MENDEL UNIVERSITY IN BRNO

MANAGERIAL, SOCIAL AND ENVIRONMENTAL ASPECTS OF THE FOREST-BASED SECTOR FOR SUSTAINABLE DEVELOPMENT

Annual Conference of the IUFRO Research Group 4.05.00
Managerial Economics and Accounting and its subgroups

Book of Extended Abstracts

Editor: Kateřina Holušová

October 4-6th 2021

On-line, Brno, Czech Republic

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Coordinator of 4.05.00 research group Lidija Zadnik Stirn

Coordinator and officeholder of IUFRO Division 4 Donald Hodges

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Walter Sekot	Coordinator of WP 4.05.01 – Managerial, social and environmental accounting-	Historical context and future challenges of managerial, social and environmental accounting within IUFRO
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Chaired by Lidija Zadnik Stirn together with Walter Sekot, Stjepan Posavec Virginia Morales Olmos, Christian Hoffmann, Maria Nijnik, Donald Hodges + all members.

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Luděk Šišák, Czech University of Life Sciences Prague, Czech Republic

Norbert Weber, TU Dresden, Germany

Lidija Zadnik Stirn, University of Ljubljana, Slovenia

Welcome to the IUFRO conference
Managerial, Social and Environmental Aspects of the Forest-based Sector for Sustainable Development
40th Anniversary Conference of IUFRO Research Group 4.05.00

ANNUAL CONFERENCE OF THE IUFRO RESEARCH GROUP 4.05.00 MANAGERIAL ECONOMICS AND ACCOUNTING AND ITS WORKING PARTIES

The forestry sector is significantly affected by environmental change and currently facing one of the biggest crises in recent history. A continuous string of natural disasters increases pressure on forest management scenarios, timber and non-wood forest products trading and pricing, sale policies, labour productivity, and demand and supply responses. These challenges considerably influence the whole value chain.

Forest management, timber and non-timber products, and wood markets are confronted with increasing pressure for enhanced managerial skills, planning, logistics, communication, marketing and analysis. The overproduction and related overall deficient demand for wood products also influence the forest-based sector. A shortage of skilled labour to manage the calamitous situation efficiently is significantly affecting the forest-based sector. The crisis in forestry becomes even more deeply rooted due to the current pandemic, which also notably decreases public interest in forest-related issues.

It is the duty of the forestry professional and scientific community at the national, European, and global levels to address this highly challenging condition and to propose steps to stabilise the forest-based and wood sectors.

Conference sessions:

- Socio-economic development of forestry in national, EU, and global economies;
- Social entrepreneurship, social innovation and corporate social responsibility in forestry;
- Labour market - employment in the forestry sector;
- Bioeconomy related current and upcoming EU policies;
- Economic and accounting approaches to sustainable development in the forestry and wood sectors;
- Socio-economic development of forestry in developing countries;
- History of IUFRO RG 4.05.00 – 40th Anniversary.

Socio-economic Importance of Forests, their Regeneration and Development Support by the Society in the Climate Change Era; Theory and Practice in the Czech Republic

Luděk Šišák[1], Roman Sloup[1], Roman Dudik[1], Jan Lojda[2], Vilém Jarský[1], Marcel Riedl[1]

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Introduction

Within the Czech society, forest is considered as renewable object, a natural, environmental or even technical phenomenon, in terms of the relevant disciplines. The forest is a more complex object, a property phenomenon as well as a social one. Forests are owned by various private, municipal, communal, regional, church, and state entities. Nevertheless, forest services fundamentally cross boundaries as well as the concept of ownership and have a substantial social significance regardless of the form of the forest property ownership.

The forest as an ecosystem is directly related to the society at the current stage of development and conditions. Therefore, forest often becomes an essential part of the society's life, a very important social and environmental phenomenon (far more than just a "natural" or "technical" thing bearing no relation to humans). The existence and further development of social services of the forest, their structure and social significance are conditioned by what the society requires from the forest. The needs of the society develop in time and the effort to satisfy them intensifies:

The society needs ⟶ Their satisfaction ⟶ Socio-economic services of forest

The needs of the society and the degree of their satisfaction, i.e., the forest services that satisfy them, vary in time and place and are constantly evolving in relation to the economic and social level of society, its culture, history, traditions, customs, and peculiarities of life. The forest might have the same technical, physical and biological character, but its utility values vary across different states, nations, and groups of populations as well as over different times. Therefore, social perception of the forest is different, too, resulting in its different social value.

Social significance – the value of forest social services, reflects the degree of satisfaction of the changing social needs, i.e., the demand at a given time and place. The forest as a social phenomenon has become more and more of a political phenomenon – a very important one for various parts of society, and for the society as a whole.

Material and Methods

The impact of climate change on the forest and its social services

The degree of provision of the forest social services within a society, their quantity and quality, depend significantly on the quantity and quality of the forest available, on the forest area and quality. Both the acreage and quality of the forest are currently significantly affected by climate change. In the CR, not only coniferous species such as Norway spruce (Picea abies L.) but also the formerly pioneering Scots pine (Pinus silvestris L.), even black pine (Pinus nigra L.) originally coming from the Mediterranean are facing a massive threat and have been dying in huge numbers. Moreover, even deciduous trees, considered resistant so far, are affected, including other pioneer species – European birch (Betula verrucosa Ehrh.), oaks (Quercus sp.) in some places, and ash (Fraxinus excelsior L.), to name a few.

Thus, we are probably at the beginning of a historically intensive fundamental restructuring of our forests.

Either the restructuring will be carried out largely by natural processes, essentially over a long period of time, and randomly without significant human participation, or it will be carried out systematically in the long run, especially to ensure that forests provide a range of significant social services requiring significant financial contributions from public sources, regardless of the type of forest ownership.

So far, the non-market forest services are generally considered to be fundamentally important forest services, but seem to be financially invisible at first glance because not going directly through the market, not bought and sold, nor recorded in accounting books. However, they have dual characteristics in relation to the market: some forest services – in comparison with non-forest aspects of the landscape which indirectly affect market relations, i.e., financially, they tangibly save social funds, and based upon the financial savings, which result from their very existence, their importance can be expressed in monetary form. They include the following blocks of services:

-"Timber production" services in the sense of biomass production affecting environmentally positive carbon sequestration and inhibiting climate change assessed on the basis of CO2 sequestration and "carbon trading" (emission allowance prices);
-"Water management" services, reducing maximum flow in watercourses, improving minimum flow in watercourses during droughts and groundwater levels, and significantly improving water quality, thus saving the public funds again;
-"Soil protection"– anti-erosion services reducing the loss of soil from the sites, limiting the deterioration of production quality, and preventing the clogging of reservoirs, streams and infrastructure by eroded soil particles, saving public finance again;
-"Non-timber production" – production and collection of forest crops (these are services of a recreational nature too, rather than services of an economic "profit" nature).

In other cases, these are purely non-market services, whose effect on saving financial funds cannot be determined at the current level of knowledge. The following blocks of services are distinguished, for example:

-"Health and hygiene" (recreation, relaxation, with a positive health effect);
-"Culture and education" (a fundamental block of nature protection services as the forest is a minimally changed environment; in the CR often the last refuge for many different species of organisms, supporting biodiversity "nature protection forest service" – a subject of science and research, education and training for different governmental and non-governmental bodies.

The values of forest social services, comparatively high in the CR, are expressed on the basis of comparison with values of similar services of non-forest landscape parts (Šišák et al. 2017).

The social forest services are related to forest market services i.e., timber production, though fundamentally different, are not mutually exclusive, in which multifunctional forestry benefits both commerce and society, exceeding the narrow category of forest ownership.

The market timber production service is significant from the ownership point of view, but also important social service, bringing jobs, wages and salaries to rural areas, paid for by the production – active multifunctional forestry, including repairment, maintenance and purchase of the means of production from outside the production forestry sector. Such forest service also means a financial contribution to the maintenance of infrastructure (road network) in rural areas.

Additionally, the timber production service helps other parts of the timber processing industry (economically and socially), providing jobs, especially in rural areas (most timber processing capacities are located in rural areas).

The market timber production service is an important contributor to finance funds to public resources by numerous taxes and payments.

Therefore, the socioeconomic value of the market timber production service lies in the total volume of revenues and sales. The latter belongs to the owner. The entire volume of sales, except

for the income of the owner, which remains after the payment of fees and taxes, will financially "dissolve" to various non-productive aspects of society (social and health care, education, defense, government, etc.).

In principle, only the net economic result – the income – belongs to the owner and represents the relatively narrow "ownership" part of the societal importance of the market timber production service. Other parts of the economic result go to employees (wages), to producers and suppliers of the means of production, and to organizations and bodies within the state – i.e., society as a whole – in the form of payments, taxes and fees to public resources covering health, social, administrative, educational and other activities of the state and society.

Financial means from the market timber production forest service to public funds:

The following payments contribute to the Czech state budget:

-Value added tax (VAT) – basic rate 21% (firewood reduced to 15%) or in the reduced-rate category, where applicable.
-Social insurance from the wage, which is 25% of the employee's gross wage, paid by the employer; the employee's social insurance payment is 6.5%.
-Personal income tax of 15% of the employer's total personnel costs; and corporate income tax 19% of the positive economic result.
-Real estate tax of 0.25% of the forest land price.

Payments made by the employer and the employee include health insurance (13.5% of the employees' gross wages), which is the income of health insurance companies and health sector.

Therefore, the subsidies from public sources provide the owners with funds for optimal forest structure regeneration and further proper care so that forests could provide their socio-economic services and values.

Results

Overview of financial support instruments under the authority of the Ministry of Agriculture for 2019–2020 and their allocation:

Support subject:	Allocation (mil. EUR)	
	2019	2020
Financial support by Government Decree 30/2014 Coll.	39,251	44,985
Services for forest owners	3,751	2,569
Claims entitled by the Forest Act	9,996	12,354
Forest tree species gene pool protection	784	0,588
Financial contribution to mitigate a bark beetle calamity impact	58,800	274,634
Rural Development Program	19,600	27,179
Support and Guarantee Fund for Farmers and Forestry	11,760	10,197
Total	143,942	372,506

The greatest development in subsidies has been recorded mainly in the last five years due to reforestation, increased logging and reduced timber quality. The impact of climate change has resulted in a sharp drop in timber prices and caused significant problems in timber sales in 2017–2020, significantly worsening economic self-sufficiency of the Czech multifunctional forestry, dependent mainly upon timber sales.

In 2019–2020, the financial support system for the formerly high profitable Czech forestry was significantly modified. Especially the years 2019–2020 brought record allocations of public resources:

-in 2019: total of 3.67 billion CZK, 143.94 million EUR;
-in 2020: total of 9.5 billion CZK, 372.51 million EUR. The total sum depends mainly on the owners of non-state forests – majority recipients of the financial support instruments listed above.

Multifunctional forestry and forests were stabilized in the Czech Republic, and continue in the long-term period. Timber processing industry was stabilized generally as well.

Discussion

In the CR, the forest is generally considered as not only a natural or technical phenomenon, but primarily a social, proprietary and political phenomenon, attempting to meet an increasingly demanding spectrum of a modern society's needs.

The quantity and quality of social services of the forest in the CR depends on the quantity and quality of the forest itself, which, currently, is significantly endangered and affected by climate change.

Socio-economic efficiency of forest and forestry as such should be based on both evaluated inputs (costs spent for their preservation or even improvement) and outputs of forest services (based on their socio-economic importance).

So called health-hygienic forest services (recreational, health) and cultural-educational forest services (nature conservational, educational, scientific, institutional) can be considered as intangible, social blocks of forest environmental services. They do not enter directly and measurably the material reproduction process. Socio-economic efficiency of the health-hygienic and cultural-educational (nature or biodiversity protection) forest services can be based on evaluated outputs of the services (applying the consumer surplus approach, use and/or non-use values, or so called expert approaches) and inputs (costs spent for their preservation or improvement (Sisak et al 2019).

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Exploring citizens' perception of deadwood in forest ecosystems in Italy

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In the last decades, deadwood has been recognized as an indispensable part of properly functioning forest ecosystems and an important indicator of biodiversity. As emphasized by several authors, deadwood plays an important role in forest ecological processes providing food and shelter to many species, reducing soil erosion and landslide phenomena, increasing soil organic matter and fertility, and facilitating tree regeneration and seeds germination (Jönsson & Jonsson 2007, Skwarek & Bijak 2015, Hofgaard 2000). However, some studies highlight that a large amount of deadwood reduces recreational accessibility and opportunities and it is perceived in a negative way by forest visitors (Tyrväinen et al. 2003, Jankovska et al. 2014, Simkin et al. 2020). Starting from these considerations, the aim of the present study was to explore and understand citizens' perceptions and preferences towards dead trees and lying deadwood in Italian forests. The study was conducted within the LIFE SPAN "Saproxylic Habitat Network: planning and management for European forests" project aimed to conserve biodiversity and increase structural heterogeneity in productive forests of the Natura 2000 network. The perceptions and preferences of 1292 respondents were collected through an online survey, administered between January and April 2021. The final version of questionnaire – modified after the pre-test stage – was made up of 17 closed-ended and open-ended questions. Questions focused on the following aspects of citizens' perception: level of knowledge on deadwood in forests; perceived importance of deadwood and its role in forest ecosystem processes; aesthetic preferences for forest landscapes characterized by different amount of deadwood (both standing dead trees and lying deadwood); and socio-demographic characteristics of respondents (gender, age, level of education, region of residence). The results show that respondents perceive the following as the most important functions of deadwood: increasing soil organic matter and fertility; providing shelter and food for wildlife. Conversely, most respondents emphasized the negative role of small size deadwood (fine woody debris) in increasing the forest fires risk. From the aesthetic point of view, respondents prefer forest landscapes characterized by a low amount of deadwood, independently from the forest type (Mediterranean maquis, European beech, Norway spruce, black pine, mixed oak forests) and the governance (coppice, high forest). Findings of the present study provide useful outputs for forest managers in order to reconcile conservation of biodiversity and improvement of recreational attractiveness.

Key words: sustainable forest management; standing dead trees; lying deadwood; questionnaire survey; visual-aesthetic preferences.

Model-based dynamic economic assessment of alternative forestry adaptation strategies to climate change in Germany

Rosenkranz L, von Arnim G, Rosenberger R, Husmann K, Englert H, Seintsch B, Roering H-W, Regelmann C, Dieter M, Möhring B

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Since the year 2018, the yield situation in German forest enterprises is characterized by extreme weather events (storms, draught) and, as a consequence, bark beetle calamities, leading to an above-average occurrence of damaged timber. In addition to processing the damaged timber, foresters are also challenged to develop and implement silvicultural adaptation strategies to climate change in order to ensure future wood production and long-term viability of the enterprises.

Within a study, jointly conducted by the Georg-August-University Göttingen, Department of Forest Economics and the Thünen Institute for International Forestry and Forest Economics (TI-WF), the long-term natural and economic consequences of two different silvicultural climate change adaptation strategies in Germany were assessed. We compared an intensive with an extensive forest management adaptation strategy under consideration of climate change induced survival probabilities, using - and also enhancing - the Forest Economic Simulation Model (FESIM).

This article outlines the methodological concept and presents first results such as the long-term effects of the two strategies on tree species area distribution, timber stock and fellings, as well as economic indicators such as liquidity and success. The comparison between the parameters of the adaptation strategies provides information and decision-making support for forest enterprises and forest policy.

Key words: climate change adaptation, forest management strategies, economic evaluation.

The Most Challenging Managerial, Social and Environmental Issues of Post-Transitional Forest-based Sector Development: Ukrainian case study

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Introduction

The reality of forest sector in Ukraine doesn't correspond fully to high societal expectations. The issues of illegal logging and corruption, the profit seeking management oriented on timber production first of all and not fully covering conservation values and multiple ecosystem services, a lack of wood market transparency have become a concern not only for NGOs but also for mass-media and local communities. It has caused an increase of forest related conflicts and worsening of the attitudes towards forestry profession (Soloviy et al, 2017). Forest legislation is complex, and there are cases of gaps or overlaps between different requirements. It creates multiple risks, for example there the risk of sanitary cuttings planned in violation of legislation and/or silvicultural requirements.

The total forest area ratio for the Ukraine is 16.73%. Around 15% of forests are located in legally established protected area (FAO, 2020). Afforestation efforts aimed to increase low forest cover are hampered due to a lack of a sufficient long-term funding, institutional limitations, lack of incentives/ subsidies for afforestation stimulation, and limited land access (Adamovsky and Soloviy 2013). In 2021 ambitious afforestation program is declared by the President of Ukraine and Government. The Green Country project has the aim to increase of country forest area by one million ha over next ten years but limited access to privatized marginal agricultural lands can be a serious barrier for its implementation.

