WORKING REPORT ON NON-WOOD FOREST PRODUCTS PRODUCED BY THE MEDITERRANEAN FORESTS

SYLVAMED
Mediterranean Forests for All
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SUMMARY

Over the last decades, increasing demands towards different non-wood forest products and services in the Mediterranean countries can be observed. Interests in production of non-wood forest products, recreation benefits, protection role of forests, biodiversity conservation and others have been the most rapidly growing. This working report focuses specifically on non-wood forest products (hereafter NWFPs).

The purpose of the report is to make a brief overview on the state of NWFPs in selected Mediterranean countries and identify the current situation to implement alternative payment mechanisms – to managers and/or forest owners for the provision of environmental services and products. First, we will make an overview on the production of major types of NWFPs, and some basic legislative background characteristics will be presented as well. Second, we will analyse if there are any special forest management planning principles and strategies enforced to provide these goods to forest owners, local inhabitants and other stakeholders. At the end, pilot actions on NWFPs that will be implemented by partners participating in the SylvaMED project will be briefly described. We have analysed the data on NWFPs using existing literature, expert knowledge and most importantly, with collaboration of all partners using working report questionnaires.

The main objectives of the report are:
• to classify the most important NWFPs in the Mediterranean countries,
• to get an overview of the definition and the use of major NWFPs in the Mediterranean countries,
• to analyse basic characteristics of the legislation on NWFPs, including the rights and responsibilities of landowners and other NWFPs users,
• to analyse different management approaches adapted to the production of NWFPs,
• to expose some major problems and recommendations of the integration of NWFPs in sustainable forest management practice.

This report is the summary of the phase: Forest beyond wood: non-wood forest products, on the component: State of the Art of the SylvaMED project. The main potential users of the report will be the project partners, who will rely on it to support the implementation of pilot actions on different systems of payment for environmental services and to develop the last component of the project on Innovation and Evolution of Public Policies, as well forestry administrations, forest managers and planners (including forest owners), and other institutions interested in production and management of NWFPs and in implementing policies that integrate economic compensation mechanisms for environmental services of forests.
Several forest policy instruments have been developed to manage such conflicts, e.g., subsidies for forest owners, limitations of free access, regulated access in favour of the owners or local inhabitants, local and lawful tolerances due to collecting is being caused to the owners or when the owners want to gather NWFPs for commercial use. Triggered conflicts among the users and forest owners. These conflicts are more distinctive when the damage is lacking both manpower (due to rural depopulation) and profitability (high costs and low timber prices, and non-marketability of ecosystem goods and services derived by these forests). In the southern part, different socio-economic changes (e.g., the rapid population growth, low income per capita, marked rural density and the limited diversification of activities) make forests and woodlands very relevant primary resources for the subsistence of the local communities, and forest environmental functions are crucial for the sustainable development of rural societies (Palahi et al., 2008).

The situation of Mediterranean forests is different from the northern rim to the southern and eastern subregion (Palahi et al., 2008); in the Northern part, the ecological, recreational and landscape functions of Mediterranean forests have been increasing due to the socio-economic changes of the last decades, but the forest management is affecting the ability of forest stands to provide different forest products. A high variety of influential factors between different Mediterranean countries can be observed, which results in different importance of the individual NWFPs and the characteristics of their production.

NWFPs present an important source of food for the local inhabitants. However, the importance of NWFPs has been changing and collecting became more a recreational activity important for a broader circle of users. On the other hand, the pressure for economic income has forced forest owners to consider NWFPs as an important part of forest outcomes, which increased the production pressure of NWFPs.

In many parts, collection of NWFPs for personal use still prevails; therefore, policy measures targeting the sustainability of personal use are of high importance. However, the increasing popularity of collecting NWFPs among forest users in some parts of the Mediterranean has exceeded the level of “personal” needs, which triggered conflicts among the users and forest owners. These conflicts are more distinctive when the damage due to collecting is being caused to the owners or when the owners want to gather NWFPs for commercial use. Several forest policy instruments have been developed to manage such conflicts, e.g., subsidies for forest owners, limitations of free access, regulated access in favour of the owners or local inhabitants, local and lawful tolerances for the gathering of a modest amount of products. In the last years, contract mechanisms, licenses or permits for the use of NWFPs issued by forest owners have been implemented in some parts of the Mediterranean countries (e.g., Italy and France).
Ownership structure and free access to forests are both tightly related to marketability of forest goods. Recently, attempts to improve the status of NWFPs in the forest management and policy with the use of different valuation methods have started to emerge. Several techniques have been proposed for estimating the monetary value of NWFPs (Merlo and Croitoru, 2005), e.g. market price, opportunity costs of labour and other raw materials, substitute goods, market price of similar goods. Many Mediterranean countries have also developed different financial mechanisms to support and increase forest management in the private forests. Subsidies for sustainable forest management are very well extended and used. However, the need for identifying alternative mechanisms to remunerate forest owners or managers for the provision of ecosystem services and NWFPs is becoming more and more important.

2. NON-WOOD FOREST PRODUCTS (NWFP) RELATED LEGISLATION

Ownership structure and public access to forests vary across the Mediterranean countries; in some countries (e.g. Slovenia, Catalonia, Italy, France) private forests prevail, while in others (e.g. Greece) their share is substantially smaller. Access to forests is in general free; however differences among analyzed countries can be observed. In Slovenia, owners are entitled to restrict the access to forest only for specific purposes, but in France or Italy private owners have stronger rights to prohibit the access altogether and even to sell the rights for using their forest. In Catalonia, the use of some NWFPs (e.g. cork, truffles) is regulated.

Some countries have very detailed definition of NWFPs, and some observe the lack of more specific definition (Table 1). In Greece, the legislation only recognises wood forest products and resin production. Resin is thus, the only NWFP officially recognised in Greek legislation. There is a mention of aromatic plants but no particular regulation (other than permitting their cultivation in forests). In a recent law (Decision 1669/33104 of 2011) the method of resin extraction and the restrictions on the forests where resin extraction can be performed are more clearly defined. The Forest Law is currently under review, particularly towards forest protection, forest management and hunting, which includes activities within NATURA 2000 sites, hunting in the forest, climate change, fungi/mushrooms and other NWFPs such as honey and aromatic plants.

Most forests in Greece are publicly owned and people have free and uncontrolled access. Mushroom collection and aromatic/medicinal plants collection is mainly done by individuals and there is no measure of the amount of mushrooms produced and collected within the forests. These activities are even encouraged by local stakeholders through informative seminars. As a consequence, there are no available estimates of the market value of these NWFP.

In France, the forest law of 2001 (Forest law, 2001) was introduced to reinforce the competitiveness of production, harvest and valorisation of wood and other forest products but there is no strict definition of NWFP. The only distinction between wood products and NWFPs is found in fiscal legislation: forest benefits are taxed according to the estimated income derived from wood products only; whereas NWFPs, also called multipurpose or secondary products, are taxed as an agricultural estimated income, which is defined only where there exists a local significant production and a real market. In Languedoc-Roussillon, there exist only two specific taxes which are defined for a NWFP: cork tax in Pyrénées Orientales department, and truffle tax in Gard department. Mushrooms and bay gathering generate nearly 38 millions of visits per year in forest (Peyron et al., 2002). Some forest owners set up systems to collect payments for NWFP gathering from the users, with diverse results.

The Catalonia forest law (Forest Law..., 1988) is divided into six major titles. Fourth title about Forest Uses refers only to forest products, in the article 46.1: “The forest products must be used according to the principle of persistence, conservation and improvement of forests” and in the article 46.2: “Timber, fuelwood, bark, pasturlands, fruits, resin, aromatics and medicinal plants, mushrooms and truffles, bee products and in general, the other products of forest land can be used as forest products”. However, some NWFP have specific legislation in Catalonia (e.g. cork, pine kernels and truffles). The owners have the property over forest resources and are entitled to regulate the use, preserving the social function. However, in the private property, some uses by third persons are legitimate (the key concept is ius usus inacui).

In Slovenia, two major legislations define the NWFPs. Resolution on national forest programme (NFP 2007) defines general groups of NWFPs and their importance for national context, and the Act on Forests (Act on Forests, 1993) defines specific regulations (rights, limitations, and prohibitions) connected to the use of NWFPs in public as well as in private forests. Additionally, criteria for forests designated as being important for the production of NWFPs are described in the Rules and regulations on forest management and planning. Although the majority of forests (almost ¾ of the forests) are privately owned, free access and recreational gathering of different NWFPs is allowed in all forests regardless the ownership.

