# Book of abstracts

# Wild Forest Products in Europe

## 13–14 October 2016

## Barcelona, Spain

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This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

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## Session 1a: Planning and supported decision-making

**Analysis of the co-production of NWFPs and ecosystem services in European countries**
Harald Vacik, University of Natural Resources and Life Sciences, Institute of Silviculture, Austria

**Predicting the berry yields for North Karelia region, Finland**
Mikko Kurttila, Natural Resources Institute Finland

**Opportunities and challenges in developing NWFP integrated decision support system in multiple use forest management planning**
Presented by Burak Sari, on behalf of Emin Zeki Baskent, Karadeniz Technical University, Faculty of Forestry, 61080, Trabzon, Turkey

**Managing for NWFPs – an assessment on the forest holding level**
Patrick Huber, European Forest Institute Central-East European Regional Office and University of Natural Resources and Life Sciences, Institute of Silviculture, Austria



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# Analysis of the co-production of NWFPs and ecosystem services in European countries

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Managing forest ecosystems for the sustainable provision of multiple forest products and services simultaneously is becoming a major issue for forest policy and managers. The combined consideration of provision services (freshwater, air, timber, food, renewable energy), regulating services (mitigating negative effects of climate, water, natural hazards, diseases as well as support carbon sequestration), supporting services (energy and material flow, water and nutrient cycling, soil accumulation, provision of habitats) and cultural services (recreate and enjoy aesthetic values, cultural and spiritual heritage) seems to be a challenging task. The identification of successful combinations for a co-production of timber, Non-wood forest products (NWFP) and other environmental services is therefore an important step in ensuring a sustainable forest management.

Within the COST Action FP1203 (European non-wood forest products (NWFPs) network) it was possible to analyze with the help of several experts in 19 European countries how the production of NWFPs influences timber production and/or other environmental services. In the survey the following steps were conducted (i) all system elements (number of NWFPs and services) were listed in a matrix, where the number of rows and columns of the matrix is related to the number of system elements to be analysed; (ii) for each element within an influence matrix the level of influence from one element over the other was estimated; (iii) the sum of the influences was calculated to indicate the active and passive influence, which allowed to map each element in an influence diagram.

In this contribution we present the results of the survey focusing on selected examples for a co-production utilizing influence diagrams that allow describing the relationship between the different system elements and providing a theoretical framework to interpret the clustering of the elements.



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## Predicting the berry yields for North Karelia region, Finland

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In Finland, right to pick berries and mushrooms from forests is important from recreational perspective. In addition, berries and mushrooms are commonly used in households and large amounts of berries are also sold in markets. Development of berry yields is therefore important from economic and socio-cultural perspectives. Forest management has an effect on berry yields so that intensified cuttings result in increased yield of cowberries and decreased yields of bilberries. To improve these estimates and to discern the tradeoffs between timber production and bilberry and cowberry yields, this study aimed to integrate the berry yield models in large-scale Finnish forest planning system. This action enables the creation of quantitative estimates on how the biological and harvestable yields of bilberries and cowberries develop in regional cutting scenarios in North Karelia, Finland. Until now, the creation of and results from cutting scenarios has strongly focused on timber production oriented aspects. Other forest uses and in particular, the evaluation of the impacts of different forest management intensities on berry yields has been missing or remained at qualitative level. The preliminary results from calculations show clear differences in berry yields between cutting scenarios, which are mainly caused by the difference in regeneration cutting areas. The results can be utilized e.g. in creation of regional forestry programs and when forest policy goals and activities are set in different policy processes.



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# Opportunities and challenges in developing NWFP integrated decision support system in multiple use forest management planning

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Forest management of today encompasses sustainable utilization of both goods such as wood and non-wood forest products and services such as water, soil, carbon, biodiversity and recreation. The primary challenge of forest management is to be able to develop planning framework to synchronize multiple use of forest ecosystems in a holistic approach. Specifically, the challenge relates to the maximization of multiple use of forests without endangering the resilience of ecosystems and conservation of forest values to support the sustainable use in the future. The challenge can largely be exercised and overcome in developing and using robust Decision Support System (DSS) to forecast future development of forests to understand the dynamics and the capacity to produce both woods and Non-Wood Forest Products (NWFPs).

This paper introduces challenges, principles, opportunities and problems in developing NWFP integrated DSS. Particular focus goes to the integration of some plant based NWFP such as Lime tree flowers, Bay leaves and Chestnut with wood production into forest management planning using a prototype ETÇAP+ DSS. In this context, conceptual framework of simulation and optimization based ETÇAP+ DSS in order to integrate those NWFP into management plans will be discussed. In the end, opportunities and challenges including primary obstacles in developing NWFP integrated forest management DSS will be presented and discussed to be able set up the future vision of forest management planning.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Managing for NWFPs – an assessment on the forest holding level

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Non-wood forest products (NWFPs) are supposed to unlock latent potentials in European forestry. Although the institutional framework regarding the production, harvesting and marketing of NWFPs differs among European countries and despite data availability is still scarce the market value of NWFPs may not be neglected. Given the socio-economic relevance, particularly in regions where other services then timber are more demanded from forests, the need for information and tools to support forest owners in sound decision making targeting at the co-production of wood and non-wood forest resources is increasing. Since forest planning methods have been traditionally tailored towards wood and wood products, there is thus far only a limited number of NWFPs covered by existing models. Furthermore, empirical data providing a comprehensive coverage of NWFPs yield are scarce and thus particularly challenging for the development of statistical models. However, the complex causal relationships between the sustained production of NWFPs, the available ecological resources, as well as the organizational and the market potential of forest management regimes are well suited for knowledge-based expert models. A Bayesian Belief Network (BBN) is a probabilistic graphical model that can be applied to a wide range of environmental problems, inter alia to aid natural resources management decision-making. In our application the BBN is applied to unravel the potential of a forest holding to integrate options for the management of NWFPs in its forest management concept. Considering diverse environmental settings and management concepts the BBN is designed to be applied to clusters of NWFPs instead of individual NWFPs species. Two case studies demonstrate that BBNs can be used to transfer expert knowledge from science to practice and thus have the ability to contribute to improved problem understanding of non-expert decision makers for a sustainable and holistic management of forest resources.



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## Session 1b: Institutions and innovation support

**The evolution of institutions for non-wood forest products: An empirical study of harvesting practices across Europe**
Irina Prokofieva, Forest Sciences Center of Catalonia, Barcelona, Spain

**Wild forest products supply chain and Legislation: effects and proposals**
Davide M. Pettenella, University of Padova. TESAF department, Italy

**Travel cost approaches to assess mushroom picking value and policy interventions effects in Catalonia (Spain)**
Valentino Marini Govigli, European Forest Institute - Mediterranean Regional Office (EFIMED), Barcelona, Spain



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# The evolution of institutions for non-wood forest products: an empirical study of harvesting practices across Europe

**Irina Prokofieva**[a], Elena Górriz[a], Emma Chapman[b], Giulia Corradini[c], Toni Dickson[b], Anze Japelj[d], Alice Ludvig[e], Silvia Martínez[f], Jelena Nedeljković[g], Dragan Nonić[g], Veera Tahvanainen[h], Verónica Verdejo[f], Adam Thorogood[i], Maria Wilding[i]
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Recent years have seen an increase in the foraging for wild non-wood forest products both for self-consumption and for commercial purposes, bringing about concerns about the sustainability of the resources. Most locally consumed and traded NWFP are de facto governed by customary laws related to land tenure and resource rights. However, in practice the enforcement of these rights is at best weak, which opens scope for different local institutional arrangements, of a variable degree of formality, governing the access to and harvesting of NWFPs.

