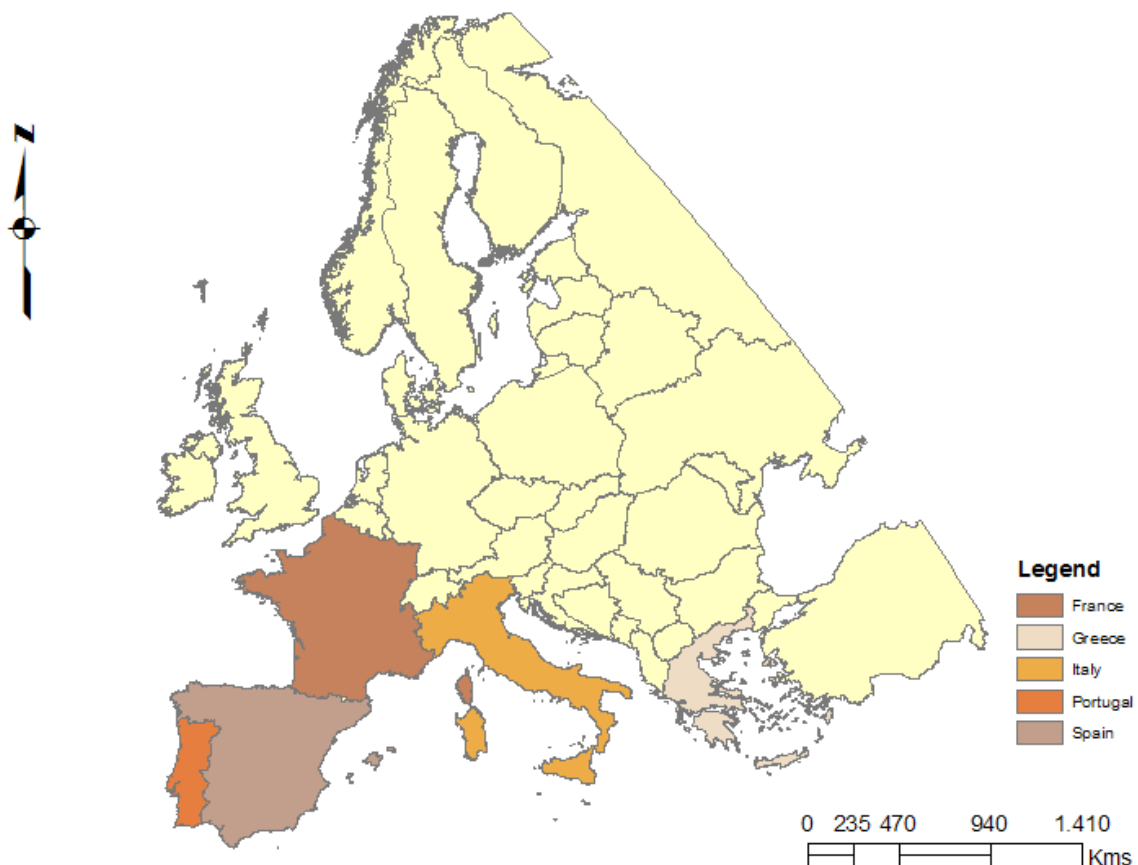
Savannas and grasslands occur around the Mediterranean vegetation, and are usually dominated by annual grasses. The evergreen woodlands are usually dominated by oak (*Quercus ilex*, *Quercus suber*) and pine (*Pinus pinea*, *Pinus pinaster* and *Pinus halepensis*). Finally, mixed forests occur in the areas of highest rainfall, in the mountain belt, in riparian zones along rivers and streams where they receive summer water. These kinds of forests are generally composed of deciduous species like *Quercus pubescens*, *Quercus cerris* or the *Ostia carpinifolia*.

