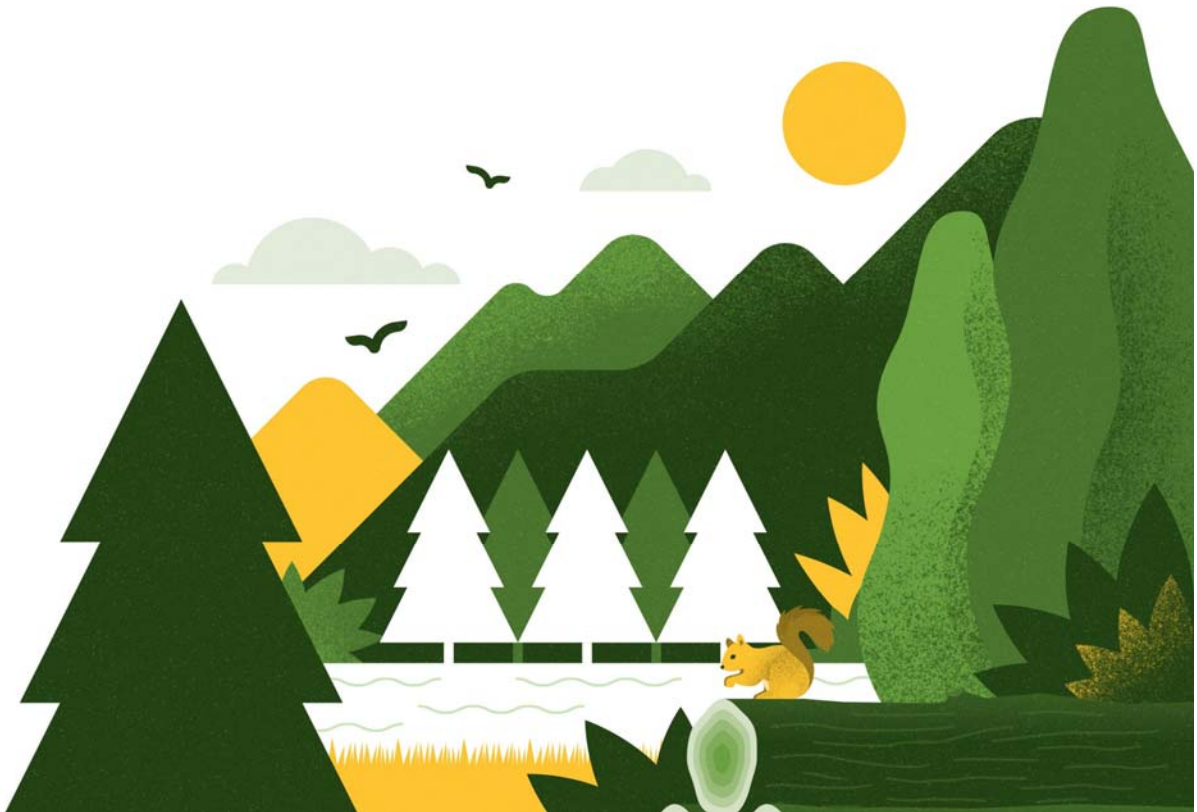
IUFRO2020 Conference

The socio-economic and socio-ecological value added of small-scale forestry in the bio-economy

7th – 8th October 2020

Abstract Book



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Welcome to the IUFRO conference: The social and ecological value added of small-scale forestry to the Bio-Economy

Bioeconomy “encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy” (EC, 2012). It includes forestry and wood production, with the related biotechnological, chemical and energy industries, but also the provision of other ecosystem services that can support sustainable economic growth. “Bio-refineries are increasingly at the core of the Bio-Economy vision at the EU level and worldwide” (World Bio-Economy Summit, 2015). Large private and public investments actors are mainly focused on capital-intensive investments based on low cost biomass in vertically integrated value chains, where the perspective of the social or ecological value added often lacks behind. As counterpart to this mainstream economic trend, we intend to focus our interests towards small-scale labour-intensive activities in the bio-economy context, including the non-wood products and cultural services, as they seem to have a minor role in the discussions of scientists and decision makers.

In the IUFRO Conference we thus want to put our focus on interpreting and promoting the impact of forest bio-economy on the development of quality product markets and nature-based services and the concepts behind them: social innovation, product diversification, multifunctionality and the value added network of vertically and horizontally integrated economic stakeholders. The extension of the economic paradigm towards social and ecological value added, leads us to the need for considering the associated trade-offs or opportunity costs. But the challenges of climate and socio-demographic changes, coupled with complex and dynamically changing political and socio-economic situations underpin the relevancy to transform our business thinking. Porter and Kramer’s (2011) shared value approach may support this mental shift.

This book of abstracts presents research proposals, project results and conceptual approaches that demonstrate how to support such enlarged interpretation and the development of forest Bio-Economy, inclusive the various facets of social, ecological and economic added values and their trade-offs, generated by multifunctional managed forests and the downstream industries purchasing, processing and selling timber and NWFPs.

The conference is organised in cooperation with the IUFRO Unit 4.05 “Managerial Economics and Accounting” and the IUFRO Task Force: unlocking the bioeconomy and non-timber forest products, with the involvement of Subunits 4.05.02 “Managerial Economics", 4.05.04 “Forest-based Value Chains" and 4.05.05 “Social Innovation and Entrepreneurship”.

Christian Hoffmann and Davide Pettenella

We gratefully acknowledge the support of our partners

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09.05 - 09.10	**Roland Psenner**, President of Eurac Research
09.10 - 09.15	**Günther Unterthiner**, Director of the Forestry Department Province of Bolzano - South Tyrol
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ABSTRACTS OF THE CONFERENCE

Keynote speakers

Contemporary innovations within the European forest-based bioeconomy: which perspectives for small-scale forestry?

Laura Secco[1], Mauro Masiero[1] and Elena Pisani[1]

[1] University of Padova, Land Environment Agriculture and Forestry Department

Innovation is often considered as an all-purpose answer to overcome emerging challenges and tackle wicked problems, included the development and implementation of effective forest-based bio-economy strategies within the current climate and biodiversity crises. When referring to innovation in forestry and forest-based bio-economy in Europe, dominant discourses, scientific publications and European funding programs mostly refer to technological innovations, large-scale industrial investments and internationalization processes. They include innovations in e.g. bio-chemicals, nanocelluloses and other bio-products, wood construction technologies, engineered green products, high-tech harvesting and marketing techniques, digital instruments for remote monitoring and control and others industrial firms-driven and business oriented production and commercialization processes. These innovations are often developed by individual large wood/paper industries, covered by patents (or other tools for protecting private knowledge) and applied by single private transnational corporates seeking at increasing their competitiveness in the global market. The majority of micro- and small-scale forest companies and enterprises, especially if they are not members of organized/structured networks, have limited capacities in adopting these types of innovation, as they require significant financial investments on infrastructures and industrial plants, abilities to create economies of scale, internationally recognized profiles and robust entrepreneurial talents.

Other contemporary common innovations in forestry include organizational and institutional innovations, linked to actors' networks driven and co-created innovation systems. These innovations systems on the one hand offer excellent opportunities of knowledge exchange, collaboration/networking and creation of a critical mass for production and marketing also to small-scale forestry companies in a specific sector or region, e.g. through the activation of private-public partnerships. On the other hand, institutional innovations such as policy reforms – which are fundamental for the system to be more functional and effective – are sometimes difficult to be implemented because of the little adaptation capacities and transformation attitudes of many public administrations and authorities.

More recently, social innovation is emerging as a promising approach in forestry, including at small scale, as it requires investments in intangible forms of capital, such as human and social capitals and their related soft skills. Social innovation has been defined – among others - as the reconfiguring of social practices in response to societal challenges seeking at enhancing outcomes on societal well-being and that necessarily includes the engagement of civil society. In this approach, knowledge is typically co-created and open access, shared by the involved community and beyond. Fields of application include e.g. revitalization of forest-based local traditions and heritage, creation of short and trustful value chains between producers and consumers of non wood forest products, community engagement for wildfire risk management and many others. While technological-oriented innovations are mainly designed for

promoting traditional forest products (timber, paper and pulp and derived products), social-oriented innovations appear as particularly appropriate for supporting the development of local economies based on other forest ecosystem services, such as recreation, landscape maintenance of new social uses of forests (e.g. forest bathing and forest therapy for human health care).

The presentation aims at providing an overview of how and to which extent contemporary innovations in Europe may contribute to small-scale forestry, stimulating reflections and discussions among participants. A special attention is given to the future perspectives delineated by the 2021-2027 European research and innovation agenda currently under development.

The forest-based (circular) bioeconomy: a globally mainstreamed narrative or a locally tailored strategy?

Dalia D'Amato[1]

[1] University of Helsinki & Helsinki Institute of Sustainability Science

The circular bioeconomy is emerging as a globally mainstreamed sustainability narrative, meaning a macro-concept proposing replicable/scalable solutions aimed at reconciling human prosperity and other social and ecological goals. Large part of the forest-based circular bioeconomy narrative is currently dominated by technology-oriented circularity of biomass-intensive large-scale activities, with particular emphasis on sectoral renewal and economic development. Responding to the multiple needs of other key societal actors, including small-scale forestry and SMEs, requires a complementary vision for a circular bioeconomy which emphasizes social innovation, quality product- and services- based markets, labour-intensive horizontal chains, system sufficiency and local participation. Measures needed to enable this transformative potential include, inter alia, developing policies and investments for the upscaling and competitiveness of radically sustainable products and services, fostering inter- and cross-sectoral collaboration and compatibility, leveraging changes in forest values and market preferences, improving stakeholder participation and awareness. Multiple societal actors, including researchers, contribute to shape the conceptual development of sustainability narratives and consequently influence the practical implementation and tailoring of the forest-based circular bioeconomy to specific contexts.

Bioeconomy and Small-Scale Forestry: Historical Perspectives and the Potential for Non- Wood Forest Products

Donald G Hodges[1]

[1] Professor and Head; University of Tennessee; Department of Forestry, Wildlife and Fisheries, USA
Coordinator; IUFRO Division 4, Forest

Profitability in most economic sectors can be influenced significantly by the level of production, more specifically by economies of size and scale. Efficiencies ca be realized in most production processes, to some extent, through identifying the optimum 'plant size' for the unique circumstances each producer faces. The forest sector is no different. Most traditional forest products sectors such as lumber, pulp and paper, and panelling have been transformed over time from many small production facilities in a market to a much smaller number of producers, with overall production increasing at the same time. Similar trends are being experienced in many of the emerging bio-based energy sectors as well. The question remains as to the role that economies of size and scale will play in the non-traditional forest-based sectors of the bioeconomy. Specifically, will small- and mid-sized enterprises (SMEs) be important actors in these sectors in the future? To address this question, this presentation examines the history of many of the traditional forest sectors, using the U.S. South as a case study. Differentiating between the concepts of economies of size and scale, those characteristics such as technological advances and specialization most significant in the evolution of these industries are identified and then evaluated for their potential effect on Non-Timber Forest Products (NTFPs). While efficiency gains in NTFPs through economies of size and scale are likely to exist, opportunities should continue to exist for SMEs to maintain an important role in the sector.