The forest-based sector's share of the national GDP in the Ukraine, similar to the EU countries, below 2%. A common understanding as a "vital sector" of the economy, which unites all sub-industries that are connected to the resource "forest", is still absent in Ukraine and urgently needed. The main challenge is to initiate a coordinated effort of market actors and stakeholder to develop and promote adapted sustainable management regimes for the abundant forest resource. It is extremely important to ensure a viable balance of economic, social and environmental principles. Without such common understanding, the forest-based sector will be unable to keep a balance between industrial growth and long-term sustainability.

Key words: forest policy, forest sector, bioeconomy, green economy, stakeholders

Material and Method

To gain a better understanding of the perception of forestry professionals and other stakeholders of forest-based sector most challenging managerial, social and environmental issues and corresponding problem solving reforms implementation, a survey was implemented in three regions of Ukraine.

600 respondents were involved in the survey, including respondents that works for the public sector, employed in wood-processing and furniture business (private sector), self-employed private entrepreneurs, which are specialized in harvesting, wood processing or non-wood forest products processing and students of forestry universities or colleges. Deeper study of the category "forestry professionals" based on assessment of 86 interviews.

Results

The above mentioned challenges have led to the following negative socio-economic trends in reference to workforce development in forest sectors of Ukraine: considerable decrease in the number of employees; aging of the working staff; low level of salary at part of FMEs; low work safety; low attractiveness of job position within the framework of forest sectors; gender inequality; underestimating the forest-based sector from governmental side an it's absence among the national priorities; insufficient role of the trade unions in regard to supporting employees; low popularity of forestry education; insufficient number and quality of the support and communicational campaigns at the regional and national levels.

It was found that forest certification, which helps to eliminate the use of timber of illegal origin in business, has a direct relationship and average correlations with the phenomenon of illegal logging and unsustainable practices. Low correlation, but a direct link, is observed between the tendency of forestry workers to strengthen control in approaches to forest management and the volume of timber harvesting in forests, the size of fines and damages caused by illegal logging, the prevalence of illegal logging by commercial entities on the basis of permits, but with a gross violation of the rules. Statistically significant factors that have a direct relationship, but low correlations with the tendency of foresters to tighten the current legal norms are the factors that cause illegal logging: high energy prices, low social security and high unemployment, steady demand for timber, the presence in the economy of the shadow sector and the operation of illegal private sawmills, which are consumers of timber of illegal origin.

The correlation indicators were also low in the study of the need to strengthen control in approaches to forest management and the necessary measures to eliminate the use of illegal timber in business and eliminate illegal logging - transfer of forest plots to the local community, strengthening customs control, termination illegal exports. The growing number of cases of such phenomena that are harmful to forestry - continuous felling in large areas, insufficient control over the sanitary condition of forests, insufficient attention to the protection of flora and fauna and increasing threats to forest resources caused by visiting tourists and vacationers. Insufficient forest protection leads to an increase in the tendency of foresters to strengthen legal regulation.

The growing number of cases proving the existence of the shadow economy, which affects offenses in the forest sector, also leads to an increase in the tendency of foresters to tighten existing legal norms (there is a direct relationship between factors, but low correlation). An inverse relationship was found between the state of the regulatory framework of forestry in Ukraine and the need to strengthen control in approaches to forest management (according to forest sector workers, the better the legislation, the less need to strengthen control), but the correlation is low.

Conclusion and Discussion

In order to improve the situation we suggest measures towards enhancing competiveness of the forest sector enterprises, investment attractiveness, new tools and technologies introduction, attention to innovation and new achievements of the forest science, promotion of forest sector as leading part of bio-economy, as the heart of green economy, as an industry that constantly contribute to sustainability. In our opinion, the following steps are relevant:

1.At the first stage, it would be reasonable to create a public council of forest sector (this body should include all representatives of different sub-industries), which can analyze sector status quo and, on this basis, to outline development prospects.

2.The forest sector must be considered as a single unit with common understanding of interlinkages among all sub-industries that deal with such important resource as "forest" ranging from forestry, woodworking industry, furniture making, and pulp and paper industry to energy generation from wood, non-timber products, green tourism, etc. Only such understanding of the forest sector as the single structure will help to solve a major problems at regional and national levels.

3.“Think tank” creation within the framework of the national forest sector for representing main ideas at the decision-making levels. Determining of main criteria and priorities for forest sector development, analyzing of future scenario for regional and national levels, sectoral regional and national strategies elaborating.

4.Elaboration of national supporting and communicational program with determined amount of funding for intensive advance in two directions mentioned above.

5.Unlike in other countries, wood is still a major source of bioenergy in the Ukrainian Carpathians (FORZA, 2017). Increasing bioenergy production and use in Ukraine brings both important opportunities, as well as significant threats that must be carefully balanced in an integrated and systematic manner while considering trade-offs with ecosystem services (Soloviy et al, 2019).

6.Application of the close to nature forestry system for which primeval forests of the Ukrainian Carpathians are a valuable natural model (Commarmot et al 2013), and environmentally friendly technologies of logging, processing, transportation etc.

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Lviv region population's preferences towards recreational forests characteristics

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Introduction

Growing demand for recreation in the Carpathian Mountains region gives rise to new challenges related to the need for formation of recreationally attractive forests. In recent decades in Europe, many studies have been conducted on social perception of recreational forests, and preferences regarding their attributes, such as tree species composition, horizontal and vertical stand structure, canopy cover and deadwood distribution (Tyrväinen et al., 2003; Nielsen et al., 2007; Edwards et al., 2012; Paletto et al., 2013; Jankovska et al., 2014; Pastorella et al., 2014; Pelyukh and Zahvoyska, 2018; Pelyukh et al., 2019a, 2019b).

Similar studies were conducted in Ukraine (Blyhchak and Soloviy, 2009; Kalutskiy, 2012; Zahvoyska and Bas, 2007; Nijnik et al., 2017), however, they were carried out without regard to the forest characteristics, which are important for decision-making aiming sustainable forest management. Studies provided by Pelyukh and Zahvoyska (2008) revealed that Lviv region population prefers mixed uneven-aged forests with informational and educational stands in recreational zones. At the same time, respondents do not intend to visit forests that are far from their place of residence and forests with deadwood.

To check the preferences stability towards forest stands characteristics, this study aims to examine the Lviv region population's stated preferences regarding increasing / decreasing the widespread of recreational forests characteristics, such as tree species composition, age structure, presence of deadwood and recreational infrastructures etc. Moreover, studies performed by Ribe (1989) and Gobster (1999) have highlighted that people's perceptions regarding forest stand characteristics depend on many variables, which are partly shaped by the influence of cultural, regional and socio-economic factors. Therefore, another aim of the study is to test the differences in preferences towards recreational forests characteristics among different groups of respondents formed by socio-economic features (gender, age, level of education and place of residence).

Key words: recreational forests; analysis of preferences; questionnaire survey; Lviv region

Material and Method

Study area

The study area is Lviv region in the western part of Ukraine. The region has a surface of 21,833 km2 and a population of 2,497,750 inhabitants divided into seven subregions. The population of the Lviv region mostly lives in urban area (60.7%).

Lviv region is one of the most forested regions of Ukraine. The forests cover 31.8% of the Lviv region territory with the average growth stock of 258 m3 per ha. Recreation forests cover a surface area of 2951 km2 comprising 19.1% from all forest stands.

Questionnaire survey

The residents of Lviv region were involved into survey using a semi-structured questionnaire divided into five thematic sections. The first section included questions on respondents' use of forests for recreation. The second section included twelve illustrated choice sets for choosing forest

with preferred attributes. The third section included brief questions concerning preferences for the attributes. These questions served as a control of consistency for the preferences elicited in the choice experiment questions. Additionally, the section included questions allowing the respondent to evaluate the illustrations. The fourth section included questions about visits of respondents to forest in childhood (until the age of 11) and how they remember them. Finally, questions revealing demographic and socioeconomic characteristics of respondents were asked. All questions are short, simple and realistic in order to minimize the time needed to fill in the questionnaire and thus motivate respondents to do so.

The survey was conducted in the period from 13-14 August 2015 in different villages and cities in the Lviv region, namely Lviv, Shchyrets, Semenivka, Pustomyty, Poverhiv, Nova Oparska, Skole, Slavske, Zymna Voda, Obroshyno, Lyubyntsi, Nyzhnie Synovydne, Verhnie Synovydne. The sample of respondents (n=138) was sized considering the main socio-demographic characteristics of local population in the Lviv region such as gender, age and residence.

Data analysis

In this study, the results of the first thematic session data analysis are presented. The collected data were analysed considering the socio-demographic characteristics of respondents. The □2 test was used to test significance of differences between the groups of the respondents. The main descriptive statistics have been developed for all questions. All statistical analysis of the collected data was carried out using XLStat 2021.

Results

A total 100 questionnaires were collected. The response rate was 72.46% Regarding the gender, 52% respondents are women, and 48% respondents are men. Most of the respondents live in an urban area (62%), whereas 38% in a rural area. The majority of respondents have an age between 25-39 years old (40%) and more than 40 years old (40%). The results concerning the level of education indicate a quite high degree: 74% of respondents have a university degree. 69% of respondents have a child.

All respondents have visited forests at least once in the last 12 months. 37% of respondents have visited the forest often (from 1 to 12 times per month). 42% of respondents once every 2-5 mounts. Only 20% of respondents have been in the forest twice a year. Respondents (69%) who have children visited the forest more often. A statistically significant difference for frequencies of the forest visited among the place of resident groups was observed (□2 test: observed value = 34.315, critical value = 31.410, p = 0.024, a = 0.05).

70% of respondents have walked in the forest in the last 12 months. Other respondents mainly played with children (67% of respondents), gathered wild mushrooms, berries, plants (55%), rode bicycles (36%), worked (24%) or enjoyed forest landscapes (22%).

Forests, recently visited by the respondents, were characterised by a little presence of broadleaves compared to conifers (66% of respondents indicated this), a little difference of tree species composition (62%) and height of the trees (58%). Regarding an educational path, 45% of respondents noted that they were not enough. 35% of respondents indicated that there were no educational paths at all. Respondents' answers about picnic facilities are divided: 39% of respondents indicated that there were enough of picnic facilities, the other 39% - not enough. 22% indicated that there were no picnic facilities at all. 39% of respondents indicated that trees were planted in rows and there were few (55%) / many (41%) dead or dying trees.

Respondents indicated that next time they would like to visit forests that would have more widespread characteristics such as educational paths (75%), higher variability of tree species (67% of the respondents), picnic facillities (68%), different height of the trees (63%), wider presence of broadleaves comparing to conifers (55%). At the same time 53% of respondents would like dead or dying trees to be less widespread. The majority of respondents (55%) could not clearly state whether they would like the trees planted in rows to be less or more. A statistically significant difference for different height of the trees among the gender groups (□2 test: observed value =

8.433, critical value = 5.991, p = 0.015, a = 0.05) and for dead or dying trees among the group with and without children (□2 test: observed value = 10.609, critical value = 5.991, p = 0.005, a = 0.05) were observed.

Discussion

The present study increase knowledge about people's preferences regarding different recreational forests characteristics to overcome the current knowledge gap and provide key information for decision makers. The results confirmed the importance of socio-demographic characteristics (gender, age, level of education and place of residence) in shaping respondents' preferences. These findings could help forest managers to increase recreational attractiveness of forest stands, which is very beneficial for national economies and enhance social welfare (Giergiczny et al., 2021). Further analysis of the collected data will provide a deeper insight into people's perceptions and preferences towards forest stand characteristics and make a positive contribution to the ongoing discussions on the need of implementation close-to-nature paradigm of forest management on the territory of Lviv region.

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Current practices and innovations in smallholder engagement in the palm oil supply chain: a systematic mapping of evidence

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Upstream oil palm value chain (i.e., cultivation, milling, and refining) is a primary driver of deforestation and extensive carbon emissions in Southeast Asia (Rival and Levang 2014). Conservation and human rights actors have long criticized upstream palm oil value chains for enshrining injustices against those living and working where palm oil is grown and processed (Etuah et al. 2020; Satria Wibawa and Prasetya 2015).

From global to local scales, public and private actors have sought to improve sustainable practices of upstream palm oil value chains through various means, including law enforcement, sustainable certification schemes, and the zoning of protected areas (Pacheco et al. 2017). These initiatives have often emphasized the role of transnational companies and other palm oil giants; however, engaging smallholders, including individual, contract, and organized farmers, in the sustainability agendas remains challenging (Obidzinski et al. 2012).

This chapter aims to synthesize the key elements of smallholders' engagement in the sustainable outcomes in the palm oil supply chain management in Southeast Asia. To achieve this goal, we conduct a rigorous systematic mapping of articles focused on sustainable palm oil supply chain globally and apply structured content analysis to mentioned articles spanning 20 years of research published in English-language, peer-reviewed journals.

The study contributes by identifying formal and informal governance mechanisms characterizing smallholders' engagement in sustainable supply chain management. It will further determine the relationship between those mechanisms and sustainability outcomes, highlighting the literature development in supply chain management in Southeast Asia.

The results aim to provide insights of the development of smallholders' engagement approaches in the past two decades and offer suggestions for future research. The research will also contribute to practice by providing development and conservation practitioners with directions for improving their approaches to engaging smallholders in the sustainable outcomes in their supply chains.

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Forest management plan as an instrument for socio-economic development of regions: a case study from Tusheti, Georgia

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There are several protected areas in the region of Tusheti, Georgia (national park, strict nature reserve and protected landscape area). Their management has considerable gaps (inventory and forest management principles are missing). The condition of protected areas is not satisfactory and dynamic changes occur recently (vegetation dieback, occurrence of insects under bark). These are reasons for which the monitoring of forest ecosystems has to take place and forest management measures have to be adjusted in order to allow careful exploitation of forest ecosystems in line with the management targets.

During years of 2014-2015 the Georgian Agency of Protected Area declared needs (after discussion with different stakeholders) for Tusheti region, that can be described as follows (only a few examples): non-existence of the forest inventory; occurrence of forests, grasslands, pasturelands and their acreage has not been determined precisely; forest areas have not been precisely defined and forest types have not been determined (defined) – the characterization of natural conditions does not exist; definitions of quantitative and qualitative characteristics of wood-producing resources (forest functions) do not exist; the health condition of forest ecosystems is not assessed; indicators of timber volume in the given area are not defined (annual increment, timber supply, timber use possibilities, logging limits, regeneration possibilities etc.); tree species composition and representation of individual species in the given area are not defined or determined etc.

As a project outputs were created maps and methodological procedures for the forest management (forest status determination) and planning; evaluation of the condition of forest ecosystems in Tusheti region of Georgia from the perspective of their endangerment by biotic factors (namely by under-bark insects), proposed methodology for basic forest management planning with emphasis on forest protection and assurance of the fulfilment of other forest functions – management of forest stands in the sense of near-natural forest management.

The paper deals results from the 4-years pilot project (2015-2018) for develop at setting up a basic model of sustainable forest management system built on actual data obtained about the condition of forest ecosystems reflected into the forest management plan of the pilot area (cca 2350 ha). An inseparable part of the outputs were a series of training courses for stakeholders, in which these were informed in detail about individual methodological procedures, map outputs, their use, and were trained for the collection of basic field data and their processing. The aim was also to enhance the qualification of staff working at Administrations of Protected Landscape Areas. Within the project solution, a simple forest management plan was be set up that would provide a general view about possibilities of using wood for the local population with respect to the current condition of forest stands within the framework of forest site classification (qualitative and quantitative evaluation, characterization of forest types). Emphasis was put on the reduction of negative factors, namely the occurrence of forest insect pests, forest fires, soil erosion, etc.

Key words: socio-economic development, region, Tusheti, Georgia, forest management plan.

Ecosystem Service Gambits: A Persistent Challenge for Ecosystem-Based Management

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Introduction

Landscapes change over time, as do ecosystems, people's values, and social institutions (Plieninger et al., 2016). As long as users and other stakeholders feel they are receiving adequate benefits and ecosystem functioning is stable, all elements of the social-ecological breath in synergy. However, when this is not the case, conflicts can arise. Conflicts related to land use or availability of ecosystem services (ES) are situations where two or more parties with different interests disagree on the use of land, its parts or ES. If all parties involved do not agree to resolve the dispute that has arisen, a conflict arises that prevents the advancement of the state of the art at the expense of welfare. Alternatively, a trade-off may occur when one land use or provision of a ES is increased and consequently another ES is decreased (Rodríguez et al., 2006). Trade-offs and conflicts differ in terms of their magnitude, temporal and spatial occurrence, number and extent, and may be a consequence of distant past causes, such as demographic change or social characteristics (see also Plieninger et al., 2016).