The Liguria forest law does not have a general definition of NWFPs. The harvesting of the NWFP is ruled by some articles. The resin collection is allowed, and collection of the straw and of the leaf is allowed for the owners for work use. Some technical specification for the harvesting of the lavender (Lavandula officinalis), of the root of heather (Erica arborea) for the manufacturing of smoking pipes, of holly’s branch (ilix aquifolium) and coniferous tree in
Christmas period are established. Other specific laws define the collection of mushrooms, and sale of truffles. The owners have the property of the forest resources and can prevent the use placing a sign according law rules. The collection of seeds for use in tree nurseries, or for consumption (pine nuts) is regulated by specific laws.

Table 1: Definition of NFWPs according to current regional or national legislations

<table>
<thead>
<tr>
<th>Country</th>
<th>Main legislation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liguria</td>
<td>Regional Forest Law</td>
<td>No strict definition. The forest products must be used according to the principle of persistence, conservation and improvement of forests. Timber, fuelwood, bark, pasturalelands, fruits, resin, aromatics and medicinal plants, mushrooms and truffles, bee products and in general, the other products of forest lands can be used as forest products.</td>
</tr>
<tr>
<td>Catalonia</td>
<td>LLEI 6/1988, de 30 de març, forestal de Catalunya</td>
<td>No strict definition.</td>
</tr>
<tr>
<td>France</td>
<td>Forest act, 2001</td>
<td>No strict definition.</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Resolution on national Forest Program Act on Forest</td>
<td>The current regulation on forestry (Forest Act, Plans for forest and game management) defines non-wood forest products as the exploitation of non-timber forest material benefits, with the exception of game and recreational use of forests, which may occur in the market.</td>
</tr>
</tbody>
</table>

3. TECHNICAL CHAPTER

The technical part of this report will be divided into five subchapters. In the introduction, general characteristics including classification of the NFWPs in Mediterranean countries will be summarized according to the existing literature. In the next four subchapters each of the selected type of NFWP will be described giving definition, legal background, characteristics of production and management, and description of pilot activities related to at least one type of NFWP. Slovenia will present valuation and management of chestnut stands, the pilot study in Anopoli (Crete) will focus on apiculture, the CRPF Languedoc-Roussillon will test a "multipass card" for gathering mushrooms, and the research on the sustainable mushroom picking in public as well as private forests will be presented by Catalonia. Finally, problems related to the management of forests where NFWPs are of great importance will be exposed with special emphasis on private forest management.

3.1 Introduction

Non-wood forest products are defined as products of biological origin other than wood derived from forests, other wooded land and trees outside forests (FAO, 1999). The use of terms connected to NFWPs is not unified: expressions like minor forest products, non-timber forest products, non-wood goods, non-wood benefits, other forest products, secondary forest products, special forest product are being used.

Many types of NFWPs exist according to literature and current forestry legislations. Different classifications of NWFPs have been elaborated for specific purposes (e.g. Table 2). NWFPs are classified as a resource category according to the functional classification, as a direct use value according to the total economic value approach (TEV) classification and partially private and public category according to the private / public nature classification (Study report, 2008). Three main characteristics connected to private / public nature of forest goods can be exposed (Study report, 2008): 1) excludability, which refers to whether a non-buyer can benefit from the good or not, 2) rivalry in consumption - if the consumption of the good by one agent precludes its use by other agents, then there exists rivalry in consumption, and 3) congestibility - a good is congestible if its use by one individual reduces the benefits accrued from its use to other users. The excludability of NWFPs depends on whether the access to the goods can be restricted or not. The rivalry in consumption of NWFPs exists, as the consumption of NWFPs by one person precludes its use by other. Since congestibility dimension is a question of scale, NWFP collecting is a congestible activity only if there are many pickers in relation to the total amount of NWFPs. Therefore, NWFPs can be considered either private goods (when forest owners can prohibit their collection altogether, e.g. the case of cork production which can be collected only by the forest owner; or when NWFP collection is restricted to a limited group of individuals, for example, purchasers of a mushroom collection license), or common pool resources (when access to NWFP cannot be restricted).

Table 2: List of non-wood forest goods (source SFC ad hoc WG report on non-wood forest goods)

<table>
<thead>
<tr>
<th>Edible plant products</th>
<th>Animal products</th>
<th>Medicinal plants and health/personal care products</th>
<th>Plant products</th>
<th>Materials and Manufacturing products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits, Honey, Mushrooms, Truffles, Nuts, Berries, Herbs, Saps, Roots, Carobs, Beverages-alcoholic, essential oils, Ferns, Ramsons (wild garlic), Flavouring agents, Spices, Maple syrup (tree sap), Sugar, Taffy, Butter, Seeds, Tisanes/Teas, Vegetables, Oils, Wild rice</td>
<td>Game meat and products, Wool, Hides, skins, pelts and furs, Trophies, Beeswax, Honey, Snails</td>
<td>Nettle, Common elder-flowers, Lime-blossom, Dog-rose hps, Medicinal plants, Herbs, Aromatherapy oils, Cosmetics, Drugs, Essential oils, Herbal health products, Nutracuticals, Perfumes and fragrances, Shampoos and soaps, Bark, Fodder</td>
<td>Forage, Cork, Wood carvings, Wreaths, garlands and swags, Natural dyes, Pine boughs, Moss, Ferns, Flowers and floral arrangements, Seasonal decorations (e.g. mistletoe and holly), Cone crafts, Graing, Gums, Resin, Compost</td>
<td>Adhesives, Dyes, Incense, Lignosulfonates, Stuffing material (e.g. moss), Twine and ropes, Turpentine, gams and resins</td>
</tr>
</tbody>
</table>
Cork, mushrooms and honey are the main individual NWFPs encountered in Mediterranean countries (Merlo and Croitoru, 2005), but several others can be identified in smaller amounts. Resins, medicinal plants and herbs, lightwood, animal fodder, fibrous materials and bark, of the root of heather (Erica arborea) for the manufacturing of smoking pipes, seeds for use in tree nurseries, or for consumption (pine nuts) were the first important NWFPs used in the forests; mushrooms, berries, forest fruits, flowers, Christmas trees, medicinal plants, truffles and honey production are the ones being currently the most interesting for consumers (COST, 2007).

Different types of NWFPs were recognized in countries involved in the SylvaMED project which encumbered harmonization of the results. Therefore, four major groups of NWFPs were identified at the beginning of the project using national or regional legislative basis, reports, studies and expert opinion of technical staff (Figure 1). All four groups of NWFPs were recognized as being important part of forest production in countries involved, and the majority of them will be tackled also to the pilot actions implemented in the second stage of the project. The truffles are separated into individual group because of their special production.

3.2 Mushrooms

3.2.1 Definition

Mushrooms represent one of the most important NWFPs in the Mediterranean, and are also an important non-wood forest product world-wide (Boa, 2004). Mushrooms have been used for medicinal, ritual, and alimentary purposes since prehistoric times (Pettenella and Kloehm, 2007). Due to diversified site conditions, mushroom diversity in Mediterranean region is very high, probably the highest in the European basin. Recent research has found more than 3,800 mushroom and truffle species in Andalusia (Spain) (Pettenella and Kloehm, 2007). The most common wild mushrooms harvested in the Mediterranean are Boletus spp., Cantharellus cibarius and C. lutescens, Amanita caesarea, Morchella esculenta (Figure 2).

Mushrooms have important economic, ecological and social significance for society. From a social point of view, mushroom collection improves (social) value of the forest; collection of mushroom enables recreational experience and to purchase the product collected to the users (de Aragón et al., 2011). Improvement of forest management in favour of mushroom production can also have positive impacts on the protection of natural resources and the conservation of landscapes (Pettenella and Kloehm, 2007). Mushrooms present a source of income for harvesters, associated businesses and for owners, if forest property rights are properly defined and protected. Therefore mushrooms may provide forest owners with the needed economic incentive to manage their forests (Palahi et al., 2009). When mushrooms become a source of revenue for forest managers, there is evidence that forests are significantly less exposed to fire, and much more protected from overgrazing (Pettenella and Kloehm, 2007).

However, mushroom collection can also lead to overharvesting and damaging habitats (e.g. Wang and Hall, 2004); in some parts of Mediterranean the influx of mushroom pickers already generates an environmental cost (de Aragón et al., 2011). This provokes conflicts especially in areas with high percentage of private forests, and even more if the owners are interested in mushroom production in their forests. The situation has increased the interests of forest owners and the administration in different regulations regarding the collection and the property rights of mushrooms (de Aragón et al., 2011). Several countries or regions have introduced legal restrictions on the harvesting of edible fungi in natural habitats because they fear that the removal of fruit bodies from the forest might impair their reproduction (Egli et al., 2006).
3.2.2 Legislative background

Property rights over mushroom collection are very diverse in the analyzed countries, and the lack of clear and solid definition of these rights can be observed. Mushrooms are generally considered a public good and are gathered for recreational use or for subsistence, forest owners, visitors and society being the beneficiaries (Figure 3). Collection of mushrooms is generally free up to a certain limit.

