Different Organizational Models of Private Forest Owners as a Possibility to Increase Wood Mobilization in Slovenia and Serbia

Špela Pezdevšek Malovrh, Peter Kumer, Predrag Glavonjić, Dragan Nonić, Jelena Nedeljković, Bratislav Kisin, Mersudin Avdibegović

Abstract

The importance of renewable energy resources has increased over the last decades due to the European Union renewable energy policy and particularly its climate change mitigation objectives. There is a need to mobilize additional wood resources from private forests in order to meet ambitious renewable energy targets and the demand for wood. Due to the conditions prevailing in privately owned forests in Slovenia and Serbia characterized by a large number of still disorganized private forest owners with fragmented and small-scaled forest properties, wood mobilization strongly depends on owners' organization and cooperation. The purpose of this study is to determine the possibilities for wood mobilization from private forest properties in Serbia and Slovenia, and propose organizational models on this basis and experience from the selected case countries. Surveys were conducted in Slovenia (n=622) and Serbia (n=248) on random samples of private forest owners. Analysis of wood mobilization potentials in Serbia and Slovenia showed that the harvesting intensity in private forests is below the potentials, therefore the preconditions to increase the level of wood mobilization exist. The main obstacles to the increase in the current level of wood mobilization in Serbia are biodiversity and the protective forest function, as well as high acquisition costs, also stated as the main obstacle in Slovenia. Moreover, it appeared that the majority of private forest owners in both countries believe that better logistics and infrastructure and interest association of private forest owners are potential solutions leading to an increase in the level of mobilization. Four models of private forest owner organization are proposed and they take into account the characteristics and attitudes of owners as well as activities in supply chain, including timber sales arrangement, construction and maintenance of forest roads, harvesting, measurement and quality assessment of timber, transportation, invoicing and payments.

Keywords: renewable energy resources, wood mobilization, private forest owners, organizational models

1. Introduction

The importance of renewable energy sources has increased over the last decade particularly due to the European Union renewable energy policy and its climate change mitigation objectives. Energy security issues, rural policies as well as income and employment generation related to bioenergy production have all played important roles (Hatemaki et al. 2014).

Renewable energy policies have consequently been developing rapidly, culminating with the European Union (EU) Renewable Energy Directive 2009/28/EC (hereafter EU-RED), which sets mandatory targets to all member states. The EU will have reached a 20% share of energy from renewable sources by 2020 (Directive 2009, Mantau et al. 2010, Blennow et al. 2014, Halder et al. 2014, Posavec et al. 2015). In addition to the EU-RED, the importance of renewable energy sources has also been recognized in the EU Forest Strategy (EC 2013) and Climate and Energy Framework for 2030 (EC 2014). The EU Forest Strategy argues that forest-based biomass »is gaining market

interest« providing »opportunities to maintain or create jobs and diversify income in a low-carbon green economy« (EC 2013). Furthermore, it is noted that »according to the National Renewable Energy Action Plans, biomass will still be the main source of renewable energy in 2020« (EC 2013). In addition to other activities, strategic orientations defined by this document include the following: a) the exploration and promotion of a fuller use of wood as a sustainable, renewable, climate and environment friendly raw material and b) the assessment of potential wood supplies and facilitation of increased sustainable wood mobilization (EC 2013).

In order to meet ambitious renewable energy targets, it is necessary to imply a far more intensive use of forest resources (Schwarzbauer 2010) and mobilize additional wood resources (mainly from fragmented private forests) to meet the demand for wood (Rauch and Gronalt 2005, Lindstad et al. 2015).

Based on EU-RED and the recognized importance of renewable energy sources, EU countries (including Slovenia) have developed and implemented their National Renewable Energy Action Plans. In addition to the promotion of production and use of energy wood from forests (Beurskens and Hekkenberg 2011), they include national policies and policy recommendations for the development of renewable resources. Policy recommendations have been successfully converted to measures leading to an increased mobilization of wood. Serbia initiated the process of harmonization of national legislation with the EU policy concerning renewable energy as part of its pre-accession negotiations. Therefore, Serbia adopted the National Renewable Energy Action Plan until 2020 (NREAP 2013), defining clear objectives in terms of conditions for energy production from renewable energy sources. In these strategic plans private forests were addressed in terms of their wood mobilization potentials.

Considering that private forests in Slovenia and Serbia are characterized by a large number of still disorganized private forest owners (hereinafter PFOs) of fragmented and small forest properties and their continuous fragmentation (Glück et al. 2010, Glück et al. 2011, Pezdevšek Malovrh et al. 2011), wood mobilization will strongly depend on owner readiness to supply woody biomass to the energy market (Posavec et al. 2015, Nonić et al. 2015). In addition, Blennow et al. (2014) report that despite great potentials and needs for additional wood mobilization, a growing number of PFOs in Europe (mostly with fragmented forest properties) do not participate in market wood supply. Therefore, PFOs cannot be expected to supply the amounts of woody biomass for energy required to meet the forest biomass share of EU 2020 renewable energy targets. The most important problems affecting wood mobilization are forest property fragmentation, the lack of PFOs organizations and insufficient motivation of PFOs for harvesting (EC 2008). Rauch and Gronalt (2005) state that the problem of low wood mobilisation is the result of structural disadvantages in small-scale forest properties, bad market position of PFOs, the lack of forest management knowledge and experience, low volumes supplied per forest owner, low machine utilisation and difficulties in promotion. Additional reasons for the low level of wood mobilization from small-scale forest properties are the lack of time needed for wood felling (Suda and Warkotsch 2002), the increase of felling costs, the age of PFOs (Bolkesjo and Baardsen 2002), the low level or the lack of profits from forest management, incomes independency from forestry, the lack of knowledge and skills related to forest management and the lack of cooperation among PFOs (Stern et al. 2013). In addition, there are new types of PFOs who do not want to fell trees, since they primarily value their forest as a place for leisure or hunting (Boon et al. 2004, Hogl et al. 2005, Ní Dhubháin et al. 2007, Pezdevšek Malovrh et al. 2015, Živojinović 2015).