Hidden in plain sight: value of non-wood forest products in the European bioeconomy

Marko Lovric[1]

[1] European Forest Institute

Many Non-Wood Forest Products (NWFPs) such as mushrooms and berries are collected across Europe. Their use is not only linked to consumption, but also to recreation, rural income and of cultural heritage. This activity is under-reported in national statistical reports, and current level of scientific research only indicates their great European-level importance though a wide array of case-study and country-level findings. In this study we aim to rectify this gap by conducting a statistically representative survey in 28 European countries with over seventeen thousand respondents, where we look at consumption and collection of NWFPs within a single year. We show that 90% of European households consume and 26% of them collect NWFPs. Based on prices that collectors receive, estimated value of NWFPs collected in a year amount to 71% of value of the roundwood removals; which is ten times more than the official national statistical accounts report. The main reason behind this discrepancy can be traced to the fact that more than three quarters of collected NWFPs are consumed within the household, and thus are not marketed. We also develop a typology of recreational, hobby and professional collectors, whose characteristics vary across socio-economic variables and geographical gradient. The general trend is that collected weigh, number of collected products and contribution of NWFPs to income increase from the West to the East of Europe.

Competing Goals Dilemma in forest-based Bio-economies

Tobias Stern

University of Graz, Institute of Systems Sciences, Innovation and Sustainability Research

Bio-economy and associated terms (e.g. circular bio-based economy) have been increasingly used and discussed (Staffas et al., 2013). Forestry, as well as agriculture, are both frequently mentioned as important sectors to be included in a vision of a future bio-economy (Langeveld et al., 2010). According to OECD (2006) the concept of bio-economy can be defined as "transforming life science knowledge into new, sustainable, eco-efficient and competitive products". Therefore, innovation plays a crucial role when realizing the vision of a bio-economy. However, potential impacts of innovations are hard to assess considering uncertainty and interrelations. In addition, the objectives underlying the different definitions and visions of a bio-economy are divers as well.
Boehlje and Bröring (2011) described three dilemmas for innovation and adoption in context of the increasing multi-functionality of renewable raw materials:

(1) the competing goals dilemma,
(2) the new entrant competition dilemma and
(3) the industry boundaries dilemma.

The European Commission (EC) expects a bioeconomic transition to have beneficial impacts along all sustainability dimensions. While bioeconomic impact assessments exist, they usually focus on a particular sustainability dimension and on specific products or technologies. To draw a more holistic picture, the potential substitution impacts of bioeconomic, sectoral generic innovations in terms of socioeconomic and environmental policy objectives as formulated by the EC must be considered. Indirect impacts resulting from a partial replacement of non-bio-based inputs with bio-based substitutes in the vehicle, construction, textile, and chemical sectors can be studied.

Results show that some innovations may be at risk more than others to have ambivalent outcomes (competing goals); to lead to displacement rather than to net effects; to cause regionally inverse effects; and to have a limited potential to decouple value generation and fossil resource use. These findings may be considered by strategists, planners, investors, and stakeholders involved in the portfolio management, promotion, and diffusion of bio-based innovations to support an effective and efficient development of a future circular bioeconomy.

Session 1: Diversification and Innovation

The role of social innovation for new opportunities and social and ecological values of small-scale forestry

Gerhard Weiss[1], Alice Ludvig[1], Ivana Zivojinovic[1], Carla Barlagne[2], Bill Slee[2], Todora Rogelja[3], Mari Bjerck[4]

[1] University of Natural Resources and Life Sciences, Vienna
[2] The James Hutton Institute
[3] University of Padua
[4] Eastern Norway Research Institute

Small-scale forestry is taking place in a wide range of contexts, a fact which leads to a variety of forest management approaches that differ in their goals, their ways of management and outcomes. Innovations in small-scale forestry may come from the owners, from forestry associations, from policy or from users or other stakeholders. The variety of possible goals and management practices is particularly visible in examples of social innovation in forestry. Social innovation is understood as the involvement of civil society in a central role in finding new solutions for the fulfilment of social needs. Social innovations in a small-scale forestry context take place in different ownership forms (e.g., private, public or joint/common ownership), have various goals (e.g., local rural development, ecological-oriented landscape management or social inclusion), apply various management approaches (from timber production to multiple services), and may be triggered or supported by various public or private programmes or organisations. With this variety, social innovations have a specific potential to contribute to social, ecological and economic policy goals for sustainable forest management. In this presentation, we ask how social innovations provide new business opportunities for small-scale forestry and which social and ecological values they contribute for society. For this purpose, we use a range of examples for forestry-related social innovations from across European countries, including various types of activities such as recreational uses (e.g. mountain biking), using forests for health, care or educational services (e.g. green care or social farming), inclusion of vulnerable groups, community forest stewardship, integrated rural development or innovations for sustainable timber production. Those examples show a colourful picture of social innovations and illustrate their potential to contribute to such different goals such as income opportunities and regional economic development, conserving ecological values of landscapes, and providing various social values for society, including ecosystem services or the inclusion of vulnerable groups (e.g. refugee immigrants).

Innovation and transformability of collective resources management in mountain regions. An applied approach to commons in Trentino, Italy

Cristina Dalla Torre[1]

[1] Eurac Research, Institute for Regional Development

Commons (intended as institutions owning or managing collective properties and civic use lands) have historically been and still are very relevant systems for collective natural and rural resources management in mountain regions (such as forests, pasturelands, dairy huts, community buildings, mountain roads) and regional development. Nevertheless, their resilience and existence are challenged by socioeconomic and institutional, among others, changes (such as global markets penetration and their impact on utilities and preferences, demographic changes and their impacts on communities´ social composition). The main hypothesis that guides my PhD research project is that only if they innovate and transform, in terms of resources´ valuing, community of reference and rules in place, commons will be able to be resilient systems and promote sustainability in resource use, community engagement and regional development. Starting from Ostrom´s legacy, I refer to theories on stewardship, on resilience of socio-ecological systems, commoning and community economies that enable to re-conceptualize the commons in their components and identify and generate innovations and transformations. Besides applying quantitative methods like Geographic Information Systems and Environmental Resources´ Valuation methods, in the project I aim to develop and propose an applied and participatory methodology to the research with a strong connection with the commons and the communities I will investigate as case studies. The aim of my contribution is to present my PhD project (within the LERH Programm at the University of Padova) to IUFRO Conference´s audience to receive both theoretical and methodological feedbacks in order to improve the project in its research designing phase.

Embracing change: How to equip Swiss small-scale forest management to meet future challenges?

Mariana Melnykovych[1], Astrid Bjoernsen[1], Roland Olschewski[1], Irmi Seidl[1]

[1]Swiss Federal Institute for Forest, Snow and Landscape Research, WSL

The increasingly tangible impacts of climate change, accelerating socio-economic dynamics and growing demand of the civil society for forest ecosystem services (FES) call for an adjustment of forest management (FM) and governance practices. Responding to these challenges in a flexible and sustainable way is particularly important for small-scale, communally-owned forests in Switzerland, where an increasing engagement of forest-associated stakeholders has been observed.

In this paper, we address the following questions: Which are the most important challenges, FM in small-scale communally-owned forest is facing in Switzerland? What adaptation measures addressing these challenges are possible and/or currently implemented? What factors enhance the capacity of FM actors to respond to these challenges? A detailed analysis of three case studies complemented by semi-structured expert interviews (n=14) addressed the above questions.

The results reveal that climate change is exerting the main pressure on FM. However, socio-economic conditions have been perceived as almost equally important, including decreasing returns from timber production, growing demand for cultural FES, changing consumers' preferences expressed in the timber market or price fluctuations in response to global markets. The case studies reveal currently implemented adaptation measures such as climate-smart forestry, promotion of wood-energy use, development of new products and services, promotion of local timber use in construction and the strengthening of forest owners cooperation, e.g., through associations. The results show that organizational and social innovations are crucial to address the current challenges. Moreover, forest ownership characteristics are determining the response capacity, such as the ability to raise and increase taxes to cover the costs of FM, the financial power of forest owners, or formal and informal collective arrangements. The expert interviews complemented the case study findings by exemplifying further possible instruments, e.g., the development of a forest bio-economy at the national level or a mechanism for FES payment, the strengthening of the cooperation between forest owners, the facilitation of knowledge exchange among different stakeholders or the increase of know-how of forest managers. Finally, general awareness raising on the contribution of forests to societal well-being and related costs are seen as important to actively embracing change.

Keywords: innovations, forest ecosystem services, new products and services, climate-smart forestry, wood energy, forest owners' cooperation, bio-economy, and small-scale forestry.

Conservation decisions of small-scale private forest owners: Attitudes, objectives and driving factors

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While forests are challenged by climate change impacts, such as increasing bark beetle infestations and droughts, competition of interests ranging from wood as a renewable resource to recreation and nature conservation is rising as well. Sustainable forest management needs to address private forest owners as they make up the majority of owners within Europe. This paper is focused on private forest owners and nature conservation as significant conservation values have been found within private properties. However, this ownership group is characterized by small plot sizes, heterogeneity and structural changes, which makes it difficult to create and implement appropriate conservation programs. Different studies have aimed to understand owners' motivations, values, attitudes and behaviors. Here, we present a literature review that synthesizes the state of the art on private forest owners and conservation decisions in Europe. Moreover, we identify trends regarding factors influencing conservation-oriented behaviors and attitudes. We find that most research has been done via surveys and focused on attitudes, stated behavior, and on the development of typologies. Factors considered to influence private forest owners ranged from owner characteristics and attitudes to property characteristics. Pro-environmental attitudes or behavior have been related to being female, having a high education, an active connection to the forest, a certain degree of formalized forest management, an urban orientation, a high ecological value of property as well as satisfaction regarding the conservation process. On the other hand, age, a rural orientation, forest management as a family tradition and a large plot size reduced the likelihood of conservationist behavior or attitude. Our review used the natural resource conflict management framework by Walker and Daniels (1997) to synthesize recommendations in the scholarly literature, covering a) substance and thus the design of policy instruments, b) procedure, meaning the design of the conservation process and its instruments, c) relationship which includes the relation between stakeholders. Considering the concerns and interests of small private forest owners in current forestry decision-making has the potential to strengthen sustainable forest management that integrates both nature conservation and resource use.