What drives the evolution of these local institutions, and why do they take different forms (access restrictions, harvesting practices, etc) and modality (formal/informal) in different regions? What role do individual behaviours play in this process? We explore the evolution of institutions governing the access to and harvesting patterns of wild non-wood forest products in Europe following a co-evolutionary framework developed by Brooks (2010, EcolEcon). Our selected case studies cover diverse NWFPs from 9 different European regions. In all these regions, we witness the evolution of different types of formal and informal institutions governing NWFPs at local scale, coupled with the changing behaviours of resource users. Our objective is to explore the factors driving the institutional development in these regions, and alongside with it test the validity of Brooks' model.

We find that apart from the factors identified by Brooks, such as, the perception of resource scarcity, attitudes and values of resource users, social capital, and economic factors, other factors play a role as triggers of co-evolutionary dynamics, namely rural communities' threshold for acceptance of external harvesters, externally-driven learning processes, higher-scale decision-making and income-generating strategies. We extend Brooks' model by incorporating these additional factors and discuss its applicability to a wider range of instances of institutional evolution.



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# Wild forest products supply chain and legislation: effects and proposals

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The market of wild forest products (WFP) is a cluster of autonomous and numerous markets, based on highly differentiated supply chains. The structure on local supply chains is affected both by local producers' competitive advantages and the impacts of regional, national and international policy makers' decisions (regulations and system of incentives). The paper describes different structures of supply chains for a limited number of WFP in 14 regional case studies across Europe.

Data were obtained during the research activities carried out within the StarTree project financed by the EC. Each case study has taken into consideration, with the same methodology, two WFP supply chains: one in common to all case studies (wild mushrooms) to facilitate an inter-sectoral comparison and another case study specific WFP to investigate inter–sectoral specific characteristics of the European markets. Interviews have been addressed to a representative sample of producers, processors, wholesalers and retailers. Local supply chains have been studied observing the price evolution and the economic relations among stakeholders.

Moreover, in order to raise the voice of European SMEs dealing with products sourced from forest, we promoted a Delphi survey, addressed to few key actors for each case study, regarding the present and the future WFP policies. The survey took place in two rounds, the first one more qualitative and the second one more quantitative and structured as a "norm drafting" exercise.

The analysis of different regional WFP supply chains highlighted the presence of a dualistic development of the market, where the Eastern European countries supply the more industrialized ones, especially for fresh products. The role of international market is fundamental for the supply of a large variety of raw WFP to the European SME, which are unable to purchase enough products from local, regional or national producers at competitive prices. In countries where the demand for a given WFP was high, we found a consistent and flourishing informal market. Skipping the fiscal and bureaucratic obligations, WFP producers are able to compete with prices on the international market. The paper ends with some recommendations for the policy makers dealing with WFP markets.



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# Travel cost approaches to assess mushroom picking value and policy interventions effects in Catalonia (Spain)

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Mushroom picking is a growing and extended recreational and commercial activity all around European countries, and within Spain, Catalonia has indeed a long-lasting tradition in such sector. Mushroom harvesting, although entails both social and economic benefits for recreational and commercial pickers, it also implies annoyances for some landowners who, as legal owners of the mushrooms, feel somehow private of potential revenues connected to such commodities. Estimating the potential of mushroom picking value becomes then a top-priority at policy level, especially when the legislative environment moves towards regulating local mycological resources.

The purpose of this paper is to estimate the intrinsic value of recreational mushroom picking for three forest areas of Catalonia where collection was controlled in autumn 2014. Two different approaches of the travel cost method (individual travel cost and zonal travel cost) were tested in accordance to the level of details included in the surveys. The demand (consumer surplus) related to each zone was derived, and was later used to model the monetary implication of introducing a picking fee.

The results so far obtained suggest that both zonal and individual methods lead to analogous results, indicating the feasibility of both approaches. Moreover the proposed fee scheme appears to be bearable by the individual surpluses of the different pickers (i.e. locals, from the county, from further away), as the perceived price elasticity of the demand allows capturing much of the current additional tax burdens. Such estimations suggest that surveys could allow policy makers to evaluate rigorously the implication of regulative policies in the context of recreational goods and services, such as the one of mushrooms.



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## Session 2a: Domestication and WFP production

**Tools to support cork oak stands multifunctional management: long term optimisations and short term refining**
Margarida Tomé, Instituto Superior de Agronomia, Lisbon, Portugal

**Effects of the bacteria *Pseudomonas fluorescens* on the mycorrhization between *Cistus ladanifer* and *Boletus edulis***
Olaya Mediavilla, Sustainable Forest Management Research Institute and IDForest-Biotecnología Forestal Aplicada, Palencia, Spain

**Effects of local factors in *Thymus sibthorpii*'s essential oils in mountainous area of northern Greece**
Eleni Abraham, School of Agriculture, Forestry and Natural Environment, Aristotle University of Thessaloniki, Greece)



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# Tools to support cork oak stands multifunctional management: long term optimisation and short term refining

**Margarida Tomé**, Joana A Paulo, João H N Palma, Sonia P Faias
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Context: Most of cork oak stands have historically been managed as agroforestry systems, combining trees with annual cultures such as wheat, that have been gradually transformed into silvopastoral systems that combine the trees with pastures and grazing under the trees. However, several management systems can be found, from stands managed with the objective to optimize cork productions to stands for which the multifunctionality is the management objective. Landowners are quite dynamic, always trying to adapt management to new market opportunities and changing edaphoclimatic conditions.

Cork oak management encompasses three main decisions: tree density (evaluated by crown cover), how often cork must be extracted (cork debarking rotation) and stand regeneration method (silvicultural system). The first decision implies the selection of the type of system, from a sparse stand compatible with agriculture, pasture or game, to a denser forest that aims at producing cork as a main product. The decisions are not straightforward, and, in a changing world, management must be adaptive, it is difficult to provide “fixed” silvicultural guidelines. Instead, adaptive management based on the monitoring and revision of the objectives, combined with the use of decision support tools to help landowners to analyse the best way to change management to face new frontiers (climate change, new markets, etc) and/or owner decision must be used. Such tools can be used for long term optimization of the system (strategic planning) to short term adaptation to optimise decisions at stand level through on-going conditions.

Research question: The objective of this presentation is to analyse the importance of short term refining of cork oak stands management versus using an a priori decision about the management approach based on long term optimisation of initial landowners’ objectives.

Methods: The research uses several stands, representing different edaphoclimatic conditions and stand structures, as case studies. Initial landowners’ objectives and average climate and cork price structure are used to propose an optimized management approach using net present value as the main criteria but providing also information on other indicators (e.g. carbon stock). Alternative scenarios for climate and cork price structure are used to refine management with a periodicity around 9 years (depending on the case) and the impact of this short term refining evaluated. Cork oak stand simulations are based on the SUBER model.

Results: The results show that the landowner has a clear advantage in using and adaptive management concept based on short term decision support tools.

Conclusions: Cork oak landowners must replace fixed silvicultural guidelines by the use of flexible tools that help them to adapt management to on-going conditions leading to an optimisation of benefits.