![Figure 3: A mushroom picker in the Bouches du Rhône forests (France) (source: CRPF de Provence Alpes Côte d’Azur)](image)

In France, every mushroom or fruit belongs to the land owner and therefore every single harvest needs forest owner’s approval (Figure 4).

The landowner can permit to pick mushrooms with recreational or commercial purposes. Picking up mushrooms on a private land, without authorization of the owner is considered a theft (R 331, Forest Code). However, there are no means to control that and the police are not interested in arresting mushrooms pickers. To soften those rules and to meet the needs of the society, there are local legislations which “tolerate gathering for domestic and family needs” with limitations for 3.4 or 5 kg/person, and when the owner did not put panels of prohibition or fences. These rules are established by Department legislation or National park. There are also rules for limiting the mushroom picking for species conservation purposes (L 411.1 et 412.1., Environmental code).

![Figure 4: “Public notice - You are in private properties. Days of collecting of mushrooms where it is tolerated by the owners: thursday and sunday.”](image)

In Slovenia, collection of mushrooms is free up to a certain limit (e.g. 2kg/person/day) and any person has the right to pick them. The gathering of fungi maybe limited or prohibited by the forestry administration in forests where these activities might endanger forest functions. Up to now, there are no areas especially designated for mushroom picking.

Liguria is the region with highest regulation on mushroom picking. Collection of mushrooms is free up to a certain limit (3 kg/person/day plus some weight limit for specific mushroom species). The majority of the municipalities have the responsibility to annually establish the local recollection season. Harvesting of wild fruits and mushrooms by a third party in a private land is possible when the forest owner provides authorisation or when it is not specifically prohibited by adequate signs. The forest owner or a forest owners’ association can establish the areas to be devoted specifically to mushroom picking. Here, a license scheme is established and there is a regional regulation regarding harvesting season, harvesting methods, species and trade. There are 30 consortia for mushrooms in Liguria. Mushrooms picking is recognized by Regional Law (art. 9 of Regional Law 27/2007). These consortia must pay a tax for having the cards for picking and have to present a report about the picked mushrooms. These reports often arrive with some delay due to organization reasons, and so, there are some problems of control of the picking (and their consequent incomes).

In Catalonia, the mushroom use does not have a clear legal framework. There are different experiences in the mycological regulation in private forests at local level (Figure 5). Municipalities can develop their own rules to regulate the access for mushroom picking. Some examples in Catalonia are Esterrí de Cardós or Alins. In general the forest owner can make use of any product, always according to the law (sustainability) and not limiting the social use. The harvesting of wild fruits and mushrooms by a third party in a private land is possible when the forest owner provides authorisation or when it is not specifically prohibited by adequate signs. In this last case, the harvesting has to be done under the concept of “usus inocui” (harmless use). This ius usus inocui must guarantee the harmless economic use (not imposing any costs on the owner, and ensuring that the mushroom picker does not derive any profit), and the harmless environmental use (resource protection). In both cases, one must take into account that the harmless use is not unlimited. The practices resulting from ius usus inocui are subordinated to the owner’s tolerance (Castán, 1992).

![Figure 5: Example of a service offered in a control area of mushrooms picking: mycological guided tour of the SylvaMED project (Catalonia) (source: CTFC)](image)

Since in practice mushroom pickers share the property rights over the product, the forest owners do not benefit from this commercial activity (de Aragon et al., 2011). It is recognized that property rights of the mushrooms are still not well defined. Private initiatives require a clear assignment of property rights to the forest owners or mushroom pickers; access payment is an example of initiatives that forest owners can take if in possession of the property rights (de Aragon et al., 2011).

3.2.3 Economic aspect

Mushrooms are an important marked good, with high income generation potential for forest owners. At the same time, mushroom picking is a popular recreational activity, making it an environmental service with limited market. If mushrooms are market goods (products), than the quantity of mushrooms (t) and the market price are good indicators of their value. On the other hand, mushrooms can also be considered as a part of a recreational activity and therefore an important environmental service. A number of valuation techniques can be applied to estimate the social benefits obtained from mushroom picking. One of the most frequently used techniques is the travel cost method where the value of mushroom picking is derived from the data of number of mushroom pickers, amount and species they pick, and commercial prices at which mushrooms were traded (for details see de Aragon et al., 2011).

Various different policy instruments regulating mushroom use exist. Examples of such instruments are private reserves and public government-administered charges - tax systems (de Aragon et al., 2011). In the private reserves mushroom pickers pay the forest owner directly for the mycological activity, which involves a change in property rights, being assigned to the forest owner. The public solution (daily governmental tax) also implies a change of property rights, assigning them to the public administration. In both solutions, the reassignment of property rights does not imply a change in the legislation, just in the enforcement based on current regulations. For instance, forest owners could take advantage of the existing legislation to set up the reserves, or the local administration could implement the tax system on their lands.
There is some experience of implementing payment schemes for collecting mushrooms in Mediterranean forests (de Aragon et al., 2011); in the Spanish province of Huesca, a forest owners association charges 180 € per season, or between 3 and 9 € per day for picking mushrooms in their forests; a similar scheme in southern France, charges 121 € per season or 6 € per day (Hazera, 2000; cit. from de Aragon et al., 2011). On the governmental side, in Spain, two types of permits are available: commercial collectors pay from 10 to 60 € per season, depending on whether they are locals or not, and non-commercial mushroom pickers pay 3 to 18 € per year depending on their place of residence. In both cases, restrictions are established on the maximum amount of kg collected.

Forest management in favour of mushroom production can be improved by using different financial instruments. A recent survey demonstrated that Catalonians are willing to pay for the picking of wild mushrooms (Mogas et al., 2005). Through this mechanism, incentives for improved forest management could be issued (Palahi et al., 2009).

### 3.2.4 Production and management

The most common physical indicators are quantity of mushrooms (t) with the market price being the most often used monetary indicator of their value (Merlo and Crotou, 2005). Valuation is based on quantities traded in the markets and, whenever statistics are available, on quantities collected for free (Table 3). Mushrooms account for less than 4% of the total economic value of Mediterranean forests (Merlo and Crotou, 2005). Average production value of mushroom collection ranges from €2—10/ha/year (Merlo and Crotou, 2005). A decade of mushroom data collection in the pine forests of Catalonia shows a wide-ranging yield (2—124 kg per ha per year), with an estimated average autumn yield of 41 kg per ha (de Aragon et al., 2011). Collection for personal use or selling mushrooms in local markets do not permit the accurate estimation of quantities and prices of mushroom production, therefore the true benefits are usually underestimated because mushrooms collected privately are not included in the estimation. The scarcity of data does not imply an absence of mushroom species but reflects the fact that mushrooms are collected for free and sold on local markets, and quantities and prices are not known (Pettenella and Kloehn, 2007).

### Table 3: Mushroom production in Mediterranean countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Information source</th>
<th>Amount of production (t/year)</th>
<th>Annual economic value (€/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wild, 5000</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>ISTAT 2008, adapted(3)</td>
<td>6628 (4)</td>
<td>8.1 (4)</td>
</tr>
<tr>
<td>France</td>
<td>peirec.org/Beaute/ champignons.annot.pdf</td>
<td>Commercialized - 4830, Auto consumed - 10000</td>
<td>17 millions € for the on sale production, and 38 millions € for the auto consumed production</td>
</tr>
<tr>
<td>Greece</td>
<td>(1)</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 (2005)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Most forests in Greece are publicly owned and people have free and uncontrolled access. As a result, mushroom collection is done by individuals and there is no measure of the amount of mushrooms produced and collected within the forests. As a result, those NAFPs have no market value. These activities are even encouraged by local stakeholders through informative seminars.

(2) Estimation according to purchase / commercial sale

(3) adapted after Mossi, 2008

(4) excluded artificially produced

The commercialization of mushrooms can have very high economic income (e.g. Table 4). The experiments which started in the Mediterranean basin in limiting conditions show that the proceeds from the productions of champignons are sometimes higher than those obtained from wood production (Mousain et al., 2011). The commercial value of fungi may equal or even surpass the value of timber (Alexander et al., 2002). In many areas in Italy, annual average income from selling mushroom-harvesting permits is now higher than from timber (Pettenella and Kloehn, 2007). The price of wild mushrooms is very high in Italy and the income can be over 40,000,000 € per year (Maso, 2008). In Catalonia, a wide ranging yield of mushroom collection (2—124 kg/ha/year), with an estimated average autumn yield of 41 kg per ha is observed (de Aragon et al., 2011). A survey carried out in period 2001-2002 in France about forest products collected during forest visits gave an estimation of 12 650 t/year for the total quantity of mushrooms declared (Peyron et al., 2002).