2.2. The study areas

The different study areas correspond to the different PROTECT partners' areas. The partners are the Province of Macerata (Italy), the Provincial Government of Malaga (Spain), the Region of Peloponnese (Greece), the National Forest Authority (Portugal), the Department of Forests-Cyprus (Cyprus), the University of Camerino (Italy), the University of Algarve (Portugal), the University of Provence (France) and the Region of Istria - Department of Sustainable Development (Croatia), who abandoned the project due to funding specific problems.

Since there are countries with more than one partner, focus was placed on each of the managed/ involving the different territorial partners (fig. 1).

Fig. 1- The different countries participating in the project



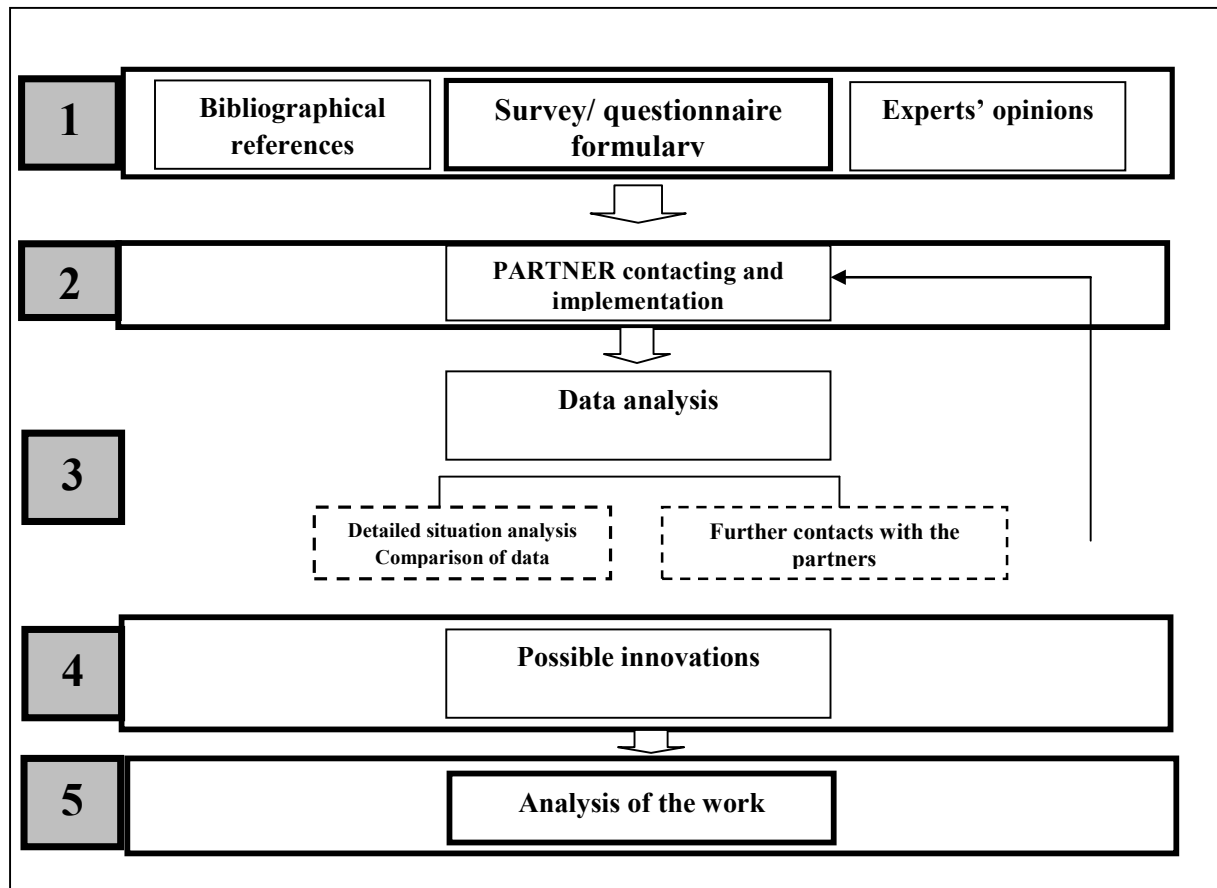
(source: own elaboration)

3. THE METHODOLOGICAL FRAMEWORK

The methodological framework created was intended to promote a detailed information gathering to determine the situation of each partner, but it was also based on the idea that a cooperative approach may be quite useful for solving common problems.