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# Effects of the bacteria *Pseudomonas fluorescens* on the mycorrhization between *Cistus ladanifer* and *Boletus edulis*

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*Boletus edulis* Bull, commonly known as porcini, are currently among the most appreciated fungi worldwide. These valued edible mushrooms reach an annual world market around one billion Euros. Most of the Boletus are collected in forest areas dominated by species of *Pinus, Quercus* and *Castanea*. However, the fructification of these fungi in forested areas occurs only in mature stands (from 30 or 40 years in the case of pine trees, for example), thus limiting the feasibility of their domestication. Interestingly, *B. edulis* species have been reported to occur in *Cistus ladanifer* L. shrublands in Northwest Spain, yielding sporocarp production as early as in 3-year-old *C. ladanifer* shrubs. Attempts towards the domestication of *B. edulis* have been focused on successfully producing *C. ladanifer* seedlings associated with *B. edulis* under controlled conditions. Microorganisms have an important role influencing the success of man-mediated ectomycorrhizal symbiosis, such as bacteria species, which improve mycorrhiza formation. Thus, in this study, we assessed the influence of mycorrhiza helper bacteria on the efficiency and intensity of the ectomycorrhizal symbiosis between *B. edulis* and *C. ladanifer*. The aim of this work was to optimize a protocol for the mycorrhizal synthesis of *B. edulis* with *C. ladanifer* vitroplants by testing the effects of fungal culture time and coinoculation with the helper bacteria *Pseudomonas fluorescens* Migula. The results corroborated successful mycorrhizal synthesis between *C. ladanifer* and *B. edulis*. Coinoculation of *B. edulis* with *P. fluorescens* doubled within-plant mycorrhization levels although it did not result in an increased number of seedlings colonized with *B. edulis* mycorrhizae. *B. edulis* mycelium culture time also increased mycorrhization levels but not the presence of mycorrhizae. These results bring us closer to producing mycorrhizal plants inoculated with economically valuable fungi for use in forestry.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Effects of local factors on *Thymus sibthorpii*'s essential oils in mountainous area of northern Greece

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*Thymus* species are used for medicinal and spices purposes worldwide. The aim of the present study was the quantitative and qualitative evaluation of *Thymus sibthorpii*'s Bentham essential oils in relation to slope exposure and to grazing intensity at flowering and fruiting phenological stage. The study was conducted in Cholomontas mountain, northern Greece at altitudes of 760 to 870 m. Plant material of *Thymus sibthorpii* from southern and northwestern exposures under different grazing intensity of small ruminants was used for essential oils extraction. Concerning the quantitative evaluation, the content of essential oils was higher in flowering stage compared to fruiting one. Additionally, the highest and the lowest content of essential oils was record in northwest areas under heavy and no grazed areas, respectively. According to qualitative analysis of the essential oils the main compound was linalool in the majority of the samples.



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## Session 2b: Working with supply chains & networks

**Wild forest products international trade: which opportunities for the European market?**
Enrico Vidale, University of Padova, TESAF department, Italy

**Network typologies for promoting wild forest products economies: a comparative analysis of eight case studies**
Riccardo Da Re, University of Padova, TESAF department, Italy

**Creation of an innovative Kenyan-European Macadamia nuts supply chain**
Matti Spiecker, Macadamiafans Kenya Ltd

**From paradox to paradigm: The non-conventional innovation in natural resin**
Sven Mutke, INIA - Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Madrid, Spain

**Non-wood forest products-based enterprises characteristics and types in Serbia**
Jelena Nedeljković, University of Belgrade, Faculty of Forestry, Serbia



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# Wild forest products international trade: which opportunities for the European market?

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Despite timber is the main output of forest sector, the commercialization of wild forest products (WFP) may have in some rural areas a relevant role in supporting and differentiating income generation processes. Cork, mushrooms and truffles, berries and fruits, nuts, greeneries, medicinal and aromatic plants, sap and resins are in Europe the main product categories collected in the wild and transferred to the end-users both in the local and international markets. For most of WFP international trade is increasing, also as a consequence of an increasing global demand of a relatively large set of products. The analysis of the patterns of WFP trade is the scope of the paper.

Among the available trade data sources, we have being working with UN Comtrade data, being this DB the most frequently used and reliable information source at international level on quantity and value of trade. In data elaboration, we faced some problems as double recording, outliers and missing values. A new cleaning methodology has been developed for solving these problems and elaborating relatively long time series.

The paper provides a comprehensive overview of the most traded WFP. Prices at different levels of the value chain, top economic players and the trade balance of the European Union at 28 countries are provided.

Results underline that European Union is a net importer of WFP and it represents almost half of the global import. The relevant role of the European demand for WFP can be considered either an opportunity or a threat. It's an opportunity for enhancing internal supply, for keeping the role in added value generation and in preserving the industrial processing know-how. It's a threat for the risk the European companies are running in term of loss of competitiveness in relation to some emerging economies. While in general the EU is a net importer of wild forest products, there are some core products in which EU is a leader supplier like cork, cork based products, chestnuts and refined tannins. WFP collected in the forest have high fluctuations of production at regional and country levels, but at global scale markets are more stable both in terms of volumes and values. In the last ten years prices of WFP generally increased in relative terms less than the volumes. The paper ends with policy recommendation on additional HS commodity codes.



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# Network typologies for promoting wild forest products economies: a comparative analysis of eight case studies

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** The paper is based on data and information provided by Adam Thorogood (LlyG), Maria Wilding (LlyG), Elena Gorriz (CTFC), Verónica Verdejo Patón (IRMA), Marian Lajos Mayr (UHAM), Jelena Nedeljković (EFI), Ivana Živojinovic (BOKU), Emma Chapman (RS), Toni Dickson (RS), and their local collaborators.*

Which are the driving forces that allow the generation of income and employment opportunities connected to wild forest product (WFP), supporting rural development at regional level? Which are the network connections among local actors (land owners, forest managers, processors, public bodies, …) that support processes aimed to re-discover the traditional values and the new market potentials connected to WFP economy? The paper tries to answer these main research questions.

On the basis of the research activities carried out within the StarTree project financed by the EC, we analyzed eight "in depth case studies" (IDCS) in different European countries, chosen as interesting and innovative examples for promoting the economic values of WFP, through private or public initiatives, and to foster local rural development. The IDCS's economic impacts at local level have been studied looking at their internal and external network structure, through the use of Social Network Analysis.

The selected IDCSs allow to analyze a large variety of factors influencing WFP promotion such as label scheme implementation, the innovative governance structure of a community woodland association, the process of a business idea formation, the role of one or few leading actors in the supply chain and the system of property rights regulations.

Results from the IDCS show different typologies of successful network organizations, that have been interpreted both in term of the efficiency of the whole network and as a result of the role played by single leading actors with relevant market or political power.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Creation of an innovative Kenyan-European Macadamia nuts supply chain

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Macadamia nuts are a healthy high end product often cultivated in agro-forestry systems. High demand and huge potential of growing these nuts by small-scale landowners with rather low technical input indicate high economic attractivity. However, production often is inefficient, the quality management not adequate, the markets difficult to access by the individual producer, and therefore the value generated by the producer was rather low. This was the starting point of Macadamiafans, a technology pioneer for enforcing efficiency, product quality, and market accessibility and transparency for small-scale land owners in a sustainable way.

Overall sustainability was the central goal of the innovative approach. In order to guarantee ecological sustainability bio-certified organic farming is a key element. In addition, Macadamia trees provide shade, reduce soil erosion and stimulate the growth of agricultural crops underneath the trees.

Innovative fully digitized internal control is the basis not only for documentation of organic certification, but also for documenting material - and cash flow, as well as for quality assessment. Economic sustainability is achieved by efficient, locally adapted, decentralized processing technology within the farmer communities, and by well organized diversified marketing. Specially emphasized is the social component: job creation, sustainable income, and continuous education of the farmers.

Founded in 2009, four manufactures in different villages have been established and 2ooo farmers are members of the Macadamiafans consortium delivering their certified nuts.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## From paradox to paradigm: the non-conventional innovation in natural resin

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For usual, concepts of innovation define criteria for innovativeness to bring “new” products, goods or services to the market. At first sight, resin and the production of turpentine from larch or pines appear to be more antique than new in type. Tar distillation and resin extraction have a long tradition that reaches for over 5.000 years across Europe. For instance, the axe of “the man in the ice” (Ötzi) was processed with tar from birch. It even has nearly ceased by the end of the 20th century. Interesting enough, in very recent years, there has been a revival of the tradition under new circumstances. The communication will examine several particular examples on production of natural resin in different European countries under different circumstances. We will analyse the fostering and hindering factors for their success as well as the forms of support they got for entrepreneurship. Although they differ substantially in size and quantity of production, they all show similarities that can explain their success: the producers have inherited the technique from their forefathers in areas where the know-how was vanishing. With dedication and specific support for building up their start-ups they could establish their brand. All cases show how a very historical product gets re-used and adapted to new societal needs or uses that are connected to health concerns like allergy protection in combination with environmental and climate protection concerns. For a specific proportion of customers the product even has nostalgic charm in terms of “retro-chic”. Because a historical product gets re-used and adapted to modern needs we label them as “traditional innovations”. Most strikingly, the specific support mechanisms and functions differ for all the cases which effects on their economic performance.