The aim of this study is to analyse the conditions of current ES use at the landscape level, identify relevant barriers to ES use, understand the ultimate causes for the occurrence of barriers, and identify how they can be mitigated. We focused on a case study in the southwestern part of Slovenia with rapid landscape evolution from semi-natural ecosystems, i.e. agricultural land, to natural ecosystems, i.e. forests (Kaligarič and Ivajnšič, 2014; Kladnik, 2011). Along with this change, the occurrence of trade-offs and conflicts has increased. The analysis of conditions and relationships is based on the Social-Ecological Systems framework (McGinnis and Ostrom, 2014; Sandström et al., 2013). The framework comprises four subsystems, namely governance systems (GS), resource systems (RS), resource units (RU) and actors (A), which are intertwined and built around focal action situations. This logical whole is surrounded by exogenous influences from the social, economic and political environment or related ecosystems (McGinnis and Ostrom, 2014). We have identified a preliminary set of eight second-tier explanatory factors that are assumed to influence management in the study area: the current state of the management regime, political aspects, the type of actors, and socioeconomic characteristics (see also Niemelä et al., 2005; Sandström et al., 2013).

Key words: Qualitative Research, Perceptions, Conflicts, Social-Ecological Systems, Landscape, Slovenia

Material and Method

Our approach in this study was qualitative. We conducted 19 face-to-face 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). We used a purposive sample with multiple criteria, namely ownership, organizational form, sector, and place of residence. Interviews were conducted from September 2019 to July 2021 and then fully transcribed. Interviewees were informed about the research topic prior to the interview and asked to give their consent to participate in the research. The average interview duration was 74 minutes.

We analysed the qualitative database following the thematic analysis (Braun and Clarke, 2006) and focused on identifying semantic themes. Through the analytic process, we then summarized and interpreted the identified recurring patterns of meaning and important themes in context. The

stages of thematic analysis are: becoming familiar with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Braun and Clarke, 2006).

The case study was located in the southwestern part of Slovenia. The area of the region was about 72,250 hectares and included five municipalities. The majority of the study area is under the Natura 2000 regime, which indicates the importance of natural and semi-natural ecosystems for biodiversity. The area is known for its relief with shallow soils, the presence of sinkholes, underground caves and other typical karst phenomena. More than 64% of the study area is covered with forests, followed by pastures (17%) and other agricultural land (7%). The reported areas were not always the same - it is important to note that the study area has experienced a radical land use change since the mid-20th century due to the abandonment of agricultural land (Kaligarič and Ivajnšič, 2014). The share of forests at the beginning of the 20th century was about 20%, while the share of pastures and meadows was about 65% (Zorn et al., 2015).

Results

Interviewees recognised three of the four groups of ES, namely regulating, provisioning and cultural. However, judging by scope and relevance, cultural ES was given the greater importance, followed by provisioning and regulating. Interviewees emphasised the broad list of actual activities, such as hiking, biking, ecotourism, and spiritual, historical, and therapeutic ES. Recognised provisioning ES include agricultural crops and other benefits from agricultural lands, raw materials from forests (e.g., timber, stone), and food from forest ecosystems (e.g., game, wild foods). Important regulating ES are purification of air and (underground) water. ES users are as diverse as ES itself, ranging from landowners, mushroom pickers, recreational users, immigrants, hunters, tourists, and others.

The study area is mainly located on a limestone bedrock and people - in order to survive throughout history - have adopted some sustainable practices, such as collecting rainwater on stony ground. Among the socio-economic and political characteristics, interviewees mentioned unfavourable ownership structure that discourage people from managing their land, changing lifestyles that involve a move away from 'nature', questionable policy instruments that prevent efficient land use, bureaucratized local self-government that worsens administrative procedures, and a poor management system that neglects users' demands. On the other hand, interviewees noticed some phenomena that can be attributed to local users and landowners, but the sources could be sought in the previous groups of attributes. Local people and landowners in the region tend to be somewhat headstrong, independent, stubborn and determined, but also very altruistic. However, the latter is not true of many interest groups that manage the environment. Because of their short-sightedness and narrow goals, they miss the opportunity to build a functioning and sustainable community. The lack of a culture of dialog is probably a consequence of the interactions between the above attributes and could further discourage landowners from actively participating in land management.

Several interviewees emphasised that private land ownership influences their behaviour and generally leads to more sustainable management practices. The sense of ownership and the ability to control things encourage owners to choose to renovate ecosystems and manage marginal lands, although this does not stop landowners from not managing their lands. On the contrary, lack of cooperation between stakeholders and users and lack of land-use strategies lead to inefficient management, conflicts between stakeholders and ES and other abuses. According to the interviewees, many users with different interests are more prone to conflict situations under such socio-economic and political conditions.

When we talk about conflicts between users in the environment, we can consider them as two-dimensional. First, there are people (i.e. subjects) with multiple and diverse interests who are involved in conflicts and want to get the most benefit from them. And secondly, there are land areas and ES uses (i.e. objects) that are affected by conflict and over which subjects fight. Conflict situations may be a consequence of the properties of the objects in relation to the subjects, the current circumstances, or the indifference and ignorance of the subjects. In either case, the root

causes of many conflicts must be sought long before the conflict actually arises. For example, overgrown areas are abandoned areas and lead to an increase in wildlife population (e.g. wild boars), which leads to conflict situations with all surrounding land and ES uses. Recreation could also be threatened in these areas as people fear being attacked by wild animals. Another example mentioned by several interviewees, is the gathering of forest fruits (e.g. mushrooms), which is regulated but not controlled. In such situations, conflicts often arise not only between the picker and the landowner, but also between the picker and owners of residential and agricultural land nearby. Pickers and other users tend to dump trash in the area, double-park in front of the entrance, steal other people's agricultural crops, and cause other inconveniences that indicate a lack of respect and awareness.

Discussion

During the analysis process, we identified several themes and established some relationships between the attributes and the potential action situation. Since the area under study offers several ES on different land areas, active management to avoid or control potential conflict situations is important but not always present. For some activities, such as wildlife versus recreational management, trade-offs are inevitable, at least from a temporal perspective. In these cases, prioritising areas for each activity through participatory methods could provide satisfactory results (see e.g. Kovács et al., 2015; Nastran, 2015). In the case of forestry and forest fruit gathering, perhaps only the temporal management would need to be improved. In other cases, such as conflicts between landowners and ill-informed users (who, e.g., dump waste in the environment), information and awareness-raising measures could be an appropriate solution.

It is of great importance to take into account the perceptions of landowners and local users and integrate these insights into an improved management framework (Ananda and Herath, 2003). For example, providing a partner to coordinate and organise ES users was mentioned as a solution by several interviewees, highlighting the importance of collaboration between stakeholders in delivering effective policies (Kovács et al., 2015). In addition, the use of some publicly available ES on private lands, such as forest fruit collection, requires monitoring (more oversight) in terms of quantities collected, a change in policy and a redefinition of measures (Rodríguez et al., 2006). Alternatively, a greater emphasis on user education and public awareness of environmental misuse in general would reduce potential conflict situations through behavioural change. In all cases, an active, dynamic approach is required to avoid sacrificing valuable ES and the well-being of the (local) population for appearances, convenience, laxity or political goals.

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The potential of accountancy data networks for assessing the significance of forestry in terms of jobs and income – the case of Austria

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Although forestry is usually of marginal significance at the level of national economy, this industry may play a substantial role in terms of jobs and income in less favoured or peripheral regions in general and for the viability of mountain farms in special. In Europe, sector statistics relies on the framework of the European Forest Accounts (EFA). Within the EFA, table B1 addresses the economic aggregates of the forestry and logging industry.

Factor income and annual working units are the most important items in regard to our subject. At least in countries with a significant share of farm forestry, self-employment, unpaid family labor and mixed income are relevant elements of sector statistics. However, capturing these is all but straightforward. A lack of sound data is also likely as regards jobs and income related to contractors' work, which is also part of the sector.

In our paper we demonstrate, how the accountancy networks operated in Austria provide clues in this respect. The number of annual working units in fact relies on a synthesis of different sources. Estimates based on data stemming from the accountancy networks augments information derived from the agricultural census. The representative network of voluntarily book-keeping farms underlying the Austrian Farm Accountancy Data Network documents the input of unpaid (family) labor in terms of working days per year. On average, this amounts to 2.41 days per ha of forest per year and 2.37 hours per m3 of harvest in the period 2010-2019. The small network of farm forestry is by no means representative.

Nevertheless, the empirical data on the productivity of family labor in harvesting (on average 0.75 m3 per hour of family labor in 2011-2020) can be used for modelling exercises and thus allow a more specific assessment of forestry activities in small-scale farm forestry. Finally, the accountancy network of bigger forest enterprises provides references in terms of capital of staff, working hours of employed labor as well as labour productivity.

Key words: European Forest Accounts, mixed income, annual working units, labour productivity

Sustainability of the labour force in forestry – Preliminary results of the study in Bosnia and Herzegovina

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Introduction

Sustainable Forest Management (SFM) for a longer time now represents a basic premise of managing forests, especially since the concept of sustainable development has been widely recognised in the early 1990s. SFM represents "the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems" (MCPFE 1993). As stated in the above definition, social aspects are an integral part of sustainable management of forests (and other natural resources) i.e., of sustainable development in general. Social aspects are gaining increased attention today and they include, among others, the functions of the forest and the benefits, which people derive from them. Forest-based employment, along with income for private forest owners, is the key material benefit from forestry to society. Employment in forest sector is both a benefit from and an indispensable input into forestry. All forest workers, contractors, self-employed workers or forest owners, are stakeholders in forest management as contributors, potential beneficiaries and those whose livelihood hinges on the sustainability of forest management (Blombäck at al. 2003). Although the proportion of employees in the forestry sector compared to the total workforce in certain countries is usually relatively small (in Europe 0.025 – 1.53%, according to UNECE 2020), forestry as a sector has a very significant multiplier effect which is reflected in the related jobs. Examples of this can be found in the production of forestry machinery and equipment, construction of wooden and timber structures, furniture sector and others which are in economic and statistical records kept separately, but forestry remains their natural determinant (Toth et al. 2019). The relevance of social aspects and of labour for forestry and forest industry has been explicitly acknowledged and addressed in numerous papers and studies (Poschen 1997, 2000), as well as in many important intergovernmental declarations and resolutions (MCPFE 1998, 2003) and also different voluntary forest management certification schemes (FSC, PEFC).

The management of forests in accordance with the principles of sustainable development is not possible without human input, including labour. SFM practices aim to maintain and enhance the social, economic, ecological, cultural and spiritual functions of all types of forests, for the benefit of present and future generations and the continuous fulfilment of society's needs. In order to achieve these goals modern forest management also needs a sustainable labour force. A skilled and sustainable workforce is essential and absolutely necessary precondition in performing all forest operations, one that is difficult to replace or recover (Šporčić et al., 2015). At the same time, forestry work, especially wood harvesting, is considered as one of the most hazardous occupations in many countries. The forestry workers are exposed to high risks of accidents, including many fatalities and serious health problems (Garland 2018.). Many recent studies also point out the significant decrease in forestry employment (Cacot et.al. 2015, Bluszkowska and Tomasz 2014, Tsioras 2012). It means that skilled labour force is leaving the forestry sector (retiring or leaving for other reasons) and is not being replaced. According to UNECE/FAO over the period 2008 – 2016, the number of forest workers in Europe decreased by 18% (UNECE 2020). Employment trends have been declining substantially, and prospects for increased formal employment in forestry are not looking very bright. So, the forestry sector is facing a big challenge of developing a sustainable workforce

what includes making forest jobs safer, better paid, and more attractive for young workers. As one of the possible solutions to a problem, often emphasized is the need for promotion and development of “greener jobs” in forestry sector. This implies a transition from traditional forestry employment (in silviculture and activities around timber harvest) to a creation of new green forest jobs seen in a broader context of all forest functions, e.g., in areas related to health, recreation and tourism in forests. Having in mind the above, this study intends to provide a closer look at the position and status of forestry workers in Bosnia and Herzegovina (BiH). The research will include their socio-economic characteristics, attitudes towards forestry profession, main concerns and problems, and opportunities to improve forest work. By examining the respondents on three different levels in BiH forestry – forest workers, forest companies (public and private) and institutions (forestry administration, science and education, interest groups), the study will provide an answer to the question of how serious the problem of labour shortage in BiH actually is. The results will also show what are the possibilities and the best ways for stronger attracting, recruiting and retaining suitably skilled and qualified workers in forestry. Preliminary results presented in this paper will reflect findings of a survey conducted in one BiH county out of totaly 9 counties that are intended to be included in the study.

Key words: employment, forestry, sustainability, workforce, recruitment

Material and methods

Data collection was based on structured questionnaires in which most questions were common to three groups of respondents: (1) Forestry institutions, (2) companies (public and private) and (3) workers (loggers, tractor drivers, choker setters, etc.) in the Canton 10 (Hercegbosanska zupanija) of BiH.

The questionnaire was designed by using relevant literature sources and with the help of interviews with persons directly involved in logging operations such as executive directors, production managers, private forestry contractors, loggers, tractor drivers, etc. The questionnaire consisted of three parts. The first part was general and included some general information about the respondent such as year of birth, length of service, social status, etc. The second part referred specifically to work in forestry or where the respondent was employed – type and duration of employment, attitudes and opinions on certain issues in forestry production etc. The third and largest part of the questionnaire was related to the issue of attracting, recruiting and retaining the labour force in forestry and is identical for all three groups of respondents. The 5-level Likert scale was mainly used in questions in the third part of the questionnaire.

Questionnaires were made in a printed version for all three groups of respondents and an online version (Google Forms) for the first two groups. Printed questionnaires were sent to all groups while online versions were sent to forestry companies and Forestry administration via e-mail and other communication applications (WhatsApp, Viber, Telegram, etc.).

The research was conducted during the first half of 2021. The sample size for the county was: 20 questionnaires for public enterprise, 20 questionnaires for logging contractors, 75 questionnaires for workers, and 5 questionnaires for Forestry administration.

Prior to the survey, the questionnaires were tested to check for ambiguous, biased, and confusing questions and to check the quality and comprehensibility of the feedback.

After data collection, a basic database was created in MS Access to enter all collected data. From the basic database, the data were exported as needed to other software packages such as MS Excel and Statistica.

Methods of descriptive statistics (arithmetic mean, median, standard deviation and frequency) were used for data processing.

Results

A total of 120 questionnaires were sent to the three groups of respondents, of which 71 (60%) returned. Questionnaires were completed by 4 government representatives (ministry and inspectorate), 22 representatives of forestry companies (14 of public enterprise, 6 logging contractors), and 45 forest workers (29 loggers, 13 tractor drivers, one choker setter and two field managers). All workers were employed by private logging contractors.

The average age of the workers was 42 years ± 10.08, (median: 43 years) with an average work experience in forestry of 10.2 years.

Results showed that 42% of all forest workers chose their job because they could not find another job, and 27% of them because they come from a logging family, 22% because the job was well paid, and 8% because they liked the job. None of the workers were members of the forestry union.

About 38% of all workers would choose the same job again while 62% would like to do something else. 24% of workers think that it is good for them where they are now, while 75% are thinking about leaving BiH – most of them would look for another job, and the rest would do the same job abroad. Indicatively, 84% of them would never encourage their children to get involved in logging.

Almost all of the respondents (96%) believe that there is a problem with the shortage of the forestry labour force in Bosnia and Herzegovina and that it would increase in the future. About 40% respondents believe that this problem had been present for a long time. Some 86% think that most employers in BiH forestry have problems with recruiting and retaining quality loggers and tractor drivers.

Majority of the respondents (93%) answered that one of the main reasons for the shortage of labour force in forestry was the departure of the workforce outside BiH. About 76% of respondents believe that the declining demographic trend also contributes to this problem.

Recruiting and retention of workers in BiH forestry

Results show that 78% of all respondents think that the main factor in the difficulty of recruiting and retaining labour in forestry is the general social, economic and political state in BiH.

Some 93% considers that a competitive starting salary represents one of the most important factors for more successful attraction of workers in BiH forestry. The same number of respondents believe that higher regular salary and a guaranteed salary increase with years of service also carries great importance. In addition, 92% answered that the social rights of workers, such as working hours, vacation, insurance, etc., are equally important.

About 96% of all respondents feels that one of the most important factors for more successful employee retention is employee remuneration and job satisfaction. When it comes to ensuring greater commitment of workers to work, almost 90% of all respondents answered that a high level of work organization in the company is the most important factor.

As a means of attracting workers, 65% of all respondents answered that word-of-mouth and recommendation was still the best way to recruit new workers, and 95% of them claimed that a Forest Workers Training Centre should be established in BiH. Also, 66% of workers believe that mechanized logging should be introduced in the future, while respondents from forestry companies were divided on this issue.

In the previously presented attitudes, no statistically significant difference in responses was found between the 3 groups of respondents.

Discussion

There is no doubt that in Bosnia and Herzegovina the problem of shortage of quality labour force in forestry exists and that this problem will become even greater in the future.

In order to mitigate the negative trend of the labour force population leaving BiH, the general social, economic and political situation in BiH will have to improve in the foreseeable future. But the forestry sector must not be idle. Increasing the starting salary, job stability, ensuring the social rights of workers remain the most important factors when it comes to recruiting and retaining forest workers. Establishing a Worker Training Centre through an integrated system can help attract and retain the forestry workers. A gradual transition to mechanized logging, where possible, could reduce labour needs but at the same time would require a smaller number of highly skilled machine operators.