#### Table 4: Economic aspect of mushroom picking cards in Liguria region (source: Report for Liguria, 2011)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Income by cards for picking (€)</th>
<th>Expenditures for the controls on picking (€)</th>
<th>Amount available for activities (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>482,120.58</td>
<td>118,498.61</td>
<td>254,535.38</td>
</tr>
<tr>
<td>2010</td>
<td>303,908.60</td>
<td>117,357.17</td>
<td>130,586.00</td>
</tr>
</tbody>
</table>

*revenues, expenses and amounts available for management of active corens collection of fungi*

**data on the income of mushrooms is based on the estimation according to the control of reports of consortiums.

Production of mushrooms depends on many different factors, site and stand characteristics being the most important ones. Among site conditions, precipitation, temperature, frost, evapotranspiration, relative humidity and water deficits are the most influential (Palahi et al., 2009). Since stand characteristics can be altered through forest management, the techniques used in management can also have significant effect on the amount of mushroom production (Bonet et al., 2008). Usually, management strategies are commonly designed to promote timber production or to promote multi-functional forests in general. Therefore, mushrooms are not specifically represented in forest management guidelines (e.g. any additional measures, limitations, prohibitions in favour of mushroom production). However, recent studies have shown that different approaches in forest management can increase the production of mushroom (e.g. Bonet et al., 2008). When mushrooms become a source of revenue for forest managers (and when forest management becomes profitable), sound management practices are often observed (e.g. thinning, pruning, cutting of invasive plants, etc.) (Pettenella and Kloehn, 2007).

Several case studies have been focused on the effects of silvicultural techniques on the production of mushrooms (e.g. de Aragon et al., 2007; Bonet et al., 2008; Palahi et al., 2009). Effects of forest stand structure on mushroom production have been analyzed in coppice and even-aged high forest management system (Pettenella and Kloehn, 2007), and the correlation between basal area and mushroom production was analyzed in Pinus sylvestris plantations (Palahi et al., 2009). The results show that stand basal area, elevation, aspect and slope were the most significant predictors of mushroom production (Bonet et al., 2008; Palahi et al., 2009). According to the models, mushroom production is the highest when stand basal area is 10-20 m²/ha; the production is higher on norther aspects and it increases with increasing altitude and decreasing slopes (Palahi et al., 2009). Thinning in forest stands significantly reduces production of some fungi in the first year, but the differences disappear within 2-6 years (Piz et al., 2006).

In France, some forest owners try to plant mycorrhized tree plants (Lactarius sanguifluus ou Lactarius deliciosus on Pinus nigra austriaca, Pinus sylvestris, Pinus pinus, Pinus pinaster) in order to improve the production of mushrooms. Different private schemes can give an incentive for forest owners to improve the conditions of the forest for mushroom production. Several management actions could be taken in that regard, e.g. thinning has a positive long-term effect by reducing stand density and basal area to a level conducive to mushroom fruiting (de Aragon et al., 2007; Bonet et al., 2008). In France, work of the Micosylva program already highlights all the possible implication of the ways of managing forestry to improve the socio-economic and ecological roles of Boletus edulis section (Raudet et al., 2011). A pilot activity in the Borghetto area (Italy) where 32,000 hectares of forest are delineated for the production of Funghi di Borghetto mushrooms (Pettenella and Kloehn, 2007), is an example of how a mushroom road with Boletus mushroom can have economic, social and ecological outcomes for a variety of stakeholders (Maso, 2008).
3.2.5 Pilot activities

In the frame of the SylvaMED project, two pilot activities for mushrooms will be implemented; one in Catalonia and one in France.

In Catalonia, a mycological regulation is trialled in a private forest property, in which forest owner charges a symbolic fee for the right to collect mushrooms, be part of a sustainable activity and at the same time, benefit other recreational offers (like mycological route, specific gastronomy offers, results of the experimental plots). In return, the owner controls the forest ensuring an environmental balance and performing forest management activities in benefit of the environmental service offered. Also, there have been conferences and round tables to present the different views on the issue of mycological regulation.

In France, the CRPF Languedoc-Roussillon will test a “multipass card” in private forests, that will permit:

- access to a forest or a group of indicated private forests which participate in this scheme,
- picking of NWFP as agreed, with a weight limit fixed by the owners,
- participation in sporting activities or other leisure, as trekking, acrobanches, quads, climbing.

“Pass cards” could be provided in exchange for payments determined by the owners, with stickers for example to put on cars to permit the identification of the pass. The pilot site will be tested in Lamalou les Bains, Hérault (Figure 6) and methods of functioning will be tested.

3.3 Chestnut

3.3.1 Definition

Chestnut is a fast growing, long-lived deciduous tree and its nuts represent one of the most important nut crops in the temperate zone. Sweet chestnut (Castanea sativa Mill) stands are very common around the western Mediterranean Basin, covering large areas particularly in Portugal, Spain, France, Italy and Greece (Gondard et al., 2006). Chestnut stands are present also in the south-eastern part of the European continent (e.g., Slovakia, Slovenia, Hungary, Bulgaria, Former Yugoslavian Republic of Macedonia, Albania, Turkey), covering all together around 1800000 ha of chestnut forests in Europe (Giudici et al., 2000). Usually, large, pure stands of chestnut do not exist in nature; this type of forests is mostly dependent on human interventions (Condera et al., 2004). In chestnut forests the private ownership is generally prevalent (70-80%) even if there is also important public forest ownership (Giudici et al., 2000).

Chestnuts have been cultivated for several thousand years in the Mediterranean region. Over many centuries, chestnut fruits had an important role as food for humans and as feed for domestic animals, while chestnut wood was used for local purposes such as wine barrels, vineyard pegs, tool handles and carpentry (Arnaud and Bouchet, 1995, cit. after Gondard et al., 2006; Condera et al., 2004).

Humans have learnt how to manage the chestnut stands in extremely advantageous and diversified ways (Condera et al., 2004). The ownership structures, the local socioeconomic organisations and the need for autarkic and economic self-sufficient systems have considerably influenced the cultivation methods (Giudici et al., 2000). The traditional management system applied to chestnut coppices was based on short rotations (12-20 years) according to the required assortments (Giudici et al., 2000); the main products from coppices were small and medium poles used in agriculture (fences, vineyard stakes), for transmission lines, in constructions, as fuel and for handicrafts. Very short rotations (2-6 years) were applied locally for special assortments (flowerpickets, baskets, trellis posts).

A few decades ago, there was a decrease in production of different outcomes from chestnut stands; however, this trend has changed recently and economic interest of chestnut stands has been increasing in several Mediterranean markets including France, Italy, Spain and Turkey (Pettenela, 2001). The demand for sawn timber of high value assortments in sectors like joinery, furniture, flooring and internal cladding, carpentry, will be important in the future (Giudici et al., 2000); for numerous outdoor facilities (e.g., in the agricultural sector and in environmental engineering), chestnut timber has advantages due to its high natural durability and the decorative aspects, especially in comparison with impregnated timber or cement/iron products, the production of which provokes a more severe environmental impact.

Today, chestnut stands are an important type of forests providing a variety of wood and NWFPs; the most important wood products from chestnut forests are timber, including saw logs, plywood, split timber, timber hardboard, posts, poles and pillars, and wood as a combustible, including firewood and wood for coal and charcoal slack (Adua, 2000). Examples of the expanding consumption of chestnut wood and fruits as “green” products are also sawn chestnut wood for the production of outdoor furniture and of solid wood furniture with traditional design, organic maroons, and tannin to produce leather treated with “natural” chestnuts (Gircenti and Rosa, 1995; cit. after Pettenela, 2001). Important NWFPs from chestnut forests are also tannin, chestnut nuts, chestnut honey, and some edible mushrooms which grow only in chestnut stands. The chestnut produces considerable amounts of nectar and, given the size of chestnut woods; it thus enables bees to produce abundant quantities of unifloral honey (de Leonardi et al., 2000). Chestnut nuts (Figure 7) are playing a new role in the rural development, and the importance of chestnut nuts as natural products has been increasing. Chestnut production could provide a good opportunity to increase farm incomes in marginal areas and opportunities for employment both the woods and the local processing industry (Pierretti and Venzi, 2009).

Figure 6: The region of pilot action for mushroom multipass card in Lamalou les Bains, Hérault
According to Giudici et al. (2000), Castanea sativa is a strategic factor for the integrated development of rural and mountainous areas in Europe from the social, cultural and economical points of view, and could imply a series of advantages:
- avoid the abandonment of marginal areas by maintaining economic opportunities jobs in environmental engineering, handicraft, enterprises in the timber chain sector, cultural education, tourism;
- offer complementary employment opportunities to farmers and family companies: to be integrated into the agro-touristic and cultural activities of their native region;
- guarantee a constant presence and control of the rural territory, important to safeguard the environment;
- integration of resource exploitation, combining forest production with agro-cultivation activities.