This project has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Non-wood forest products-based enterprises characteristics and types in Serbia

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The contribution of the forestry sector to the economic and social development can be increased by providing necessary support for the establishment and development of forest-based SMEs. As forestry sector in Serbia is in process of transition, it is important to know the mechanisms and factors which influence the formation and development of forest-based small and medium enterprises (SMEs). However, in Serbia, there is a lack of knowledge about forest-based SMEs, and particularly about those whose business is based on non-wood forest products (NWFPs). In this context, the aim of the research was to determine the characteristics and types of NWFPs-based SMEs and its representatives. In this study, the quantitative research approach was applied. Door-to-door survey was conducted with 91 representatives of NWFPs-based SMEs in Central Serbia. The questionnaire was a combination of 65 questions (open- and close-ended). Only those questions that relate to the characteristics of NWFPs-based SMEs and their business, and socio-demographic characteristics of the respondents, were selected for this paper. Results of cluster analysis showed three types of NWFPs-based SMEs, in regard to basic characteristics ("small rural" is prevailing), and three types in regard to business activities ("procurement, processing, selling" is prevailing). Based on the characteristics and attitudes towards additional training, four types of NWFPs-based SMEs representatives can be distinguished. These results are of importance for rural areas, since NWFPs-based entrepreneurship can have a positive impact on its sustainable development and the population income diversification. As well, the results can serve as a basis for further detailed research on types of SMEs and possibilities of improvement of entrepreneurship in NWFPs sector. In addition, the need for specific support measures in relation to different types of entrepreneurs should be studied in the coming period.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Session 3a: Planning and supported decision-making

**Developing empirical models for predicting production of lime tree flowers (*Tilia* sp.)**
Emin Zeki Baskent, Karadeniz Technical University, Faculty of Forestry, Turkey

**Yield models for wild mushrooms in *Pinus sylvestris* and *Pinus pinaster* stands of northern Spain**
Mariola Sánchez-González, INIA-CIFOR, Madrid, Spain

**Meat me on the corner: 'Game' theory redressed in cyber clothing**
Johan Barstad, The Norwegian University College of Agriculture and Rural Development, Norway



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Developing empirical models for predicting production of lime tree flowers (*Tilia sp.*)

Derya Mumcu Küçüker, **Emin Zeki Baskent**, Burak Sari
Karadeniz Technical University, Faculty of Forestry, Turkey

*Tilia sp*. is one of the most important Non-Wood Forest Products (NWFPs) with soft and easily worked timber, herbal flowers and ornamental characteristics. The consumption of herbal teas of *Tilia sp*. is increasing due to the importance of the activity in preventing and treating diseases. Bark, flowers and leaves of *Tilia sp*. are the main utilization parts as NWFP. Lime tree flowers can be found in the markets as only flowers or flowers with bract.

*Tilia sp*. woodlands in Turkey is approximately 11.500 ha (OGM, 2013) and the potential of lime tree flowers is about 250 tons/year (OGM, 2004). However, unconscious picking and overharvesting of highly valued medicinal and aromatic lime tree flowers cause to endanger the future production capacity of lime tree stands. Therefore productivity or yield modelling of lime tree flowers has become a strategic importance in sustainable management of forest. Also, empirical yield models are indispensable tools to integrate the products into the multiple use forest management plans.

The primary objective of this study is to identify inventory method in lime tree flowers with and without bracts and model yield productivity of lime tree flowers in the Yeniköy planning unit, Turkey. In this stage, 30 sample plots were taken from the study area based on stratified sampling method. All the fruit bearing branches of 2-3 sampling trees within each plot were cut down and then all flowers and bracts were collected. The relationships between lime tree flowers yield and some predictors such as topographic and stand based parameters were analyzed with regression analysis. In this way, predicting the productivity of lime tree flowers was determined for the planning unit. These developed models can provide great opportunity in developing and implementing long term multiple use forest management plans particularly with decision support systems.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Yield models for wild mushrooms in *Pinus sylvestris* and *Pinus pinaster* stands of northern Spain

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In Spain there is a deep-rooted tradition of mushroom picking and trade. Hundreds of tonnes of edible forest mushrooms are sold annually in local markets, contributing to a significant economic activity of several million euros and settling the rural population to the forest environment. Mushroom production is often the main source of income obtained from our forests. For this reason Spain has led much of the research conducted so far on mushroom yield modelling covering a number of forest ecosystems. Several empirical models for predicting the production of wild mushrooms in different *Pinus* species stands have been already developed in north-central, and north-eastern stands, separately. In this study we will compile the existing dispersed mycological datasets to develop a joint mushroom yield model for northern Spain based on fungal production data from *Pinus sylvestris* and *Pinus pinaster* plots distributed between Catalonia and Castilla-León regions for the period 2008-2015. Different models will be developed for the following types of mushrooms: edible, marketed and non-edible. A non-linear mixed-effect (NLME) modelling approach will be used to take into account between-plot and between-year variation in mushrooms yields using stand attributes, soil and annual climatic variables as predictors. With these models we expect to improve our understanding on how the factors related to forest stand structure, soil characteristics and climate influence on wild mushrooms production.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Meat me on the corner. 'Game' theory redressed in cyber clothing

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Wild game harvesting has long traditions in Norway and is still an important element in rural livelihood and culture. Further a significant amount of meat, from more than 200 000 large carcasses, enter into the local food chains. Almost nothing exits, though, from the local level and into retail or restaurant business. Norway has a fairly well functioning market for distribution and sale of wild fish, and to some extent for products like cured wild meat, but none at all for fresh/frozen wild game.

A demand for such products exist, also outside of the hunting areas in rural Norway, but there are no pathways connecting meat to urban customers. Partly due to lacking traditions, poor logistics and to strict hygienic and safety measures from the Meat Control.

The world has seen an influx of smart apps aiming to connect producers/providers and clients/users. 'Ûber' and 'AirBnB' are two examples of such tools, using GPS and the potential of smart technologies overcome logistic challenges and establish direct contact between 'the most relevant actors'.

A multi and mixed methods strategy will be used, with the use of document studies, interviews and observation in a setting of dialogue meetings and development workshops

This paper aims to advocate the use of novel smart-phone/app technology. Developing share-based apps for wild food/wild products can be viewed as a modernization of traditional share-based cultures that still are alive in local hunting cultures. Thus a project such as this may show interesting pathways to integrate traditional customs with modern-day urbanity – as such a tool to improve linkages between the rural and the urban livelihoods

Secondary aims are to develop practical approaches for enabling apps to be viable and acceptable for both providers and customers, with a special focus on providing for the professional customer (restaurants and meat-shops).

Further, it is well known that the success of an app does not rely solemnly on its technical qualities alone. Less tangible factors also tend to dominate – like perceived usability, market penetration rate, links to, and piggybacking on parallel needs/demands and existing activities.

The paper will present results from the development period, with a focus on how the dialogue between the providers, the customers and the development capacities have been structured and carried out.