Session 2: Multifunctional use of forest resources. Socio-ecological forest services

The contribution of forestry to the Total Economy of Farm - empirical evidence from North (A) and South Tyrol (I)

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Just by integrating all production factors, a sustainable business strategy that balances between resilience and economic targets and considers all business units can be assigned to diversified farm forests. The guidelines for establishing a farm forestry accountancy network (Niskanen & Sekot 2001) have already contemplated a Total Economy of Farm (TEoF) concept to point out the economic role of forestry in relation to other operating units of an economic entity. As forest management copes with manifold particularities, ranging from temporal detachment of expenses and revenues, economic burden and various calamities to an untended forest business culture, we presume that active small-scale farm forests (< 200 ha) may decline in line with the agro-structural change. To counteract this, with "TEoF" we want to provide an incentive to the 60,3% private forest holdings in Europe (I: 66.4%; A: 74.2%) (Eurostat & FAO 2010; MCPFE 2011), of which 99% are smaller than 50 ha (Schmithüsen and Hirsch 2010).

In cooperation with the Austrian small-scale farm forestry accountancy network we recently built a similar network in South Tyrol to which we applied the principles of TEoF. For our cross-border study between North and South Tyrol we refer to 13 exploratively selected farm forests in South Tyrol that were surveyed in the first two periods. By considering the period-specific distribution of expenses and revenues, also in case of discontinued harvesting, we display the annual results in a cost object accounting with absolute and relative economic indicators for each operating unit. Beyond that, the multiannual assessment enables us to compare each unit across-periods and to apply a benchmark analysis with the mean values derived from the South Tyrolian sample. With adding the mean values from 13 North Tyrolian farm forests from the same periods, we extended the benchmark analysis to a cross-border comparison, at least for the forestry indicators. Results may provide governance impulses to sustain small and medium-sized farm forests. As the latter have a high responsibility for conserving cultural landscape areas, their production directly influences societal relevant ecosystem services. Since actively managed farm forests are capable of combating and repairing damages that are occurring more and more frequently, and since they might be consulted for implementing coordinated CO2 compensation measures, the maintenance of small scale farm forests is important as they deliver a significant contribution to the European Green Deal.

Double bark thickness estimation models of common European broad-leaved species, compatible with harvester forest machine systems

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Bark is vital for a tree's survival during growth. It serves as a barrier for biotic and abiotic environmental factors. On the other hand, it decreases the value of the bole mass once the tree is felled, even with the recent increased demand for bark as a biofuel, soil conditioner, or landscaping product. This is because bark still has lower value than merchantable timber. Thus, overestimating its thickness (and subsequently its share on the total timber volume) can lead to considerable losses for the forest owner. Double bark thickness depends on many factors, tree species being one of the most important. Certain species have rough bark (e.g. pine, oak), while others have fine bark (e.g. beech, plane, eucalyptus). Besides tree species, numerous other factors affect bark thickness. Some of them are tree-specific (age, height, diameter, genetics), while others are external (growth rate, latitude, site productivity). This renders constructing a generic bark thickness estimation model impossible. While manual bark deduction procedures exist, they are laborious, time-consuming, error-prone, and are becoming obsolete, due to the increase of fully mechanized harvesting systems. Harvesters were developed in Northern Europe, where linear modelling was the most used double bark thickness estimation method in practical forestry. However, this was not the case in all European countries. German foresters frequently use the diameter band deduction method, Czech foresters use bark deduction tables, based on a polynomial model. The latter bark deduction method cannot be used with harvesters, as the forest machine systems installed in harvesters are not equipped with such functionality. Therefore, we constructed linear models, based on the polynomial models currently used in Czechia, to enable a more streamlined method of merchantable timber volume estimation. The mean double bark thickness for beech was 15.1 mm (polynomial and linear model) and 15.48 mm (polynomial) or 15.49 mm (linear) for oak. The mean relative error between the new linear bark thickness estimation models and the current standard polynomial models was 0.55% for beech and 0.066% for oak. The mean absolute error of our model was -0.0089 mm for beech and +0.0108 mm for oak. We therefore conclude that the newly models can be used in fully mechanized logging instead of manual bark deduction methods. This would greatly help to limit the amount of time and work consumed by remeasuring logs by Czech foresters. It would especially help small-scale forest owners, for whom, manual estimation of the volume of merchantable timber presents a considerable burden.

The Chestnut tree: a resource for the socio-economic revival of inland areas in a bio-economy perspective

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The chestnut tree has been widespread for centuries in the inland areas of Mediterranean Europe. In the Piedmont region (North-Western Italy) it is the first species, with over 200,000 ha, thanks to its great elasticity and ability to provide diverse assortments. In fact, chestnut is able to provide wood for industry and agriculture, energy assortments and important NWFP's, as well as numerous ecosystem services.

This work aims to analyse the forest cutting carried out in the 2017-2018 forest season in Piedmont, and the definition of potential strategies for the valorisation of the resource, with regard to the main difficulties encountered in the sector.

During the considered period, 1,244 forest operations were carried out, involving about 1,300 ha for a total amount of 145,000 mc. Most of these logging activities are made up of small cuts, 0.5 ha each, with unit volumes of 20 mc/cut, compatible with the structural characteristics of small businesses and private who carry them out. This capillary intervention can also be attributed to other reasons, such as land property pulverization, difficult accessibility of the woods due to the orographic characteristics and the reduced road network of mountain areas where chestnut is mostly located.
Other causes influence the characteristics of the cuts and their economic result, as the environmental problems, such as fires, pests and diseases, as well as socio-economic factors such as the abandonment of mountain areas and the lack of public funding. In addition, analyses have shown that almost half of the volume cut is used for self-consumption (42%), while the volume marketed is mainly used for energy purposes (about 89%) drastically reducing the possibility of economically exploiting this raw material. On the basis of the results obtained from the structural analysis, the study led to the identification of possible strategies useful to enhance the resource, in compliance with the targets proposed by the SDGs of Agenda2030: i) forest management with the triple aim of obtaining woody, NWFP's, such as chestnuts and mushrooms, and enhancing ecosystem services; ii) associationism between forest owners and forestry companies, and creation of forms of aggregate offer; iii) enhancement of products with local wood, introducing product innovation with high added value, certification and local brands; iv) adoption of policies at local and national level, forms of financing, training of operators and awareness of civil society.

Life Brenta 2030 Project - Promoting good governance and innovative financing schemes for biodiversity and water conservation of Brenta river

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The purpose of this work is to present the main actions of the "LIFE Brenta 2030" project, which aims to develop an innovative governance model with local management, promoting the participation of the main stakeholders of the territory for the protection of the Natura 2000 site "Grave e Zone Umide del Brenta". One of the most innovative actions of the project is the financing schemes for conservation actions for the protection of native flora and fauna, which will be supported thanks to a water tariff item, the "ERC" (Environment and Resource Cost) component in application of the principle "those who pollute / use pay required by the EU Water Framework directive. The Natura 2000 site "Grave e Zone Umide del Brenta" has in fact recently been affected by an increase in the capacity of water withdrawal for drinking use near the lake of Camazzole, which will lead to numerous environmental impacts, among which the lowering of the level of groundwater. To mitigate this impact, the Life Brenta 2030 project aims to create, thanks to the innovative financing of the ERC component of the water tariff, some Forest Infiltration Areas, which allow the recharge of the underground aquifer and the qualitative improvement of groundwater. A portion of the ERC water tariff component will also be used to finance Payments for Ecosystem Services (PES) for the conversion of land within the Natura 2000 site, from conventional to organic agriculture, guaranteeing a further qualitative improvement in groundwater. The current configuration of the integrated water service often does not take into consideration the needs of the territory and the impacts caused to the environment in which the water withdrawal infrastructures are present. The project therefore aims to guarantee a sustainability of the integrated water sector that lasts over time and that takes into account the environmental quality standards set for the Natura 2000 site and the interests of the numerous stakeholders in the area.

Session 3: Multifunctional use of forest resources. Socio-ecological forest services

Small-scale forestry, large-scale problems? Building cooperation to improve ecosystem service delivery

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Ecosystem services (ES) are essential for humans, yet supply might not always follow the demanded quantity or quality, leading to conflicts and unsustainable management. We investigated the perceptions of relevant stakeholders in the karst area in the south-western part of Slovenia regarding the use of ES, the role of local users in the provision of various ES and factors influencing ES distribution and quality. Nine personal interviews with regional stakeholders (e.g. public services, institutes) from different sectors (e.g. forestry, agriculture, culture) and individual landowners (e.g. farmers, forest owners) were conducted from September 2019 to February 2020. Prior to the analysis, a codebook was prepared based on the Social-Ecological Systems framework. The majority of interviewees shared the view that karst ecosystems in general offer a wide variety of ES, which is mainly attributed to the biodiversity and diversity of ES uses due to the region's location at a crossroads between the Mediterranean and continental geographical regions. However, due to the decline of agriculture, people are abandoning land use, which leads to the overgrowth of pastures and open spaces. While some interviewees see these abandoned areas as something negative, others tend to see them as a way to generate additional income, e.g. by producing woody biomass. Almost all respondents felt that agricultural policy does not apply appropriate measures to prevent abandonment of agriculture and land degradation. Other factors influencing the quality and quantity of ES and the well-being of people are mainly of a social nature and include lack of management and control, lack of knowledge and culture of dialog and lack of cooperation between stakeholders. Several interviewees stressed that land ownership by private owners influences their behaviour and generally leads to more sustainable ecosystem management. The sense of ownership and the ability to control things leads owners to opt for ecosystem renovation and management of marginalized areas. Nevertheless, small and fragmented ownership could have the opposite effect due to partial landscape planning and the increase in potential conflict situations. "Karst is a region of poverty" is perceived by some indigenous people who have experienced difficult living conditions in the past - and since they do not see the opportunities hidden in the ecosystems, they do not fully exploit their fruits. Foreigners who move to the Karst tend to take the incentive and leadership to start and carry out various cultural projects in or for ecosystems. Strengthening cooperation between stakeholders by providing a partner to coordinate and organize them would improve ES management and bring the greatest benefits to the majority. Yet, a wider exploratory study would be beneficial to identify the most appropriate actor to take the leadership.

Indigenous Socio-Cultural Forestry Management and Research in British Columbia, Canada

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In the Merritt Timber Supply Area that covers 1.13 million hectares in British Columbia's southwest interior, there is a two+ decades effort underway to have socio-ecological values for Indigenous Peoples incorporated into forestry operations and other resource extractive sectors. The author is the General Manager of Eshknam Cultural Resources Management Services (ECRMS), a consulting operation owned by four First Nations (Indigenous) communities from the Nlaka'pamux Nation, and the role of ECRMS is to provide input into the forestry, development and resource extraction activities throughout the Nlaka'pamux Nation Traditional Territory.