Fundamental approaches that can lead to increased wood mobilization are based on PFOs cooperation and the formation of more PFOs associations and cooperatives (Glück 2002, Nichiforel and Schanz 2009, Becker 2010, Schwarzbauer et al. 2010, Mendes et al. 2011). In addition, it is necessary for PFOs to overcome their distrust towards the existing organizations primarily in the new EU member states as a result of past negative experience caused by general collectivism (EC 2008). Schwarzbauer et al. (2010) argue that wood mobilization is particularly high in formal forms of cooperation (different forms of partnerships, associations or PFO cooperatives). Moreover, Becker (2010) highlighted cluster initiative and local forest management cooperatives as forms of PFO organization with the highest significance for wood mobilization. The classification of PFOs into groups, their attitudes (Schaffner 2008) toward wood mobilization (Huber et al. 2013) and motivation have great importance for the solving of this problem.

The aim of this paper is to determine the possibilities for wood mobilization from private forest properties in Serbia and Slovenia on the basis of: 1) PFOs characteristics, 2) wood potential for mobilization as the difference between the increment and harvesting rate and 3) the attitudes of PFOs toward wood mobilization. Based on the results and models existing in the selected case countries, different PFOs organiza-

tion models are proposed in order to increase wood mobilization. The following activities in the supply chain were analyzed in the determination of the models: timber sales arrangement, construction and maintenance of forest roads, harvesting, measurement and quality assessment of timber, transportation, invoicing and payment.

2. Background

2.1 Brief description of private forests

Private forests are an important resource of national economies in Serbia and Slovenia. Forest cover accounts for 29.1% (2,252,400 ha) of the territory in Serbia, of which 47% (or 1,058,400 ha) are privately owned forests (Banković et al. 2009). Private forests are characterized by small-scale and fragmented forest properties owned by a large number of forest owners (about 900,000). More than 72% of the owners have properties smaller than 1 ha, while the average forest property size reaches 1.27 ha (Glück et al. 2011). Since 2006, some »large« private forest owners (churches and religious communities) have emerged as a result of the restitution process. By the end of 2014, 23,195 ha of forests and forest land were returned to churches and religious communities (Restitution 2014). The process of property restitution to churches, religious communities and physical persons has not been completed yet. In Serbia private forest owners associations (PFOAs) do not have great significance and impact on forest policy. The first PFOAs were established in Serbia with the assistance of FAO projects in 2006 (Nonić et al. 2010). By 2015, 22 PFOAs were established at the local level, as well as the Serbian Federation of Private Forest Owner Associations as the umbrella organization in 2009. However, due to the necessary change in their legal form, only eight PFOAs have continued to be active after 2011.

In Slovenia, forest cover accounts for 58.4% of the territory (1,183,433 ha). According to data from the 2010–2020 forest management plans, Slovenian PFOs control a larger share of the country's forests than in any other country in the region (76% of approximately 1.2 million ha). The property is divided into approximately 314,000 individual plots, owned by roughly half a million owners. Individual properties are mostly small (64% less than 1 ha) and fragmented, while individual owners possess three plots on average (Pezdevšek Malovrh et al. 2010). That situation resulted in an underutilized management of private forests (harvesting rate below potential), which hinders wood mobilization. Although PFOAs started to develop in Slovenia at the beginning of the 2000s, membership is still low (less than 1% of owners are members of PFOAs). Thirty local PFOAs were established by 2015 (Leban 2014). In addition to local PFOAs, the Association of Private Forest Owners was established at the national level in 2006. Its main goals are to promote cooperation among owners, support the establishment of new local associations and facilitate links between the public forest administration and private forest owners (Mori et al. 2006).

2.2 Potentials of wood mobilization from private forests

The potentials of wood mobilization from private forests in Serbia and Slovenia was analyzed on the basis of data obtained from public forest administrations. The realizable potential was calculated as the difference between the annual growth increment and the volume of wood harvested and was presented as the percentage of utilization (Tables 1 and 2).

In the Serbian study area, the overall potential for wood mobilization is 616,689 m^3/yr, and the average utilization amounts to 57% of the annual growth incre-

Table 1 Potentials for wood mobilization from private forests in the Serbian study area

Forest region	Increment, m^3/yr	Annual cut, m^3/yr	Realization, %
Belgrade	2353	656	28
Kučevo	47,970	50,517	105
Boljevac	98,278	49,815	51
Despotovac	26,595	23,820	90
Kragujevac	30,942	7954	26
Loznica	75,849	22,144	29
Užice	30,776	13,750	45
Prijepolje	37,191	19,295	52
Ivanjica	28,875	11,895	41
Raška	22,022	9038	41
Kraljevo	17,257	9398	54
Kruševac	21,900	18,859	86
Kuršumlija	31,129	18,384	59
Niš	21,194	4307	20
Pirot	20,207	17,682	88
Leskovac	61,804	37,897	61
Vranje	42,347	37,917	90
Total	616,689	353,328	Average: 57

Source: PE »Srbijašume« 2013

Table 2 Potentials for wood mobilization from private forests in Slovenia

Regional unit	Increment, m^3/yr	Annual cut, m^3/yr	Realisation, %
Tolmin	467,508	238,086	51
Bled	18,778	187,158	101
Kranj	388,995	263,703	68
Ljubljana	618,765	428,648	69
Postojna	238,533	206,704	87
Kočevje	257,199	185,747	72
Novo mesto	428,966	299,006	70
Brežice	311,833	340,363	109
Celje	365,079	228,999	63
Nazarje	271,003	206,396	76
Slovenj Gradec	236,247	214,013	91
Maribor	460,081	324,307	70
Murska Sobota	126,244	114,705	91
Sežana	239,204	121,154	51
Total	4,594,435	3,358,988	Average: 73

Source: Report of Public Forestry Service of Slovenia about forests for the year 2014, 2015

ment (PE »Srbijašume«, 2013). Based on the data for 2014, the total available potential for wood mobilization in Slovenia is 4,594,435 m^3/yr, and the average utilization amounts to 73% of the annual growth increment (Report of Public Forestry Service of Slovenia about forests for the years 2014, 2015).