Therefore, the methodological framework used was based on several steps, which are presented in the following figure (fig. 2). These were all carried out during the PROTECT project, and constituted an initial phase of the WP2 work.

Fig. 2- Schematic design of the methodological framework followed



In a **first step**, a general questionnaire was created which followed some of the main guidelines and ideas of different previous projects and studies regarding the main indicators to be considered. Therefore, the main findings regarding the indicators of the MOSEFA project (Guidelines for Establishing Farm Forestry Accountancy Networks) based on EFI (2001) were analysed in a very detailed way. In order to consider a careful design of such formulary, we also used as a reference the questionnaires created in some agricultural studies, namely the Agricultural Census and other related studies.

We also asked for a critical background of some partners in order to have a more clear and detailed insight of those situations. Furthermore, some experts in the field were asked the relevant points to be considered in this kind of formulary, and their opinion was inserted whenever possible, always considering the project's main objectives.

The following structure was defined: 1) Forest physical characteristics 2) Forest uses, 3) Output, 4) Social/ legal issues, 5) Forest management, 6) Forest fires and prevention, 7) Agro-forestry farms. All the items are related to different dimensions of the problem.

Besides the inclusion of the characteristics of the forests which would imply some specific considerations, other main subjects were also considered such as the forest use and the output in terms of productions. Also, the social issues, namely the propriety of the forest, were considered, and the consideration of fire occurrences was another crucial item to be inserted for risk planning reasons. Finally, a point was inserted regarding the situation/existence of farms within the area, namely those which have as land use forests, since in many cases they may have a relevant role in forest management and fire prevention.

In a **second step**, the questionnaires were distributed to all partners who implemented them according to our guidelines. In a **third step**, the questionnaires were analyzed following a critical opinion of different experts regarding their validity and eventual doubts/inefficiencies.

A systematic comparison of the results was also conducted for the purpose of withdrawing results and valorising the study. The data were analyzed with respect for the eventual richness of information that may be retired from them (Alberto Pérez, 2012). Statistical analyses were also implemented. Therefore, a detailed analysis for each variant of the management model, to be developed, was made.

In a **fourth step**, possible innovations were analysed, and new ideas that were present in some of the members studied, following the premises that a cooperative approach may give some good results.

Finally, in a **fifth step**, a critical analysis of the data collected for each of the areas for modelling purposes was performed, but also regarding possible problems of this approach. This allowed an idea of the problems that this approach may present to become apparent and to design guidelines for a posterior application in other areas.