The area has been subjected to heavy harvesting pressure primarily due to an effort to manage for the Mountain Pine Beetle epidemic that primarily attacked Lodgepole pine (Pinus contorta), but secondarily Douglas Fir (Pseudotsuga menziesii) and Ponderosa pine (Pinus ponderosa). The recently completed Timber Supply Review has reduced the harvest level from 1.5 million cubic metres down to 1.2 million cubic metres. The highest harvest level for the areas was 2,814,171 cubic metres primarily driven by the effort to address the Mountain Pine Beetle infestation.

This harvesting rate has greatly impacted the landscape that the Nlaka'pamux First Nations call home, and there is an increasing effort to influence the scale and scope of the forestry and to shift a timber focus to one more inclusive of First Nations socio-ecological interests and concerns.

This presentation will focus on the last 25 years on how the First Nations have attempted to have their socio-ecological concerns incorporated into Forestry Management and Planning and includes being members of the Innovative Forest Practices Agreement, the Nicola Similkameen Innovative Forest Practices Society and establishing Stuwix Forest Products - owned by eight First Nations.

The presentation will review how ECRMS works closely with other First Nations owned entities to undertake desktop GIS reviews, Preliminary Field Reconnaissance of proposed forestry harvesting blocks and, where necessary, undertake Archaeological Overview Assessments or Archaeological Impact Assessments. This forestry consultation occurs with all the forestry operators who harvest within the Territory, including the Provincial Government Timber Sales operation, and companies such as Weyerhaeuser. Stuwix Forest Products can at times serve as a promoter of higher standard forest practices, as exemplified by the additional protection they undertake around riparian areas.

Finally, the presentation will examine the recently completed Cultural Survival Areas Project by which the eight First Nations worked together to craft up forestry operations procedures around Cultural Survival Areas and worked with industry and the BC Forest Service to implement them.

Supplemental income and forest management values of family forest owners in Alabama, USA

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Family forest owners make-up approximately 60, 58, and 43 percent of all forest owners in Alabama, the Southeast, and the United States, respectively. Therefore, family forest owners are critical to maintaining forest health and productivity. Due to a combination of shift in ownership and land degradation, timberland is being separated into smaller tracts and management is likely deficient as smaller tracts are less likely to have a management plan or received forest management advice.

To assess the perceptions of family forest landowners in Alabama about alternative income generating opportunities on their lands and to better understand their motivation or lack thereof for managing their forestland a questionnaire was developed and mailed to a random sample of 1,000 family forest owners in Alabama who own at least 10 acres of forestland. Based on the results of the first questionnaire, a second questionnaire was developed to obtain additional information on alternative income generation and was mailed to a random sample of 700 family forest owners in Alabama who own at least 10 acres and were not mailed the initial questionnaire.

In total, 192 responses have been received from the first survey yielding a 19.2 percent response rate. Acreage owned ranged from 10 acres to 80,000 acres with the largest percentage of respondents (27%) owning between 10 and 50 acres. Timber production, hunting/fishing, and land investment were the top reasons for owning forestland. Sixty-two percent of respondents reported that they currently do not generate income from their forestland. However, over 68 percent of respondents stated they are interested in doing so. Of those that have generated income, 23 percent stated it comes from means other than timber with hunting/fishing lease income as the top non-timber method. Most respondents do not have a written management plan, nor have they received management advice. Most are interested in managing their forestland, but indicate they are not sure what to do. After adjusting for 30 undeliverable addresses, there were 126 responses for the second survey, which yielded an 18.8 percent response rate. Lack of knowledge, wildlife damage, and property damage were the top three barriers preventing these forest owners from generating alternative income. Of those that do generate alternative income, over 83 percent manage them themselves and nearly 79 percent of those forest owners sell their products by contracting them out instead of selling them on their own. These results propose that many landowners want alternative ways to generate income from their forestland and are aware of the importance of management. However, they lack the education and experience needed to take the next steps in addressing the what? and how? questions. Further, these results highlight the importance of connecting them with professionals to assist in making management decisions.

Session 4: Small scale forestry

Application of the corporate social responsibility in forest SMEs in SR

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The existence of environmental problems leads society to the promotion of sustainable development. Sustainable development is a way of development that reconciles economic and social progress with the full preservation of the environment. At the level of market economy, this concept has been transformed into an institute Corporate social responsibility (CSR). This institute is a manifestation of introducing a certain form of the basic moral principles to the economical practice. CSR is a response of business entities to a variety of economic, social and environmental problems. Forestry companies, which are particularly sensitive to environmental and social issues, should increasingly develop and improve their implementation levels of CSR. Most studies point out that entities operating in the forestry sector have difficulties in applying valid CSR instruments. Nevertheless, this group of entities tend to develop their business by giving importance to the principles of sustainable development.

Small and medium-sized enterprises (SME) represent an important group of business entities operating in the forestry sector in Slovakia. The topic of CSR is in Slovakia, still reviewed and described only marginally. The aim of the article is to propose indicators enabling the assessment of the degree of implementation of the CSR principles applicable in the conditions of forest SMEs enterprises. Selected methodological approach is based on the fact that the legal forms of business applied to this group of companies and the related method of reporting are considerably different and at the same time not all entities are required to publish financial statements and annual reports. An analysis of quantitative indicators from available financial statements was applied, which was subsequently supplemented by a questionnaire survey.

The result of the quantitative analysis is the design and testing of the application of a selected group of indicators for evaluating the degree of CSR implementation in a selected group of companies. The proposed set of indicators covers all areas concerned, such as economic, environmental and social. As the results have shown, the evaluation carried out on the basis of them alone is not sufficient and it is necessary to supplement it with information from within the company. The results showed significant differences in the approach of SMEs to CSR issues. In the case of small and micro-enterprises, little or no attention is paid to this area, and SMEs adhere to the concept of sustainable growth in combination with an ethics code. This approach can be considered insufficient as it does not cover all required areas. In particular, the social sphere remains uncovered. The achieved results demonstrated the need for support for the introduction of CSR principles in the analysed group of companies as a tool to increase the added value of forest SMEs for all involved actors.

Forestry contributions to bioeconomy in the Czech Republic

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Forest-based bioeconomy has been adopted as the national forest strategies in many European countries. However, in the Czech Republic, the Bioeconomy Strategy has not been officially included in national policies. As the starting point, forestry in the Czech Republic has implemented sustainable forest management to produce biomass and other bio-based materials; thus, it is thought to be one of the potential bioeconomy hubs in the country. The research aimed to review the potential contribution of the Czech forest owners to bioeconomy. More than half (56.04%) of the Czech forests are owned by the state, followed by the private entities, municipalities, legal persons, and communal possessed-forests (19.18%, 17.13%, 3.12%, and 1.18%, respectively). In 2015, the Gross value added (GVA) in the Czech forestry was 883 million euros. The Czech forestry contributed to 3.4% of the total GVA from all EU-28 countries. The share of the forestry and wood processing industry alone (1.180%) was slightly lower than agriculture's share (1.713%), indicating the importance of the forest-based sector in the country. From 2000 to 2018, fuelwood production and the ratio between fuelwood and industrial roundwood were increased. The share of firewood has been stagnated in recent years; however, the consumption of wood chips (post-harvest waste treatment) is growing slightly. In 2018, the total felling slightly ascended the entire net annual increment due to the high demand for timber in a relatively short time and a small region. Additionally, the bark beetle attack has driven the forest owners to process the calamity logging hastily, resulting in a decrease of the present forested landscapes in the country. Besides wood products, mushrooms were the most collected non-wood forest products (21,900 kg per year), and altogether berries picking were 17,000 kg per year. The Czech forestry supports the bioeconomy principles to mitigate climate change by providing forest biomass for bioenergy. Research on financial support for forestry carried out among larger forest owners has shown that the most preferred option, with a 70% share, is the option of direct payments for forest area, which was preferred by commercial companies and municipal forest owners. The second most preferred option was the payment for ecosystem services with a 17% share (the option preferred especially by church forests). For small-scale forest owners (representing 90% of the number of all owners), payments for specifically implemented ecosystem services would be a suitable option. Direct payments for the area would be insignificant for small assets. Through the adoption of the forest-based bioeconomy strategy, it is expected that other forest ecosystem services (FES), e.g., provision of non-wood forest products, improvement of biodiversity and ecological situation, will also be promoted. By doing so, the general use of forests by the public can be maintained and financially take into account the ecosystem services provided to the public by forest owners; thus, it could create a new business opportunity for the owners.

Municipal forests and forest cooperatives in the Czech Republic - the unresolved potential of forest property by the economy after transformation

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After the fall of the communist regime, the Czech Republic underwent an evolution of complex economic transformation. This period also includes the implementation of the restitution process and the return of forest property to municipalities. In terms of ownership structure today a communal and municipal forests own (as of 2018) 17.15%, which is 447,537 ha of forest.

In this paper, we focus only on a part of municipal forests (municipal forests owned by small municipalities with an average population of ± 1000). The aim of the paper is to find out the reasons why a significant part of these properties is not effectively managed or not used. Restitution of forest property of towns and municipalities was in progress from 1991 under the Act No. 172/1991 Coll., on the transfer of some assets from the property of the Czech Republic to municipalities.

What does the current situation look like after almost 30 years of restitution? Especially during the 1990s, due to the fragmentation and small areas, a forest cooperative was established. For better management, an arondation process also took place for some properties, especially in the 1990s. However, there are a large number of municipalities that own forests, but do not yet manage them.

The method of a qualitative data collection relied on structural questionnaires with the goals to try to identify the causes, which are the reasons for no management. We also asked about the willingness to join for cooperatives. The research realized in 30 selected municipalities in the region of South Moravia. For better understanding of the issues, we also asked the locals. Whether, for example, if they would buy wood from the municipality, look for a job at the municipal forests, or welcome information about the municipal forests.

The results tend to be reluctant to deal with the situation. The reason is the small area of property, often the fear that the establishment of a cooperative would not solve the situation. This negative approach of municipal councils brings with it other socio-economic as well as ecological problems.

At the end of the article, suggestions for improving the situation discussed and the benefits that would bring, for example, the association of these forest properties into cooperatives or the focus on social entrepreneurship in forestry listed. It can be stated that the ownership of forests by municipalities still represents unresolved economic, social but also ecological problems.

How national forest funds can support small-scale forest businesses to deliver ecosystem services?

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National Forest Funds (NFFs) represent an increasingly relevant funding source for the forest sector globally. It is estimated that NFFs hold or manage more than USD 1213 billion worldwide (FAO, 2015, Rosenbaum & Lindsay, 2001). With the increasing role of these funds, also their complexity in terms of structure and operational procedures is growing. While many of these funds are State-driven and often support public goods types of projects with a focus on social and environmental benefits, some are supporting privately managed small-scale for-profit enterprises related to wood and non-wood forest-based value chains.