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## Session 3b: Social capital - collective action and collaboration

**Research in action – the essential role of stakeholders in the development of NWFP opportunities**
Jennifer LG Wong, Wild Resources Ltd., Bangor, UK

**Scouting social Innovation in the woods: collaborative strategies in Mediterranean non-wood forest products**
Isa Pelto, European Forest Institute – Mediterranean regional office (EFIMED) and University of Helsinki, Finland

**Social capital articulating moss picking in Wales: the role of networks and trust**
Elena Gorriz, Forest Sciences Center of Catalonia (CTFC), Barcelona, Spain and European Forest Institute – Mediterranean Regional Office (EFIMED)



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Research in action – the essential role of stakeholders in the development of NWFP opportunities

**Jennifer LG Wong**[1], Marelli Asamer-Handler[2], Emma Chapman[3], Antonia Dickson[3], Efa Doringer[4], Christine Fischer[5], Veronica Verdejo Paton[6], Bettina Wanschura[4], Maria Wildling[7]
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To be successful interventions in NWFP markets needs to be innovative, based in local realities and ideally benefit from the pro-active engagement of a variety of actors. Formal research can provide a framework with which to analyse the ecological and social context, theory which can help select the most promising avenues to achieve specific goals and case studies to inspire. Although this is invaluable in order for academic research to inform praxis it needs to be mediated by actors who need to be able to bridge the space between theory and local realities and engage multiple stakeholders in the implementation of an agreed intervention. In order to better understand these processes and to further explore the nature of NWFP innovation and institutional development StarTree included five case studies in which practioners explored the process of NWFP development using an action research approach. These case studies were development of product branding in Austria; scoping of opportunities for community forest owners in Wales, technological development for mushroom identification and monitoring in Castilla y León, supporting and developing existing initiatives for NWFP marketing in Scotland and development of a truffle development strategy in Catalonia. This paper reviews the lessons learnt from each of these case studies and consolidates these into general observations regarding the role of stakeholder participation and action research in particular in NWFP development.



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# Scouting Social Innovation in the woods: collaborative strategies in Mediterranean Non-Wood Forest Products

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In a context of fragmented forest ownership and diffuse NWFP harvesting, structuring the demand and supply of these products is challenging. The lack of critical mass entails efficiency problems for value chains and policy instruments, given large transaction and control costs, as well as the competitive global market pressures.

This situation could change by applying collaborative approaches where different actors establish cooperative mechanisms, such as associations, cooperatives, business integration, user-manager agreements, cross-municipality consortiums and business models of the like. These forms of collaboration are based on social capital of rural communities and constitute social innovations crucial for generating added value in rural areas. While this topic has been timidly studied in the timber sector, it has been often neglected in the analysis of NWFP value chains.

Framed within the theories of Social Innovation, this study aims at exploring the forms and evolution of collaborations in the NWFP value change. Semi-structured interviews and questionnaires were conducted for Spanish cases on wild mushrooms, cork, pine nuts, resin and truffle. We will present a mapping of the NWFP Social Innovations, their legal forms and implications, the key factors for their emergence and consolidation. Lessons learnt will be extracted for fostering this type of entrepreneurship.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Social capital articulating moss picking in Wales: the role of networks and trust

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Harvesting moss (assorted bryophytes) has been practiced for decades as a diversified livelihood strategy in West Wales & the Valleys (UK). The legal ownership of the moss lies on landowners (e.g. state and private owners), from whom pickers need to seek permission. In the absence of formal regulations, different permits for pickers have emerged as private agreements. After a period of environmental concerns in the early 2000s, no apparent conflict exists in the area, inviting a reflection on the functioning of the picking system. Given the scarce available knowledge on this activity, we explored the design and implementation of the picking agreements in the area.

Twelve in-depth interviews were conducted to enquire about: harvesting practices, ecological impacts, social context, permit agreements and their enforcement, as well as future prospects. Interviews were transcribed and analysed using a deductive-inductive approach.

Our results show that while permits are essentially the same for public and private woodlands, they differ in how they are set up and procured. Harvesters' licenses on state forests give exclusive rights in certain zones and are allocated through annual bureaucratic processes. In private forests, instead, permits are allocated through restricted auctions which formalise into face-to-face agreements.

Informants across the value chain and regulatory bodies highlighted the importance of personal relations in the sustainable harvest of moss: a reputation created after years of picking predisposes land managers to renew harvest rights to the same pickers, who in turn commit to careful picking. The lack of ecological concerns is justified by the regional-scale spatial zoning of harvest areas, pickers' traditional ecological knowledge, the "esoteric" character of the value chain, specialized hand work, and pioneer ecology of some commercial moss.

From an institutional design perspective, permits are zonal and based on theoretical harvest quotas. The low level of field policing has three main implications: the reliance on pickers' reports of harvested amounts, the development of informal sanctions among pickers, and the perception of symbiosis through pickers informing authorities of infractions in the forest.

Imposition of the "Woodlands & You" policy has changed traditional harvest permits in public forests into a more open and bureaucratic allocation, which is not supported by pickers. However, in a context of loss of suitable moss harvest locations, shedding more light on the relevance of moss picking could induce land managers to take moss into account within their management regimes, to guarantee future rural income streams.



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## Session 4a: Silviculture

**Optimizing the management of cork oak stands in Spain**
Presented by Maria de la O Sanchez Gonzales on behalf of María Pasalodos, Dep. Selvicultura y Gestión Sistemas Forestales, Centro de Investigación Forestal, Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA-CIFOR), Madrid, Spain

**Effect of thinning on mushroom productivity and diversity**
Sergio de Miguel, Departament de Producció Vegetal i Ciència Forestal, Universitat de Lleida-Agrotecnio Center, Spain

**Linkages between mushroom production, forest growth and climate in Mediterranean *Pinus pinaster* stands**
Juan Pemán, Departament de Producció Vegetal i Ciència Forestal, Universitat de Lleida-Agrotecnio Center, Spain

**Cone production in *Pinus pinea* forests facing climate change: proposals for adaptive management**
Rafael Calama, INIA-CIFOR, Madrid, Spain

**Silviculture guidelines for *Pinus pinea* management for cone production in Portugal**
João Freire, Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal


This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Optimizing the management of cork oak stands in Spain

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*Quercus suber* L. is, together with *Pinus pinea* L., the most important multipurpose tree in Spain. Its main product is cork, which is the outer bark of the cork oak very appreciated for presenting good properties in terms of elasticity, impermeability and termal insulation. Moreover, cork is also one of the most representatives NWFP from Mediterranean forests, providing revenues of 325 million of euros at the European level, Portugal and Spain being the countries with the higher amount of hectares of this specie. In general cork oaks are debarked at regular periods of time which vary from 9 to 14 years depending on the area. However, these debarking periods are mainly based in tradition and expert knowledge but no quantitative analyses have been carried out in Spain in order to set them. In this study the main aim is to analyze how different factors can influence the optimal management of *Quercus suber* stands. Among the factors considered we found economic (discounting rates, cork prices) and stand-related factors (cork thickness). The methodology employed consists in an optimization-simulation system where the existing growth and yield models for *Quercus suber* are implemented together with and optimization algorithm. The results show the influence of the above mention factors on the optimal management of *Quercus suber* stands and allow deriving recommendations that will improve the management of these stands.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Effect of forest thinning on mushroom productivity and diversity