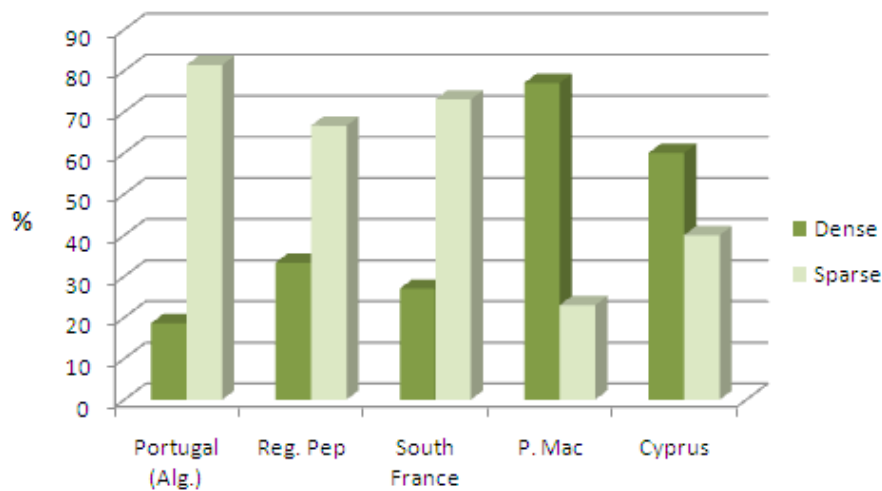
4. RESULTS

The results are presented next and follow the main points of the survey structure. These results refer in some cases to the area that is surrounding the enquired or to the general background, for adaptation purposes to each reality. The Spanish results are not presented.

4.1. Forest physical characteristics

Regarding the physical characteristics of the forests, in spite of all members being in the Mediterranean domain, there are quite different physical characteristics among them. Even so, the forestry area combined does not represent more than 32% of the total area, with the highest value registered in Greece. The forest also has different characteristics regarding density as can be seen in the following figure (Fig. 3) which presents the situation in the different studied PROTECT.

Fig. 3- The forest density in the different PROTECT partners



(source: survey results)

The forest height at maturity age is considered to be around 12 or more meters, except in Portugal and South France, where the average reaches from 5 to 8 meters. It is also considered that there are different predominant forest types in each partner.

Regarding the Province of Macerata, Italy, there is a predominance of broadleaf and deciduous species. It is estimated that about 95.2% of woods are composed of broadleaf forests and 4.8% of reforestations with conifers; at the same time, about 92.4% of woods are composed of deciduous forests and 7.6% of evergreen forests (2.8 holm oak woods, 4.8 reforestations with conifers). Evergreen forests' floristic composition is always composed by a percentage of deciduous trees - 37% individuals and 32% in volume. The most widespread deciduous woods are dominated by *Quercus pubescens* s.l., *Ostrya carpinifolia*, *Quercus cerris* or *Fagus sylvatica*. Also, the evergreen woods are dominated by *Quercus ilex* subsp. *Ilex*.

Regarding Cyprus, there are only permanent leaf trees, and the vegetation composing the forests in Cyprus are mainly trees, including shrub and bush understory, where coniferous species predominate. The dominant specie is *Pinus*, occupying more than 90% of the forest area.

Specifying the analysis, the main tree species in Cyprus are *Pinus brutia*, Calabrian Pine, which thrives up to 1200 m altitude, and it is the dominant species forming extensive forests on the Troodos and Pentadactylos mountain ranges and in other regions; the *Pinus nigra* ssp. *pallasiana*, Troodos Pine, which forms thick forests around the central Troodos area, from 1200 up to 1950 m; finally, the *Cedrus brevifolia*, Cyprus Cedar which is restricted around the Tripylos peak (Paphos Forest) from 800 up to 1400 m. Riparian vegetation is mainly composed of broadleaves like *Platanus orientalis*, Plane Tree and *Alnus orientalis*, Alder.

As regards shrubs these are either part of the understory of the forests or they form extensive maquis and garigues. Under favourable conditions some shrubs attain the dimensions of small trees. The main shrub species found in Cyprus are: *Juniperus phoenicea*, Phoenician Juniper, *Quercus alnifolia*, Golden Oak, *Acer obtusifolium*, Maple, *Arbutus andrachne*, Strawberry Tree, *Pistacia lentiscus*.

In the Region of Peloponnese, Greece, the situation is the same: there are only evergreen forests, and the forest is dominated by coniferous species such as fir, black pine and spruce and there are also chestnuts. The undergrowth consists of broadleaf species such as *P. lentiscus*, *Arbutus*, *Olea europea*.

In France, the South-East forest is a mixture of broadleaved species and conifers with evergreen foliage, maquis scrublands and wooded garrigue scrublands. The general French forest, on the other hand, is mostly a forest of broadleaved trees. Broadleaved stands cover 59% of the forested area. Conifers are more often present in the Landes Forest and in the mountainous regions. Mixed broadleaved/coniferous stands are located at the interface between plain and mountain.