3. Methods

3.1 Survey method

Similar representative nationwide surveys were administered to private forest owners in Serbia and Slovenia with some variation in accordance with the country-specific conditions mainly in organization of forestry sector, in order to determine the possibilities for wood mobilization. The questionnaires were developed as a result of literature analyses and previous socio-economic research related to owner attitudes, motivation and behavior related to the management of their forest properties and wood mobilization (Pezdevšek Malovrh 2010, Glück et al. 2011, Pezdevšek Malovrh et al. 2015, Posavec et al. 2015). The survey questioned owners about a range of issues, and several questions were analyzed in relation to the research aims. These were related to the mobilization of wood resources (PFOs attitudes towards mobilization, obstacles or problems that prevent them to increase the level of mobilization), forest management and socio-demographic characteristics of PFOs.

Personal data about PFOs were found in the encrypted relational databases of the Land and Property Register obtained from the Surveying and Mapping authority of the Republic of Slovenia (SMARS 2007) in Slovenia and from the public enterprise for state forest management »Srbijašume« and Republic geodetic authority in Serbia. Therefore, our target population in both countries consisted of individual PFOs.

At the time of the research, 330,949 distinct PFOs were listed in the Slovenian Land and Property Register and the following PFOs were excluded from study population as they were not considered as a part of our target population or could not be used in our study due to the missing of relevant data: co-owners, church, commons, companies, owners younger than 15, and those without an address or living abroad. From the final population, PFOs were selected with a simple random sample. The data were obtained through an email survey. In order to maximize response rates and reduce survey error, the Dillman's Tailored Design Method (TDM) was partly adopted. As recommended by Dillman (2007), the postal and e-mail survey involved a sequence of five contacts, two of which were used in our data collection, including a questionnaire and cover letter with a token incentive and replacement questionnaire 2–4 weeks later. The reply envelopes were enclosed by postal survey to make it easier for the respondent to return the questionnaire.

In Serbia, a stratified random sample was selected from 107,790 PFOs. The criteria for PFOs classification to strata included the existence of PFOAs in the past, as well as the geographical distribution (forest territorial units and cadastral municipalities) and size of forest properties. On the basis of previously mentioned criteria, 10 municipalities were selected as territorial units in four forest areas (Severnokučajsko, Timočko, Južnokučajsko and Podrinjsko-kolubarsko forest area). All PFOs within the territorial units were divided into strata according to their property size (up to 0.99 ha; from 1 to 4.99 ha; from 5 to 9.99; from 10 to 19.99 ha; more than 20 ha). 310 PFOs were selected randomly (confidence level of 95% and confidence interval 5%) within each stratum in order to ensure that all groups are equally represented. The data were collected through personal interviews.

The survey was distributed via email to 2012 PFOs in Slovenia, while in Serbia 310 PFOs were visited for

face-to-face interviewees. The total response rate for the survey in Serbia was 80% (248 replies) (Nonić et al. 2013), while in Slovenia it was 30.9% (622 replies). Taking into account the high non-response rate in Slovenia, mainly caused by errors in the national register, the results should be interpreted tentatively. The questionnaire was tested in October 2012 and the survey was carried out in the period from November 2012 to July 2013 in Serbia. The questionnaire test in Slovenia was conducted between February and March 2015 and the survey was conducted from March to May 2015.

Due to confidentiality concerns, non-respondents were not followed further, so the differences among those respondents were not estimated. Representativeness of the sample was checked by inspecting spatial distribution of the respondents to test their random distribution across the country.

3.2 Data analysis

Data analysis in this study was performed in two stages. The first stage involved secondary data analysis to estimate the potentials of wood mobilization from private forests in Slovenia and Serbia. The second stage involved a summary of collected data through the use of frequency distribution and selected location measures (mean). Data analysis was conducted by the SPSS 20 statistical software package.

4. Research framework

As recognized by previous research, efficient PFOs organization at the local level is an important step in solving the problem of wood mobilization from small-scale forest properties (Nonić and Glavonjić 2012, Nonić et al. 2011, Pezdevšek Malovrh 2010, Glück et al. 2011, Weiss et al. 2012).

There are a number of PFOs organization models that can be divided into two major groups: a) organization with a focus on management, marketing support and provision of services such as technical and financial support, as well as knowledge and information exchange, and b) organization focused on gaining political support by including PFOs in the political process, with active participation in the creation of policy frameworks for the forestry sector (Weiss et al. 2012).

According to Rauch and Gronalt (2005), there are two common distinct supply chain types from small-scale forests: a) PFOs with small forest properties that »handle all forest activities including harvest planning, felling and timber haulage by themselves and sell directly to the industry or trader« or b) PFOs who »may be members of a Forest Owner Cooperative, an organization of forest owners that bundles harvested timber and typically sells to the wood processing industry«. Similarly, Mendes et al. (2011) and Glück (2002) consider that resolving the aforementioned issue of wood mobilization can be achieved through the potential of forest cooperatives and associations.

Table 3 Basic characteristics of private forest owners

Characteristics of private forest owners, %	Serbia	Slovenia
Gender		
Male	94.8	65.4
Female	5.2	34.6
Age	n.a	Average 57.5
<30 years	2.8	3.9
30–60 years	69.0	54.1
>60 years	28.2	42.0
Primary occupation		
Farmer	36.7	–
Unemployed	10.1	5.7
Pensioner	22.2	49.5
Student	–	0.4
Employed	19.8	38.5
Other	11.3	5.9
Level of education		
Primary school	41.5	18.4
Secondary school	48.4	59.2
University education	10.1	22.2
The average distance from the residence to the forest property		
≤5 km	65.3	67.9
6–20 km	27.0	18.9
21–100 km	7.7	13.3
Size of forest property	Average: 7.4	Average: 7.5
<1 ha	8.5	35.9
1–5 ha	52.0	40.1
5–10 ha	20.2	8.6
10–20 ha	11.7	5.9
>20 ha	7.7	9.5

In our study, Germany and Austria were chosen as case countries for an overview of existing PFOs organizational models, based on the fact that these countries have a long tradition in PFOs cooperation, which resulted in a high level of exploitation of forest resources. Moreover, due to similar forest sector organization models, these experiences can be applied in the analyzed case countries.