3.3.2 Legislative background

There is no specific regulation for chestnut in any of the analyzed countries, and a clear lack of legislation background for chestnut utilization in forests can be observed. Similar problems as in the mushroom production evaluation are recognized; the majority of chestnut is gathered for personal purposes or is sold on local markets. The regulation of chestnuts in Catalonia is provided for by law Catalan Forestry Law (6 / 1988 Article 49), like mushrooms, so the Government of Catalonia can regulate the collection and prohibits the gathering if needed. The legislation is less clear, but in some cases the same as for mushroom – chestnut gathering is allowed for non-owners but with some limitations (e.g. 2 kg/person/day in Slovenia). Some Quality Labels connected to chestnut production exist in Spain and Italy, which means that trade of chestnut, is regulated by the internal code of the Label.

3.3.3 Economic aspect

The theoretical background of chestnut production is similar as for mushroom picking – chestnut collection can be seen as an environmental service (recreational activity for consumers, also non-owners), and as important market good - a side product in multifunctional forest or a major product in orchards. According to the existing literature and case studies implemented in several Mediterranean and other European countries, chestnut is considered mostly as a market good which could bring high economic income for the forest owner or the local communities.

In the last decades, it is noticeable that the utilization of chestnut and the economic interest for chestnut production has been decreasing. Therefore chestnuts need strong marketing actions to overcome the problem of their seasonality and expanding the sale period (Pierrettori and Venzi, 2009). The purpose of these strong marketing actions lies on the need to confront decreasing overall prices for the chestnut and rising labour costs and shortage of manpower for manual picking (Pierrettori and Venzi, 2009).

Four instruments are playing a remarkable role in the expansion of some promising chestnut markets: certification, networking and promotion, new approaches to selling and the procurement policies of public authorities (Petenella, 2001). For the owners who want to enhance the value of their production, it is essential to join some certification programme and to promote aggregate forms of management, because the production units are too small and therefore difficult to manage efficiently (Pierrettori and Venzi, 2009).

3.3.4 Production and management

Chestnut nuts can be produced in orchards or can be a part of natural forest production. The harvest of chestnut nuts is every year, but the crop is stronger every third year. Some figures from case studies show that the production of chestnut can be around 700 kg per hectare; there are around 80 to 100 trees per hectare and the amount one tree produces is around 7.5 kg (Barklay, 2010).

<table>
<thead>
<tr>
<th>Country</th>
<th>Share of forest area</th>
<th>Inventory method</th>
<th>Amount of production (t)</th>
<th>Value of production (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>/</td>
<td>ISTAT 2008</td>
<td>137,500</td>
<td>188,396</td>
</tr>
<tr>
<td>*Liguria</td>
<td></td>
<td>ISTAT (1997)</td>
<td>261,700</td>
<td>133</td>
</tr>
<tr>
<td>Catalonia</td>
<td>No data</td>
<td>No data</td>
<td>436 (4)</td>
<td>0,63ME (2)</td>
</tr>
<tr>
<td>France</td>
<td>600 ha (1)</td>
<td>No data</td>
<td>11,000 (2001)</td>
<td>No data</td>
</tr>
<tr>
<td>Greece</td>
<td>3,300 ha (3)</td>
<td>No data</td>
<td>12,000 (2009)</td>
<td>No data</td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td>SFS, 2007</td>
<td>51</td>
<td>262,57E</td>
</tr>
</tbody>
</table>

Table 5: Chestnut nut production (t) in the Mediterranean chestnut producers (Source: FAO)

Table 6: Production of chestnut in selected Mediterranean countries

(1) Ministry of Rural Development and Food.
(2) http://4epohes.com/articles/36-2009-04-10-20-26-55-9452-2011-06-02-12-20-17
(6) Sold by private producers on food market (average in 1994-2002)
(8) Adapted after Masi, 2008.
(9) Chestnut groves including high chestnut forests and fruit-bearing chestnut groves (cf. after Adua, 2000)
In Greece, there are over 1,000 ha of chestnut woods in the Parnon mountain range in the Peloponnese, southern Greece, and the average chestnut production is about 250 tonnes per year. Urbanisation of the population and the abandonment of the chestnut forests, the chestnut cancer which appeared in 1963 and has since spread to the whole country, and the lack of strategic planning from the part of the state to support chestnut production are the main reasons for the reduction of production of chestnut in the last 30 years (Diamantis, 2006). There are urgent urges for development of processing and standardisation of chestnut products, as the country can support higher production and benefit further by processing the crop and producing the secondary products (chestnut puree, flour and cream), in addition to the natural crop (Nanos, 2011). The problem of the non-recognition of the variety of NWFPs as such in the Greek legislation has been highlighted by Diamantis (Diamantis, 2005) describing chestnuts as one of the major NWFPs that with the right promotion can provide financial benefits to the producers, as well as the country. Greece is currently importing chestnuts, when it has the capacity to not only to cover its needs but also export. So a legal framework recognising and addressing the NWFPs that can be produced in Greece is essential.

In France, 3300 ha of forests is designated for chestnut production, but they are considered as orchard and agricultural product, with graphed trees and low density.

In Slovenia, chestnut is a minor tree species that is usually mixed with other tree species. There are also some chestnut stands in the south-eastern part of Slovenia in approximate area of 1000 ha, around 300 ha of which are of pure chestnut stands. However, these stands are not designated for chestnut production; they are important for multiple aspects as are all other forest areas in Slovenia.

There is very little research done in the field of forest management effects on the production of chestnut fruits or other NWFPs from chestnut stands and even less results from practical experiences. It is not known if forest owners manage their forests to improve the production of chestnut fruits or other non-wood products. It would be interesting to get more information on how to improve forest management in favour of the production of various NWFPs from chestnut forests, and with the concept of multifunctionality providing also timber and social and ecological benefits to different stakeholders.

Different management systems influence the amount of chestnut production. Coppices, coppices with standards, high forests and orchards enable production of various products, such as poles, logs and fruits (Pettenela, 2001). Chestnut fruits are outcomes mostly from orchards, but also from high forests and from coppices with standards (Pettenela, 2001). Orchard for fruit production were the main cultivation method up to the middle of XXth century (Giudici et al., 2000); the decline of the rural areas, the onset of diseases and the demand for timber for tannin production led to the abandonment and the conversion to the coppice management of many chestnut orchards. New silvicultural methods, alternative to the traditional management and compatible with the principles of the sustainable development, could restore a relevant part of chestnut coppices and high forests for improvement of chestnut fruits and other NWFPs from chestnut stands.

### 3.3.5 Pilot activities

Pilot project on chestnut products will be implemented in Slovenia. South-eastern part of Slovenia was included in the research because chestnut stands present an important share in total forest area (Figure 8). The project will be implemented on 11 ha of private forest. Here, different management techniques (silvicultural systems) will be selected and presented to increase the production of chestnut nuts and other timber products (timber for fences, poles...). The main activities will include field inventory, marking trees to cut, cutting the trees and inventory after harvesting. Management strategies will be selected together with experts and forest owners.

The main participants in the project will be the forest owner, Slovenia Forest Service, and other experts in the field of silviculture and management of chestnut stands. The expected results will be gathered as a guidelines for the forest owner, expertise about management of chestnut stands and guidelines to manage forests to produce higher values of NWFPs (for partners, other Mediterranean countries).
by Ministry for forestry and agriculture and depend on the legislation on forests. The reason for this is that forest beekeeping is declared as one of forest functions and the bee hives are a part of forest infrastructure.

3.4.3 Production

Beekeeping has a long tradition in Mediterranean region. Due to favourable natural conditions (high biodiversity) and socio-economic factors (rich tradition, income supplementing farming) this part of the world is one of the most important sources of honey production. Data and values on the honey production are available through the national statistics; value of honey production is usually based on the estimated quantities produced by beehives placed in forests and the average market price (Merlo and Croitoru, 2005). The importance of honey production differs among analyzed Mediterranean countries and is not dependent only on amounts of production. In some cases (e.g. northern Mediterranean) the values of honey are significantly higher than in some southern countries. Europe has more than 23 million hives, Spain, France, Italy have 1.90, 1.12 and 1.00 hives separately (Gu et al., 2002). Europe is one of the biggest honey imports in the world (Gu et al., 2002).

Currently there are about 1.5 million beehives in Greece and 23,000 people are involved with apiculture, of which only 3,000 are occupied full-time. Greece has the highest beehive density in Europe, three times higher than the European average. In terms of production, Greece is third in Europe. Annual honey production is approximately 14,000 tonnes and the producers are selling their product either directly to the customer or through a co-operative foundation. The amount produced and prices for honey have even increased in the last decades (Table 7). The opposite can be observed in some other Mediterranean countries; the amount of honey production in France has decreased from 35000 tonnes in 1880 to 20000 tonnes in 2000 (http://www.planetoscope...).