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Edible mushrooms, which represent important non-wood forest products worldwide, are mostly mycorrhizal fungi living in intimate association with host trees in forest stands. Changes in stand structure along with differences in meteorological and site conditions are likely to affect fungal dynamics and, hence, mushroom yield and diversity. While other environmental drivers cannot be controlled by land managers, stand structure can be modified by means of forest thinning operations. The aim of this study is to shed light on the short- to medium-term impact of thinning on fungal yield and diversity. For this purpose, 28 experimental plots established on pine stands in Catalonia (NE Spain), representing a gradient of thinning intensity in stand basal area ranging from 0 (i.e., control plots) to almost 80%, were monitored since 2008 to present. During this 8-year period, mushroom yield and diversity data were collected weekly in every plot during autumn in order to assess the influence of thinning intensity on mushroom dynamics over time. Additionally, several soil samples were extracted to analyze the thinning effects on fungal mycelia. We found an immediate positive impact of light thinning on the provision of key edible mushrooms, mainly due to the extremely positive reaction of *Lactarius* group *deliciosus* fungi (and especially *Lactarius vinosus*) to tree and understory removal, which represent the most marketed group of mushroom species in NE Spain. This effect gradually fades away from the first to the third year after thinning. Interestingly, we also found a negative influence of heavy thinning on both aboveground and soil extramatricial mycelia (EMM) productivity of *Lactarius vinosus*. Furthermore, thinning seems to have a slight negative impact on mushroom species richness and diversity. Regarding functional diversity, thinning increased the abundance of ectomycorrhizal mushrooms and decreased the biomass of saprotrophic sporocarps. This study discusses plausible ecological reasons behind our findings.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Linkages between mushroom production, forest growth and climate in Mediterranean *Pinus pinaster* stands

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Edible mushrooms represent one of the most valuable non-wood forest products worldwide. Indeed, edible fungi can be worth as much as (and even more than) timber in many areas where forest productivity is low. Mediterranean forests are characterized by such low productivity values and there mushroom production experiences huge variability both between years and between sites. Diverse environmental drivers cause these variations. Climate is a key factor affecting fungal fruiting, but it does not explain entirely mushroom emergence. Furthermore, most edible mushrooms are mycorrhizal fungi that depend on the allocation of carbohydrates from the host trees to fungi. Thus, both radial tree growth and mushroom yield are conditioned by the amount of carbohydrates produced by the trees. In turn, carbohydrate synthesis and storage are driven by different environmental factors (e.g., temperature, humidity, solar radiation). Yet, the responses of forest growth and mushroom production to climate may differ among tree and fungi species, forest types and site conditions. The aim of this research is to contribute to describing and explaining these relationships by providing further insight into the linkages between mushroom production, tree growth and climate. This study was conducted in a Mediterranean *Pinus pinaster* forest located in Catalonia (NE Spain). Annual tree growth and mushroom yield data were collected from 28 experimental plots using dendrochronology and weekly mushroom inventories for the period 2008-2014. Climatic information was gathered from the closest climate stations. We found that mushroom production increased with wet conditions during summer and autumn. Earlywood and latewood production presented different growth patterns and responded positively to wet spring and late-summer conditions, respectively. The sensitivity of both seasonal wood formation and mushroom production to water availability suggests that warmer and drier late-summer conditions would decrease both processes, mainly in areas characterized by severe summer droughts as Mediterranean forests.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Cone production in *Pinus pinea* forests facing climate change: proposals for adaptive management

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Context: Forests in the Mediterranean basin are among the most vulnerable ecosystems facing climate and global change. Increments in temperatures, decreases in precipitations and occurrence of severe drought episodes are expected under these new scenarios, resulting in severe impacts on both the health of the forests as well as on the provision of Ecosystem Services. *Pinus pinea* forests in the Spanish Northern Plateau, currently occupying a limiting area due to low precipitation and intense continental climate, are expected to show processes of growth stagnation, decay, and a severe decrease in cone production, the main commercial product obtained from these stands.

Aims / research questions: The main aim is to estimate the expected provision of ecosystem services, with special attention to cone and nut production, through a productive cycle for a representative stand of *Pinus pinea* L. in the Northern Plateau. Different management alternatives would be compared under different climate scenarios, in order to provide optimal adaptive management schedules maximizing cone production.

Methods: A pure, even-aged, representative stand of *Pinus pinea* in the Northern Plateau at pole stage was chosen as case study. The new annualized version of the integrated tree level model PINEA2, including climate-sensitive submodels for annual growth and cone production was used to forecast the evolution and the provision of Ecosystem Services – cone and nut production, timber, fuelwood, CO2 fixation, structural diversity – through a whole 100-years productive cycle. Business as usual management was compared with a proposed alternative management under three different projected climate scenarios: current climate and two alternative RCP scenarios.

Results & conclusions: Most severe climate scenarios results in a significant reduction of tree and stand vigour, growth capacity, and both cone and timber production. New proposal for adaptive management, based on early intensive silviculture, maintenance of low stocking densities and enlargement of rotation length would, in part, mitigate these negative effects.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Silviculture guidelines for *Pinus pinea* management for cone production in Portugal

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Portugal is at the moment the country with the second largest area of stone pine (*Pinus pinea*), after Spain. According to the last NFI (2010) the present area of stone pine stands is 173 716 ha. The Iberian Peninsula accounts, approximately for 75% of stone pine distribution. Due to its favourable site and climate conditions Portugal has, on average, higher cone yields per unit of area than Spain, being usual, in bumper crop years, adult trees and stands having, respectively, more than 500 kg and 6 tons of cones per hectare.

The aim of this work was to compare for each stand development stage different stand structures in terms of cone production per hectare.

The analysis of cone production for more than seven years in permanent plots established in stands with different ages and competition conditions showed that cone production per hectare and cone quality decreased in stands with high basal area which corroborated the variables selected in the Pinea.PT cone weight model.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Session 4b: Institutions and innovation support II

**Non-timber innovations an innovation system analysis for the side-activities of forestry**
Gerhard Weiss, University of Natural Resources and Life Sciences, Vienna, Austria

**Who owns wild forest products in Europe?**
Presented by Cosmin Cosofret on behalf of Laura Bouriaud, Stefan cel Mare University of Suceava, Romania

**Non Timber Forest Products Linguistic Diversity. The case of mushrooms**
Kalliopi Stara, University of Ioannina, Greece

**The practice of entrepreneurship in the non-wood forest products sector: Support for innovation on private forest land**
Alice Ludvig, University of Natural Resources and Life Sciences, Vienna, Austria

**Innovating in the transition forestry: cases of non-timber forest products innovations in forestry sector in the South-East Europe**

Jelena Nedeljković, University of Belgrade, Faculty of Forestry, Serbia



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Non-timber innovations: an innovation system analysis for side activities of forestry

**Gerhard Weiss**, Alice Ludvig, Ivana Zivojinovic, Patrick Huber
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Non-timber forest products are often presented as a potentially promising but neglected business field of forest holdings. Thus they are often termed “side-products”, “niche markets” (Mantau et al., 2001) or even “non-market goods (Mavsar et al., 2008). As a result, the field of non-timber products and related business opportunities are hardly visible and recognized, although they seem to be bigger than often thought (Wolfslehner and Vacik, 2009).

The problems behind why the assumingly bigger potential is partly neglected include, first, a limited marketability, connected to the often found public good character of such products (Mantau et al., 2001; Mavsar et al., 2008) but, second, also a limited attention of established sectoral innovation systems, thus providing only limited support of or even barriers against their development (Rametsteiner et al., 2005; Weiss et al., 2011; Buttoud et al., 2011). The proposed paper starts from the second observation and aims to analyse with empirical examples what this unfortunate environment means for innovations. How do they come about? What support and what barriers exist?

For the research questionnaires have been sent to and interviews have been conducted with central innovation system actors and with innovators in specific innovation case studies. As a result, it can be said that there is no “one” innovation system supporting non-timber products but support is given through certain programmes from several sectoral innovation systems, including forestry, agriculture and nature conservation.

When actors and support organisations are grouped according to types of organisations, most actors belong to regional level organisations. Also the products are often of specific regional relevance. An important policy implication thus is that sectoral support programmes should provide for sufficient leeway to flexibly adapt to local products or other local specific needs. The cross-sectoral characteristics of many of these products seem to be furthermore the reason for direct barriers because of a competition between the involved sectors – forestry, agriculture and nature conservation (Buttoud et al., 2011). The forestry sector seems to be hesitant in supporting activities which may benefit other groups than the land owners – these products are often for the benefit of processing companies, conservationists or the broad public.