According to research studies conducted in Germany, there are three different PFOs organizational models depending on wood mobilization and the wood supply chain (HAF 2008). »Model I« is an organization of PFOs who independently perform all forest management tasks. According to this model, an association fulfils the role of a coordinator among the PFOs, forest service and the wood processing industry. »Model II« is an administrative version of the association that performs the role of a coordinator between the forest owner and forest service. »Model III« is an association involved only in the coordination of PFOs, while coordination in other areas is carried out by other, larger associations or specialized marketing companies.

In Austria, Rauch and Gronalt (2005) distinguished among four PFOs organizational models, depending on the knowledge related to forest management: 1) the »model of PFOs who are acting independently«, 2) the »Styrian model«, 3) the »individual accounting model« and 4) the »dividend model«. Within the first model, PFOs take the greatest share of responsibility. In the »Styrian model« owners themselves perform the activities of harvesting and transport, while the association sells assortments concludes contracts and sorts the invoices to individual owners. The »individual accounting model« is characterized by joint forest management of several owners, while the income and expenses are calculated independently for each owner. The »dividend model« involves joint forest management of all members, whereby revenues and expenses are associated with a joint account, i.e. there is no individual accounting for each plot.

5. Results

5.1 The basic characteristics of private forest owners

The profiles of PFOs are presented in Table 3. The results show that PFOs in Serbia and Slovenia are mostly males (in Serbia 94.8% and in Slovenia 65.4%), aged between 30–60 (69% in Serbia and 54.1% in Slovenia), mainly with high school education (48.4% in Serbia, and 59.2% in Slovenia). The basic occupation of PFOs in Serbia is farming (36.7%), while in Slovenia most of them are pensioners (49.5%). More than 60% of PFOs in both countries live close to their property (at a distance shorter than 5 km). The average size of a property in Serbia and Slovenia is almost identical (7.4 ha in Serbia and 7.5 ha in Slovenia), with a predominant share of small forest properties of up to 5 ha (60.5% in Serbia and 76.0% in Slovenia).

5.2 Private forest owner attitudes towards wood mobilization

There were eight statements in the survey that measured the PFOs' attitudes related to wood mobilization (opportunities and potential solutions leading to an increase in the level of mobilization), whereby due to the better comparability of the results, responses to the offered statements are recoded into three groups (agreement, disagreement and don't know) (Fig. 1).

It appeares that the majority of PFOs in both countries believe that a better logistics and infrastructure (better openness of forest complexes) are potential solutions leading to an increase in the level of mobilization. Moreover, PFOs in Serbia think that interest association of PFOs (42.3%) and market share and marketing (41.5%) have a decisive impact on the increase in the level of wood mobilization from private forests. PFOs stated that education and training (18.5%), greater involvement of employees in public enterprises (11.3%) and the existence of forest extension services (19.8%) do not have an impact on wood mobilization.

A 52.3% of respondents in Slovenia think that interest association of PFOs and education and training (36.6%) have an important role in solving the problem of insufficient wood mobilization from private forests. Moreover, they also consider that the use of wood for biomass (36.4%), more intensive participation of the state through grants, loans and fiscal policy instruments (34.8%) and more intensive extension service offered by public forestry service (32.3%) can contribute to the solving of the problem.

5.3 Obstacles to the increase in the level of wood mobilization

Approximately a half of PFOs in Serbia (50.4%) think that the level of mobilization is unacceptable with a possibility for improvement, while the situation in Slovenia is the opposite, as 51.5% of PFOs consider the level of mobilization suitable.

PFOs in Serbia consider that conservation of biodiversity and protective functions of forests (52.4%),

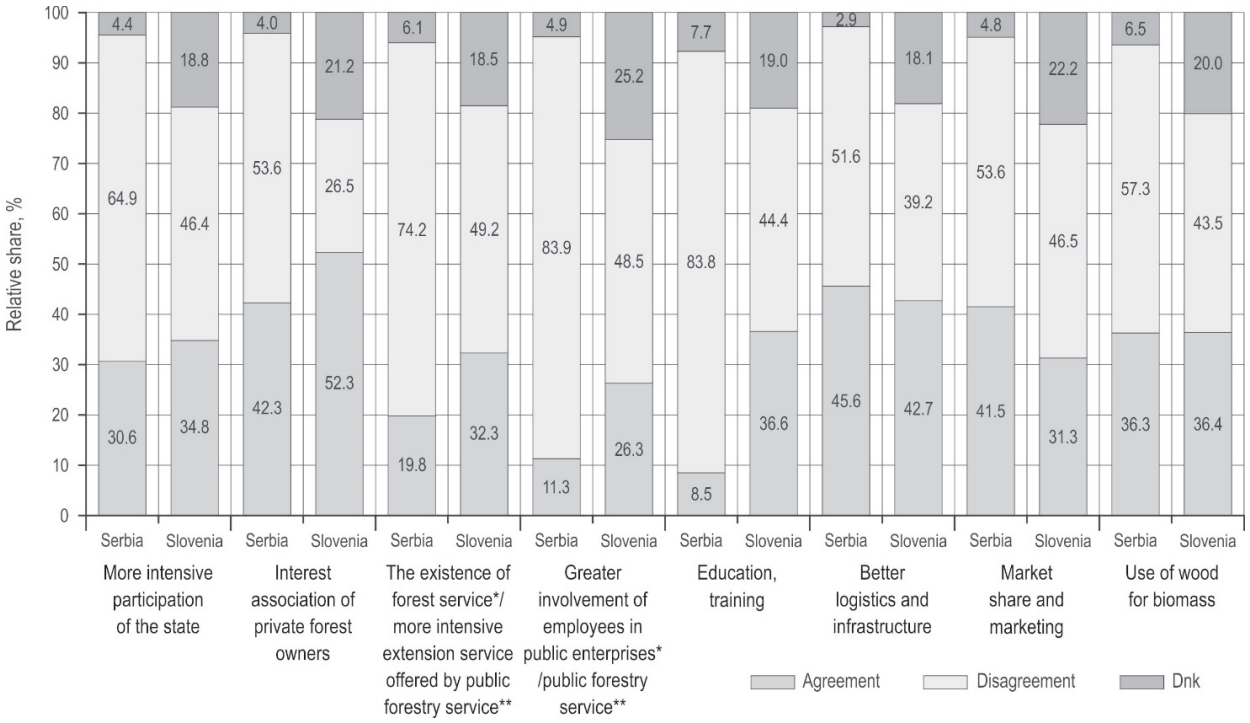

Fig. 1 Attitudes of PFOs towards the opportunities and potential solutions leading to an increase in the level of mobilization. Notes: Agreement = strongly agree plus agree; disagreement = disagree plus strongly disagree; Dnk = Don't know. The original scale and coding was done as strongly agree – 5; agree – 4; I do not know – 3; disagree – 2 and strongly disagree – 1; * Offered response for Serbia; ** offered response for Slovenia (due to different organization of forestry sector)

high acquisition costs (22.6%) and unfavorable technical characteristics of the equipment (18.1%) (Table 4) are the main obstacles to an increase in the level of wood mobilization. In addition, 27% of PFOs consider that there are no obstacles related to wood mobilization from private forests.