Of course, all of the foregoing is a very complex task that requires a systematic approach and active participation of all stakeholders involved, primarily the Ministry of Forestry, forest companies, trade unions, educational and other institutions.

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Social innovations and social entrepreneurship - a powerful tool in forest landscape restoration to tackle climate change and biodiversity loss

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Land use change, the demand for timber and wood fuel, climate change and recently the COVID-19 pandemic, put forest ecosystems under increasing pressure. Furthermore and consequently, these ecosystems are now threatened by numerous disturbances e.g., insect infestations and pathogens, droughts, windthrow, landslides, invasive species and increasing threat of landscape fires which have intensified in frequency, severity, and extent over the last few decades. To respond to the looming climate crisis, biodiversity loss and forest landscape degradation, e.g., in the EU several strategic documents recently has been adopted (e.g., EU Green Deal, EU Biodiversity Strategy and the related EU Forest Strategy (in July, 2021), EU Strategy on Adaptation to Climate Change (2021), and the EU Bioeconomy Strategy). These documents set visions and concrete actions for strengthening forest resilience to the increasing natural and anthropogenic disturbances by accelerating efforts of governments and communities worldwide. The recently launched UN Decade on Landscape restoration (2021) sets an ambition target at global level to increase quantity and quality of forest landscapes, strengthening their protection, encouraging forest restoration efforts worldwide and ensuring the long-term resilience of forest ecosystems. In this presentation we will explore how social innovation and social entrepreneurship in forestry can contribute to reaching these targets. We do it by examining different case studies and innovation actions in Europe and beyond. We suggest that social innovation initiatives (if scaled-up and/or scaled-out) can be a powerful tool to fulfill forest landscape restoration commitments, contributing simultaneously to climate change mitigation, green jobs' creation and building the long-term resilience of forest socio-ecological systems.

Key words: social innovation, climate change, disturbances, forest landscape restoration, communities' engagement

Forest-based social innovation in Slovenia: the revival of traditional charcoal burning

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Introduction

As one of the means for achieving the European Green Deal aims, European Union reaches for social innovation, which is even made mandatory in many Horizon Europe calls. The increased attention of policy and research communities to SI is due to its intrinsic nature of bringing positive change in society (Bosworth et al., 2016;) and offering promising solutions to contemporary social and environmental problems (Edwards-Schachter and Wallace, 2017; Pisano et al., 2015). Social innovation is about the intentional process of change in behavior that creates new products or services, new relationships, new institutions, and/or new organizational forms (Polman et al., 2017). In rural contexts where forests are fundamental resources, SI can be defined as "the reconfiguring of social practices, in response to societal challenges, which seeks to enhance outcomes on societal well-being and necessarily includes the engagement of civil society actors" (Polman et al., 201, p.3).

The concept of social innovation is frequently used in rural development literature as it can support rural communities in solving local problems, reduce social inequalities and disproportionate resource use (Sabato and Verschraegen, 2016; Živojinović et al., 2019). (Neumeier, 2012; Živojinović et al., 2020). SI can help in revitalizing rural areas through the involvement of the community in finding innovative solutions (Melnykovych et al., 2018; Nijnik et al., 2019; Živojinović et al., 2019).

One of the examples of forest-based SI in Slovenia is the case of the Charcoal Land and the revival of the traditional charcoal burning in Slovenia. The aim of this article is to scientifically document the revival of traditional charcoal burning in Slovenia. To fulfill our aim, we analyzed the social innovation process of the development of the Charcoal Land initiative, who sparked this revival.

Theoretical background

We used the social innovation framework developed by the SIMRA project. The framework distinguishes 3 broad phases of the SI process: preparatory, reconfiguring, and project (Secco et al., 2017). The first phase is preparatory actions for collective benefits, which is characterized by the development of novel ideas and collective action (Górriz-Mifsud et al., 2018; Secco et al., 2017). Preparatory actions lead to a process of reconfiguring governance arrangements; networks or attitudes, which mark the second phase called reconfiguring and reconfigured social practices. (Holtz, 2014, p. 1) The process of reconfiguring leads to the project(s) needed to implement and realize SI idea in practice – the phase called project activities, procedures, and practices. Through SI projects the novel SI ideas are implemented and the "actions may spread to higher levels of the system (scaling). This interaction generates products, and outcomes (negative or positive) that can potentially change many, or perhaps all, of these input factors" (Górriz-Mifsud et al., 2018, p. 21).

Key words: social innovation process, traditional charcoal burning, collective action, forestry, Slovenia

Methodology and methods

To scientifically document and analyze the revival of traditional charcoal burning, we used an in-depth case study of the Charcoal Land Initiative and (Yin, 2009, pp. 46–51). The Charcoal Land is located in Central Slovenia, the local community Dole pri Litiji. It is characterized by hilly to rugged terrain. It includes 28 villages and hamlets, with approximately 770 inhabitants in 250 households. The households are individual or in a group of few, connected by poor road infrastructure. There are approximately 120 farms in the area. Focus on self-supply of food and feed is strong and most of the farms produce forage crops and silage maize. Vegetables and fruits for human consumption are usually produced in the gardens next to individual households. Infrastructure is poor (Martin Höher et al, 2017).

For data collection, we used key informant interviews, semi-structured interviews, and document review. In total, we conducted five unstructured interviews (Whitehead, 2005) with the key informant, and 20 semi-structured interviews with other key actors. We also conducted a review of archived documents kept by the Charcoal Land Initiative (about 300 documents in Slovenian language). Archive documents (AD) contained e-mail correspondences, notes, minutes meetings, idea drafts, project proposals, calls for projects, media publications, invitations, journal articles, posters, tickets, etc. Archive documents and interviews were analyzed by the lead researcher using content analysis (Mayring, 2014). For reconstructing the revival of traditional charcoal burning, we used event-sequence analysis, in the particular visual mapping (Spekkink, 2013). Mapping of the Charcoal Land activities enabled us to identify and construct the timeline of the events that led to the revival of the traditional charcoal burning in Slovenia.

Results

The development of the Charcoal Land initiative and reconfiguration of charcoal burning practice took 20 years following all three phases of the SI process.

Preparatory action

1999 – 2001: Idea initiation and development – The revival of charcoal burning practice started with the idea of the two regional foresters who noticed that charcoal burning is still occasionally practiced by a few families in Dole. They mobilized a small group of actors and elaborated the idea in the working draft called Charcoal burning in Dole, listing all the potential benefits of the revival of charcoal burning practice (AD ID4, KII2, SSI2). During 2001, this small group of actors attracted several more charcoal burners and formed the Section for Preservation of Natural and Cultural Heritage, under the Sports Society Dole pri Litiji. (AD ID12, SSI2, SSI4). They affirmed their idea in the wider community during the celebration of the Local community day (ADs ID9, 10, KII2, SSI12). They constructed and registered the Charcoal Path that has an educational and recreational purpose (AD ID25). For the official starting of the project Charcoal burning in Dole, they decided to try to connect charcoal burning with Forest Week 2002 (AD ID22).

Reconfiguring phase

2002 – 2004: Promotion, growth, testing, and consolidation – As the State Forest Service director dedicated the Forest Week 2002 to traditional forest practices and skills, the ignition of the Charcoal pile in Dole was a central event (AD ID28, KII3, SSI8). Forest Week 2002 included activities such as publishing the book about charcoal cooking in Dole pri Litiji, literary competition, photo competition, and painting workshops (AD ID31). Forest week 2002 was promoted in local and national media, (ADs ID 41,42), and attracted politically important persons (ADs ID 54 – 56), which gave the national visibility to charcoal burning in Dole (KII2, SSI5 - 8,10,12)

Project phase

2005 – 2018: Implementation of developed activities, scaling out, institutionalization, and scaling up – In this period the Charcoal land initiative continued with already developed activities, such as traditional walk on the Charcoal Path, painting colony, a celebration of the Local community day, etc. (ADs ID 186, 188, 190, 191,202, PO 2017-2019), which were followed with media attention (ADs ID187, 198, 207).

From 2005 to 2008 charcoal piles were ignited all over Slovenia (scaling out) (ADs ID 192, 207, 209, 216, 230, 244, 245, 250, 252, 256). In 2009, charcoal burners established the Slovenian Charcoal Burners' Club (ADs ID 260-262). Together with the district forester., State Forest Service, Cultural touristic recreational center Radece, they organized national event All Slovenian charcoal pile ignitions (ADs ID 271, 272, 286, 289, 290, 292 – 294, 308).

In 2012, charcoal burning was registered as intangible cultural heritage and entered in the Register of Cultural heritage (MIZKS, 2012). In 2015, traditional charcoal burning was regulated by Decree on subsidiary activities on farms (Official Gazette No. 57/15 in 36/18). This means that charcoal burning has to be registered by an agricultural holding (farm) as a complementary activity. It also has to be registered in the Craft register managed by The Chamber of Craft and Small Business of Slovenia.

During the national gathering of charcoal burners in September 2018, the informal Slovenian Charcoal burners' Club changed its legal status into the Association of Slovenian Charcoal burners. In September 2019, the Association of Slovenian Charcoal burners became a member of the European charcoal burners Association. In 2021, they prepared and ignited the World's biggest charcoal pile which had about 300 m3 of wood obtained from silvicultural forest works.

Conclusions

This reconfiguration of traditional charcoal burning practice was caused by the hardship of the area of Dole pri Litiji brought by the decline of industry, loss of jobs, and migration of population to urban areas. Through the activities of the Charcoal Land and Slovenian charcoal burners, new relationships and civil sectors organizations were established and local, regional, and national actors from all sectors were connected. The Charcoal Land initiative contributed to enhancing outcomes on people's well-being. Those manifested on multiple levels, from an individual (such as the sense of self-worth of charcoal burners), local (i.e. improved infrastructure in the local community) to national (such would be the spreading of the practice all over Slovenia).

Unfortunately, charcoal burning as well as other SI initiatives in Slovenia are often not adequately recognized by policymakers, public authorities, and civil society. For example, by regulating traditional charcoal burning, increased obligations are posed on the charcoal burners. As these kinds of initiatives are not recognized by Slovenian policy documents, charcoal burners can obtain support only for some activities through Rural Development Programme or forestry funds (Rogelja, 2018). Due to this they have access to limited resources and support mostly through informal relationships with organizations such as State Forest Service and Municipalities. In addition, the Charcoal Land, as well as many other SI initiatives in rural areas, are facing limited capacities of local inhabitants for leading SI initiatives. Flexible regulations, innovative ways of financing and supporting local inhabitants to build capacities are still needed in other to enable forest-based SI initiatives like Charcoal Land to live up to its full potential.

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Can forest work be greener and safer? The Role of Environmental and Safety Indicators in Forest Harvesting Operations

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Introduction

Today environmental degradation, as a result of anthropogenic activity, receives a great attention of media, public and policy makers through advocacy of "green growth" as a strategy for achieving sustainable development and the introduction of relatively new procedures for monitoring and reporting on firms' ecological performance (Šporčić et al., 2012). Sustainable forest management has been identified as a means to help mitigate carbon dioxide emissions, a greenhouse gas and contributor to climate change, while also maximizing multiuse benefits through close-to-nature silviculture (Labelle and Lemmer, 2019). The existing limitations in utilization of natural resources and the outgrown conventional approach to economic development and growth under the motto "grow now, clean later" encouraged todays companies to a new production approach where with the lower amount of inputs they try to achieve the same or higher outputs (Sporčić et al., 2012). At the same time, this environmental efficiency must never be viewed solely through reduced resource use. Efficient use of energy sources represents their efficient and smart use without disturbing working, production and living conditions, and also simultaneous reduction of harmful effects on the environment, lower release of harmful compounds, water pollution, waste disposal, etc. Close-to-nature management, optimization of silvicultural treatments and low-impact harvesting are examples of strategies for improving forest stocks (FAO, 2016) and contribute to the development and advancement of the green economy within the forestry sector.

Furthermore, indicators of safety at work, as a social component of business operations, in the context of the Croatian forestry sector and management of state forests, are being partially marginalized. Forestry contractors and private forest owners, even worse, do not perceive this issue at all. The injury rate is significantly higher in forestry than in other sectors, which classifies this profession as a high-risk category sector. The recorded mortal injury rate in US forestry was 19 times higher than in other sectors (Lefort et al., 2003). In Australian forestry the injury rate is 2 to 3 times higher than the rest of the industry (Driscoll et al., 1995). Poje and Potočnik (2017) point out that the lower frequency of injuries at work can be achieved through the unconditional commitment to the safety culture at all organizational levels. Safety culture can be understood as a subculture or a part of the overall organizational culture that affects attitudes and behaviour and influences the level of safety in the organization (Hale, 2000). In accordance with the above, this paper presents the role and implementation possibility of selected environmental and safety indicators in evaluation of forest harvesting operations.

Keywords: forestry, environmental indicators, safety indicators, harvesting operations

Materials and Methods

An overview of scientific and / or operational experiences related to environmental and safety indicators provided in this paper is based on available domestic and foreign literary sources. The research methods included search of relevant online databases and websites of green declared institutions, and analysis of several relevant documents and papers published in digital or printed form. For the purpose of interpreting the role and importance of calculating and reporting safety

indicators, as a social component of business operations, standardized annual reports on accidents at work in the company Hrvatske šume Ltd. are used and analysed as part of the paper. In the processing and analysis of research results analytical, comparative and descriptive techniques were applied using the current theoretical and practical knowledge from the subject issues.

Results

The first analysed environmental indicator is related to the concept of environmental performance of the company through the assessment of the application possibilities for energy intensity indicator (EEI) at the forest office level. Sampled studies (Šporčić et al., 2012; Šporčić et al., 2011) indicate that forest offices which manage selection forest stands have a significantly lower energy consumption at the silvicultural operations than forest offices that manage regular forest stands. Also, best results of the forest office environmental performance and the lowest average value, seen through the energy intensity indicator on the operations of felling and skidding (MJ/m3), depends on the share of used internal and external services and depends upon the statute of piece volume at annual cut. Weaknesses come from limitations in a non-systematic approach in keeping of the internal records on energy consumption and also the passive approach to the issue of environmental protection in this form (Šporčić et al., 2012).

EROI (Energy Return On Investment), as the second analysed environmental indicator, is a ratio between energy obtained from energy production process and energy consumption during separation, growth, etc. into new forms of energy (Pandur et al., 2015; Pandur et al., 2018). Sampled study (Pandur et al., 2018) under the conditions of the specified felling site for the mechanized harvesting system results with EROI of 71.5. When compared to similar research conducted with semi-mechanized harvesting system (felling and processing with a chainsaw, energywood forwarding) (Pandur et al., 2015) results show that forwarding in mechanized system lowered the energy investment of extraction per m3 to 0.6 of the one recorded in semi-mechanized system. On the harvesting system level, mechanized system reached 1.6 times bigger energy investment than the semi-mechanized. Differences could be the result of different harvesting influencing factors, but surely reflect the high difference in energy consumption when using harvester instead of a chainsaw.

The remaining three selected environmental indicators (Greenhouse gases emissions – GHG, Particulate matter emission – PM, Non-renewable energy consumption – NR) were calculated and analysed at the level of felling site, from the time of felling until the timber is placed at the truck accessible road. Results of sampled study (Labelle and Lemmer, 2019) for the three research sites indicated that over the full rotation period, a SM (semi-mechanized) harvesting system produced the lowest environmental impacts (GHG, PM and NR); however, when considering different silvicultural treatments separately, the SM system had the lowest environmental impacts for thinnings, while the FM (fully-mechanized) system generated the lowest environmental impacts for final fellings.

Related to the social component of business operations, the number of injuries per year, in the observed five-year period ranges from 210 to 255. The indicator related to the number of injuries per 1,000 employees ranges from 26.97 to 34.01, which is the difference of 7 injuries per 1,000 employees between the best and the worst annual result. Comparing the second indicator to the state from 2009 when it amounted to 29.4 (Martinić et al., 2011), the safety situation in the company can be described as “neutral with negative oscillations”.

The analysis of the basic characteristics of the selected environmental indicators shows low demand regarding management understanding and mathematical complexity for their implementation. Only EROI, GHG emissions and PM emission show medium demand regarding data requirement and cost of implementation. On the other hand, basic characteristics of the selected safety indicators shows low demand for all four evaluated characteristics.

Discussion and Conclusion

By achieving a satisfactory level of ecological performance, the company in the eyes of the public, consumers and investors, also develops the image of an environmentally conscious company what can provide a competitive advantage in a dynamic national or global market (Šporčić

et al., 2012). Based on the presented examples, it is possible to include new business performance indicators related to environmental efficiency in everyday forest harvesting operations. Their monitoring and reporting can contribute to more reliable and better planning, analysis and evaluation of business performance in forestry. With the aim for operational implementation and monitoring of selected environmental indicators, it is necessary to develop an action plan with elaborated goals, activities to achieve the goals, indicators and stakeholders at the level of a felling site.