In Greece, honey production is organised in 80 cooperatives, and numerous small production groups. Each producer has on average 77 beehives. Crete has the highest number of beehives (210,000 out of the 1.5 million nationally). Large-scale producers apply for financial support by the EC, in order to receive technical support, combat diseases, conduct rational apiculture, support laboratory tests and strengthen the capita of co-operatives and help the producers receive support by specialists (EC directives 797/2004 and 917/2004) (Papanagiotou, 2010). In 2001, honey had a production of 10,000 tonnes and a value of 45M € (http://www.google.com/books...). In 2008 honey was sold by the producers at 6.22 €/kg on average.

In all countries, legislation defines the areas where the bee hives can be installed. Several factors influence the zoning restrictions for bee hives installation; ecosystem type or minimum distance to industries, buildings and neighbour forest owners being the most important. Beekeeping is regulated through special licenses, other control schemes or by the rules on bee management and marketing. Honey trade is ruled in all countries by quality control, product composition and product label content.

In Spain, there are different quality marks under regulations contained in autonomic rules. In Catalonia, areas for honey production are designated according to the property and resource use. These production areas operate under contract. In Greece, the applicant is responsible for the environmental protection of the area where the beehives are installed (Presidential Directive, 1981).

In France, the owner of a swarm has the right to claim and seize it until it has ceased to follow; otherwise the swarm is the owner of the land on which it landed (Rural Code). The mayor or warden may refuse the installation of hives in areas at risk, regardless of the distance of the hives (Order of 1984). In Languedoc-Roussillon, in answer at the request of bee-keepers, the CRPF LR has worked about plantations and enrichment with species of trees and shrubs, producers of nectar and pollen (Lagacherie and Cabannes, 1998).

In Slovenia, legislation on honey production includes the regulations on the type of beehives, population of producing bees, healthy status, the silvicultural treatments to be applied, quality controls, product composition, etc. The zoning restrictions depend especially on ecosystem type. Subsidies for beehives installation are provided

3.4.2 Legislative background

Property rights over honey are quite diverse in the analyzed countries. Beekeeping is regulated through specific (forest) legislation. Honey is in general not the property of forest owners; however, forest owners have the right to install beehives following the mandatory prescriptions and the licences required, and the right to provide authorisation about where the bee hives can be installed to the person installing the beehives (Figure 10). This has to be done with the collaboration of foresters or according to the valid forest legislation.

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In France, many beekeepers place their beehive in or near a forest and produce honeys with a forest qualification (honey of fir tree, chestnut tree, honey of acacia, honey of lime etc.), but the specific forest production quantity is not estimated. There is generally a verbal agreement between beekeepers and forest owners, and owners are usually rewarded with some honey pots. Only some specific places, very required for their tree species, have a commercial value; for example beehive sites in lime forests in Pyrenees.

Table 8: Amount (t) of honey production in Catalonia (source: MARM, 2009)

<table>
<thead>
<tr>
<th>Country / Region</th>
<th>Inventory method</th>
<th>Amount of production (t)</th>
<th>Value of production (thousands €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalonia</td>
<td>Census beehive</td>
<td>2.1</td>
<td>8.6</td>
</tr>
<tr>
<td>France</td>
<td>/</td>
<td>20 000</td>
<td>90 000</td>
</tr>
<tr>
<td>Greece</td>
<td>N/A</td>
<td>15,682 (2008)</td>
<td>125 500</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Purchase</td>
<td>1798 (1994-2002)</td>
<td>13485</td>
</tr>
</tbody>
</table>

The honey production in Catalonia is around 2,000 tonnes per year and it represents around 1% of the total production in the EU (Table 8). In 2008, there were 1,204 beekeeping or official marks in Catalonia (Table 9). According to a study from Fundació mòn rural (2009), the economic value of beekeeping production is around 8,500,000 €.

Table 9: Current honey production in Mediterranean countries

<table>
<thead>
<tr>
<th>Country / Region</th>
<th>Inventory method</th>
<th>Amount of production (t)</th>
<th>Value of production (thousands €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalonia</td>
<td>Census beehive</td>
<td>2.1</td>
<td>8.6</td>
</tr>
<tr>
<td>France</td>
<td>/</td>
<td>20 000</td>
<td>90 000</td>
</tr>
<tr>
<td>Greece</td>
<td>N/A</td>
<td>15,682 (2008)</td>
<td>125 500</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Purchase</td>
<td>1798 (1994-2002)</td>
<td>13485</td>
</tr>
</tbody>
</table>

The average values of wild honey range from 6-8 €/kg. These values are even higher if the honey is of special species. As an example, the rare monofloral strawberry tree honey (Arbutus unedo) sells for 15—18 €/kg in Italy (Guarrea and Escuté, 2007).

In Slovenia, the production of honey has been increasing over the last years (Table 10). Forest beekeeping is becoming more important. One of the reasons is the naturalness of forest honey compared to honey produced on agricultural lands. The main honey tree species that are represented in the forests are Castanea sativa, Prunus Avium, Robinia pseudoacacia, Abies alba, Picea abies, Acer pseudoplatanus and Prunus Avium.

Table 10: Production and market of honey (t) in the period 1997-2004 (Source: Medved, 2006; cit. after Statistical office of RS)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Import</th>
<th>Export</th>
<th>Domestic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1,500</td>
<td>389</td>
<td>116</td>
<td>1,831</td>
</tr>
<tr>
<td>1998</td>
<td>1,900</td>
<td>432</td>
<td>137</td>
<td>2,120</td>
</tr>
<tr>
<td>1999</td>
<td>1,370</td>
<td>243</td>
<td>64</td>
<td>1,740</td>
</tr>
<tr>
<td>2000</td>
<td>2,300</td>
<td>213</td>
<td>64</td>
<td>2,058</td>
</tr>
<tr>
<td>2001</td>
<td>2,350</td>
<td>229</td>
<td>214</td>
<td>2,440</td>
</tr>
<tr>
<td>2002</td>
<td>2,450</td>
<td>30</td>
<td>242</td>
<td>2,440</td>
</tr>
<tr>
<td>2003</td>
<td>1,850</td>
<td>73</td>
<td>230</td>
<td>2,326</td>
</tr>
<tr>
<td>2004</td>
<td>2,350</td>
<td>294</td>
<td>220</td>
<td>1,898</td>
</tr>
</tbody>
</table>

Forest beekeeping has a long tradition. Currently there are 8500 beekeepers which own 150,000 populated hives. The production varies from 2000 to 2500 t of honey per year. Slovenian forests have a high potential of producing forest honey (e.g. Figure 12), however it has not yet been used. The prices of forest honey are higher than honey produced in agricultural land; flower honey is sold for apps. 6 € / kg, and the prices for forest honey vary from 6.50 € for acacia and lime honey to 7 €/kg for mixed forest and chestnut honey, 7.50 € for spruce honey and 8 € for silver fir honey.
3.5 Truffles

3.5.1 Definition

Truffles are defined as ectomycorrhizal mushroom, growing in the forest (and if so, ruled by the forest law) or in "truffières" (and if so, ruled by civil law). Among truffles a key role is played by species Tuber magnatum pico, T. melanosporum, T. brumale, T. aestivum, and T. uncinatum (Pettenella and Kloeinh, 2007). The most important truffle producers are Italy, Spain and France. Due to very high prices truffles have big weight in the economy of the regions where they can grow. Cultivation of black truffle presents complementary activity to agricultural traditions, diversifies the rural economy and promotes renewed land-use (Bonet et al., 2009). Truffles are produced in plantations; however wild truffle species can also be found in the natural environment. The search of wild truffles with the assistance of specially trained dogs is becoming an increasingly popular activity (Figure 14). It is also important to notice that in the last decades, the production of many wild mushrooms has significantly decreased, but the interests in truffle cultivation have been increasing. The production of wild mushrooms is stationary and have a high variability in annual production, conditioned by weather conditions, state and forest type, the type of forest management that applies to forest and other factors (Martinez de Aragon et al. 2007).

3.5.2 Legislative background

In Catalonia, the current legislation is the Order of the July 15th, 1991, from Generalitat de Catalunya, about regulation of the truffle sector, modified by the Order of the 9th August, 1994. This Order provides, among others, the collection schedule; the conditions that the fruit must have the search and collection methods and commercial activity. In Slovenia, truffles are protected by the Regulation on the protection of wild fungi (Official, 1998). The interest in harvesting truffles is increasing, therefore the professional bodies of the Ministry of environment are currently investigating the risk and the impact of harvesting truffles to find out whether the truffles can be harvested in a limited and controlled areas. In Greece, there is no specific legislation on the collection of wild truffles in the forest. In Liguria, amount of regional concession tax for every person who collects truffles is about 93 € per person and is foreseen by regional law 18/2007, but it's difficult to assess the total budget because the amounts are taken by region in a cumulative way, together with other concession taxes.