Table 4 The main obstacles to an increase in the level of wood mobilization (multiple answers)

Obstacles	Serbia, %	Slovenia, %
Legislation	3.2	13.7
Lack of planning documents*	3.6	6.2
Unfavorable technical characteristics of the equipment	18.1	15.8
Biodiversity conservation and protective functions of forests	52.4	4.9
High acquisition costs	22.6	27.5
Social functions of forests	6.5	6.5
No obstacles	27.0	37.1

* For Slovenia, an offered response was »management plans«

The largest number of PFOs in Slovenia considered that there were no obstacles related to wood mobilization (37.1%), stating that high acquisition costs (27.5%), unfavorable technical characteristics of the equipment (15.8%) and legislation (13.7%) are the main obstacles.

6. Proposed models of private forest owner organization

The cooperation of PFOs is one of the key instruments to increase the level of wood mobilization from private forests as recognized in previous researches (i.e. Rauch and Gronalt 2005, MCPFE, DG AGRI, UNECE/FAO 2010, Becker 2010, Pezdevšek Malovrh 2010, Nonić and Glavonjić 2012, Weiss et al. 2012), whereby the choice of organizational form of cooperation depends on the identified types of PFOs (Schwarzbauer and Stern 2010, Pezdevšek Malovrh et al. 2015, Nonić et al. 2013).

Analysis of wood mobilization potentials in Serbia and Slovenia showed that the harvesting intensity in private forests is below the potentials; therefore, there are preconditions to increase the level of wood mobilization. Moreover, PFOs in both countries think that

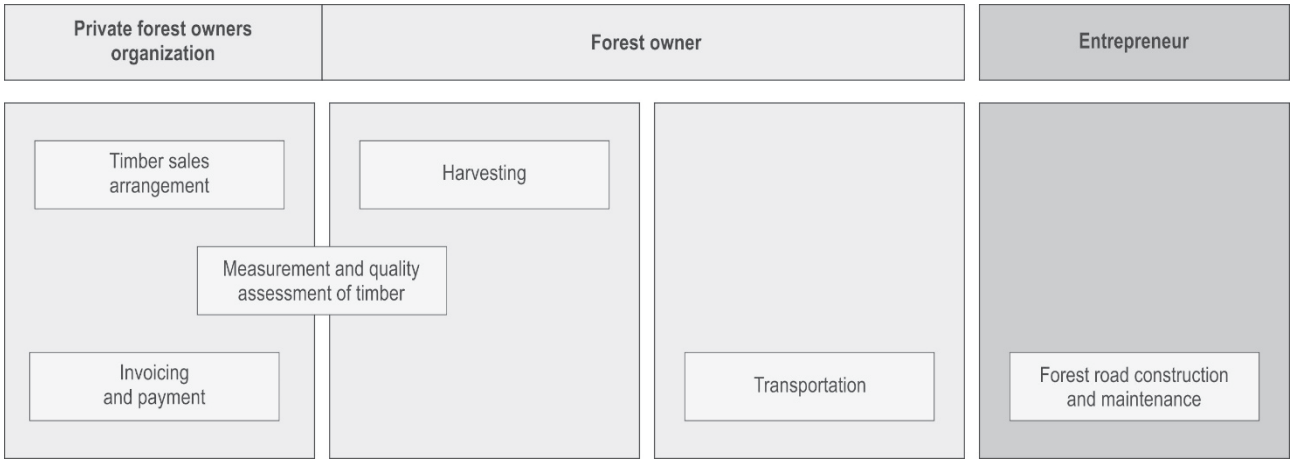

Fig. 2 Activities within »Model I«

there are possibilities for improving the level of wood mobilization and that interest association of PFOs can contribute to the solving of the problem. Based on the above facts and the experience from the selected case countries (Austria and Germany), four models[1] of PFOs organization have been proposed to boost the mobilization of wood from private forests. The choice of a particular model depends on the PFOs' experience in the forests management, professional and technical capacity of PFOs, offers of service providers (silviculture, harvesting and transportation), as well as the local market of timber assortments.

»Model I« is proposed for PFOs who possess skills and knowledge in the field of forestry and are full-time engaged in their forest. According to previous research, these owners have been referred to as »active« owners (Pezdevšek Malovrh et al. 2015), »the owners focused on timber production« (Kline et al. 2000, Boon and Meilby 2007), »businessmen« (Mizaraite and Mizaras 2005), »the owners with full-time work in forestry« (Wiersum et al. 2005) or »economically oriented owners« (Loenstedt 1997, Becker et al. 2000, Bieling 2004, Ingemarson et al. 2007). Timber production as the predominant management orientation is of high importance, because they generate economic revenue (Ní Dhubháin et al. 2007, Pezdevšek Malovrh et al. 2015). The income from the forest is largely involved in the total annual household income. Within this organizational model, PFO organization performs the arrangement of timber sales, measurement and quality assessment of timber, invoicing and payment. With timber sales arrangements, the PFOs ensure contract-fixed price of wood throughout the year. PFOs or members of the organization perform timber harvesting and its transportation to the wood processing industry. In addition, PFOs are involved in the measurement and quality assessment of timber. Forest road construction and maintenance is performed by a contractor (entrepreneur) hired by the organization, because of the high initial investments in the purchase of machinery (Fig. 2). The proposed model of PFO organization is similar to cooperatives.