Viewed through the social component of business performance, technological advances and workplace safety management systems have contributed greatly to the creation of a more secure world, but the introduction and improvement of safety culture at workplace is considered as a key to further improvements. The reason for that is a statement that says, “Safety and health management systems at work are not effective at workplaces with underdeveloped safety culture” (Hale and Hovden, 1998). The International Labor Organization (ILO) also noted that the key element of occupational health and safety management is the promotion of a culture of prevention in the enterprise (ILO, 2009). Therefore, the introduction of a proactive safety culture can lead to further reduction in work injuries and diseases (Nielsen, 2013; Kim et al., 2016).

In addition, the safety and prevention of work-related injuries also has a significant role in the process of certification of forest management according to the FSC standard. According to the mentioned, the recent version of the German FSC International Forest Certification Standards has set clear requirements for operators working with a chainsaw and for legal entities performing wood harvesting activities in forestry. Professional workers, but also non-professionals, must prove their training in accordance with the European Chainsaw Certificate (ECC) as one of the conditions for meeting FSC principles 1 and 4 (German FSC standard, 2018).

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Corporate Social Responsibility as part of forestry bioeconomy strategies

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The term bioeconomy refers to the share of the economy based on products, services, and processes derived from biological resources (e.g., plants and microorganisms).The bioeconomy is crosscutting, encompassing multiple sectors, predict that the bioeconomy will be a key component of the future economy. Specifically, many view the development of and transition to predominantly a bioeconomy as a means to address grand challenges such as climate change, food security, energy independence, and environmental sustainability. Advancing the bioeconomy is also viewed as an opportunity to create new jobs and industries. Bioeconomy strategies cannot follow a one-size-fits-all logic, but the design and implementation require reflecting on goal priorities, existing assets (not only as economic potentials but existing and possible collaborations), and the socio-economic context. Globalization determines the economic environment to identify new development models that harmoniously integrate the modern digital economy with corporate social responsibility for sustainable development. CSR is voluntary in nature and includes those activities that the organization carries out beyond legal obligations, whether in relation to its employees or to society and the environment. The purpose of CSR is to contribute to the sustainable development of the whole society. The state can support the dissemination of the concept of CSR by creating appropriate conditions for its dissemination, supporting its promotion and supporting socially responsible activities.

Social responsibility codes, adopted by either international organizations or by some companies (generally multinationals), have a special role to play in “guiding” business, society and partners towards compliance with rules and norms of conduct. Climate change is one of the major challenges of our time and already impacts on the opportunities for societies to grow and business to prosper. Without drastic action the future will be more difficult and costlier as it will require major adaptations. Business has a key role to play, globally and in Europe. Corporate climate change disclosure is only a means towards a carbon neutral economy and the real challenge is to make the collective investment, collaboration and business transformation. Sustainability is no longer about individual company’s management but it is about the entire eco-system and is only possible if implemented through strengthening local communities. Understanding how stakeholders perceive corporate social responsibility (CSR/CR) is of importance, especially in industries that place high social demands on the sustainability of their products and services.

Mendel University is involved in The Third Way (T3W) Project: Development of a new curriculum that supports and promotes Social Enterprise as a destination of choice for European vocational and higher education graduates. This project is developing tools and a curriculum to improve communication and knowledge sharing between the vocational and higher education sector and social enterprises (The so-called Third Sector). 10 organisations form 9 countries have come together, under the leadership of Technical University of Dresden, to meet the aims and objectives of the project. More information: https://thethirdway.eu/

Mendel University is involved also in project KABADA: Knowledge Alliance of Business idea Assessment: Digital Approach. It aims at developing a tool based on an artificial intelligence (AI) for the assessment of business ideas and plans applicable to a wide range of young entrepreneurs for the promotion of self-employment and business activities. More information: https://kabada.eu/

Key words: bioeconomy, strategy, corporate social responsibility

The nexus between forests and energy: role of universities in development of sustainable bioenergy sector in the Ukrainian Carpathians Mountains

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Introduction

Climate change, ecosystems degradation and the COVID-19 pandemic have become existential challenges for Europe and the whole world. To overcome them the European Commission had elaborated the European Green Deal (2019), the programme aimed to transform the EU into a modern, resource-efficient and vibrant economy, ensuring: no net emissions of greenhouse gases by 2050, economic growth decoupled from resource use, no person and no place left behind. Recently the European Commission has adopted a package of proposals to align EU climate, energy, land use, transport and tax policies to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. Achieving these emission reductions is critical in the next decade. In this way Europe will become the world's first climate-neutral continent by 2050 and make the European Green Deal a reality.

For Ukraine, bioenergy is one of the strategic directions for the development of the renewable energy sector, given the country's high dependence on imported energy resources, primarily natural gas, as well as the large potential of biomass available for energy production. Ministry of Ecology and Natural Resources of Ukraine works in line with EU institutions and set goals like 65 % decrease of carbon emissions till 2030 comparing to 1990. Decarbonization of the national economy, transformation of energy, forest, building construction and transport policies, and development of renewable energy sources in Ukraine became essential components of its recent environmental policy. However, transformation of energy policy with a focus on renewable resources, like forests, raises new sustainability challenges and needs a holistic view of the transformation process to avoid eco-destructive economic behaviour and promote sustainable energy transition especially in fragile mountain regions like the Ukrainian Carpathians.

Key words: sustainable bioenergy, universities, Ukrainian Carpathians, SWOT, TOWS

Material and Method

Transition (or return) to a wider use of energy wood by local population of the Ukrainian Carpathians region requires a number of preparatory measures. First of all, the potential of available wood that can be extracted for economic needs without harming forest ecosystems should be determined. In this case, wood biomass should be used in accordance with its highest economic and environmental added value in order of priority - from a manufacture of wood products, their reuse and processing to use wood residuals for energy purposes.

SWOT-analysis was used to determine the advantages and disadvantages of energy wood use in the region, and the TOWS matrix were applied to elaborate strategies for its development.

Results

Advantages (availability and traditional use of energy wood, general lower price comparing to gas) and disadvantages (need for additional equipment for burning firewood or briquettes), opportunities (energy independence and stability, forecasting of production capacity) and risks of using energy wood in the region of the Ukrainian Carpathians are identified using SWOT-analysis.

Possible strategies for use of energy wood in the regions of the Ukrainian Carpathians are analysed.

It is pointed out that universities play an important role in training professionals who are able to design and implement optimal management decisions to promote energy efficiency and energy saving policies, the transition to renewable energy sources, including energy wood.The article presents experience of the Ukrainian National Forestry University in this realm, namely development of the problem-based course (Farley et al., 2009) on sustainable bioenergy for students of the masters' programmes on environmental economics, forestry and wood-working. The course provides an insight into the nexus between forests and energy in the context of the Ukrainian Carpathians (Soloviy et al., 2019) as well as attitudinal diversity concerning the phenomenon (Nijnik et al, 2017). Appearance and efficiency of such social innovations as energy cooperatives are considered.

Discussion

Measures at both the national and local levels are needed to achieve an efficient and sustainable use of wood as an energy source. At the national level, it is necessary to improve the regulatory framework for the use of bioenergy, in particular energy wood, to refute the common belief that renewable energy in Ukraine is much more expensive than traditional. At the same time, according to Western European experts, the cost of energy from renewable sources is constantly decreasing, and energy from traditional generation is increasing. It is worthwhile to study the experience of advanced countries in using market-based instruments to develop low-cost reliable energy sources, including wood energy.

At the local level, logistics models along the entire chain, from the procurement of energy wood to its supply to the consumer, need to be improved. This is especially true for the supply of sufficient volumes of wood as a source of energy to communities in the highlands of the Ukrainian Carpathians, which do not have an access to other energy sources, including gas. Another task is to expand the offer of modern equipment for wood waste incineration, which in Ukraine still remains underdeveloped. These and other innovations sustained by such social ones as education and knowledge exchange between stakeholders will enable the forest-energy nexus management on the basis of sustainability.

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Social innovation to promote Green Recovery of forest-dependent communities

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In this paper, based on examples from the UK and beyond, we advance conceptual and practical knowledge of social innovation and suggest on using it to meet the UN Sustainable Development Goals and those of Green Recovery. We demonstrate that social innovation can assist in tackling societal challenges and utilising the opportunities available and newly emerging in marginalised wooded areas. We show how social innovation can enable forest-dependent communities to realise and develop further their capabilities, while reducing inequalities, and promoting social justice and inclusion. Results provide evidence that by adding to improving human wellbeing, social innovation can create new responses to pressing social demands that are not adequately addressed by markets or existing (e.g., public) institutions. We believe that the conceptualization and operationalisation of social innovation in the context of forestry, offered by the SIMRA project and our findings from case studies (e.g., on attitudes of local people to sustainability changes; their innovative actions; improved participation in decision-making and on impacts of social innovation, on the ground) can help informing forest management decisions and the design of policy and practice measures for Green Recovery and long-term sustainability of socio-ecological systems.

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Key words: social innovation, communities, forest

Ambivalent demands on European's Forest – A change is gonna come!

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Since the forest dieback in the 1980s, the forest has not received such high political attention as it currently does. Due to the multiple demands on European forests, the range of interest groups has never been broader than today. And because forests, but also society are facing major changes, the diverging interest between exploiting limited resources and conserving ecosystem services for the public welfare, become stronger. These conflicts between the different visions, how sustainable and multifunctional forestry should be applied, is shaped by two dimensions: A communication and information deficit and a democratic-political imbalance. The "red-list species" of forest experts, who perceive that their sustainability measures contribute positively to public welfare, are encountering resistance from a "phalanx" of environmental lobbies and NGOs, against which the forestry sector can hardly compete. In particular, the strict protection to 10% of the area to preserve biodiversity (EC, 2020/380), which is equivalent to abandoning the territory, and the proposed revision of the LULUCF directive (EC, 2018/841) in relation to the European Climate Law (EC, 2021/1119), for achieving climate neutrality in 2050, offends forest owners. These developments cannot be reversed. What is needed is a transparent socio-cultural dialogue and monitoring process that is optimally aligned with forest ecological requirements, the expectations of society, forest administration and all the actors along the supply chain. Thus, we have to lead an open and fact-based discussion on what demands are justified and what turns out as wishful thinking. In that respect, we as a society would indeed also have to consider, how we are going to tackle European forests' threats from the climate crisis, for which we are jointly responsible, to sustain their multifunctionality for Europe's well-being.

Key words: EU-Forest Strategy, socio-cultural dialogue, climate neutrality, sustainable and multifunctional forestry

Sustainability impact assessment of forest-wood supply chain: an experience from Italy

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The 2030 Agenda for Sustainable Development came into force in 2016 as the main United Nations (UN) platform for achieving integrated goals across the three dimensions of sustainable development: the environmental, social, and economic. The 2030 Agenda goes beyond the “simple wish list”, supporting progress towards sustainability through addressing complexity and interactions and defining concrete targets and indicators. Furthermore, the Agenda contains opportunities and calls for a deeper participation for all stakeholders - from governments to civil society - to contribute to sustainability, implementing and delivering the required actions.

Among the tools to support the evaluation of policies taking account of sustainability, Sustainability Impact Assessment (SIA) is a process to identify and assess the impacts of strategies and single operations with a systematic, integrated, and iterative approach.

Considering the forest-based sector, entire forest value chains need to be included in the SIA approach. In the present study, SIA was applied in the context of the Italian forest-based sector, to assess and contribute to increase the sustainability of a forest-wood supply chain at local level.

The process was structured in four phases: (1) review-based identification of a set of indicators suitable to assess the forest-wood chain; (2) involvement of actors of forest-wood chain through a questionnaire survey and evaluation of the performance of indicators considering the tree dimensions of sustainability; (3) development of a GIS-Based (QGIS 3- open source) procedure to identify suitable zones for the forest-wood supply chain implementation. The indicators were pre-selected based on the GIS method and served as input for the optimization modelling; (4) implementation and testing of the GIS-Based procedure in a pilot area in Italy (Unione di Comuni Valdarno e Valdisieve, Tuscany region). At the end of the first phase, a set of 11 indicators was developed considering the three pillars of sustainability. In the second phase, 30 actors of the forest-based sector have been involved in the SIA process, to assess and weight the suitability of indicators in increasing the sustainability of the forest-wood supply chain. In the last phase, spatial data of the forest-wood supply chain have been stored and analyzed, integrating them with indicators supporting the development of strategies oriented to perform sustainable short supply chains. The results of this study provide to the accounting of forest chains’ impacts from financial and socio-environmental viewpoint integrating the SIA process with a bottom-up GIS approach.

The SIA process, integrating with a bottom-up GIS approach qualitative and quantitative information, contribute to the accounting of forest chains’ impacts from financial and socio-environmental viewpoint.

Key words: public participation, Sustainable Development, integrated assessment tools, indicators, GIS, 2030 Agenda

An analysis of the long-term capital-market performance of forestry companies: Investors' perspective

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Introduction

Investing in forestry is recommended as a good portfolio risk diversifying choice (Gyawali, 2008; Mei, 2019, 2015). This is because of forests' relative illiquidity, irrelevance regarding public market daily pricing and exposure to end-use markets that are not ideally correlated with the economy as a whole (Busby et al., 2020). Investors who seek diversification benefit from holding forest assets (Anthony Cascio and Michael Clutter 2008) regarding its high risk-adjusted returns, low level of correlation with other financial asset classes (Restrepo et al., 2020) and regarding forest's inflation-hedging abilities (Wan et al., 2013).

From the investor's perspective, the main purpose of investing is to increase, or at least, preserve the current level of his/her wealth (Damodaran, 2002). About 80% of the world's forests are owned by governments (Palo and Lehto, 2012), and governments usually are not exclusively profit-oriented but hold forest capital more preferably for social well-being instead (Möhring, 2001). Thus, it is not suppressing why the forestay perspective as a lucrative branch is neglected.

In the recent past, the United Nation's launched a Responsible Banking initiative (UNEP FI, 2019) which will ensure that banks' investments align with the society demands, sustainable development and with Paris Climate Agreement (EU, 2016). Also, there is The Global Ethical Finance Initiative with similar goals (UN, 2021). As a result, more and more investors are integrating environmental, social and governance (ESG) factors into their investments. This is why it is to be expected that the investment in the forestry sector will increase in the decades to come. Profit oriented investors and the academic audience are interested in research studies like this one, which will bring an analysis of capital-market performances and perspectives of forestry companies. Therefore, this paper is an attempt to fill the knowledge gap regarding the performances of investing in sustainable and profit-oriented forestry, particularly by purchasing stocks of publicly traded companies (companies that are present on capital markets, i.e. stock exchanges).

The main reason why we have focused just on the forestry companies that are listed on stock exchanges is that stocks of these companies are evaluated daily by market participants and thus are instantaneously capturing market sentiment and perceived sector perspective. A study like this one should give a more realistic overview of the economic characteristics of forestry business, unlike e.g. Posavec et al. (2021) who evaluates State and no-market-competitive forestry. Furthermore, added value for the forest economics literature will be given in the segment of real (market) based investments, not just theoretical ones like Beljan et al. (2020) and Chudy et al. (2020).

Key words: investment, natural resources, added value chain, stock exchange

Material and Method

Using the PWC's (2016) list of the Top 100 Global Forest, Paper and Packaging Industry Companies and combining it with 128 companies from the Yahoo Finance (YF) database on the

companies registered in Lumber & Wood Production (YF, 2021), we made a starting data sample for the analysis. In the second step, only companies whose shares are regularly publicly traded on stock exchanges were observed.

For each company the Yahoo Finance profile and its Official page have been examined. Thus, only the companies for which it has been founded that possess or lease forests, have been taken for the analysis of the long-term capital-market performance of the forestry sector.

According to Damodaran (2002) we used the basic tools to evaluate forestry companies (stocks) characteristics. In the first place here is the 5-year Beta coefficient (β) which is "a measure of a stock's systematic (market) risk or the extent to which the returns on a given stock move with the stock market" (Brigham and Ehrhardt, 2009). After that, in the timespan of the last 5 and 10 years, we have analyzed stocks' total investment returns, and associated partial returns both capital gain and dividend yields. In addition, we performed general linear regression analysis to investigate the existence of significant positive risk-return relation for the forestry companies. Our further research will be expanded with the Return on Equity (ROE) and the Return on Asset (ROA) (Damodaran, 2002) which are crucial indicators of the fundamental analysis.

Results

In total, we have analyzed 48 companies that have satisfied the condition of forest possession (ownership or lease). According to their business activities 1) forest management 2) sawmilling, 3) production of final products (e.g. furniture), and 4) paper production, it is possible to distinguish them into the type-subgroups. For this phase of our research here we present just the long-term capital-market performance of forestry companies for the overall sample.