This paper aims at describing the recent developments of NFFs and assess how NFFs' funding targeting small-scale forest enterprises can actually contribute to the provision of different typologies of forest ecosystem services. The research will assess existing National Forest Funds which are already supporting small scale forest enterprises by using a stepwise approach. Case studies will be presented including from Costa Rica, Portugal, and Tanzania with respectively the Forest Financing Fund (FONAFIFO), the Floresta Atlantica Fund, and the Tanzania Forest Fund (TaFF).

The paper is organized in three sections. In the first one, the paper will address the questions: how are NFFs designed and how are their operations structured? What type of funding windows are targeting small-scale enterprises? The second section will analyse more specifically the typology of beneficiaries under the small-scale enterprises funding windows: e.g. legal forms, size, financing instruments provided by the funds (grants, loans, equity, etc.), underlying business models, etc. Finally, the third section will propose a framework for assessing how NFFs support small-scale enterprises in delivering ecosystem services. The proposed framework will highlight how a sound impact assessment and Monitoring & Evaluation approach could be put in place to enable NFFs managers to better plan strategically for impacts. The proposed framework will encompass a diversity of forest ecosystem services and will build on multiple returns expectations (environmental, social and economic).

Aggregate socio-economic value of timber species produced by smallholders in the Peruvian Amazon

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In the Peruvian Amazonia, as natural stocks of timber are depleted, much of the regional demand of timber is increasingly being supplied by smallholders. A great diversity of tree species are found either planted or managed by smallholders in their house gardens, fallows and forest patches. While farmer's landholdings are functioning as sources of seeds, seedlings and other germplasm material of over-exploited timber species, they contain economically important stocks of timber. Herein, are reported, the estimated stocks of timber, the number of timber species as well as the price and estimated amount of wood products that are sold in Iquitos. Data were collected from a sample of 33 families and their landholdings located in Moena Caño village near Iquitos. Among the average 13 tree species found in sample landholdings, three valuable hardwood species: capirona [Calicophyllum spruceanum), Cedro (Cedrela odorata) and canela-moena (Licaria trianda) were found as adult, juvenile and seedlings in each sample properties. Among the most common timber products sold in the Iquitos market were construction materials and firewood. All processes of timber production and marketing follow an informal chain, where smallholders are exposed to be penalized for selling timber without legal documents. We recommend a framework for formalizing timber productions by smallholders in the Peruvian Amazonia.

Selection of indicators of sustainable management of small-scale forestry with an emphasis on the principles of Bio-Economy

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The paper deals with the proposal of the selection of indicators of sustainable management in small-scale forestry, with the continuous improvement of their condition and the fulfilment of the widest possible range of forest functions with emphasis on the principles of bioeconomics. Based on the selection, a proposal is made to increase the competitiveness of the value chain based on forestry. The competitiveness of forestry should result not only from the fulfillment of production functions, but also from the fulfilment of non-production functions. The performance of the functions of companies required in particular in the public interest should then also be adequately assessed. The economic efficiency of small-scale forest management should consist primarily in minimizing costs and not in maximizing revenues. The sustainable use of natural resources cannot be separated from the provision of ecosystem services and other externalities associated with them. The paper aims to propose possible indicators of management with the fulfilled principles of bioeconomics. This involves defining the goals and interests of small forest owners. The development of new value chains in fields using renewable biological resources, from primary products to consumer markets, can facilitate the cooperation of companies across regions and fields. It is necessary that even small forest owners look for new solutions and also use and sell these solutions so that as much of the added value remains in the national economy. Thanks to the principles of sustainable forest management and the formulation of cultivation practices, which are part of the concept of bioeconomics and circular economics, small-scale forestry can be motivation for more efficient forest management.

More inclusive Small-scale forestry beyond NWFP in North Africa

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Tunisia and Morocco, which are part of the Mediterranean area whose forests are highly vulnerable to climate change. Many efforts were deployed to implement strategies to ensure the preservation and sustainable management in particular of forest resources. More than 20% of the country's rural population rely heavily on the forest natural resources for their livelihoods, including the exploitation of non-wood forest products (NWFPs). Highly regarded food products are collected from Mediterranean forests, such as nuts, berries, mushrooms and truffles, as well as aromatic and medicinal plants. NWFPs can play a role in the circular bio-economy, providing sustainable alternatives to fossil-based raw materials. NWFPs are marketed mainly informally at local, national, regional and international levels. Despite these efforts, the situation is still fragile and hindered by the degradation of natural resources and the challenges for adaptation to climate change.

In Tunisia, a Market Development Approach (MAD) was adopted and applied for the first time in Tunisia in 2013. The MAD approach was designed to specifically help forest's households, users and the local communities in developing a sustainable livelihood system and increasing their economic assets as well as improving sustainable forests management. The initiative identified market development tools and enhanced integration of the selected microbusiness within its social and economic environment at local, regional and national levels. It supported capacity building of the local actors by a series of training and field demonstrations. The project helped setting up a public and private partnership along the value chains with the local population through its support to a selected microbusiness operating in NWFPs valorisation in two targeted areas (Jendouba and Beja).

In Morocco, a rural women's cooperative was created which aimed at improving the livelihoods of rural women through the valorisation and commercialization of Argan oil. The Afoulki cooperative has more than 1200 active members and is the main source of revenue for many rural women in the Region of Souss Massa (Agadir). Cooperatives were supported financially and technically by national institutions and international organizations. The Afoulki cooperative has been actively contributing to the sustainable development of Souss Massa.

Results show the important role played by civil society as lay people, households and communities as well as non-profit organizations, associations by commitment and volunteering. Additionally, thanks to the trust built between all actors, that rural woman was able to set up her project and to make it last in time. to improve their incomes and protect forests.

Session 5: Non wood forest products

What are the main characteristics of Non-Wood Forest Products picking households in Spain?

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Non-Wood Forest Products (NWFP) represent a substantial resource for recreational and commercial activities in forest areas. According to Lovric et al. (2020), 26% of European households collect some NWFP, mainly for self-consumption, which provides further evidence on the great socio-economic importance of NWFP. However, the existence of marked between-country differences regarding the harvesting of non-animal NWFP by households makes it necessary to focus on country-level patterns to get further insights into the use and harvesting of NWFP. In this contribution, we zoom into the Spanish data within the European online household survey on the harvesting and consumption patterns of NWFP with the aim of understanding the main patterns of this (mainly cultural, but also provisioning) forest ecosystem service.

The statistical sample included 973 responding households, based on a pre-stratification according to their distribution among rural and urban areas, and a post-stratification according to household size. This information was complemented with the municipal population density and forest area of each observation. We hypothesized that variables such as the presence of children in the household, household size, municipality population density, urban/rural self-identification, municipal forest area, and the purchase of NWFP could be potential determinants for being a NWFP-picking household. Descriptive and binary logistic regression analyses were conducted to check the influence of these variables, both for all NWFPs altogether and for each NWFP category separately (wild mushrooms, foliage and greenery, truffles, wild nuts, wild medicinal and aromatic plants, wild berries, and sap and resin).

Our results show that 16.9% of the households in Spain pick some type of NWFP. More specifically, 12% of the households pick wild nuts, 11.1% pick wild mushrooms, 11.4% pick wild plants, 6% decorative plant materials and 0.8% pick truffles. The results show that households that often purchase NWFP and households that identified themselves as living in a rural area increase their likelihood of picking NWFPs. Other factors such as household size and municipality population size can also significantly contribute to explain and characterize the NWFP picking practice. On the other hand, the presence of large forested areas within the household municipality or the municipality population density did not contribute significantly to explaining the NWFP-picking patterns by Spanish households.

From an informal to a legal wild forest product economy: the Italian experience on new fiscal regulations

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Wild forest products constitute natural, renewable and healthy products deriving from low Carbon intense management systems, so they represent a good example for the implementation of the bioeconomy. Traditionally, wild forest product economy is connected with informal transactions, part-time and non-professional players. A proper governance framework, based on clear and effective property rights, regular contracts and implementable fiscal regulations, is of fundamental importance for an appropriate sector development.

Currently, in Italy the majority of the wild forest products collected by locals (mushrooms, truffles, berries, wild herbs,) are used for self-consumption, but a considerable part of the harvest enters in the national supply chain. To support and boost the role of these products in the new bioeconomy paradigm, and to enlarge the final markets of these products in the food, medicinal and cosmetic sectors, wild forest products need formal systems of traceability and regular transactions among the players along the value chains.

The paper describes the recent fiscal reform introduced in the 2019 Budget Law by the Italian government to tackle the informal transaction of the sector. The contents of the reform and a comparison between the available information before and after the reform will be discussed in the paper, describing the remarkable increment of the number of legally registered occasional commercial pickers as well as an increment of self-employed pickers. These outcomes of the reform allow to understand the importance of the wild forest products in the forest economy. The paper argues as well on the future potential increase of the formal transactions, which is not only the way for the wild forest product economy development but also an opportunity to gain reliable secondary data for monitoring the sector and inspire the further policy actions. Furthermore, increasing the share of legal and traceable products in the wild forest product sector is essential to comply with relevant EU regulations such as the hygiene and food regulations (EU 178/2002 and EU 852/2004) and the EU Food Labelling Regulation (EU 1169/2011).

The law and the implementation process of the fiscal reform have been based on the scientific evidence gained thanks to two EU projects (the FP7 StarTree project and the H2020 INCREDIBLE project) and represent a very interesting and replicable case study for other EU countries that are facing the same challenges and need to improve transparency and legality to join the new bioeconomy pathways drawn by European policymakers.

Quantifying the contribution of Non-Wood Forest Products in the European forest-based bioeconomy

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Forest ecosystems provide numerous services that contribute to the wellbeing of the societies. If wood supply is the best-known service from forestry, non-wood services have drawn attention over the last decades. Although their market value is currently not as high as that of wood, their values and their contributions to wellbeing are possibly greater. However, the lack of knowledge about the benefits of non-wood forest ecosystem services hinders efficient forest policy decision-making processes.
An important step that has been made to consider the value of ecosystem services in National Accounts with the development of the System of Environmental-Economic Accounting – Experimental Ecosystem Accounting (SEEA EEA) co-signed by UN, EC, FAO, OCDE and the World Bank. Aligned with the structure of the national accounts, this new system focuses on the evaluation of interactions between ecosystems and the economy, estimating in particular the flows of services in physical and monetary terms.
Starting from the valuation framework in the SEEA EEA, our study seeks to explain the causal relationship between the use of Non-Wood Forest Products and its value chain as part of the European forest-based bioeconomy. In order to do so, we will develop a Social Accounting Matrix extended to the considered ecosystem services (EcosySAM). In practice, the new EcosySAM is developed starting from a standard SAM to which we add the ecosystem as a primary supplier upfront. Then we open the accounts for the sectors that embed parts of the value chain related to the service considered.
Two Non-Wood Forest Products are used as case studies, reflecting the dual component of market and public value of NWFPs. It is important to take into account both components in order to have a realistic estimation of the total economic value NWFPs can bring to the bioeconomy. For the market component, we will consider the use of cork along its entire value chain, investigating the data on quantity and volume and how this product adds value into each step of the forest-based bioeconomy in Europe. For the public component, we will focus on wild mushrooms, forest berries, and tree nuts to investigate, through a choice experiment, the monetary value that people attach to the experience of visiting forests and collecting those products. The public component of NWFPs is the less investigated, although it encompasses an important social value from Western to Eastern Europe.
We believe our results will allow providing an evaluation of NWFPs that is still missing in the literature and to disentangle the factors that influence the value that people, as final beneficiaries, attach to such products. This, in turn, will support multipurpose forest management and will help decision-makers in designing forest strategies that properly account for the benefits NWFPs provide, both to economy and society.