Similar results were reported by Rauch and Gronalt (2005) in the framework of the »Styrian model«, in which owners perform harvesting and supply of wood to the wood processing industry, while other activities are carried out by the employees of the association and representatives of the wood-processing industry. According to a research in Germany, in one of the organizational models, the owners within the association carry out all necessary activities, including forest road construction (HAF 2008).

»Model II« is similar to »Model I« and is proposed for the same group of PFOs with the difference that the transportation of timber is performed by a contractor due to high costs and long amortization period of the transportation vehicles (Fig. 3).

Within »Model II«, activities of the PFOs organization end on a roadside landing or after the measurement, quality assessment and loading of timber. The proposed model of PFOs organization is the same as in Model I (cooperatives).

»Model III« is proposed for PFOs who live close to their forest property, whose main source of income is not related to forestry, which determines their valua-

[1] Based on the experiences from case countries, four models of owner organization are proposed in order to more easily present activities and actors within the model, where the proposed models can also be seen as one model with four different business plans.

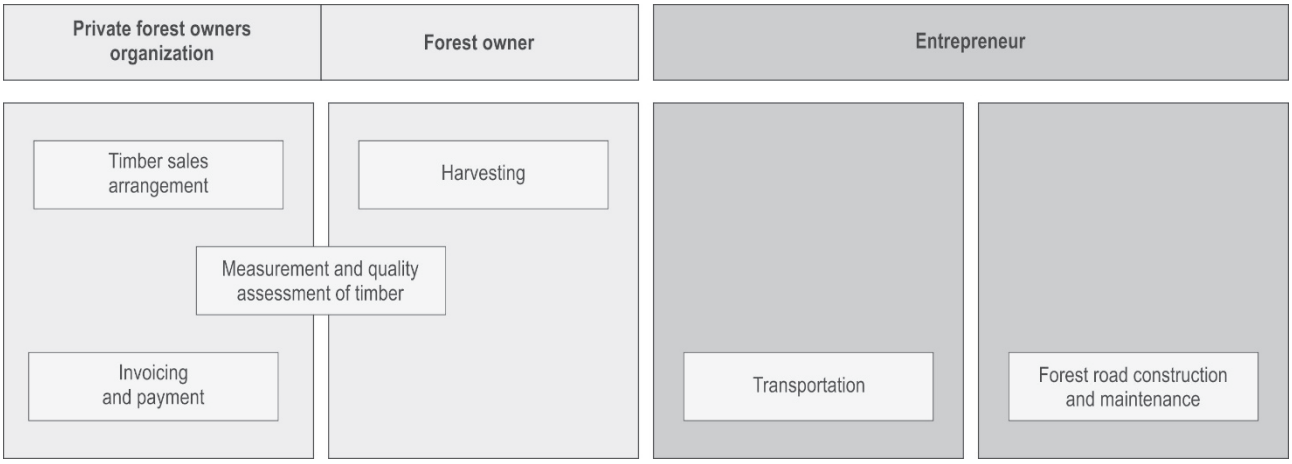

Fig. 3 Activities within »Model II«

tion of production and other forest functions. According to previous research, these owners are referred to as »multi-objective owners« (Kuuluvainen et al. 1996, Karpinnen 1998, Kline et al. 2000, Boon et al. 2004, Mizaraite and Mizaras 2005, Nonić et al. 2013, Pezdevšek Malovrh et al. 2015,) or »multi-functional« owners (Wiersum et al. 2005). Forestry neither affects the total annual household income nor has a small impact on it. They spend little time performing activities in their forests and are, therefore, without experience. A PFOs organization performs timber sales arrangement, measurement and quality assessment of timber, and invoicing and payment to owners. As in the previous models, the arrangement of timber sales ensures a contract-fixed price of wood throughout the year. In addition, the PFOs organization performs tasks such as harvesting and transportation contracts, forest road construction and maintenance contracts, while these works are carried out by a contractor (Fig. 4). In addition, together with PFOs, the association controls all contracted activities.

The »individual accounting model« in Austria and »model II« in Germany have similar characteristics. Within these models, owners do not perform work in their forest and leave these activities to private companies (Rauch and Gronalt 2005). In addition, Lutze (2010) studied the »business manager« model in which employees of the association carry out part of the tasks

Fig. 4 Activities within »Model III«

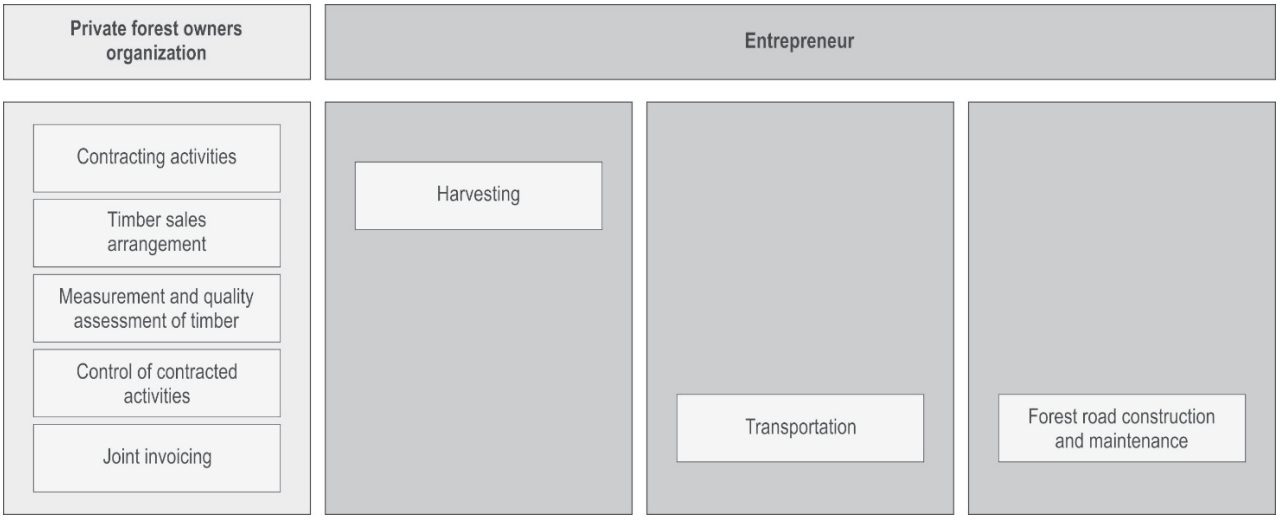

Fig. 5 Activities within »Model IV«

and perform operational management of other activities in the supply chain.