The positive last five-year Beta coefficients (β) are ranging from 0.21 to 3.46 and amount to 1.15 on average. It is important to stress that in the overall sample there are three companies with negative Beta values, and when taking those into the account the forestry average is 1.06. This indicates that from the inventor's point of view the overall forestry sector is on average more volatile (risky) than the capital market as a whole (by the market it is meant on the overall Stock Exchange market).

An important measure of investment performance is the capital gain which is representing the change of the stock price over time. The average capital gain in the last 5 years (2016-2020) is -1.6% annually and in last the 10 years (2011-2020) it amounts to -0.2% annually. Of course, in the mentioned period, there are few companies which capital gain is quite high, up to 26% annually in the last 5 years. However, on average, the negative capital gain has been realized in the forestry sector. Besides the capital gain, the stockholders expect an investment return in the shape of dividend payments (which is not mandatory and reflect the company's dividend policy). In the last 5 years about 94%, and in the last 10 years about 75% of companies in the sample make a dividend payment. The average dividend payment was 2.3% annually in the last 5 years (max. 9.2%), respectively 2.7% annually in the last 10 years (max 19%).

Finally, the total return is the sum of capital gain and the dividend yield. It represents the level of investors (stockholder) wealth increase which is mathematically expressed by compound interest. So, for our sample, the total returns are ranging from -42.4% to 30.8% annually in 5 years and from -28.2% to 34.4% annually in 10 years. Those figures are indicating that an investor could lose or gain a significant amount of his capital if holding an undiversified investment portfolio. However, the total return averages 0.8% annually for the last 5 observed years, and 2.6% annually for the last 10 observed years. Meaning that an investor whose portfolio was solely consisting of shares of all forestry companies could easily achieve an investment profit in the long run.

Furthermore, our linear regression analysis points out that companies that are involved in the paper production business are perceived as more risky (measured by a beta coefficient) and are also on average generating significantly higher investment profits (measured by a total return) for their stockholders.

Discussion

Regarding the final sample it needs to stress that only those companies which are present on a stock exchange and which are possessing forest land have been taken as relevant for this research (48 companies in total). If some stock is traded on more than one stock exchange, we obtained the data from the stock exchange where a larger trade turnover is realized. In the case of using the data from other stock exchange, it is possible that the presented results would vary to some extent. In addition, since sometime investors' domestic currency does not correspond to the currency in which stock price is listed on stock exchange, some positive/negative foreign exchange differences (risks) are possible. Also one should take into account the level of inflation over time. Thus, to obtain real total returns, one should subtract the inflation (2.16% (USIC, 2020)) from the observed nominal total returns.

Observed negative Beta coefficients are more than interesting phenomena (3 companies in the sample). That indicates that those forestry companies are inversely correlated with the overall market. This makes them ideal candidates for hedging portfolio returns in times when markets go down. In other words, in the situation when the stock market is declining, the investors might be looking to secure their wealth by investing in stocks with a negative Beta. Here we see that some forestry companies could be perceived as a favorable investment opportunity in a case of stock market decline.

Conclusion

Overall, the analysis has shown that investing in publicly traded forestry companies, worldwide, has its economic justification. But looking into detail it is evident that there is a wide range of value of Beta coefficients, capital gains, dividend yields and total returns. It can be assumed that those differences are a result of different forest characteristics and what is the most important, the company's business activities (doing just silviculture and forest management, or sawmilling, or producing final products (e.g. furniture), or paper production, or the combination of all named activities). Forestry companies who besides silviculture and forest management are performing other business activities, and by that extending the added-value-chain, are those with the higher rate of operating profit and investor's return, but also have a higher level of systematic (market) risk.

The conclusion is that the long-term capital-market performance of forestry companies on average is positive and is likely to be positive in the future. Thus, the recommendation is that a reasonable portfolio manager should consider investing in the forestry branch because the risk-return contribution of these stocks might be beneficial for his/her investment portfolio.

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Analysis of public support for the implementation of nature protection measures in the study areas of Gornja Bistrica and Murska šuma

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Introduction

The Mura, a river with a lowland character, was included in Natura 2000 in Slovenia with its entire course. The Mura SI3000215 (Habitats Directive, hereinafter HM) and Mura SI5000010 (Birds Directive) were created. Of the 3 forest habitat types (FHT) in HM, FHT 91E0 (River willow, alder and ash) and 91F0 (Flood oak-ash-elm forests; Dakskobler et al. 2013) were included in the GoForMura project. Both were in poor condition (U2-) (ZRSVN 2013), so one of the key objectives of the project was to implement protection measures that would at least partially improve the ecological condition. The problem of both FHTs is related to the regulations of the Mura riverbed in the 1960s and to the hydromelioration of agricultural land.

Interrupted water supply, groundwater pollution, disease, and deforestation and conversion of FHT into meadows or economically more profitable forests have impaired tree vitality and viability (Levanič, 1993; Čater and Batič, 1999; Kelenc, 2008).

Proportional to FHT are threats in FHT living species. Certain amphibians are threatened by the disappearance of aquatic habitats needed for reproduction, introduction of fish and pollution from agricultural land. Saproxyl beetles disappear under the influence of the introduction of non-native species, too little biomass and too little oak. The European beaver (Castor fiber) and Eurasian otter (Lutra lutra), whose population status was studied within the project, are also present at HM. Both FHT and all the above groups of animal species were addressed in the management plans for Murska šuma and Gornja Bistrica, which, in addition to the objectives, also stated the threats and protection measures that will be implemented.

The general objective of the project was more efficient management and monitoring of Natura 2000 sites. One of the more detailed objectives of the project was to inform the public about Natura 2000-related activities. Within this objective, a representative public opinion survey was conducted on the adoption or support of the implementation of the Natura 2000 Management Program and field protection measures.

Key words: Natura 2000 sites, Ecosystem services assessment, Choice experiment

Material and Method

Two surveys were conducted on a sample of residents of the studied area and forest owners at the beginning (in 2015) and at the end of the project (in 2016). The readiness assessment approach identified support for protection measures among landowners and support from the local public, which would otherwise face a deterioration in the conservation status of habitats and species. The survey was conducted in the municipality of Murska Sobota, where there is a higher frequency of people.

The questionnaire consisted of four sections. The first section was intended to obtain general information about the visitor and his knowledge of the area and the reasons for visiting the floodplain Mura forests. The second section of questions referred to the respondent's opinion on the preservation and burden of floodplain forests along the Mura, and the goods and services that forests provide. This was followed by the discrete choice experiment (DCE), which was to obtain data on support for protection measures between landowners and the local public under the

willingness to pay approach. The last part consisted of socio-demographic questions. The third section was key for obtaining data, the analysis of which is the subject of our research.

The questionnaire for the second round of surveys in 2016 was adapted mainly in the DCE part, where the graphical material was adjusted so that it was possible to see practical examples of the implementation of measures in study areas.

Discrete choice experiment

The experiment consists of six choice sets with three alternatives each. In each set, one alternative represents the current situation (without additional measures) and the other two represent hypothetical conditions with additional measures. The purpose of this part was for the respondent to review the changes proposed by each alternative and make trade-offs with the hypothetical payments (allows calculation of willingness to pay) and decide on one favorite alternative. Thus, the individual expresses preferences that can be assessed by econometric discrete choice experiments.

Data collected through selective experiments are analyzed and interpreted on the basis of a Random utility model (RUM) (McFadden, 1973). It is assumed that the utility function of individual U consists of a deterministic observed part of utility V, which is a linear function of the attributes of good / service x and a stochastic unobserved part ε representing the error element (Louviere, 2001; Olschewski et al., 2012).

$U_{ni} = V_{ni} + \varepsilon_{ni}$

The deterministic component of the utility function includes attributes that are expected to significantly influence respondents' decision in choosing a particular alternative. In our case, the context of alternative forest management scenarios related to the improvement of FHT 91F0 and 91E0 was current.

Based on data on the choices of individuals in the discrete choice experiment, their socio-demographic characteristics and answers to other questions in the survey, we can estimate the parameters $\boldsymbol{\beta}$ in the utility function, which represent the preferences of respondents (Hensher et al., 2005). The utility function of the respondents in this research is defined as:

$U=\beta_1*TUJ + \beta_2*VB + \beta_3*AVT + \beta_4*HRO + \beta_5*PLA + \varepsilon$

where the deterministic part includes five attributes: "invasive plants" (TUJ), "otter and beaver population" (UK), "newly established indigenous forests" (AVT), "endangered beetle population" (HRO) and "annual monetary contribution" (PLA).

The respondent's willingness to pay (WTP) to change the level of an attribute is calculated as the negative quotient between the parameter of each attribute and between the parameter for the payment attribute. Thus, the WTP for the attribute under study is calculated by the following equation:

$WTP = -\beta k/\beta c,$

where βk is paramater of attribute k and βc parameter of atrribute payment (Greene, 2012).

The design of the experiment was generated as a sequential orthogonal partial factorial design with 18 choice sets. The design was unlabeled, which means that the alternatives did not have a substantive meaning in the sense that the attribute levels would indicate a specific management strategy but were merely combinations of alternative states. We used Ngene software (2012) to create the experimental design.

To analyze the data obtained in the discrete choice experiment and estimate the utility function parameters, we used the Latent class model (LCM) – after testing the MNL model and rejecting the IIA assumption. LCM allows analysis of preference heterogeneity by classifying respondents into classes in which preferences are homogeneous but they differ between classes. NLOGIT 6 (2016) was used to evaluate the econometric model.

Results

Multinomial logit model and independence from irrelevant alternatives (IIA)

Upon the Hausmann test the IIA assumption (Luce, 1977; Louviere et al., 2000; Vivithkeyoonvong and Jourdain, 2017) was rejected for MNL models estimated for both (2015 and 2016) surveys. Thus, a model specification that allows for relaxation of the IIA restriction needs to be implemented. Therefor the latent class model was used to analyze the data.

Evaluation of latent class model

The LCM allows respondents to be classified into a set of q classes, but to which class an individual belongs, whether known to that individual or not, the researcher does not know (Hensher et al., 2015). Preferences are assumed to be homogenous within classes and vary across classes.

One of key steps is to identify the number of latent classes, which is a procedure involving multiple trade-offs among values of information criteria (Bayesian Information Scale (BIC) and the Akaike Information Scale (AIC3), consistent Akaike Information Criterion (CAIC)), signs of parameter estimates, class sizes and value of pseudo R2.

Based on all the above criteria, we concluded that the most appropriate number of classes for the 2015 model is 3, and 2 for the 2016 model.

In addition to the basic attributes, we included additional variables in the model, which were obtained through socio-demographic questions and additional questions from the questionnaire. We retained only those that significantly contributed to explaining the respondent's choices.

According to the probabilities of belonging to the classes, the respondents from 2015 were classified into three classes. 41.3% were in the first class, 40.2% in the second and 18.4% in the third.

Respondents in the first class expressed positive preferences for the removal of invasive species and for increasing the area of indigenous forests (WTP of € 0.80 for each additional hectare).

In the second class, respondents expressed positive preferences for increasing the area of indigenous forests (WTP of € 0.95 for each additional hectare) and for establishing a stable state of the beetle population (WTP of € 2.67). They expressed negative preferences and a negative willingness to pay for the removal of invasive species and a 50% increase in otter and beaver populations.

In the third class, respondents expressed positive preferences for increasing the area of indigenous forests (WTP of € 0.37 for each additional hectare). Negative preferences and negative willingness to pay were expressed for the removal of invasive plants and for a 50% increase in otter and beaver populations. In all three classes, respondents expressed a negative preference for the annual monetary contribution.

Additionally, we found that older respondents were less likely to be in the first and second class compared to the third class. Those for whom the good of wood and branches was important in the floodplain Mura forests are less likely to be in the first than in the third class.

In the re-survey in 2016, respondents were classified into 2 classes, so that in the first class 80.7% and in the second class 19.3% of respondents were classified.

Respondents in the first class expressed positive preferences for increasing the area of indigenous forests (WTP of € 4.17 for each additional hectare) and for establishing a stable or improved state of the beetle population (WTP of € 9.85 for reaching a stable population state and € 5.88 for an improved state). At the same time, they expressed negative preferences and a negative willingness to pay for an increase of the otter and beaver population by 50%.

Respondents in the second class expressed positive preferences for the establishment of a stable state of the beetle population, with WTP of € 1.5. They expressed negative preferences and a negative willingness to pay for a 50% increase in otter and beaver populations.

In both classes, respondents expressed a negative preference for the annual monetary contribution.

Respondents for whom the diversity of flora in the considered forests is important are less likely in the first than in the second class.

Discussion

Knowledge of the attitudes and opinions of the inhabitants of individual areas towards management programs of protection areas and towards individual protection measures is important for the successful implementation of measures and the realization of long-term goals related to nature protection. It is important to identify stakeholders in the space, understand their position and reach consensus through education, conversations, and cooperation between them.

Our research has shown that people's preferences for changing the state of individual attributes vary. We found that in general, in the first and second survey, positive preferences for newly established areas of indigenous forests prevail, which means that respondents are willing to pay something for them. The same was found in a survey of the preferences of the inhabitants of the Basque Country in Spain, to key attributes related to the Natura 2000 site. Here, too, residents are willing to pay for newly established indigenous forests (Hoyos et al., 2012).

Our results show a markedly negative view of the 50% increase in the otter population, and a particularly negative attitude towards the 50% increase in the beaver population in both surveys. We also found that respondents in one class of the survey from 2015 and in both classes of the survey from 2016 have positive preferences towards establishing a stable state of the population of endangered beetles. In the first class of survey from 2016, they also support the establishment of a better state of the endangered beetle population.

The fact that positive preferences were expressed for insects (beetles) and negative preferences for larger mammals (otter and beaver) is somewhat surprising. White et al. (1997) determined the economic value of endangered mammals among North Yorkshire residents in England and found that respondents had positive preferences for the otter and were willing to pay for its conservation. Both otters and beavers have been considered charismatic species in various studies (Urban et al., 2010; Brazier et al., 2020). Martin-Lopez et al. (2006) in their study found that respondents in Donana National Park in Spain were very supportive of charismatic megafauna and were willing to pay for these species as well. On the other hand, they were much less in favor of microscopic species or species that aroused fear in them. People show a greater interest in vertebrates (in our case otters and beavers) than in invertebrates (in our case beetles). Despite the fact that some groups of living beings play a key role in the functioning of ecosystems (microorganisms, algae and invertebrates), the general public does not appreciate them and is not willing to pay for them. In our research, we found the exact opposite - respondents express a greater preference for invertebrates than for vertebrates. A possible reason for the dislike of beavers and otters is the damage these two species cause to humans. Otters catch fish in water bodies, thus reducing the possibility of fishing for fishermen, while beaver causes damage to trees and to crops in the fields. In Mississippi, the monetary value of beaver damage is estimated to be between 4% and 7% of the total delivered value of wood in that state (Shwiff et al., 2011).

A possible reason for the high approval of beetles and opposition to otters and beavers is also that the beetles were presented as endangered in the survey and that their current population size is very low. In this way, respondents may have felt a greater vulnerability of this group of animals and were more sympathetic to it than to the otter and beaver in the DCE. In addition, beetles do not have as great an impact on humans, forestry, agriculture, fishing and their other activities as beaver and otter or people have at least that feeling and therefore find it easier to take protective measures in favor of beetles.

It is particularly surprising to note that in the first surveying (2015), respondents in two classes expressed a negative preference for the removal of invasive plants and a negative willingness to pay for this protection measure. We expected that the attitude towards invasive plants would be markedly negative in both the first and the second survey. A related study by Adams et al. (2010) in

Florida State Parks showed that park visitors were willing to pay to reduce the area of invasive plants. We hypothesize that there may have been a misunderstanding of the attribute about invasive plants in the DCE, and that respondents understood that the planned measures would increase rather than decrease the area of invasive plants.

If we compare the results of both consecutive surveys in 2015 and 2016, we can see two obvious patterns. The first is that the negative preference for otters and beavers increased further from the first to the second survey. Given that respondents already showed negative preferences in 2015 and that protection measures were implemented in that year to improve the habitat of otters and beavers, it is likely that respondents in 2016 expressed even greater opposition to population growth, as measures in 2015 contributed to improved conditions for an increase in these two populations.

Another visible pattern is the increase in positive preferences to establish a stable or improved status of endangered beetle populations. This could be partly explained by the fact that conservation measures to increase beetle populations carried out after the first survey are less demanding than the measures in favor of increased otter and beaver populations.

In both surveys, respondents strongly supported the establishment of new areas of indigenous forests. This most likely indicates people's understanding that the natural tree composition of forests is important primarily in terms of the resilience of forests to the effects of climate change.

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Influence of environmental damages on business performance on state forests companies

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Introduction

A natural disaster can be caused by a natural, technical or biological event. In Republic of Croatia and Slovenia, the most common natural disasters are ice breaks, wind breaks, snow breaks, forest fires and bark beetle attacks. These phenomena have a short and long-term impact on the operations of forestry companies, because they reduce the production capacities and income from devastated areas.