Finally, in Portugal, the predominant type is a permanent leaf forest. The main species present are Cork oaks, Eucalyptus and Holm Oaks. The first one is located preferentially in Serra do Caldeirão (in the center north of the Algarve territory) and Serra do Espinhaço de Cão (in the southeast of the territory). The Eucalyptus plantations are mostly located in Serra de Monchique (in the northeast of the Algarve territory), and they are more recent in the territory. Finally, the holm oaks are mainly concentrated in the northwest part of the territory (Alcoutim county).

The above analysis allows the conclusion that there are differences among the different PROTECT project partners that need different answers. In order to better understanding the composition of such areas, the next table (table 1) presents the different forest species' dominance in each partner, represented by the area dominated by such species.

The analysis of these results shows that, in Cyprus, there are practically only Pinus trees; all the other areas reveal a more reasonable distribution of their forestry species. There are also some species not typical of Mediterranean forests but are linked to particular conditions, such as in the Province of Macerata, where the altitude is high. Moreover, there are quite different variations among all the other areas, revealing not only the diversity within the Mediterranean basin but also the influence of different geographical factors.

Table 1- The predominant species in each of the PROTECT partners

Species/area	Prov. Mac	Cyprus	S. France	Reg. Pep	Port-Alg.
Pine-trees	4,8	99	31,3	12,9	7,3
Cork oaks			3,1		21,5
Holm-oaks	2,8		27,4		10,6
Oaks	20,3			9,02	0,07
Pubescent Oaks			20,4		
Ostrya carpinifolia	52,8				
Castanea sativa	0,7				
Fagus sylvatica	11,5				
Cedar trees		0,2			
Riparian vegetation		0,5			
Spruce				10,63	
Chestnut				0,15	
Evergreen				66,7	
Eucalyptus					10,5
Beech			6,4		
Others	7,1		11,4		

Prov. Mac-Province of Macerata; Cyprus-Cyprus forests; S. France-South of France; Reg. Pel.-Region of Peloponnese Port-Alg.-Portugal-Algarve

(source: survey results)

4.2. Forest management

Distinct management models with different organizations are present in these forest areas. In common, all of them argue to promote the participation of different agents and stakeholders.

In the Province of Macerata, Italy, there is a combination of a public, associative and private managing system. Forest management in Italy is subjected to DM June 16, 2005, the so called “Guidelines for forest planning”. Regions must draw up their Regional Forest Plan that defines the range of application, conservation strategies and forest sector development. Also, Marche’s Regional Law number of 2005 provides guidelines for the Forest Regional Plan, and so the regional plan for this area was approved by Marches Regional Council on February 26, 2009.

These plans provide indications about regional forest heritage, the functions of woods, guidelines for management of public properties (Demanio Forestale Regionale), criteria for a sustainable management of Marches woods, woods to be submitted to management forms and intervention priority, and management models in public properties (Demanio Forestale Regionale).

Management plans are drawn by “Comunità Montane”, the authorities which directly manage woods belonging to “Demanio Forestale Regionale” and authorize felling, activities and interventions in all the woods belonging to their territories, except for small cutting areas. Out of territories belonging to “Comunità Montane”, cutting down is authorized by the Province of Macerata. Due to the legal framework, only in particular cases the Province of Macerata can authorize forest surface reduction or transformation, which means the forest’s conservation is assured.

Despite everything mentioned above, the main objective discussed on our survey is wood production, considering both the production and protection issue, with no other additional objective being considered as relevant.

In Cyprus the management system is based on multiple uses of forest resources and seeks to protect and improve the natural environment for the benefit of all citizens and visitors from abroad. The system is directed to the improvement of forests’ condition; conservation of soils and watersheds; protection of the flora, fauna, biodiversity and heritage; the promotion of ecotourism; and the sustainable production of wood and non-wood products, up to the limits of forests’ capacity to supply them. This is a public model, which still provides incentives for the participation of different stakeholders, and it does not have profit or other related aspects as an objective. The main forest uses discussed on the survey were three: wood production, wildlife conservation and tourism.