Changes in the dynamics of non-wood forest products of animal origin during the last decade

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Non-wood forest products (NWFP) are goods derived from forests that are tangible and physical objects of biological origin other than wood and used for health, nutritional needs and provide materials for large scale industrial processing and international trade (FAO, 2015). These products include not only plants, their parts as fibres, gums, and resins as well as parts for food and food additives but also products of animal origin (game meat, pelts, skins, trophies, glands and other products). In this study we concentrate attention on changes in the dynamics of the main huntable ungulate species like moose (Alces alces), red deer (Cervus elaphus), roe deer (Capreolus capreolus) and wild boar (Sus scrofa).

The data on game number and harvest were collected from each regional Environmental Protection Department under the Ministry of Environment (n= 8) and model area in the North Western Lithuania (long-term game monitoring since 2003). The data were analyzed using STATISTICA® 9 software.

The growth of moose and red deer populations and their harvest gradually increased in the last decade. Both species have satisfied by living conditions (habitat suitability, food supply, reproduction and offspring survival). However, roe deer show sharper susceptibility to winter changeability of the past year and corresponding fluctuations in the number and harvest due to prenatal offspring losses and increase in diseases and further increases again.

The unusual and depressive picture of changes in wild boar number and inadequate harvest have emerged from the spread of African Swine Fever (ASF) since 2014 and corresponding implementation of the state strategy to reduce risk, prevent and suspend disease transmission. The comprehensive studies of species territorial distribution, habitat suitability, foraging and social behaviour revealed needfulness of the strategy of adaptive management of wild boar population and necessary great regard to the herd index and timely changes in species management

Session 6: Non wood forest products

A perspective of innovative multifunctional forestry for societal benefits: a focus on Ukrainian Carpathians

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In this paper, in the context of the development of bio-economy the Ukraine's Carpathians, we explore existing demands for forest ecosystem services at a local level, as well as institutional capabilities (including the emergence of social innovation) and practical issues of the contribution of non-wood forest products and services (NWFP&S) to the well-being of rural communities. We applied participatory techniques (based on interviewing of stakeholders) in combination with the mixed methods of analysis. Our findings indicate that NWFP&S are considered to be important for (marginalised) communities living in remote, highly forested areas, where the human well-being is usually lower than in other, more accessible, and socially and economically advanced regions. In the Carpathians, forest-dependent communities heavily rely on forest products and amenities and are dependent upon the supporting ecosystem services of the trees. Forest also contributes to the sense of identity of many community members, whilst economically, timber remains very important. A challenge for innovative multifunctional forest management is thus to attain a proper balance between the provision of NWFP&S and wood production. We conclude that priorities and concerns of forest dependent communities are to be considered and addressed, as well as their demands for multiple ecosystem services of forest. Moreover, all relevant stakeholders are to be involved in the decision-making to build resilience and enhance sustainability of remote mountain localities. In consideration of the economic side of innovative forest management for societal benefits: commercialization and value-added processing of NWFP should be explored to raise the household income, while small-scale, green tourism considered to enhance sustainable harvesting of NWFP. Finally, it is crucial to increase environmental awareness and strive for social cohesion with the promotion of eco-social innovation in marginalised rural areas.

A forest-based bioeconomy framework with bio-based transition pathways for primary products

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The bioeconomy narrative's focus on biotechnology is dominant in higher income countries. This industry is driven by research and development, patents and income generation from commercialisation of technology. This approach to the bioeconomy is arguably not relevant for large parts of renewable natural resource use base in lower income countries- the approach does not reconcile accelerating economic growth with environmentally sustainable resource use. Meanwhile, the utilisation of environmental income for meeting subsistence and commercial needs by low-income households contributes to 28% of total household income with 77% derived from natural forests. This is an opportunity for environmentally sustainable economic growth within the bioeconomy paradigm on a national level. While recent literature mentions three approaches (biotechnology, bioresource and, bioecology visions), their micro-distinctions and causal linkages are not operationalised. Critically, transition pathways that reconcile economic growth and ecologically sustainable renewable resource use out of poverty are not elucidated for lower income countries. Additionally, the sustainability aspect of the bioeconomy has been questioned alluding to the need of using robust and holistic governance strategies and policy interventions to ensure such a transition. This paper (1) develops a set of key questions to operationalise the three bioeconomic schools, (2) applies the schools across selected cases with lower income economies and, (3) outlines transition pathways and policies that streamline economic growth and sustainability. The visions are operationalised using a qualitative content analysis of national bioeconomy strategy documents as well as a bibliometric analysis of research articles within the period 2015-2020. Furthermore, the resulting bioeconomic schools are operationalised by conducting a comparative analysis of cases in India, Burkina Faso and South Africa. Multi-level perspective (MLP) theory is intersected with governance measures to develop corresponding transition pathways and regulatory policies for each case. This culminates in an analytical forest-based bioeconomic framework relevant for lower income economies.

The role of non-food forest based products in bioeconomy value chain

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Social sensibility and social perception of forest values has changed in recent years. Economic importance of non-wood forest products (NWFP) has increased over the last several decades, and now presents a respectable share in the global economy. Croatia is starting to develop a bioeconomy strategy as an implementation of the EU Bioeconomy Action Plan. There is no common understanding of what bioeconomy is; what is at stake and what it can do to the national economy. A well-defined and sustainably managed forest and wood industry could play an important role in implementation and boosting bioeconomy targets, especially in rural areas.

The aim of the study is to present recent research about characteristics of NWFP's added value chain and their role in Croatian bioeconomy. Data regarding collecting, usage, processing, buying, selling/reselling was analyzed using descriptive statistics tools and added value chains for the most common products (mushrooms, medical and aromatic plants, berries and other fruits). Results indicated processes and monetary values in each added value chain segment, and also, contribution of NWFPs to the bioeconomy regarding economic values and new policy issues.

Forest based products are becoming a crucial part of bioeconomy and represent an example of an economically efficient usage of natural renewable resources in rural areas with sustainable approach.

The bioeconomy and non-timber forest products in lower income countries: a framework and its application to medicinal plants in Nepal

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Bioeconomic approaches are dominated by bio-technological interventions relevant in a western European context. This paper focuses on advancing bioeconomy thinking to increase its relevance to national economies in lower income countries. Specifically, we: (i) develop a bioeconomic school relevant to environmental products in these economies, (ii) apply them to the case of commercial medicinal plants in Nepal, and (iii) use this analysis to identify transition pathways and regulatory mechanisms facilitating the simultaneous achievement of economic growth and sustainability. Empirical data is drawn from a nation-wide investigation of the medicinal plant production networks and includes data on harvesters (n=540), traders (n=393), central wholesalers (n=73), regional wholesalers (n=128), and secondary processing enterprises (n=79). This allows a quantification of the economic importance of the medicinal plant production network and an assessment of its contribution to the country's bioeconomy. We find that commercial medicinal plants are of national economic importance and can form the starting point for developing a national bioeconomy strategy combining low carbon economic growth with sustainable resource use.

Session 7: Actors along the regional value chain

Relational attributes in social ecological systems fostering the transition towards a bio-based economy: insights and operative indications

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The bioeconomy concept makes explicit the close connection between humanity and nature. The notion refers to the multiple ways of environmental-friendly production based on biological processes, which realisation requires cross-sectoral and interdisciplinary research and the involvement of different types of actors interacting with the ecological systems across scales and societal domains. The interplay among society and nature is theorized in the Social-Ecological Systems (SES) approach which underlines that every social process is an embedded part of nature. In this framework, collaboration, conceptualize as a participative approach aimed to involve stakeholders to identify priorities in management actions, constitutes an essential tool to empower communities by identifying novel solutions and strategies to solve environmental issues through collective learning. Powered by external and self-evaluation processes, collaboration allows people to increase the effectiveness of their actions and to adjust them to emerging needs, by learning from previous successes and failures. Nevertheless, at present knowledge on how collaboration can enhance the good governance of SES and the transition towards a bioeconomy is still limited, with the risk that it could be conceptualized as a panacea solution. Furthermore, the close connection among humanity and environment requires a greater awareness on relations arising among actors (i.e. State, market, community, and research organizations) involved in environmental governance. Moving from scientific literature on projects and programs evaluation, this study aims to analyse how relations and interactions among actors involved in SES management have been conceptualized and evaluated. The final aim is to identify different typologies of relational attributes among them by providing policy indications for the environmental governance. The literature review, based on the analysis of 68 articles selected through queries on SCOPUS database, shows that the effective management of SES requires the involvement of all types of actors having different responsibilities and duties associated to their stakeholder group. At present evaluations reported in scientific articles mostly focus on public authorities' role, with a minor attention on other actors' contribution. A relation is made at least by two different entities, this requires not to focalize only to one side, but also to the others, in this case, community, market actors and research organizations. In particular there is the need to clarify direct relationships between research organizations and community, which are analysed by very few papers. In addition, there is the need to measure quantitatively stakeholders involvement on environmental collective actions through a network approach in order to identify who has a central role on sustainability transition and to what extent actors belonging to the four categories play a relevant role on it.

New development of Italian forest owner associations: towards a better integration of SME in the forest-based bioeconomy

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Forest ownership fragmentation and lack of horizontal integration among forest owners represent some of the main factors that traditionally affect the competitiveness of the Italian forest sector. Since 1923 (Royal Decree No. 3267), the Italian regulatory framework has promoted, providing numerous and different legislative tools, the creation of forest owner associations for ensuring more active forest management. Despite numerous efforts implemented by the Italian government, there is a lack of national forest owner associations large enough to be considered representative of the whole sector.

In the first part, the study aims to present and analyze the role of forest owner associations in the context of the last Italian legislative acts: Decree no. 34 of 2018, and the related Italian forest strategy published, in draft version, in February 2020.

In the second part, four case studies of forest owner associations are described to identify and analyze the main implications and results of specific national and regional policies. Two of them, Lowland Forest Association (AFP) and Forest Association of Vicenza (AFV), are located in the Veneto Region, and their creation was financed through the Rural Development Programme (RDP) 2000-2007 (measure 9.6). AFP, which manages more than 1500 ha of public and private forest close to the Venetian coast, and AFV, which aggregates owners and forest companies in the Venetian Pre-alps, are the only two active associations out of the ten financed by RDP in the Region.