3.5.3 Production

Europe produced annually between 22 and 134 tonnes of black truffle during the 1990 and 2007 which represents 90% of the total world production. The Spanish production is 30-40% of the European production. In Catalonia, truffles have an important presence, representing 30% of the truffle surface in Spain. The main areas are Prepirineo and Prelitoral mountains. Truffle recollection is regulated in Catalonia by a specific regional law (Figure 15). There are 80 ha of forests designated for plantations of truffle production. The average amount of production is 3 tonnes per year with 1.3 M€/year of economic value.

There are no complete data regarding the production of truffle in Greece, as the endeavour is still at early stages. There are only estimations which are based on the Italian production. Italians report a production of 4-5 kg per tree in 15 year old oak trees, assuming a plantation of 500 trees per hectare. The problem is that the plantation takes a long time to produce, with slow oak trees producing after 8-12 years and faster-developing chestnut trees producing after 5-6 years. The National Institute of Agricultural Research (ETHIAGE) and the Institute of Forest Research are promoting the cultivation of truffle in Greece, with lectures since 1998 (Diamantis, 2005). EC directive (1257/99) is subsidising the installation of truffle plantations as well as small irrigation system and fencing of the plantation.

In France, major part of the truffle is produced in the south-eastern part of France, in a region called Tricastin (north of Vaucluse, South of Drôme). But the market there is very secret, and everything is paid in cash, so the amounts passing through those market places are hard to estimate. The production of truffles varies; the highest production – over 20 tonnes was after the year 1995 (Figure 16). There are 10000ha of artificial truffle plantation, the average amount of production is 40 tonnes of Tuber melanosporum and 55 tonnes for all kinds of truffle which amounts in average to 70 M € per year (http://agriculture...).
Bonet et al. (2009) report that annual fresh weight production from plantations vary from 15 up to 100 kg per hectare which amounts to 300-450 € per kilo up to 700 – 900 € per kilo. Total yield of one hectare of truffles in Spain, France and Italy varies from 19000 up to 67000 € (for details see Bonet et al., 2009). Total value of the production has been increasing slightly in Italy and decreasing in France the last 15 years (Figure 16).

From the year 2003 imports of truffle in Catalonia have remained around 15 tonnes (Figure 17). Although France was the main supplier of truffles for Catalonia, in the last four years this trend has been changing in favour of the truffles from China. During the period 1995-2004, 91% of the truffle exported from Catalonia was destined to France and the 6% to Italy (Figure 17). However, in the last five years, although France has maintained its hegemony, its role has decreased to 76%. In this last decade, countries like the United Kingdom (11%), Italy (5%), Germany (3%) are taking the relay (Source: “Con sabor a Bosque” project).

In France, some research of truffle production exists. For example, the study of plant biodiversity in truffle plots confirmed their interest in the maintenance of diversity and heterogeneity across the landscape Uzès. Plantations and renovations are characterized by a specific procession original including species of closed habitats and species of semi-open midway closed between scrubland and meadows or groves. Presumably, this diversity is similar to that which was present in the scrublands farms during the early twentieth century. Today, many truffle plots are installed on the plain thus increasing the diversity of flora and landscape, but it is an environment where truffles have never been grown, therefore there are no traditions related to truffle collection. The truffle also survives in the matrix of scrubland, its native environment. We could think that this is a case of maintaining a traditional landscape. However, it seems necessary to recall that the vast majority of spaces are truffle in Uzes established by planting orchard type, emerged from the 1950s and intended to the sole production of truffles.

The CRPF Languedoc-Roussillon work about truffle silviculture and had published two reports about the main economic and ecologic issues of the techniques of the silviculture developed by the CRPF LR (Lauriac, 2004). Research observations of IRD Montpellier in coppice of Holm oaks tend also to show a floristic biodiversity increase with truffle silviculture (de la Barres et al., 2003). Little experimentations are also realised by private owners in their forest, with the coordination of CRPF Languedoc Roussillon (CETEF silviculture truffière).

3.6 Other Non-Wood Forest Products

NWFPs in this chapter will not be included in the pilot activities in the second stage of the SylvaMED project. However, they present important aspect of NWFPs in several Mediterranean countries and some basic information about their exploitation could be useful for the future research in the field of NWFPs.

Resins

Resins were considered important by the Greek partner. Resin is the only NWFP officially recognised in Greek legislation. In a recent law (Decision 1669/33104 – 19th April 2011), the method of resin extraction and the restrictions on the forests where resin extraction can be performed, are more clearly defined. Legislation prescribes certain guidelines and limitations of the use and management in favour of resin production:

• to permit resin extraction from particular trees/forest,
• to regulate issues regarding the collection of forest products in general (with the exception of acorns) and resin extraction,
• the trees from which resin can be extracted must have a breast-height diameter of 0.8m, including the bark,
• the usage of chemicals that stimulate the production of resin is allowed,
• lethal resin extraction is permitted (with two to four fronts simultaneously on the tree),
• decision on formation of committee that supervise resin-extraction forests,
imposing and lifting bans on resin extraction in certain forests, if deemed necessary.

Resin extraction has been performed in Greece since 500 B.C. It is mentioned as an activity by Theophrastus in his document “About Plants.” During the first third of the 20th century Greece was the 5th largest resin producer in the world. Resin production is still very high in Greece (Table 12), although the production has decreased in the last decades (Table 13). Even though today it is at is lowest ever, the Aleppo Pine forests from where resin is extracted have great significance for the country. Profit margins from this activity are very low but quite important in the frame of holistic forestry, since pine forest that are used for resin extraction are maintained by the producers and do not suffer a great fire risk. The legal framework covering resin extraction is addressed by the Parliamentary Decision 439, issued in 1968. Obviously, it is very outdated and needs to be updated with renewed scientific information (Tsoumis, 1995).

Table 12: Production of resins in Greece in period 1970-2010

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20,587t</td>
<td>12,558t</td>
<td>6,265t</td>
<td>5,761t</td>
<td>3,901t</td>
<td></td>
</tr>
</tbody>
</table>

* Approximate price of resin that the producer sells the product to the trader is 0.20 € / Kg. No data on prices before 2008 were found.

In a pine forest, criteria for designation of areas for resin extraction are set up according to the scientific information and are put into force by the Head of the Regional Forest Directorate. It usually requires a person declaring interest in extracting resin from a public forest. The Forest Directorate will evaluate their application and the status of the forest and if they decide that there is no risk for the forest (provided the correct methodology is implemented) then they permit the extraction of resin. Occasionally they will make spot checks to ensure that the producer follows the correct methodology and that the forest is still healthy. The user of the forest needs to keep the understory clear of growth (which is essential for his work as well), hence reducing the fire risk for the forest. There is no particular "management strategy" other than the reduction of the fire risk. Criteria for designated areas are presence of eligible species: P. halepensis, P. brutia, P. nigra and P. maritima. According to Parliamentary Directive 439/1968 resin producers are responsible for protecting the forest and for this task they receive a subsidy from the State. Directive 439/1968 permits resin extraction on P. halepensis, P. brutia, P. nigra and P. maritima. It also defines the dimensions of the trees for resin extraction and the general method of the extraction, sets the legal boundaries and the fines for illegal resin extraction.

Table 13: Current production of resins in Greece

<table>
<thead>
<tr>
<th>Share of forest area</th>
<th>Inventory method</th>
<th>Amount of production (t)</th>
<th>Value of production (TE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>147,548 ha (1997) (2)</td>
<td>N / A</td>
<td>3,901 (2008) (1)</td>
<td>0.20 € / Kg</td>
</tr>
</tbody>
</table>

(1) Ministry of Environment, Energy & Climate Change
(2) Ministry of Rural Development and Food

Resin extraction is particularly popular in the island of Evia, north of Athens. In the area of Limni in Evia, there is an organised co-operative of resin-producers. These producers are either renting out trees that belong to private owners, or the local Forest Directorate designates trees that can be used for resin extraction. The price yielded is 0.13 €/kg (2004), which is approximately the price the producers pay for the rental of the trees. The personal profit originates from the subsidies they receive from the State, not for the resin they produce, but because working within the forest requires them to tend and care for it, clearing waste and dead plant material, hence protecting it from fire and promptly notifying the authorities whenever there is an instance of forest fire, and guiding the fire-fighting vehicles through appropriate routes, as they have expert knowledge of the area. The subsidy was 0.35 €/kg in 2004, with every pine tree producing about 2.5 – 3.5 kg of resin.

Cork

The cork can be used to make decorative objects such as fruit baskets. Cork is harvested from the tree by collecting the think bark (Figure 19). Areas for cork production are defined according to the property and resource type. These are production areas which are operating under contracts. There are 123,000 ha of these areas, Quercus suber L. being the most important tree species. 3.1 t of cork are produced per year. The estimated economic value of the sector is 1,079,148 – 1,731,286 €/any. The main objectives are improving knowledge and innovation to reduce the plague (Coroebus undatus) and stimulate the commercialization to avoid the reduction of the companies that buy cork.