Finally, an indirect barrier is found in the fact that non-timber forest products are a side-activity of any relevant sectors which leads to a “blindness” of the institutional system towards these products: a lack of statistics, specific research, education and training programmes and focussed support structures are the result.



This project has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Who owns wild forest products in Europe?

**Laura Bouriaud**[1], Irina Prokofieva[2], Liviu Nichiforel[1] et al.
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The recent emphasis on wild forest products rises the question of rights to access, harvest and commercialize these forest products that often follow a different ownership regime than the forestland to which they are attached. We have studied the property rights structure on 59 different wild forest products harvested in 14 European countries and regions. The property rights system was studied in each region for one to seven different wild forest products and for four categories of forest ownership: private, State, municipal and community forests. Each wild forest product was considered individually and characterized by a number of variables derived from Schlager and Ostrom (1992) frame that differentiates five type of rights: access, withdrawal, management, exclusion and alienation. We have introduced also the variable "type of harvesting", e.g. for personal consumption or for trading purposes (commercial harvesting) as a relevant indicator of potential entrepreneurial activities.

To further identify commonalities and differences in property rights structure, we have applied a multi-correspondence analysis (MCA). The first two dimensions, explaining 22% of the variance, are determined by the variables related to exclusion, distinction between commercial and personal use and the presence of harvesting quota for the wild forest product. We have discussed these findings in relation to intrinsic characteristics of the wild forest product, e.g. exclusivity and rivalry, but also in relation to the physical and legal means to either enforce the link between the wild forest product and the forestland ownership, either to clearly separate ownership on wild forest products from forestland ownership.



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## Non timber forest products linguistic diversity: the case of mushrooms

**Kalliopi Stara**, Jose Antonio Bonet, Jennifer Wong, Mersudin Avdibegović, Johan Barstad, Laura Bouriaud, Danut Chira, Bryan Dickinson, Simon Egli, Peggy Ehrlich, Birutė Karpavičienė, Tine Grebenc, Mike Hale, Jiri Kadlec, Dragan Karadžić, Jonas Kasparavičius, Ljiljana Keča, Nenad Keča, Henn Korjus, Miroslav Kovalcik, Irmgard Krisai-Greilhuber, Ivana Kušan, Dinca Lucian, Lilja Magnúsdóttir, Pablo Martín-Pinto, Juan Martínez de Aragón, Virginie Molinier, Vivika Kängsepp, Henn Korjus, Derya Mumcu Küçüker, Michael Nahm, Vaska Nedanovska, Teodor Nedelin, Juan Andrés Oria-de-Rueda, Ervin Rasztovits, Marcel Riedl, Kauko Salo, Celeste Santos e Silva, Jonathan Sheppard, Nicola Sitta, Paweł Staniszewski, Maria T. Stoyanova, Edoardo Suriano, Antonio Tomao, Philipp Toscani, Toms Zalitis, Željko Zgrablić

COST Action FP-1203 ”Non-Wood Forest Products” (http://www.nwfps.eu/)

Mushrooms have a special position in many cultures where they are used as food, medicine, handicrafts, have special cultural significance as symbols or in rituals and are a motivation for forest recreation. However, there is also a dark side to mushrooms which are also associated with poisoning, decay and death. This dichotomy is reflected in the separation of mycophilic (mushroom-loving) and mycophobic (mushroom-fearing) cultures. The aim of this research is to examine the diversity and coherence of European mushroom cultures through the lens of linguistic analysis of mushroom names focusing on (a) names for two ubiquitous, wild mycorrhizal mushrooms common and commonly used across Europe (1) the cep (*Boletus edulis*) and (2) the chanterelle (*Cantharellus cibarius*) and (b) "national" mushroom species, which are culturally significant within countries. Collection of names was undertaken by the members of COST Action FP1203 Working Group 1 - Mushroom and Truffles. All names including dialect variations and synonyms, the literal meaning of the name and etymology were recorded. To date, we have collected more than 1,400 names from 28 countries. The cep is represented in our results with almost 300 names and the chanterelle with more than 400 names, while 41 other species are mentioned as "nationally important". Concerning the use, most species mentioned are characterized as edible with few references to commercial, poisonous, medicinal or handicraft material. Our next step is the classification of these names to different folk categories, which would group names according to whether they refer to: habitat description, colour, shape, relation to persons or animals etc. We hypothesize that the number and diversity of names is an index of the extent to which a culture is mycophilic or mycophobic. Furthermore transference of names from one language to another should reflect the changing nature and extent of homogenisation of European mushroom cultures.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# The practice of entrepreneurship in the non-wood forest products sector: support for innovation on private forest land

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The paper sets out to examine the characteristics of support for innovation processes in Non-Wood Forest Products (NWFP). The typical enterprises and start-ups which emerge in this sector tend to be small-scale and family owned. We claim that there is a large unused potential for NWFP to support rural development and increase incomes of land owners and rural enterprises. In this article, we study what makes selected and so far successful product innovations in NWFPs special and subsequently what were the factors that supported their development and marketing? These questions we study at hand of four empirical innovative case studies in four European rural areas. We come to the conclusion that the entrepreneurs show some common features in the ways they started their business. However, they have applied individual strategies for the realisation of their own ideas. In line with recommendations from recent literature on creating innovations, all of them have used some “external” support, but at very different levels: They range from monetary support and consultation of effective support organisations to personal non-monetary exchange-relationships in social networks within a communal area. Our results contribute to an understanding of entrepreneurial behaviour as a very individual and context-specific undertaking on the one hand and as a “universal” activity with common features and attributes on the other.



This project has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Innovating in the transition forestry: cases of non-timber forest products innovations in forestry sector in South-East Europe

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Driven by political and economic reforms, forestry sectors in selected South-East European (SEE) countries (Slovenia, Serbia and Macedonia) faced the changes in last two decades, which resulted in increment of private businesses development. Many of those entrepreneurial businesses become innovative in the sphere of various forest goods and services, such as non-timber forest products (NTFPs), whose role have been neglected over time and their full potential is still under estimated. Therefore our aim was to analyse how innovations arise and are developed in such 'under-developed' innovation systems in selected countries? For the purpose of this research, we conducted semi-structured qualitative interviews with the people responsible for selected innovative business. Interviews were related to the issues of the idea and product development, the firm foundation, the supporting and hindering factors and actors in the entire process of business development. For understanding the framework conditions, we interviewed representatives of organisations in-charge for NTFP-based enterprises. Results show that several national policy programs (e.g. in the field of SMEs, forestry, and nature protection) form a framework for NTFPs innovation support. However, in all selected countries, there are no policies specifically tailored for NTFP-based innovation. Analysis showed how such innovations occur in the systems where both innovations and NTFPs-based private business are novel to the forestry institutional settings. Analyzed innovations are developed solely by the owners and their personal ideas, in which most information and finances are coming from the business itself. Different modes and levels of cooperation had an effect on the development of these success cases. Innovation systems in selected countries are under development and did not significantly contributed in development and running of those businesses. Lessons provided by these cases can be significant for strengthening existing NTFP and forestry innovations systems foster its effectiveness in future.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Session 5a: Perceptions and Knowledge

**Perception of harms and property rights shapes private forest owners views on wild mushroom picking policies**
Elena Górriz-Mifsud, Forest Science Center of Catalonia (CTFC), Barcelona, Spain

**Collection and consumption of wild forest products in Europe**
Marko Lovric, European Forest Institute

**The forest owners' view on berry and mushroom picking on private land**
Veera Tahvanainen, Natural Resources Institute Finland

**Non timber forest products: An ethnomycological study on mushroom knowledge in the Waldviertel, Austria**
Irmgard Krisai-Greilhuber, Dept. of Botany and Biodiversity Research, University of Vienna, Austria

**Sabores de bosques sostenibles**
Ana Belén Noriega, PEFC ESPAÑA, Madrid, Spain



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Perception of harms and property rights shapes private forest owners views on wild mushroom picking policies

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Wild mushroom picking counts with a market, recreational and touristic value, and their productivity could be modulated through micosilvicultural practices. In Spain, wild mushrooms legally belong to the landowner, who seldom captures part of that value and hence counts with little incentives to address forest management towards an optimized fungal production. Based on the 440 replies to a survey to private forest owners in Catalonia (north-eastern Spain), we statistically analysed their experience with pickers in their holdings, their policy preferences and their willingness to engage in a mushroom reserve.