The other two associations analysed, Valle Infernotto land association and Forest Community of Monte Pisano, represent some of the first results of specific regional policies, recently implemented by Piedmont and Tuscany, respectively.

Valle Infernotto Land Association was formed in 2018, in the context of Regional Law no.21 of 2016 that aimed to provide operative tools for forest owners to create associations in the Piedmont region. Whereas, the Forest Community of Monte Pisano, strongly promoted by Regional law no.11 of 2018, is based on a protocol among the main actors, including local municipalities and the Tuscany Region, for promoting active forest management.

The study concludes that today, forest owner associations in Italy are characterized by very different structures and objectives, that has to be considered in the establishment of the next Italian legislative operative tools, such as the issue of a specific fund for supporting the creation of forest associations.

Local implementation of EU forestry policies: a case study of Tuscany Region

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Forests cover 43% of the European Union; 51% of these are public properties[a]. Therefore, the implementation of European policies in public forests acquires a considerable role. Despite the importance of this sector, European forest strategies are exclusively based on volunteer participation of EU Members States and they are not defined by a legally binding common forest policy. Hence, forest policy is delegated to the national level, but the concrete implementation of strategies only occurs at the local level. Particularly in Italy, forest policies have undergone important transformations, starting with the process of decentralization[b] which has transferred forest competences from the State to the Regions.

In the current study, implementation policies are examined at a local level. The Region of Tuscany is analyzed as the case study. A survey was conducted which involved 150[c] public forest workers, who represent the principal actuators of public forest policies. On the one hand, the purpose was to analyze the trend of the workers assigned to forest activities; on the other hand, the aim was also to verify the implementation of forest interventions, relating to the forest policies and to the multifunctional forest management.

The collected data have enabled the research group to determine that the population of forest workers suffered a severe constriction among the 90s (about 1400 units) and the actual period (448 units). Furthermore, a detailed profile of both forest workers and performed activities in regional forests was outlined. The flexibility of the survey model has proven itself to be a valuable tool in examining different management solutions. Indeed, a regional reality might articulate in a multitude of very different scenarios, such as the management alternatives identified during this research: the optimization of territorial functions; the enhancement of environmental aspects; the sustainable forestry. Such a supporting model would allow the Public Administration to obtain numerous benefits in the monitoring of forest regional management, such as construction of homogeneous archives to confront data and information related to very different territorial realities. Moreover, a supporting decision model would allow identifying both critical situations, which should be deepened, and best practices of management, which could be disseminated over the entire territory.

[a] If Russian Federation is included, public forests reach 91% of the entire wooded land (MCPFE Report, Vienna, 2003)

[b] D.P.R. 15-01-1972, n. 11, Trasferimento alle Regioni a statuto ordinario delle funzioni amministrative statali in materia di agricoltura e foreste, di caccia e di pesca nelle acque interne e dei relativi personali ed uffici, GU Serie Generale n.46, 19-02-1972 - Suppl. Ordinario

[c] They represent about 34% of the entire population of forest workers in Tuscany.

Session 8: Politics & Governance. Certification & labelling. Climate Change adaptation

Measuring and assessing forest-based circular bioeconomy to implement the National Sustainable Development Strategy in Italy

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In the last decades, many political documents (EU and national Bioeconomy Strategy) and peer-reviewed publications focused on bioeconomy, that it is frequently argued to be a key part of the solution to global challenges (climate change, ecosystem degradation, deforestation). In this context, it is important for the forest-based sector to quantify and demonstrate its contribution to the bioeconomy in a sustainable and rational way.

The present study was carried out within the FOR.CIRCULAR project aimed at implementing the National Sustainable Development Strategy 2017/2030 (NSDS). The study was structured in two main steps, the first one investigated the scientific literature on bioeconomy and forest-based bioeconomy by applying social network analysis to bibliometric science, while the second one considered the scientific and grey literature to identify and develop a set of indicators suitable for the forest-based sector. The selected circular bioeconomy indicators were applied to the forest-wood chain of the Tuscany region (Italy).

The objective of the first step of the study was to provide an overview on the main aspects characterizing the bioeconomy issue, so was conducted a bibliometric network analysis. In the timeframe 20032020, 1,756 documents on bioeconomy were published by 3,695 scientific organizations from 92 countries, while 225 documents on forest bioeconomy were published by 567 organizations from 44 countries. Germany and Finland are the two most productive countries with 17.4% of bioeconomy and 32.8% of forest bioeconomy documents. The co-occurrence network map of keywords shows the linkage between bioeconomy and climate change mitigation and the reduction of dependence on fossil fuels; from the map emerge also the key role played by biorefinery and biotechnology. Conversely, forest-based bioeconomy is more related with the following three concepts: sustainable development, bioenergy production, climate change mitigation. In the second step of the study, a set of indicators to quantify the forest-based circular bioeconomy was developed and classified considering the three pillars of (environmental, economic, and social) of sustainability and the 4R (Reduce, Reuse, Recycle, Recover) of circular economy. Finally, the set of indicators was implemented in the Tuscany region to test their applicability and replicability.

Constrained liquidity in times of calamity. A study on adaptation in private forest enterprises in Germany

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Calamities have caused severe damages in German forests during the last two years. The loss of forest stands as an important source of income makes it increasingly difficult to secure sustainable revenues, which threatens the livelihood of many private forest enterprises. In addition, valuable ecosystem services are affected and there is a lack of financial resources for the necessary investments in reforestation and climate change adaptation. An online survey was used to investigate the perception of private forest enterprises towards solving liquidity problems. From December 2019 to January 2020 a total of 156 completed and 151 partially completed online questionnaires from private forest enterprises with a total area of over 210,000 ha were evaluated. The enterprises were separated into groups according to their size small (500 ha) - and dominating tree species Norway spruce, deciduous trees, and Scots pine. Evaluation of the survey showed that salvage logging of the last two years is two to three times higher than the regular logging in these enterprises. Small enterprises and spruce dominated enterprises are particularly affected. Operational measures and forest policy instruments, e.g. saving expenditures, expanding revenue or subsidies, for securing liquidity were examined. The practical applicability of the tax-free reserve of the Forest Damage Compensation Act (ForstSchAusglG) was explored. The study shows that the forest enterprises primarily aim at preservation of asset and value sustainability in forest management. In contrast, almost 50 % of these enterprises do not have a systematic financial planning. The tax-free reserve is being examined as a possible instrument to secure liquidity, but only a small proportion of those surveyed make use of it. Due to limited financial resources, legal restrictions and inflexibility of the tax-free reserve, it is seen as impracticable for the current calamity. This shows that self-financing by means of timber production is reaching its limits in the ongoing forest calamity. Therefore, alternative operational financing concepts must be developed and implemented. Additional private forest enterprises expect financial public support through e.g. the remuneration of ecosystem services, the relief of public charges and financial promotions. Furthermore, they are developing ideas for alternative sources of income.

Restoration of declining spruce stands in the Czech Republic: a bioeconomic view of solving the situation of small forest owners

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Czech forestry has been facing the problem of declining stands, especially coniferous, in lower and middle locations in most parts of the Czech Republic in recent years. Currently, the problem concerns spruce, but also pine stands. As a result, there is a surplus of merchantable timber on the market, especially spruce timber from bark beetle salvage feelings, which causes a decrease in the selling price of all assortments of spruce wood. In the period of 2015-2019, the price of spruce wood in the assortment of quality class III.A/B (saw logs without bark beetle infestation) decreased by 42 %, in the case of assortment quality class V. (pulpwood) it was up to 57 %. This situation has a negative effect on the amount of receipts achieved from the sale of wood, which also has a negative effect on the cash flow of small and large forest owners, who have a significant proportion of spruce stands on their forest property.

A very fundamental problem will arise for small forest owners, who do not have, or due to the small size of their property, cannot have, a mixed species composition of their forest stands. In the Czech Republic, small forest owners predominate in terms of total number among all owners. These are represented mainly by individuals, of which there are about 349 thousand. (approximately 89 % of all forest owners). There are about 268 thousand individuals owning a forest with a maximum size of 1 hectare (69 % of all forest owners).

When designing reforestation after calamities, in the field of economic efficiency, large forest owners have traditionally been based on a long-term perspective, which results from the "Forest Rent Theory". Large forest properties have a richer tree composition and calamities do not usually affect all forest stands of such property. The situation is different for small forest owners, where the calamity situation often affects the entire forest property. The long-term horizon of economic efficiency from the point of view of rotation period is too remote for an individual small forest owner. Such an owner prioritises forest regeneration at minimal cost, when the achievement of the main volume of revenues concerns the future generations.

In the conditions of the Czech Republic, the use of alternative tree species in the regeneration of stands, such as white birch, provides lower costs for established plantation, e.g. compared to European beech, and will enable faster receipts from timber sales because of a shorter rotation period. Current economic calculations show that even from a long-term perspective, birch stands are an economically viable alternative to commercial tree species in the Czech Republic, which include, among others, Norway spruce, Scots pine and European beech.

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Consumers' willingness to pay for bio-textile products made from certified wood fibers

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In the update of the EU Bioeconomy Strategy, it has been emphasized that the bioeconomy is a key element to the functioning of the EU economy and to build a carbon neutral future. The bio-textile products made from certified wood fibers represent an important product innovation able to diversify the portfolios of enterprises and to implement Bioeconomy Strategy. The aim of this study is to estimate the Italian consumers' willingness to pay for 3 bio-textile products made from certified wood (socks, T-shirt, shirt). The data were collected using a questionnaire administered face-to-face to a sample of 1,144 consumers. In the questionnaire, 2 scenarios have been proposed to consumers: status quo scenario corresponded to regular clothing (100% cotton fibers clothing, produced in industrial plantations with high water and soil nutrients consumption), whereas the hypothetical scenario offered the same clothing produced with bio-textile wood fibers following production systems respectful of the environment. Regular socks were proposed at 3 , T-shirt at 15 , Shirt at 40 . The results show that 98% of consumers are willing to pay a premium price for bio-textile products with a mean premium price of 3.85 for socks, 13.15 for T-shirt, 66.20 for shirt.