»Model IV« is proposed for absent owners, including owners who live far away and have no contact with their forest property, the ones who live abroad or old owners with no descendants willing to manage their forests. These owners are referred to as »new« or »urban« forest owners (Ziegenspeck et al. 2004, Hogl et al. 2005, Schwarzbauer et al. 2010, Weiss et al. 2012), »resigning owners« (Boon et al. 2004) or »passive« (Kline et al. 2000, Pezdevšek Malovrh 2015) forest owners. The owners have no knowledge and experience in forest management and, therefore, are not interested in the management of their forest property. Moreover, none of the forest management objectives are important to them except ownership and keeping the forest in the family. These owners were created as a result of demographic change, the process of restitution or acquisition of forest ownership through the process of state or social property privatization (Nonić et al. 2013). A PFOs organization acts similarly as in the previous model, except that there is no classification of invoices to the owners individually because of joint forest management. Therefore, both invoices and payments are related to the joint account of the organization (Fig. 5). PFOs are not physically present and do not participate in any of the activities. All activities are arranged and performed exclusively by the organization. Therefore, the PFOs organization arranges harvesting and transportation contracts, forest road construction, maintenance contracts and timber sales, performs the measurement and quality assessment of timber, invoicing and payment to the owners. Measurement and grading is performed while loading on a truck-road. There is no need for an individual measurement for each owner, but only of the total cargo to be shipped.

The management is carried out in the total area, so that every member of the organization receives some income from forests in accordance with the volume and value of timber or their share in the total forest value. In the »dividend model« Rauch and Gronalt (2005) report similar results, according to which joint forest management is carried out and owners receive funding according to their forest property size, i.e. their share in the total managed forest complex.

7. Conclusions

The study explored the potentials of wood mobilization from private forests in Serbia and Slovenia, the characteristics of PFOs, PFOs attitudes related to wood mobilization and the main obstacles.

On the basis of the results, it was established that there are potentials for additional wood mobilization. It was also found that PFOs are mainly representatives of the elderly population, farmers or pensioners with a fragmented forest property. The main obstacles to the increase in the current level of wood mobilization in Serbia are the conservation of biodiversity and the protective forest function, as well as high acquisition costs, also stated as the main obstacle in Slovenia. In addition, about one third of owners in Slovenia considered that there were no obstacles to wood mobilization improvement, and it can be concluded that Slovenian owners seem to be uninterested. This may be a consequence of the 2014 ice break in Slovenia and the

resulting increase in the quantity of wood on the market, which was not substantial in Serbia.

Despite the obstacles related to wood mobilization, this paper also presents potential solutions leading to an increased wood mobilization through better logistics and infrastructure, more intensive use of wood for biomass, intense participation of the state (through loans, subsidies and fiscal policy instruments) and PFOs organization.

On the basis of the obtained results and experience from the case countries (Austria and Germany), four models of PFOs organization are proposed, as the cooperation of PFOs is one of the key instruments to increase the level of wood mobilization from private forests. The models take into account the characteristics and attitudes of PFOs, as well as the activities in the supply chain, including timber sales arrangements, construction and maintenance of forest roads, harvesting, measurement and quality assessment of timber, transportation and invoicing and payment. Moreover, models can also be proposed to different types of PFOs. They can be included in the production of business plans and their choice depends on their forest management goals, professional and technical capacities of the owner, local service providers' offer and local market of timber assortments.

The proposed models for active owners with full-time work in forestry provide some security in forest management and business, as the PFOs organization arranges sales and ensures contract-fixed prices of wood throughout the year. In this way, forest owners have secured timber sales and are encouraged to increase wood mobilization.

For PFOs whose main source of income is farming or another economic activity, the presented model of organization enables professionalization of a whole range of forestry services. PFOs without sufficient motivation, time or knowledge required for forestry works have the possibility to delegate forest management activities to relevant professional workers, which could result in the improvement of the existing level of wood mobilization from small forest properties.

For absent owners, the benefits from PFOs organization would be mainly determined by a certain type of security reflected in the sustainable management of their forest by a professional thereby generating certain revenues. An important strategic measure for these owners would be their inclusion in professional networks and information channels, especially if one bears in mind the growing number of these owners and the tremendous potential of wood mobilization from their forests.

In the coming period, it is first of all necessary for state institutions to stimulate wood mobilization from private forests through various (regulatory, economic and informational) policy measures, taking into account different types of forest owners.

8. References

Banković, S., Medarević, M., Pantić, D., Petrović, N., 2009: The national forest inventory of the Republic of Serbia – the growing stock of the Republic of Serbia. Ministry of agriculture, forestry, and water management – Directorate for Forests, Belgrade, 244 p.

Becker, G., Borchers, J., Mutz, R., 2000: Die Motive der Privatwaldbesitzer in NRW (Eigentumsverbunden und nutzungsorientiert/den meisten ist Wald mehr als Holz. Allgemeine Forst und Jagdzeitung 22: 1180–1183.

Becker, G., 2010: Prospects for the market supply of wood and other forest products from areas with fragmented forest ownership structures. Case study: Saxony/Germany. Albert-Ludwigs-Universität Freiburg, Institute of Forest Utilisation and Work Science, Freiburg in Breisgau, 93 p.

Beurskens, L.W.M., Hekkenberg, M., 2011: Renewable energy projections as published in the national renewable energy action plans of the european member states. European Environment Agency, Energy Research Centre of the Netherlands, 244 p.

Bieling, C., 2004: Non-industrial private-forest owners: Possibilities for increasing adoption of close to nature forest management. European Journal of Forest Research 123(4): 293–303.

Blennow, K., Persson, E., Lindner, M., Faias, S.P., Hanewinkel, M., 2014: Forest owner motivations and attitudes towards supplying biomass for energy in Europe. Biomass and Bioenergy 67: 223–230.