In France, the management system for forests, whatever the type of owner (private or public), is based on a sustainable management. Regeneration is always the case after each harvest. This is realized by plantings or by seedlings coming from the stand itself. Cuts are progressive during the stand’s lifetime. The public forest, managed by Office National des Forêts (ONF), is divided between state-owned forest and other public forests that belong to local authorities, mainly townships. Private forests’ management is realized by certified forest managers or by the CRPF (Regional Center of Forest Ownership) by the owner itself. Whatever the manager, if the surface is more than 10 ha, the “Serot” French act must be applied, imposing a specific management plan. The FFN (National Forestry Fund) brings financial support for the owners. The FFN is financed by tax payments given by all wood industrials or importers. The main use discussed was wood production.

The Region of Peloponnese has a forest management model based on public laws, and they are managed according to this within the principle of sustainability. For regulation purposes, there have been two main Forest Acts enacted: the forest code of 86 in 1969 and the law of 998 in 1979, which are also supported by additional acts.

In the Region of Algarve, Portugal, the management model can be private, associative and public. The majority of the area is managed by private owners. There are several forest producers' associations who give technical support to these private managers. Since 2005, a new territorial ordinance figure was created - the Forest Intervention Zones (FIZ). A FIZ is a continuous and delimited area, composed mainly of forest areas, subjected to a forest management plan and to a specific plan of forest intervention and managed by an entity (which may be a forest producers' association). It has a minimum of 750 ha and includes at least 50 owners or forestry producers and 100 rustic properties. It is constituted by the initiative of a group of land owners or forestry producers - the creator nucleus. Finally, the public areas are managed at the national level (matas nacionais) or in associations between the national level and the municipalities (forest perimeters).

In these two countries, the main uses discussed on the survey were wood production and wildlife conservation.

Given these results, it seems that society still does not value the multiple uses of forests, which means it is not recognizing its true value – in the end one can argue that the society probably will not be available to pay for its true value.

Besides the main objective, we also wanted to know which products are mostly considered within the main objectives. In the Province of Macerata, the main product is timber, used mainly as firewood; additionally, there is also some unspecified production of truffles and fungi. In Cyprus the main product is pinus timber used mostly in local private sawmills and as fuel wood and for the production of charcoal. In the Region of Peloponnese, Greece, the main product is also timber, mainly for sawn timber and also for firewood. In South France the main product is timber, and in the Algarve, Portugal, the forest gives two main products: timber, for wood and paper pulp, and cork, which has a very high quality in this area. This means that producers are not only centered in some uses, but that they do not value other products, such as non-timber products, which are interesting products for which these areas have potential.

4.3. Social/ legal issues

Concerning the social and legal issues, namely the ownership of the forest area, the situation is also quite different among all the PROTECT partners.

In the Province of Macerata, the forest is mostly privately owned by small owners or small owners associated in "Comunanze Agrarie", which are particular forms of collective ownership. In this case, the lands belong to the inhabitants and each of them can exercise the rights of civic use, for the traditional forms of exploiting the land, namely grazing and wood harvesting.

In Cyprus the forest is mainly public and it is therefore mostly managed by state entities.

In the Region of Peloponnese, Greece, a large percentage of forest land is owned by the state, and the small percentage of non-public forests is either private, municipal, church property or co-owned.

On the contrary, in South France the ownership is mainly private, representing 73% of the total of owners, which is also a value close to the national average. 3/4 of these owners have inherited their forest, 85% of them live in the region where their forest is located, 57% of private owners are retired people and 12% are active farmers.