Besides the broad support to the introduction of a regulation encompassing picking norms, our results show that forest owners counting with a management plan, expressing perception of larger harms and of private rights over mushroom picking tend to support more the establishment of a picking fee system. Respondents supporting a picking fee, with larger harms' perception and closer to provincial capitals show larger eagerness to establish a mushroom picking reserve with their neighbours. Forest owners making a living from the primary sector or working in rural tourism, going more frequently to their forest, and perceiving larger congestion of pickers in their property tend to perceive larger harms. Mushroom productivity jointly with restrictions to forest access have been found as predictors of perception of pickers' congestion.

These findings guide policy makers about the factors for policy design in view of potential engagement.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Collection and consumption of wild forest products in Europe

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The national systems of reporting on the marketed WFP are fragmented and cannot be considered as representative, as an important share of WFP is traded in informal markets and collected for personal use. Thus, the social and economic importance of WFP is in most cases underestimated.

In order to tackle these issues a Europe-wide survey has been undertaken, with a goal of assessing the collection and consumption of WFP. The survey was conducted in all European Union countries, Serbia, Turkey and the European part of the Russian Federation. Unit of analysis is a household, where the minimal national sample sizes have been defined with 95% confidence level and 5% confidence interval. Categorization and listing of wild forest products has been based on the feedback of experts covering different parts of Europe. The final list of WFP was composed included 45 products for the section on collection and 14 groups of WFP for the section on consumption. The survey was based on panel data design.

Distribution of the survey resulted with 19665 respondents, which is almost triple of the minimal sample size. Results show that 32% of all households have collected WFPs during 2015. The most frequently collected group of WFP is wild berries (77%), followed by wild mushrooms (71%) and wild medicinal and aromatic herbs (53%). The most frequently collected WFP per group are cones, Penny buns, Summer truffle, Blackberries, Wild garlic and Birch sap. Quarter of all the households whose members have collected WFPs during 2015 also are forest owners, and more than half of them have annually went between 3 and 12 times to forest in order to collect WFPs. Half of them did not experience any major problems during the collection of WFP, while the main constraints were bad weather (22%) high competition with other pickers (15%). Fresh or dried nuts is the most frequently consumed group of WFP (72%), followed by fresh berries (59%) and dried, frozen or prepared wild berries (48%).



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# The forest owners' view on berry and mushroom picking on private land

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In Finland the picking of berries and mushrooms from the private land, regardless of background of a picker or the purpose of picking, is allowed by the Everyman's rights. During the past decade the commercial berry picking has become more organized and alienated from the local traditional picking habits. The predicted increase of commercial berry and mushroom picking may increase the utilization of private land for picking. Past development and future expectations have resulted in public discussion on the acceptable boundaries of Everyman's rights. The aim of the study was to find out the forest owners opinion on Everyman's rights in berry and mushroom picking to understand the socially acceptable terms for berry and mushroom picking on private land. The questionnaire was sent to 2000 forest owners in North Karelia and Kainuu regions in January 2015. Half of the questionnaires had specific questions on berry picking and half on mushroom picking. The response rate was 48 %. According to the results most of the forest owners were satisfied with the Everyman's rights regarding berry and mushroom picking. They did not express a need to restrict traditional picking for household use. Conversely for the organized commercial picking some restrictions were in demand, especially if the picker was foreigner or non-local. In addition, the idea of publishing berry and mushroom yield maps from their forests was objected. According to the forest owners the acceptability of berry and mushroom picking could be advanced through dialogue between forest owners, berry and mushroom enterprises and pickers and also by creating commonly formulated picking instructions for pickers. For the sake of acceptability of the business it is important to take into account the expectations of forest owners on the matters concerning their premises.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

# Non timber forest products: an ethnomycological study on mushroom knowledge in the Waldviertel, Austria

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A qualitative and quantitative ethno-mycological study was conducted during summer 2015 to survey the knowledge about mushrooms as well as the collecting behaviour of the population of the Waldviertel (Austria), located in the northwest quarter of Lower Austria. Altogether 98 persons participated in the study and completed an online-questionnaire concerning mushrooms. Additionally, three qualitative and semi-structured interviews with local experts of fungi were conducted. Generally, following aspects were investigated: origin of knowledge about fungi, collecting behaviour, knowledge about edible and toxic fungi, their possibility of confusion and legal backgrounds. Furthermore, the study focused on the social impact of the nuclear explosion in Chernobyl that took place in 1986. It reports if the nuclear catastrophe had any influence on the collecting behaviour of the test persons. The study participants were divided into three different age categories: children and teenagers (10-19), young adults (20-29, grown up with internet), adults (30-100, grown up without internet). In fact, the participants in the age category between 30 to 100 years showed the best results. Altogether 41 edible mushroom species were mentioned, of which 26 were also collected. *Boletus edulis*, *Cantharellus cibarius* and *Macrolepiota procera* were the three most-known and also most-collected species mentioned. The generation that was affected by the nuclear incident on average quit collecting mushrooms for two to three years. All in all, it can be claimed that the survey revealed the great importance of the older generation for transfer of knowledge of mushrooms as natural forest products as they were the best informed.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919

## Sabores de bosques sostenibles

**Ana Belén Noriega**, Marta Salvador, Arantza Pérez Oleaga, Araceli Muñoz, Pablo Narvaez, Esperanza Carrillo
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Sabores de Bosques Sostenibles, es un proyecto desarrollado por PEFC España con la intención de dar a conocer el bosque a través de sus sabores. Su objetivo es promover los productos certificados PEFC en el sector alimentario, difundiendo el valor de la certificación forestal como herramienta para la mejora de la competitividad de los productos silvestres en los mercados.

El proyecto partió del Estudio “Desarrollo comercial de productos silvestres a través de la gestión forestal sostenible.” basado en una encuesta a los responsables de 76 restaurantes, y a gerentes y directores comerciales de 75 empresas de productores además de entrevistas realizadas a expertos del sector gourmet. A continuación se editó la “Guía Sabores de bosques sostenibles” dirigida a que productores, recolectores, transformadores y comercializadores en la que se da a conocer los productos de origen silvestre y qué valor añadido les aporta la certificación PEFC.

Dicho estudio reveló el excelente nivel de aceptación de los productos forestales certificados por parte de la alta restauración española. Un 81,6% de los grandes chefs españoles cree que sus clientes valorarían la presencia de productos silvestres sostenibles en sus platos. Los encuestados creen que la certificación podría ofrecer garantías de trazabilidad al consumidor y mejorar la comercialización de estos productos.

Como resultado el libro de cocina “El bosque en tu paladar”, une la gastronomía con el mundo forestal. En sus páginas, el lector encontrará productos, técnicas y propuestas prácticas para desarrollar una “cocina sostenible” con aroma a bosque. Además de dar a conocer algunos de los manjares que esconde el monte, sus aplicaciones culinarias y la importancia de su aprovechamiento sostenible, el libro propone una veintena de recetas basadas en productos que ofrecen múltiples posibilidades en cocina y repostería: hongos, trufas, plantas aromáticas, piñones, castañas, miel, jamón ibérico criado en dehesas, etc.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 311919