Impact of education in increasing of Climate Changes adaptation among students, Iran

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Correct knowledge on the effects of climate change is a key factor for informed action and the emergence of an individual's determination to deal with the effects of climate change. Environmental education is the most basic method to increase awareness on climate change and environmental issues on intermediate students of the urban and rural areas of Kalibar County in the Arasbaran region as forest dwellers and Tabriz city as the non-forest dwellers. The main aim of this research was measurement the environmental information and climate change of students and effect of workshops in increasing tier information. The statistical population of this research was 69 thousand persons and data were collected from 221 intermediate students by questionnaire in six schools. From the urban and rural areas of Kalibar County and just urban area of Tabriz city were selected randomly one school and totally six schools randomly. Content validity of the questionnaire was confirmed through a panel of academic and executive specialists. Its reliability was also measured by using the Cronbach's alpha coefficient in environmental fields (0.74) and climate (0.84). Based on the results, more than 90% of students in both forest and non-forest areas emphasized on the importance of Arasbaran forests. Internet was mentioned as the most important source of environmental and climate information among non-forest (42.1%) and forest dweller (34.5%) students. The holding of a workshop for both groups of individuals led to an increase of about 10% in relation to climate change by about 38%. Respectively, 34% and 15% of students in non-forest and forest regions stated that they had not information on the crisis caused by climate change, which increased to five and eight percent in the post-workshop period, respectively. After the workshop, 63.5% and 60.7% of students in non-forest and forest regions believed that they could and should carry out climate change campaigns. Overall, the results of the research showed that the workshops had a significant effect on the attention and increase of students' environmental information; therefore, it is recommended to pay more attention to environmental issues in student extracurricular activities.

Session 9: Methods and Models. Valorization of ecosystem services. Impact assessment and trade-offs

Prediction of the Development in the Raw Material Basis of Wood in the Context of the Developments in the Bark Beetle Disaster in the Czech Republic

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In the context of the extremely dynamic development in the bark beetle disaster in the Norway spruce stands, the wilting of coniferous forests, and the continued pace of salvage felling, enterprises engaged in the timber industries express concerns about the decline in the raw material basis in the years to come. For the decennium of 2017 2026, the overall Czech growing stock of spruces of all age classes amounts to 399.6 million m3 of timber to the top of 7 cm o.b. Building on the exploitation percent, the theoretical outlook for the spruce logging potential for the next decade (2017 2027) is 112.63 million m3 of timber to the top of 7 cm o.b. Should the pace of the bark beetle disaster continue with the same intensity and supposing that the overall annual felling with permanent restrictions on planned felling reaches 20 million m3, the complete spruce growing stock from the 5th age class on could be felled within approximately the next 18 years. This article brings a prediction of the development in the raw material basis of wood for the period up to the year 2027.

Socio-economic essence of the forest, its management, protection and regeneration as a property, economic and social phenomenon in the climate change era on the example of the Czech Republic

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The paper deals with the issue of the socio-economic importance of multifunctional forests and forestry in terms of the climate change impact, presented on the example of the Czech Republic (CR), Central European Region. Within the Czech society, forest is mostly considered not only a natural, environmental or technical object but also a social object and a social phenomenon.

Forestry and forests are also becoming a political issue, regardless of the form of ownership (e.g. private, communal, church, municipal, regional, state). Forest areas and their quality attract a massive interest of people as the social and socio-economic services of forests fundamentally transcend individual boundaries or the concept of ownership and gain a significant role regardless of the specific forms of forest ownership.

Just in relation to the present massive threat to the forest by climate change, the forest has become a more and more important political phenomenon for various parts of the society and for the society as a whole. Therefore, multifunctional forestry operations are supported from the public financial funds. In total, the CR climate change forestry was supported by almost 144 mil. EUR in 2019.

But not only the non-market forest services (e.g. recreational, CO2 sequestration, nature protection, soil protection, water regulation including water quality, etc. compared to other, non-forested parts of landscape) are of a social significance. The forest market services are also essentially important for the social sphere, creating working places and supporting life quality in rural areas. Simultaneously, the comparative substantial portions of taxes and social payments from forest (forestry) market production services return into the public budgets (pension, health and social insurance etc.).

Therefore, the given concept of socio-economic significance of forest services in the CR is a strong basis for justification of public funds supporting the forest protection, regeneration, and restructuring, providing both market and non-market forest services in the extreme era of climate and forest change.

The contribution of sustainable plant-based development in transiting to a bioeconomy the case of Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong in Nepal

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In line with the IUFRO Task Force Unlocking the bioeconomy and non-timber forest products, this research adopts an interdisciplinary approach to contribute to the body of knowledge about the role played by non-timber forest and environmental products in fostering a transition to a bioeconomy in rural economies of low and middle-income countries. It relates to the bioeconomy definition given by the German Bioeconomy Council and to the bio-resource and bio-ecology visions, as identified by Bugge et al. (2016), in contrast with the most common bio-technology vision and approaches characterizing high-income countries and economies.

Non-timber forest and environmental products can have a great economic, social and environmental relevance in rural economies, being essential to natural ecosystems' sustainability and contributing to livelihood food security and diversification strategies. These products may support bioeconomic transitions, reducing the socio-environmental impacts of economic growth through the implementation of science-based sustainable harvests and production management systems. However, both national and regional level data estimates are generally missing or of low methodological quality, resulting in a scarce inclusion of these products in policy interventions towards a bioeconomy.

This research aims (i) to quantitatively investigate a single plant species' value chain in terms of volumes and values, (ii) to estimate its sustainable harvest rates and (iii) to qualitatively discuss potential sustainable plant-based development-related policy interventions guidelines at the national level. The presented specific case is about Nepal and Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong (Plantaginaceae family) commonly known as kutki a perennial rhizomatous herbaceous alpine Himalayan species in a monotypic genus, characterized by a guerrilla strategy clonal growth. Its rhizomes have been harvested in the wild and traded for centuries for traditional medicine and healing purposes. Kutki recently gained both livelihood and conservation interest, because of the fast-growing regional demand. This research integrates social, trade, biological and ecological data and scales them up from the local level to national level estimates. Kutki data were extrapolated from existing literature and empirically generated from semi-structured surveys along its well-established value chain - harvester survey (n=44), trader survey (n=48), central wholesaler survey (n=31), Indian and Chinese regional wholesaler survey (n=24 and n=42 respectively), secondary processor survey (n=13) carried out in the broader framework of the Transiting to Green Growth Natural Resources in Nepal (TGG-N) Project. Current annual kutki's collection seems to be unsustainable.

The effects and impacts of the Vaia storm on local timber markets in Northeast Italy

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At the end of October 2018, the Vaia storm largely affected the northeast part of Italy, leaving a mark on its forest sector and local timber markets. Three areas have been heavily impacted among the others: the Province of Trento, the Province of Bolzano and the Veneto region.

The study aims to present how the timber price trends in the three areas have been impacted by the Vaia storm and how the use of innovative systems, such as web platforms, can coordinate and improve transparency for local market dynamics and actors.

The largest part of the data for the study comes from the Province of Trento and the Province of Bolzano, where timber and wooden products are sold through web portals that collect information on wood prices and on buyers and sellers. Data and information for the Veneto region were more difficult to collect, since they were sparse and disconnected, lacking a coordinated system to monitor timber sales. The data were filtered for predominant species and ordered chronologically and descriptive tables were prepared: monthly average and moving average along the timeseries for adjudication prices; monthly average and the cumulative sum for volumes. Then, price timeseries were compared for the three areas.

Preliminary results of the analysis show that prices have fallen to 30-50% of their values, and the average volume per month has increased over 5 times after the storm. This trend was found in all three areas, but the price decrease seems lower in Trento and Bolzano, where web platforms are used.

The study shows that the lack of connection between local demand and supply, started already in the early 1990s, has reached a peak because of Vaia impacts. Fragmentation of private property, as well as the low propensity of local companies to undertake innovation, are, among the others, key elements that make the many local timber supply chains not well structured and efficient. In this context, initiatives such as the IT-FOR web platform in the Veneto region, modelled after the Trento and Bolzano experience, may help to support local timber markets capable to adapt to the different size and structural organization of actors in the forest-wood chains.

Using Earth Observation data to compute Economic Accounts for Forestry: testing a small-scale forestry unit through remote sensing

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Knowing the evolution of forest resources constitutes a key environmental information for making strategic and operational decisions for resource use and conservation. Such information is crucial when developing and implementing Bioeconomy strategies at different levels, insofar as it can help in assessing the sustainability of the forest value chains. To that end, the System of Environmental-Economic Accounting (SEEA) framework (United Nations, 2012) is under development, which includes the Economic Accounts for Forestry (EAF) as a satellite account. In past years, some attempts have tried to apply this framework, deriving recommendations for its application in forests (Varela et al., 2013). These attempts have generally addressed large administrative units (regions, States). One recommendation indicates the opportunities that advances in remote sensing provide, as new sources for detecting e.g. land use and volume changes at high resolution. Moreover, the EU Green Deal encourages business (and thus, lower scale players) to include sustainability accounting within their regular reporting actions.

In this context, we have tested the opportunities and limitations from employing Earth Observation data in environmental forestry accounting in a small-scale forested area. We approach this through testing for the Roncal valley (Navarre, Spain) the land, physical and monetary timber accounts, and proposing a methodological approach based on the SEEA framework.

Our results show that satellite information (namely, forest mask and forest types) can feed in the Land Use Accounts, disaggregating even for dominant forest species, and identifying species shifts. By combining Satellite (e.g. fire scars, clearcuts) with LIDAR-based information (volume), the stock and flows of timber volumes can be derived. Finally, by noting the stand age (crossing satellite and LIDAR site index and height-derived data), the monetary value has been estimated. Yet, complementary non-EO information is required, in terms of strict conservation areas and harvesting limitations (e.g. protected tree species, restricted site indexes, or mechanical technicalities), plantation species, timber market prices and basic marketable species' silviculture.

This methodological approach, developed within the EU project MySustainableForest, operationalizes the opportunities provided by new technologies to showcase small-scale forestry contributions in Environmental-Economic Accounting, which can be ultimately up-scaled for regional or State reporting.

Possibilities for the development of the PES concept in Serbia based on the perception of stakeholders

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The concept of Paying for Ecosystem Services (PES) in certain parts of the world and some countries is well known among stakeholders in the field of forestry and nature protection. In Serbia, however, this concept has not been developed and little is known about it due to the lack of PES schemes at the state or local level. So far this concept is present only through certain international projects, mainly in the protection of large river basins. The aim of this paper was to identify stakeholders related to the PES concept and note their opinions about this concept and opportunities for its development in Serbia. The purpose of this paper was to determine, based on the opinions of stakeholders who can be directly involved in the development of PES, what are the possibilities and difficulties for this type of environmental policy. The subject of the research are stakeholders from several areas related to forestry, nature protection, and land management. All stakeholders are classified into one of four major groups: buyers, sellers, intermediaries, and knowledge providers. The stakeholder opinions were mapped out using a structured questionnaire divided into three thematic sections. The first part was related to general and personal information. The second part was related to the assessment of the importance of ecosystem services in Serbia and the general opinion about the existence of PES in our conditions. The third part focuses on the answers about the possibilities and obstacles due to the possible development of PES. The data were collected through an online survey and face-to-face interviews. It has been shown that the opinions of stakeholders can be a very good starting position for the creation and development of PES while avoiding many problems that would arise without the existence of their suggestions.