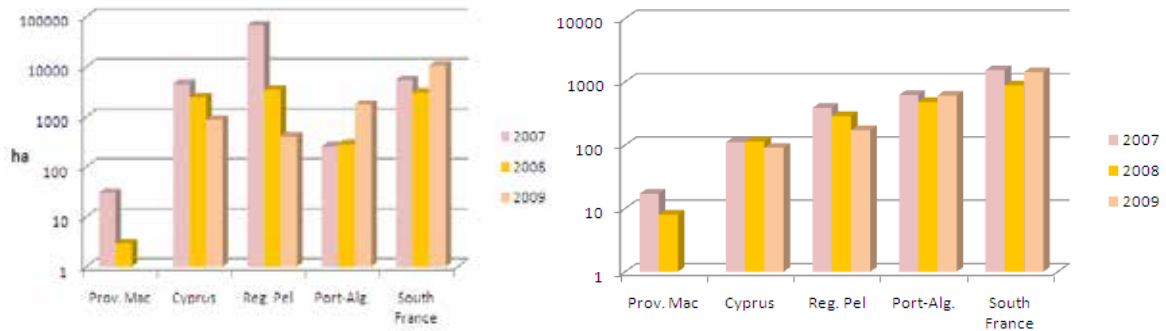
Finally, in Algarve, Portugal, almost all of the forest is owned by privates, individuals and enterprises, mainly with low dimension properties.

4.4. Forest fires and prevention

The forest fires are a problem in these areas. The following figure (fig. 3) represents the burnt area (ha) and the number of fires in the different partners' areas.

The most relevant burnt area was registered in the year of 2007 in the Region of Peloponnese, Greece. Concerning the number of fire occurrences, the Algarve and South France registered the largest numbers with a tendency to increase in all the years; the other three regions registered, in these years, a tendency to decrease.

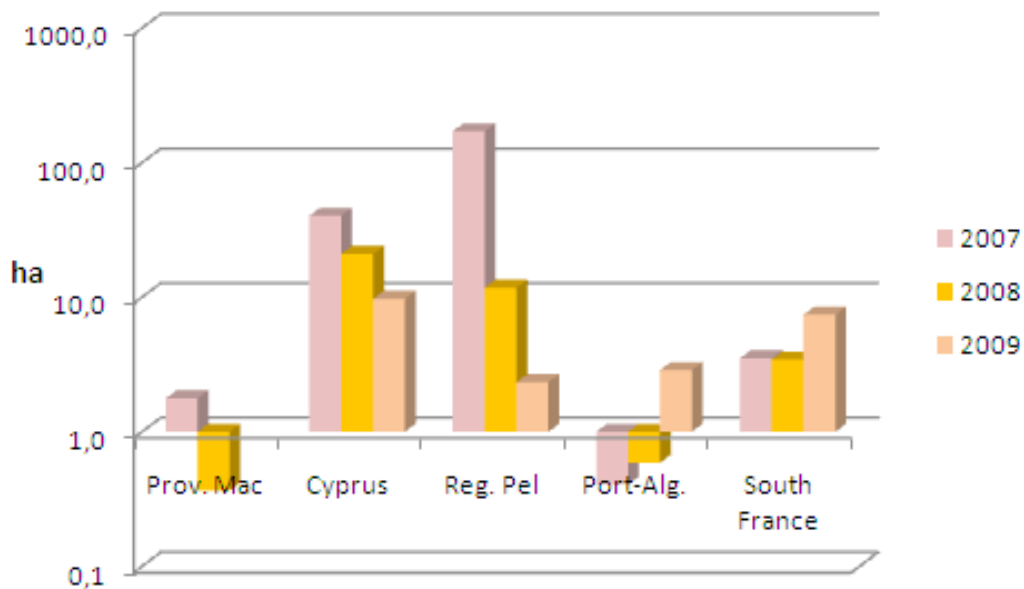
Fig. 4- The forest area burnt and the number of occurrences



(source: survey results)

The burnt area by forest fire is presented as follows. Results show that the higher average values of burnt area by forest fire are found in Cyprus and the Region of Peloponnese, with a decreasing tendency. In South France and Portugal, the value is lower, but the results present an increasing tendency on the analysed years.