The protection of forests from natural disasters is legally regulated in the Republic of Croatia and Slovenia. Articles 41 to 45 of the Forest Act of the Republic of Croatia (OG 115/18) stipulate that persons who manage forests are obliged to take a set of measures to protect forests from fire, other natural disasters, harmful organisms and harmful anthropogenic impacts. Also, the Forest Act of the Republic of Slovenia in chapter 2 (Forest protection) prescribes that forest owners or owners of forest wood assortments must carry out prescribed measures for the prevention of plant diseases, prevention of overpopulation of insect populations, which may disrupt biological balance in the forest, and to prevent other damages in forests. The prescribed measures must also be implemented by the owners of forest trees growing outside the forests (OG 30/93).

Different effects of climate change influence business operation of state forestry companies, and have wider social and economic consequences for other forest owners and society as a whole. Adaptation measures in business operations and forest management must include various strategic, tactical and operational business decisions in order to achieve strategically planned goals. Sustainable forest management requires the development of long-term adaptation measures and methods that are appropriate for certain forest conditions. In addition to environmental conditions, it is necessary to consider the economic aspects of management that should include risks and uncertainties that may affect the development and business of the company (Kajanus et al, 2019), due to the long-term nature of forest management.

For the purposes of this paper, the impact of environmental damages that occurred because of the climate changes on business performance of Croatian Forests Ltd. and Slovenian State forest company Ltd. (SiDG) were analysed for the period 2016 to 2020. The quantities of sanitary felling from 2016 to 2020 are shown, as well as business indicators from the profit and loss account, annual revenues and expenditures, return on investment (ROI), return on equity (ROE) of state forest companies.

Key words: environmental damages, business performance, forest company

Material and Methods

Croatia's forest area covers 2,759,039.05 ha (Forest Management Plan of the Republic of Croatia from 2016 to 2025), 49,3% of the countries land area. Of that number, state property is 2,097,318.16 ha or 76%. The state forests are managed by the state forest company. Croatian forests Ltd (Hrvatske šume d.o.o.) is responsible for the management of most (97%) of the country's state-owned forests and forest areas. The remaining 3% belong to other public institutions such as

municipalities, the military, etc. Average annual cut is from 5,5 to 6 mil m3 (Croatian Forests Ltd Business reports).

Slovenia's forest area covers 1,180,281 million ha (58.2% of the countries land area), with about 6 million m3 harvested annually since 2014 (ZGS 2020). At present about 76% of the forests in Slovenia are privately owned, 21% are state owned and 3% are owned by local communities (ZGS, 2020). State forests are managed by the state forestry company. SiDG was established by a Management of the state forests Act approved by the government on 14 October 2015 and subsequently Slovenian Parliament adopted on 2 February 2016.

In order to analyse influence of environmental damages on business performance of state forests companies, caused by climate changes, the relevant annual business performance and financial reports have been analysed.

The basic data for the analysis are the balance sheets and the profit and loss account from the business report. Profitability indicators that were analysed are return on property equity (ROE) and return on assets (ROA) indicators.

Profitability is assessed in relation to costs and expenses and analysed in comparison to assets in order to see how effectively a company uses its assets to generate sales and profits. The profitability indicators also show whether it makes sense for the company to use financial leverage or take out a loan. By definition, if the return on equity is higher than the return on assets, it is profitable to borrow or use external sources of finance.

Cost-effectiveness indicators are calculated on the basis of data from the profit and loss account and the current relationship between income and expenditure, or it is indicated how many units of income are realized by the unit of expenditure. The ratio between total revenue (TR) and total expenditure (TE), result with indicator of overall cost-effectiveness or cost-effectiveness of the whole activity.

Results

In the company Croatian Forests Ltd., the largest damages occurred in 2018 due to wind breaks, so that a total of 6.3 million m3 of wood was produced. Until then, the average felling was about 5.5 million m3 per year. Coniferous forests, i.e. spruce and fir, suffered the most. There was great forest damage in the Republic of Croatia, of which the most significant were ice break and floods in 2014, wind brake (500.000 m³ of wood volume) and fires in 2017. The increased intensity of extinction of Narrow leaved ash stands caused significant management difficulties (Ugarković, 2017). The total economic value of Narrow leaved ash stands on an area of about 32,500 hectares is estimated at about 324 million EUR (about 10.000 EUR/ha).

During 2017, 328 forest fires were recorded in Croatia, which burned 48.543 ha of forests and forest land, owned by the state and private forest owners, and agricultural land. In terms of the number of forest fires, it was a year with an above-average number of fires (328 fires compared to the average of 273 per year in the past 26 years). The burned area exceeds the annual average of 14.300 ha. The fires mostly affected karst areas (99%) and state forests, which were burned to 85% of the area, compared to 7% of burned private forests and 8% of agricultural land. In Slovenia number of fires and the burned area are low compared to the neighbouring Mediterranean area.

In addition, according to data from 2020, the most damaged species in the Republic of Croatia is the Narrow leaved ash, in which 75% of significantly damaged trees were recorded. This figure is particularly worrying when we consider that ten years ago ash was, along with beech, our healthiest species with only 8% of significantly damaged trees, and in the last decade the percentage of damaged trees has risen to a worrying 75%. Croatian Forests Ltd. in 2020 produced 6.0 million m3 of gross timber. In the total gross mass of logging, the felling cut was 3.4 million m3, the intermediate cut was 1.2 million m3, and the side revenue, which includes droughts, wind breaks, snow breaks and ice breaks, and illegal logging amounted to 1.3 million m3.

According to SiDG, in 2019 sanitary felling accounted for 48% of total felling, or 615.946 m3, mostly conifers (71%). In 2018, due to damage from wind breaks, sanitary felling was 85% of the

total felling, or 1.5 million m3, which is the highest in the observed period since 2016. 95% of felling was related to spruce and fir species. The felling plan was exceeded by 60% for that year. The share of sanitary felling in SiDG from 2016 onwards is mostly due to damage from insects (bark beetles), which is a consequence of the wind break in 2014 and the new wind break in 2017. With windstorm in 2018 and 2019 more than 60% of Slovenian forests are damaged by natural disasters (approximately 18 million m3).

Observing the business indicators ROI, ROE, cost effectiveness and profitability in the period 2016 to 2019, for the Croatian Forests Ltd. the best year was 2016 for ROE (10.94) and ROA (7.43). Income was higher in 2019 (EUR 304 million), but profitability was the lowest (EUR 6.28 million). In SiDG company, the highest ROE (39.82) and ROA (32.17) and profit with EUR 16.9 million was in 2017. The highest income was in 2018 (EUR 76.8 million). Cost effectiveness was the highest in 2016 for Croatian forests (1.12), and 1.29 for SiDG in years 2016 and 2018.

Discussion

Although certain environmental damages are recorded independently, a number of risks act together (e.g. drought/fire, wind/ice/bark beetles) and cause additional management costs in the long term, and reduce the value of assets (capital and growing stock). According to the analysed business indicators, SiDG has overall better indicators for ROI, ROE and cost effectiveness compared to Croatian Forests Ltd. Croatian Forests Ltd. has higher operating income and expenses, and realized profit in 2016. In addition to larger number of employees (and thus operating costs), the company manages a larger area of forests (over 2 million ha), and invests a lot of funds in the biological regeneration of forests. SiDG manages less valuable coniferous species, which are highly endangered by environmental damages. However, these problems did not significantly jeopardize the company's operations, which made a profit in the observed period, and the ROA and ROE indicators are significantly higher than the company Croatian Forests Ltd. Funds for financing the biological restoration of forests are planned from the secured funds of the annual plan of Croatian Forests Ltd., allocated funds in the amount of 3% of the value of sold wood, from the fee for the use of non-wood forest functions and other sources in accordance with law.

Although both companies are achieving positive business results, the costs of restoration of damaged stands have increased significantly compared to the costs of forest exploitation under normal conditions. The increased quantity of assortments causes a drop in market prices, reduced profits and revenues. Also, the reduced optimal rotation length affects the lower expected rate of return on capital and land rent.

Forestry companies are most dependent on long-term management plans that are developed in accordance with the prescribed rotation. However, environmental damages influence productions plans and planned income from the annual cut. Therefore, companies need to develop risk management models and set aside the resources needed to repair the damage caused by climate change. It is necessary to establish measures and models for adaptation to changes in habitat conditions, to restructure the sales model, to continue quality restoration and protection of forests (especially in NATURA 2000 areas), and to digitalize business processes (Pezdevšek Malovrh et al., 2019). Also, there is a need to include various strategic, tactical and operational business decisions in response to changed business environment conditions. Although the analysed state-owned companies have good business results, it is necessary to think about long-term strategic development in order to increase economic, social and environmental functions of forests, which are essential for the development of green economy and set strategic goals of the EU Green Deal.

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Towards to determination an optimal rotation period taking into account the health of forest stands, economic efficiency and forests biodiversity

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Introduction

In terms of natural conditions, the Czech Republic is situated for the optimal growth of beech. In its ecological optimum, it can reach its maximum timber volumes without significantly affecting health. Norway spruce is a biogeographically boreomontane species. In Central Europe, spruce has a warm disjunct area, ie. that its area includes separate areas in the higher mountains, approximately from an altitude of 850 m above sea level. In the conditions of the Czech Republic, Norway spruce production reaches high values, however, at lower altitudes, the significant influence of mainly biotic pathogens increases, but the threat to stands in general. This can be manifested mainly by deterioration of the healthy conditions and quality of wood (rot, breaks, susceptibility to reduced physical stability and vitality), especially in older stands.

Due to these production possibilities depending on natural conditions and the mentioned tree species, the Czech Republic has a very advantageous position, therefore as one of the cardinal tasks of the current forest management is the need for appropriate differentiation of rotation period depending on the nature of the habitat to help determine basic economic recommendations.

Forest-economic studies dealing with the optimization of rotation period determination show that in the richest and most lively habitats, a well-defined length of rotation plays an important economic factor and has a significantly greater weight than, for example, in poor or extreme habitats (Nikajima et al. 2017).

Due to the current disintegration of spruce stands in the Czech Republic, it was necessary to make change of legislation with the tendency to reduce the length of the rotation period. This was done at some target forest management sites with an average rotation period of 80 (or more years) for about 60 to 80 years.

However, the Czech Republic is still one of the countries with, on average, the longest rotation period of forest cutting in Europe. The rotation period of forest stands is still on average for 80 to 100 years for Norway spruce and for 100 to 120 years (sometimes up to 140 years) for European beech. These indicators are still higher compared to, for example, Croatia, Slovenia, Italy or Poland. And it is surprising that the same rotation period is common in boreal for Norway spruce.

The determination of rotation period in the Czech lands is conceived in the following way: rotation period represents the framework production time related to the economic group. It should be based on ensuring the quantitative and qualitative production of wood, on the performance of forest functions. It is based on the toll maturity of forest stands included in the forestry management group. Ideally, the combined toll maturity should be taken into rotation period, which represents the condition of the forest stands, in which the quantitative and value toll rotation reaches a maximum, but in the case of production losses they reach a minimum. The choice of rotation period should be based on the qualitative characteristics of the harvested wood assortments, with regard to fructification, seediness or youthful ability, characteristics of consumer use (construction, technical and other wood) and financial issues (ie achieving the best material yield). Habitat influences are necessary take into consideration for determination of rotation period.

An important factor is therefore the loss of production due to the reduction of quantitative and qualitative production due to influence of biotic or abiotic factors. This effect is manifested in two levels a. By direct degradation of wood mass (influence of fungal pathogens, possibly saproxylic insect species) and by increasing the probability of forest ecosystems degradation due to abiotic factors.

The question therefore arises based on which indicators the rotation period defined in the legislative regulations applied in the Czech Republic was determined. Determining the optimal rotation period is important from both an economic and ecological point of view. Foresters, as part of the management of forest ecosystems, should also benefit the natural environment by maximizing the efficient use of vegetation and tree species. Two factors play an important role in finding the optimal rotation period for forest stands, from an economic point of view it is the discount interest rate and the length of the rotation period. It is essential to find the optimal rotation period in terms of value production. From a certain intensity of damage, the growth of wood does not have to replace the increase in damaged volume, and further cultivation of these stands loses its economic justification. Damage also reduces the stability to varying degrees, and the achievement of the originally set rotation period is then not realistic and it is rather a matter of further interventions to achieve the rotation at all. Often these interventions come at a considerable cost.

An aspect that has recently become very important not only in forest stands is biodiversity. According to Hubbell, "biodiversity is consistent with species richness and the relative abundance of these species in space and time." Whittaker (1960) distinguishes alpha, beta and gamma diversity. What effect does the optimal rotation period have in relation to the diversity of forest ecosystems?

The aim of this study is to introduce a new approach for the starting project of Influence of rotation period on the health of forest stands: possibilities of determining the optimal rotation period of forests with regard to the economics of management and diversity of forest ecosystems (supported by the Grand Agency of the Czech Forest State Enterprise). The aim of the project is to create a methodological tool for determining the optimal rotation period for Norway spruce and European beech forest stands of the most widespread target economic groups with a higher emphasis on species diversity, but also the economic efficiency of forestry management.

Key words: optimal rotation period, site classification, wood assortment methods, biodiversity, economic efficiency

Material and Methods

Biodiversity measurement resp. to α-, β-, γ- diversity, can also be based on a comparison of individual habitats of the Czech Forest Site Classification System and data from the Czech Forest Site Classification Database. Based on these data we are able to have got, for example, the total number of species in the site, the total number of species in all localities compared together, the number of exclusive species, the total number of recorded species, comparison of the poorest and richest localities probably by vegetation levels and edaphic categories, but also age stand, the total number of species of vascular plants divided by family, of which to mark protected species (variously listed in the red lists, etc., including tree species). The outputs of the database can be suitably supplemented by our own field research and especially the diversity of vascular plants (ie phytocenouses) can be compared.

For the purposes of solving the project, a series of forest stands will be selected for field investigation and verification of the suitability or unsuitability of the specified length of the rotation period. The stands will be selected on the basis of: tree species composition, an occurrence of pests, characteristics of the habitat (the focus is mainly on rich, nutrient habitats). We expect to inspect at least 100 forest stands. Data on soil and undergrowth will be collected, including a comparison of vegetation growth characteristics and evaluation of tree growth manifestations – dendrometric characteristics, for the needs of diversity assessment a phytocenological relevés (and floristic survey) will be performed, and a general evaluation of zoocenouses will be performed. It will be crucial to determine the assortment on the forest stands. Also during this field survey, the health

condition of the stands will be described and evaluated with regard to the occurrence of fungal pathogens, bark beetles (and other) insects, the occurrence of diseases, fractures, damage to game, etc. A special methodological procedure will be created. Everything will be add by assess the occurrence of abiotic and biotic factors and assess the condition of forest stands, including the occurrence of natural regeneration.

Based on the field data obtained in this way, an economic analysis will be performed with the aim of price valuing the forest stand at a given age for the simultaneous rotation period. For this purpose, the traditional procedure for price valuing standing forest stands shall be used. For individual assortments, the achieved prices of wood in CZK.m-3 will be determined, with reasonable regard to the general development tendencies of wood prices and to specific regional conditions, subsequently the gross sales yield will be determined from the above obtained data. Production costs (harvesting costs) will be determined at the valuation date, understood as costs for wood production. Thus, the values of toll yield at the age of m are determined. The value of toll yield is understood here as the value determined during the harvesting of the forest stand. This calculation can be supplemented (based on the findings of the healthy conditions of forest stands) also by the expected price value of stands (according to the theory of Chang 2001; Zhang, 2001; Zhang & Pearse, 2011; especially according to Macpherson, Kleczkowski, Healey, et al. 2016, Loisel 2013).

Discussion and Results

The expected results of the project will be: (i) Comparison of the diversity of forest phytocenoses (vascular plants and bryophytes) for Norway spruce and European beech stands (variously mixed) in different age classes for selected habitats site within economic units; (ii) Comparison of price value production for different rotation period within economic units (and other site classification units) based on field surveys and forestry planning data; (iii) Quantification and qualification of the effects of the rotation period on the ecological stability and diversity of forest ecosystems for Norway spruce and European beech stands on the basis of own field surveys; (iv) Proposal of the optimal setting of the optimal rotation period according to economic units (and other units of the site classification) in comparison with the currently valid rules.

The economic investigation should be carried out in cases where exceptional ecological conditions of vegetation, growth, production, health or other require a change in management principles. In the context of climate change and the degradation and decay of Norway spruce monocultures, economic research can be considered highly desirable. Economic analysis and justification is most often required by the proposed change in the rotation period, determination of the optimal toll age for transformations, adjustment of the target tree species composition on a certain set of forest sites and types of forest stands for production or conservation reasons, etc. abiotic harmful factors (wind, snow, frost), or as well as the economic justification of widespread forestry management activities.