Figure 19: Pile of extracted cork in the forest (left) and cork extraction process in Catalonia (right)
(source: CPF Archive)

Pine kernels

The pine kernels or the nuts of stone pine (Pinus pinea L.) have been used in the Mediterranean region for centuries. In Catalonia pine kernels are known as pinones, in Italy as pino domestico or pinone, in France pignon, edc. Natural or afforested stone pine stands occupy more than 600,000 ha in the Mediterranean basin, mainly in the western countries of the region: Spain (accounting for more than 60% of the total world area of the species), Portugal, France, Morocco, Tunisia and Italy (Calama et al., 2007). Pine nuts have very important economic impact; due to high prices of pine nuts they are important for the local economy (income for local inhabitants and forest owners). The social importance of pine nuts utilization is not so distinctive, unless we consider the use of pine kernels in many world cuisines. Positive ecological effects are clear: pine stands or mixed oak – pine stands have an important landscape-conservation and environmental-protection function.

In very productive areas of Spain, Portugal, or Italy, annual yields of pine kernels can be over 1,000kg of cones per hectare per year; the average production in Spain ranges from 150 to 570kg of cones/ha/year depending on area, year and forest stand (Montero et al., 2004; Piqué 2005, cit. after Tores et al., 2007). Regarding pine cones, the average production in Catalonia is 570 kg/ha/year. Providing an average price of 0.33 €/kg pine cones, the average income would be 188 €/ha/year. Final consumer prices vary from region to region, but an average 2006 price in Spain for a final consumer was €35/kg (Tores et al., 2007).

In Catalonia there are no specific big masses for the pine cones production, but there is an important business network and collecting tradition (Barranco and Ortuño, 2004). Annual production of pine cones amounts to about 500-1,300 kg/ha (period 2000-08, Piqué, 2009). From this information and taking into account the surface of pure pine masses in Catalonia (14,108ha), the total annual production of pine cones in Catalonia can be estimated between 7 and 18 thousand tons. The collection and commercialization of the pine cone is regulated, through the law (ORDRE de 18 de julio de 1991). The picking season is defined from 15th October to 15th May (modification by ORDRE of 5 of July, 1995). The document also establishes how to collect, without causing damage and establish specific areas to collect pine cones by the owner, and also regulates the pine cone marketing. The license of the pine cone-picking person, which is free, is essential both for the collection and for trade the product. The infringements are punished according to the LAW 6/1988, 43/2003.

In Catalonia, pine kernels are the main commercial product produced from stone pine stands. In the whole Spain, total annual amount of cones harvested, computed using data series from 1980-2000, ranges from 5,000 and 50,000 tons, with an average value of 30,000 tons (for details see Calama et al., 2007). There are 23,000 ha of forests in Catalonia which are useful for collecting pine kernels and they produce an average of 200t/year. Annual economic value of pine kernels production amounts to 2.5 ME. In 2006, the average price of the shell pine kernels...
in Catalonia amounted to 3,900€/t (Anuarios de Estadística Agraria, MAPA y Anuarios de Estadística Forestal, MMA). An interesting comparison of integration of pine and timber production was made by Tores et al. (2007) explaining that annual cone production ranges from 130 to 450kg/ha and timber production from 1—2 m³/ha. Additionally, adequate silvicultural practices consist of stand density controls (clearances) all through the forest life cycle, and progressive regeneration cuts to promote natural regeneration at the end of the rotation age. When timber production becomes a priority, clearances are less intense to maintain higher tree densities, and rotation ages become shorter (around 80 years). When cone production becomes the priority, stand density must decrease and rotation ages range from 120 to 150 years. Pruning is a common practice although there is some controversy about the effect on cone production (Tores et al., 2007).

4. ECONOMIC VALUATION OF THE NON-WOOD FOREST PRODUCTS (NWFP)

Non-Wood Forest Products have two types of demand:
- the pure productive one, captured by market prices; and
- the recreational activity of going to the forest and, additionally, harvest some product to take home. This is especially relevant for berries and mushrooms (e.g. France, Catalonia), but also for chestnuts (e.g. Slovenia). Pine seeds, cork or honey need more complex harvest methods and are therefore not related to recreational uses.

While in the first case, the product is aimed to be sold in a more or less formal market, the second is often considered as for “self-consumption”, with no-profit orientation.

Attention must be paid then when referring to “NWFP” values:
- either to the unit of product itself and its market price (more appropriate for the productive purposes); or
- other indicator of recreational visits to the forest (total number of visits, satisfaction with the activity, area devoted to recreational harvesting etc.). This can also have a monetary value that can differ from the market price; such value is captured by means of valuation methods. This value represents the maximum willingness to pay off an average citizen. See table 14 for a comparison exercise.

Table 15: Mushroom values and prices in Spain. Sources: Martínez-Aragón et al. (2011), de Frutos et al. (2009) and Martínez Peña et al. (2003)

<table>
<thead>
<tr>
<th>Place</th>
<th>£/kg</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solsóns county (Catalonia)</td>
<td>From 4.38 to 10.65 €/kg</td>
<td>2003 local-market prices for final seller</td>
</tr>
<tr>
<td></td>
<td>From 2.28 to 6.42 €/kg</td>
<td>2003 local-market prices as revenues for mushroom pickers</td>
</tr>
<tr>
<td>Recreational value (user surplus based on Travel Cost Method)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solsóns county (Catalonia)</td>
<td>39 € per journey</td>
<td>2003 prices considering, petrol, knowledge on mushroom species, expected amount to be collected and age.</td>
</tr>
<tr>
<td>Pinar Grande (Soria)</td>
<td>10.49 € per trip</td>
<td>Zonal variant of TCM and only considering petrol cost</td>
</tr>
<tr>
<td>Pinar Grande (Soria)</td>
<td>63 € per trip</td>
<td>Zonal variant of TCM for non-local pickers</td>
</tr>
</tbody>
</table>

Therefore, normative regarding their harvest should consider both cases. For acceptability reasons, a differentiated treatment is generally applied.

A payment for environmental service could be established in areas where forest owners are in the position to offer additional value to the current status quo situation; this is, generally changing their management activities towards different ones that enhance the production of the target NWFP. Such additional efforts to improve NWFP production are the ones to be compensated through, i.a. entrance fee or tax; however, citizens tend not to see such improvement, as they think that NWFP grow and evolve naturally, therefore an information campaign is crucial.
5. RECOMMENDATIONS

According to the brief overview of current status of NWFPs production and management in selected Mediterranean countries several problems can be observed. Some general recommendations for further work in this field are exposed:

• General definition on NWFPs exists; however, the lack of clear definition of individual NWFPs can be observed, which unable clear classification. All important NWFPs should be clearly defined in order to serve as a basis for forest policy evaluation.

• The data available on historical and current utilization and production is limited and varies among analyzed countries.

• The data available on historical and current utilization is not always connected to the forest ecosystems; products like honey and truffles can also be produced outside forests. More clear distinction of production of forest goods is needed.

• Importance of individual NWFPs is estimated to generally. Missing knowledge on local importance is connected to the lack of practical experiences in favour of NWFPs production.

According to the principle of sustainable and multi-objective forest management all forests should be managed in a way to provide a variety of forest products and services. However, special needs for enriching NWFPs are usually not considered in the forest management planning practice. There is a noticeable lack of knowledge about the effects of different management approaches on the production of NWFPs. For the future research, it will be very important to develop case studies with different management and silvicultural techniques to establish clear guidelines for forest management practices in favour of NWFPs production.

Some problems are connected to the theft and the difficulties to pick some non wood forest products (available time, ability …). A solution for landowners could be to rent a part of their forest to interested people. This solution is possible if the neighbour forest owners gather themselves to organize a close watch and use a good contract with the interested people.

There is clear lack of recognition of NWFPs and the lack of funding for forestry actions related with the management plans, lack of incentives for private forest owners to exploit their forests, through poor market connections and high up-front investment. For example, an urgent need for the other forest services, in addition to timber and resin extraction must be recognised in the Greek-legislation, and for the Ministry of Rural Development and Food, to provide appropriate directions to the Forest Directorates, in order to produce Forest Management plans with multi-functional forests in mind. Especially these days, when national funding for the implementation of forestry actions is inadequate, additional funds must be sought out, through the implementation of PES schemes. It is recommended that a nation-wide survey is made, coordinated by the Forest Directorates, on the possibilities of setting up such schemes, with regards to the NWFPs, and in particular chestnuts, mushrooms / truffles, honey and other specialised apiculture products (propolis, royal jelly).

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