Fig. 5- The burnt area by forest fire



(source: survey results)

The causes of fires registered within the different areas seem to be two: arson and negligence (table 2); nevertheless, there are a large number of respondents reporting unknown causes.

Table 2- The main causes of fires in the PROTECT partners

Area/cause	Unknown	Negligence	Accident	Arson	Others
Prov. Mac					
Cyprus					
Reg. Pel.					
Port-Alg.					
South France					

(source: survey results)

4.6. Agro-forestry farms

The agro-forestry farms may be present in different areas of the Mediterranean Basin, and their logic may dictate some important consequences for forest management. Concerning this issue, three partners - the Region of Peloponnese, South France and the Province of Macerata – mention the existence of farms within the forest area. This question, however, must be detailed with data from other sources, such as national statistics. For the partners who gave a positive answer, the French partner had no information on the farms' characteristics; the situation, for the two other partners, is presented below.

In the Province of Macerata, 45.87% of the forests are included in the farms' area. These are mostly private farms, whose key management objectives regarding forest are timber production and conservation. They develop activities regarding extensive cattle production and agriculture.

In the Region of Peloponnese, less than 10% of the forests are included within the farms, and they are mostly private. They mainly develop activities regarding extensive cattle breeding and hunting and use forests mainly for extensive cattle breeding. Their average net income is low and no conservation objectives were referred.

4.7. Discussion

The above results allowed us to better understand the implementation of a forest management model; however, there are some questions to be addressed and discussed.

As was presented before, in the Mediterranean region one can find different forests with different physical characteristics. These physical characteristics are related with different physical and human factors. This diversity represents a net of interactions between agents and physical factors that must be carefully considered in a management model.

Regarding the main uses of forests, it seems to be quite a specialization, with the activities relating to non-timber products and tourism not being particularly valued. Therefore, it seems that an additional gain could come from the valorisation of those products. For a management model purpose, this issue should be carefully discussed within the partnership.

Finally, regarding forest management, it was shown that there are different management models which may easily respond to problems in other areas. In Portugal the recently created FIZs could be an interesting solution to replicate in other areas such as France or the province of Macerata, or the ideals of the "Comunità Montane" could work better and improve the situation in Portugal. This is especially true for those areas whose types of owners are the same.

For forest fires, the aspect that must be underlined is the substantial number of fire occurrences that have, as main causes, unknown – the common feeling of people inquired was that these fires' causes, although not officially classified this way, would be mostly arson,

negligence or accident. A management plan should mainly consider a concerted approach to fight these fire causes.

The management of these areas must often consider the existence of agro-forestry farms. These farms may have different characteristics, but a common characteristic is their scale. A management plan could profit from the ideas presented, for instance, by the Province of Macerata, which may be applied in other areas.

Due to the above exposure, the model to be developed must consider the differences among partners but should also be able to integrate approaches, including some of those presented.

5. CONCLUDING REMARKS

This study provided detailed information about current problems in the Mediterranean area and several management options used to tackle them. It was shown that some of the practices carried out in the different countries may be applied in other areas. It was also shown that the forest fires tend to be a problem in most of them. In spite of the fire being a natural agent in the territory, it is a fact that, many times, it is related to negligence and arson, which are non-natural causes.

The questionnaire administered to the different PROTECT partners also provided a general problem description of the forest management situation in the different partners and their main problems. Therefore, a model for forest management of the territory may be developed.

Finally it is recommended that a posterior application of such methodology should consider a more complete approach concerning forest fires' prevention and occurrences; also, the implementation of such method should be as participatory as possible, since it will allow valorising the results. Social issues should also be accounted in a more detailed way considering both the type of owners and other relevant aspects, such as the importance of the forests to society.

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