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Contribution of the forest sector to the Uruguayan economy

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Introduction

Give the increasing importance of the forestry sector in the Uruguayan economy and the impact of the forestry sector on local economies, a discussion on the economic impact or contribution of the forest sector is needed. Furthermore, even though the second exported product in 2020 was cellulose, there are not many studies on the economic impact of the Uruguayan forestry sector that include a regional vision. Several authors have pointed out the usefulness of these analyzes to understand the forestry sector and to design public policies.

The concept of economic impact is related to forest policy. Even though, it is important to distinguish between contribution and economic impact, the difference between the concept of economic impact and economic contribution is not always considered (Henderson et al., 2017; Li et al., 2019; Watson et al., 2007).

In Uruguay, some studies have analyzed the impact of the sector or the contribution without making a difference between the concept, or even using both in the same report (CPA Ferrere, 2017; Morales Olmos and Siry, 2009). The objective of this study is to analyze the economic contribution of the forestry sector in Uruguay to the Gross Domestic Product (GDP).

Uruguay has a total effective forest area of 1,034 million hectares (ha), from which 952,755 ha are commercial plantations (Dirección General Forestal, 2018). The planted area covered with eucalyptus is 606,568 ha and with pine 183,809 ha. Furthermore, as of 2018 data 159,248 ha were either new plantations or harvested, and it is expected that most of this area is devoted to eucalyptus. The rest of the area is covered with Salix sp, Populus sp plantations. In addition to this, native forests cover 835,349 ha (Dirección General Forestal, 2019). Native forest in Uruguay is not exploited for commercial purposes.

The main internal destinations of eucalyptus plantations are the pulp industry, the chip industry, the solid wood industry (sawmills and a plywood factory), firewood, and roundwood exports. There are two pulp mills, UPM, with Finnish capital, and Montes del Plata, with Swedish and Chilean capital. Both plants have a similar production capacity, 1.4 million tons per year Montes del Plata and 1.3 million tons per year, and all their production is exported. Additionally, there is a chip mill that operates in a market niche from the production of Eucalyptus globulus chips. In the sawmill industry, according to Forest Division data, there are around 92 sawmills in the country (Boscana and Boragno, 2020). Finally, there is one veneer mill located in the North region which owns a mill and plantations.

Key words: National Accounts, Uruguay, economic contribution

Material and Method

The System of National Accounts (SNA) is a standardized system of macroeconomic economic information designed by United Nations to compile consistent information by country (United Nations, 2021). They adjust to the stage development by country and intend to generate

comparable information to design public policies. The National Accounts provide information on Gross Domestic Product (GDP) of a country considering three approaches: expenditure based, output based, and income based. The expenditure approach refers to the sum of domestic demand, gross capital formation (a proxy for investment), external balance of goods and services. The output approach is defined as the sum of the gross added value by industry, plus taxes less subsidies. The income approach is the sum of employee's income, gross operating surplus, taxes and production and imports. The GDP calculated using the output approach is a measurement of the direct contribution of the sector to the economy (by large items).

Although the SNA provides us with an indicator that is easy to interpret, and we can analyze its evolution over time, it is important to understand how the variables are estimated. In the case of the forest sector there are three main activities, or industries, that are included in the National Accounts: silviculture, wood products industry, and pulp and paper industry. In some countries, it is also included printing and graphics. For the Uruguayan case, we considered that a good description of the sector should include silviculture, wood products industry, and pulp and paper. The analysis was conducted with and without printing and graphics, as in the country there are not paper mills and therefore the paper is imported.

To analyze the contribution of the forestry sector to the Uruguayan economy, the National Accounts of Uruguay were analyzed. Uruguay's National Accounts have used the year 2005 as a base, however in 2020 the National Accounts based on 2016 were presented. The version using 2016 as a base year has not yet been published disaggregated by sector for more recent years. Therefore, in this work the trend of the sector's contribution was analyzed with the 2005 base version and then a comparative analysis of the sector's contribution in 2016 in current prices is carried out. In future versions it is expected to have the information by industries for more recent years.

Uruguay has recently published a new version of the National Accounts changing the base year from 2005 to 2016 (Central Bank of Uruguay, 2020a). The new version includes a new version of the linkages of the sectors in the economy in the supply and use tables. The supply and use tables show the allocation of goods and services by industry in intermediate and final uses (United Nations, 2020).This publication allows to analyze the linkages of the forest sector with other sectors in the economy as the country does not have an updated input-output table.

The silviculture activity includes planting, harvesting, and delivering the wood. Therefore, wood production is a long- term activity as in the case Uruguay rotations go from 8-12 years for pulpwood to 16-23 years for solid wood. The final step is to reconciliate all the data from different sectors and allocate it correctly to sectors in the economy. For the forest sector, one example is with harvesting data, as they collect data from companies, estimate stocking by age class and species based on the Forest Division data and later they need to compare the figures with actual harvest volumes provided by the Forest Division.

Results

The Uruguayan GDP in constant terms increased an average of 4.1% between 2005 and 2018, while the GDP of the forest sector increased 15.6%. During this period two major changes in the pulp industry happened: in 2007 a Finnish pulp mill with a capacity of 1.2 million tons per year started their activities, while in 2012 the second pulp mill doubled the production capacity of the country. The trend GDP of the forest sector has been uneven with peaks in 2008, 2014 and 2015. On the other hand, only in 2009, 2011 and 2012 the change rate of the forest sector GDP was below the change rate of the Uruguayan GDP in constant terms.

In the National Accounts which base year 2005, the forest sector increased it contribution to GDP in constant 2005 Uruguayan pesos from 1.4% in 2005 to 4.2% in 2018 (Central Bank of Uruguay, 2020b) The contribution in current Uruguayan pesos in the same period went from 1.9% in 2005 to 2.7% in 2018 (Central Bank of Uruguay, 2020b). The differences are explained by the deflators estimated by the Central Bank of Uruguay: while the GDP deflator followed an upper trend in the

period 2005-2018, the forest industries deflators, including silviculture and harvesting, wood products and pulp and paper industries, followed an oscillating trend.

The share of the forest sector in the Uruguayan GDP in current terms went from 1.4% in 2005 to 2.4% in 2018. The most important change was in the pulp and paper industry, as the share went from 0.2% to 1.5%. This change can be explained by the fact that in 2007 the first pulp mill started its activities, and in 2012 the second one doubled the production capacity of the country.

When analyzing the value added by industry at basic prices, in current Uruguayan pesos, the total contribution of the forest sector in 2016 was 2.4% when printing and graphics was included and 2,1% when it was subtracted. When comparing with the previous version, base year 2005, the share increased by 0.4%, from 1.9% to 2.3%. The differences are explained by an increase in the share of silviculture, harvesting and others, increasing from 0.5% to 0.7%; an increase in the share of wood products industry, from 0.4% to 0.5%; and an increase in the share of pulp and paper industry, from 1.0% to 1.1%.

Discussion

Discussing about the economic impact and economic contribution of a sector are not equivalent. It is important to distinguish the objective of the study and to identify the most appropriate method. In Uruguay there are few studies that analyze the impact or contribution of the forestry sector to the economy despite its importance for the economy.

This research is a first approach to the analysis of the contribution of the Uruguayan forestry sector considering the national accounts based on 2005 and the new national accounts based on 2016. Although the complete series are not yet available to date, when analyzing the year 2016 it was observed an increase in the participation of the forest sector in the GDP in current prices. In the long term, when analyzing the data between 2005 and 2018, the GDP of the forest sector trend was uneven with two peaks in 2008, 2014 and 2015 explained by the installation of two pulpmills. This result shows the big impact that these two investments made when other changes might not be reflected.

Finally, in the 2016 version the Central Bank made available the matrices that allow us to analyze the link between the sector and other sectors of the economy. The discussion on the linkages of the forest sector with other sectors in the economy is in force among the actors of the forestry sector in Uruguay. In a study on the perceptions of individuals living in a forest region of Uruguay, a positive perception of the economic impact of the forestry sector was observed, with some concerns for the environment and a concern about the messages that are communicated regarding the sector in relation to the possible biases, truthfulness, reliability and availability of information (Bortagaray et al., 2019). Therefore, it is necessary to complement the purely economic analyzes with others that include the actors and other sectors.

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Potential of structural changes in sustainable forestry and woodworking

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The poster aims to present the scientific community with the genesis, the course, and the results so far of the National Agency for Agricultural Research project “Potential of Structural Changes in Sustainable Forestry and Woodworking”, which was carried out by members of the Department of Forest and Wood Products Economics and Policy of Mendel University between 2018 and 2020. The project objective proceeded from the premise of the economic viability of forest management as it is the key pillar of sustainable forest management and plays a major role in sustaining forests and the many benefits they bring to society. Since this economic viability basically depends on the wood-producing function of forest management, the role of the woodworking industry should also be stressed alongside forestry. The project results shall be used to create an optimization model of the wood flow in the primary processing of wood based on the balance of resources and wood consumption and the cascade of wood consumption in the processing of wood with the focus on assessing various possible options to change the structure of inputs and outputs (including the aspects of climate change in the forest sector conditions).

Acknowledgements: The outputs of the project were created with the financial support of the project of the Ministry of Agriculture NAZV No. QK1820358.

Key words: sustainable forestry and wood processing, evaluation of wood flow, optimization of sustainable wood processing

Direct assessment of biomass productivity in short rotation forestry with the terrestrial laser scanner: an application from Romania

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Short rotation forestry (SRF) provides an important supply of biomass production (Dănilă, 2019). In NE of Romania are installed over 800 Ha of this crops (Dănilă et al. 2016). The SRF enjoys the support through environmental and economic policies (Oberthür & Ott 1999). A precise estimate of biomass production is needed for the sustainable planning of forest resources and for the exchange of energy in ecosystems.

The use of the terrestrial laser scanner (TLS) to estimate the production of above ground wood biomass (AGWB) of short rotation forestry brings an important technological leap among indirect methods. TLS technology is justified when destructive methods become difficult to carry out and biomass equations do not give accurate information (Coșofreț et al. 2018).

The main purpose is to estimate the biomass productivity on tree parts (total tree, branches and stump) in short rotation forestry with TLS technology.

Measuring the hybrid poplars crops by TLS may have the following consequences: (i) higher accuracy of the estimate of biomass production in the SRF; (ii) cost and time effective measurements over the biomass of tree parts; (iii) new and validated allometric equations for SRF in NE Romania; (iv) solid instrument for industry to estimate biomass.

The research will contribute to the development of knowledge in the field of hybrid crops.

Acknowledgements: This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS – UEFISCDI, project number PN-III-P1-1.1-PD-2019-0388 and project DECIDE - Development through education entrepreneurship and innovative doctoral and postdoctoral research", POCU/380/6/13/125031, a project co-financed by the European Social Fund through the Operational Human Capital 2014 – 2020.

Key words: above-ground woody biomass (AGWB); short rotation forestry (SRF); terrestrial laser scanner (TLS).

Win-win public-private partnership for financing sustainable poplar plantations and biodiversity conservation in the Region of Lombardy

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Natural protected areas and the Regional Ecological Network are the main examples of Green Infrastructure that exist in the Lombardy Region, Italy. Supporting the maintenance of these areas is a major challenge, especially in times of constraints in public spending.

The poster presents a Payment for Biodiversity Conservation Scheme (ECOPAY Connect) that brings together park authorities, the timber industry, and the poplar tree farms under the common framework of FSC® (Forest Stewardship Council) certification.

The scheme is carried out in an area under intensive poplar-plantation management in Southern Lombardy, where natural protection is carried out by the Oglio Sud Regional Park. In this context, two local poplar farms certified under the FSC Standard, according to Indicator 6.5.5 have been required to retain 10% of the surface as a "representative area", restoring close-to-nature ecosystems.

After a participatory approach led by expert consultants, the farms and the Park Authority signed two 5-year agreements in which the farms commit to carrying out specific interventions in natural areas owned by the Regional Park to fulfil the requirement.

This solution is win-win and transforms a compliance requirement into an opportunity, where a public-private partnership led to reduction of costs for both partners, and more functional restoration. It also represents the first Payment for Ecosystem Services officially signed between a Park and an FSC-certified farm in Italy.

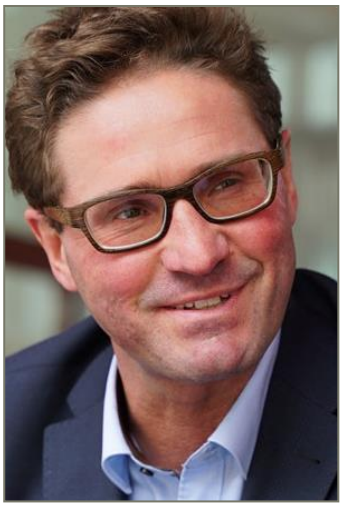
After the first two agreements, two more poplar farmers decided to join the scheme, that is now stabilizing in the territory assuring the economic and environmental sustainability of poplar practices.

Acknowledgements: The scheme was realised thanks to the collaboration between different institutions and projects: it was launched with a grant from the Cariplo Foundation and was then developed as a case study in the Horizon 2020 Sincere project. Thanks are due to: Oglio Sud Regional Park, FSC Italy office, Rosa Anna e Rosa Luigia, Rosseghini, Baboni, Aporti, Panguaneta and Invernizzi companies.

Key words: PES, FSC, ecosystem services, poplar plantations, green infrastructures, nature-based solutions, public-private partnership

KEYNOTE SPEAKERS

Christian Hoffmann



Christian Hoffmann holds a PhD in Forest Economics from the University of Natural Resources and Life Sciences in Vienna. Since 2006 he is employed as a senior researcher at the Eurac Research Institute for Regional Development, where he leads the "Rural Economy" research group. He is a member in the EUSALP AG6, where he coordinates the Task Force “Multifunctional Forestry and Sustainable Use of Timber”. In this function, he contributed to the ARPAF Project REDIAFOR that targets on “Reinforcing Dialogue in Forestry” to overcome diverging interests. At the Institute of Regional Development, he copes with regional products in the ARPAF project "100% Local" and the survey on territorial brands. Besides, he deals in the Interreg IT/CH project “Living ICH” with sustaining the intangible cultural heritage of agro-alimentary food-chains and aims in a CLLD Leader project to conserve ancient seed varieties in the Alps. For the Province of Bolzano, he works for establishing a "Sustainable Food System” and a “Circular Economy Strategy”. Additionally, he is a scientific committee member of Science for Carpathians and a deputy of the IUFRO unit "Forest Based Value Chains".

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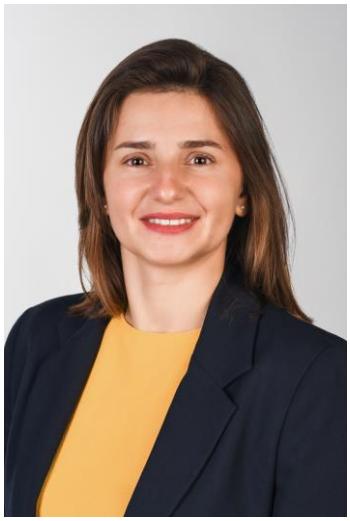

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Dr Melnykovych was Swiss Government Excellence Scholarship holder for her PostDoc project at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL. She also worked on several international projects (e.g., EU Horizon 2020 SIMRA, ENPI-FLEG Program, EU COST Action SENSFOR, EU COST Action European NWFPs), holding research and consultancy positions at the European Forest Institute, IUCN and World Bank, ENGO ‘NEPCon’, and the National Forestry University in Ukraine.

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Mendel University Training Forest Enterprise Masaryk's forest Křtiny

„Diverse forest for the climate change“

We would like to visit several very interesting places near Brno city. Early in the morning we would got the buses and visit the Moravian Karst. Where the Mendel University Training Forest Enterprise covers.

The Training Forest Enterprise (TFE) consists of a vast complex of forests covering more than 10 thousand ha. The representation and distribution of woody plants reflect the vegetation gradation and habitat conditions. Deciduous trees (33% dominated by beech) cover 62% of the forest area, and 38% are covered by conifers (19% spruce).

Sustainable forest management targets at increasing the resilience of forests by introducing appropriate adaptation and mitigation management measures in changing environmental conditions and optimal use of the production potential of forests, all concerning habitat conditions and ensuring the fulfilment of forest ecosystem services and other functions, with particular regard to the needs of the university (teaching, research) and the public (recreation). It is implemented through 15 silvicultural models, mostly focusing on uneven aged forestry.

TFE also includes three forest arboretums, many forest meadows with exotic tree species, hundreds of kilometres of forest roads and tourist paths, natural springs and small forest water pools or ponds. The Faculty of Forestry and Wood Technology Mendel University in Brno closely collaborates with the Training Forest Enterprise. The TFE offers experimental forest stands, greenhouses, forest nurseries, a game preserve, a sawmill, mechanised log depot, and other establishments for educational and research purposes.

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