Bolkesjo, T.F., Baardsen, S., 2002: Roundwood supply in Norway: Micro-level analysis of self-employed forest owners. Forest Policy and Economics 4(1): 55–64.

Boon, T.E., Meilby, H., Thorsen, B.J., 2004: An empirically based typology of private forest owners in Denmark: Improving communication between authorities and owners. Scandinavian Journal of Forest Research 19(4): 45–55.

Boon, T.E., Meilby, H., 2007: Describing management attitudes to guide forest policy implementation. Small Scale Forestry 6(1): 79–92.

Dillman, D.A., 2007: Mail and internet surveys – the tailored design method. Wiley, New York, 523 p.

Directive, 2009: Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Official Journal of the European Union L 140/16, Brussels, 47 p.

EC, 2008: Mobilisation and efficient use of wood and wood residues for energy generation. Standing Forestry Commit-

tee ad hoc Working Group II on mobilisation and efficient use of wood and wood residues for energy generation. European Commission Agriculture and Rural Development, 57 p.

EC, 2013: A new EU Forest Strategy: for forests and the forest-based sector, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions COM(2013) 659 final, Brussels, 17 p.

EC, 2014: EU leaders agree 2030 climate and energy goals. http://ec.europa.eu/clima/news/articles/news_2014102401_en.htm. Accessed 8 December 2015.

Glück, P., 2002: Property rights and multipurpose mountain forest management. Forest Policy and Economics 4(2): 125–134.

Glück, P., Avdibegović, M., Čabaravdić, A., Nonić, D., Petrović, N., Posavec, S., Stojanovska, M., 2010: The preconditions for the formation of private forest owners' interest associations in the Western Balkan Region. Forest Policy and Economics 12(4): 250–263.

Glück, P., Avdibegović, M., Čabaravdić, A., Nonić, D., Petrović, N., Posavec, S., Stojanovska, M., 2011: Private forest owners in the western Balkans – ready for the formation of interest associations. European Forest Institute Research Report 25, EFI, Joensuu, 234 p.

HAF, 2008: Schulungsunterlagen zur Mobilisierung der Waldbesitzer, Perspektiven für eine verbesserte Rohholzbereitstellung. Holzabsatzfonds und Pöyry Forest Industry Consulting GmbH, Bonn, 176 p.

Halder, P., Paladinić, E., Stevanov, M., Orlović, S., Hokkanen, T.J., Pelkonen, P., 2014: Energy wood production from private forests – nonindustrial private forest owners' perceptions and attitudes in Croatia and Serbia. Renewable and Sustainable Energy Review 35: 515–526.

Hatemaki, L., Muys, B., Pelkonen, P., Pettenella, D., 2014: Forest bioenergy in Europe: Reassessment needed. Think Forest, European Forest Institute, Joensuu, 7 p.

Hogl, K., Pregernig, M., Weiss, G., 2005: What is new about new forest owners? A typology of private forest ownership in Austria. Small-scale Forest Economics, Management and Policy 4(3): 325–342.

Huber, W., Schwarzbauer, P., Stern, T., 2013: Analyse der Motive österreichischer Kleinwaldeigentümer als Schlüssel für die Holzmobilisierung. Schweizerische Zeitschrift fur Forstwesen 164(9): 278–284.

Ingemarson, F., Lindhagen, A., Eriksson, L., 2006: A typology of small-scale private forest owners in Sweden. Scandinavian Journal of Forest Research 21(3): 249–259.

Karpinnen, H., 1998: Values and objectives of non-industrial private forest owners in Finland. Silvia Fennica 32: 43–59.

Kline, J.D., Alig, R.J., Johnson, R.L., 2000: Fostering the production of non-timber services among forest owners with heterogeneous objectives. Forest Science 46(2): 302–311.

Kuuluvainen, J., Karppinen, H., Ovaskainen, V., 1996: Landowner objectives and non-industrial private timber supply. Forest Science 42(39): 300–309.

Leban, V., 2014: Efficiency analysis of forest owners associations in Slovenia and Germany. MSc. thesis, University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Forest Resources, Ljubljana, 165 p.

Lindstad, B.H., Pistorius, T., Ferrantic, F., Dominguez, G., Gorriz-Mifsude, E., Kurttila, M., Leban, V., Navarro, P., Peters, D.M., Pezdevšek Malovrh, S., Prokofieva, I., Schuck, A., Solberg, B., Viiri, H., Zadnik Stirn, L., Krč, J., 2015: Forest-based bioenergy policies in five European countries: An explorative study of interactions with national and EU policies. Biomass and Bioenergy 80: 102–113.

Loenstedt, L., 1997: Non-industrial private forest owner's decision process: A qualitative study about goals, time perspective, opportunities and alternatives. Scandinavian Journal of Forest Research 12(3): 302–310.

Lutze, M., 2010: Forest owner associations as intermediaries between forest owners and the wood based industry. In: Proceedings of IUFRO Conference 3.08 Small Scale Forestry, 6.06.02 Extension, 6.06.01 Technology Transfer, Bled, Slovenia, 389–400.

Mantau, U., Saal, U., Prins, K., Steierer, F., Lindner, M., Verkerk, H., Eggers, J., Leek, N., Oldenburger, J., Asikainen, A., Anttila, P. 2010: Real potential for changes in growth and use of EU forests, Final report, EUwood, Hamburg, 160 p.

MCPFE, DG AGRI, UNECE/FAO, 2010: Good practice guidance on the sustainable mobilization of wood in Europe. Ministerial Conference on the Protection of Forests in Europe (MCPFE), FOREST EUROPE Liaison Unit Oslo, Norway; European Commission (EC), DG Agriculture and Rural Development, Brussels, Belgium; United Nations Economic Commission for Europe/Food and Agriculture Organization of the United Nations (UNECE/FAO), Timber Section, Geneva, Switzerland. 76 p.

Mendes, A., Štefanek, B., Feliciano, D., Mizaraite, D., Nonić, D., Kitchoukov, E., Nybakk, E., Duduman, G., Weiss, G., Nichiforel, L., Stoyanova, M., Mäkinen, P., Alves, R., Milijić, V., Sarvašová, Z., 2011: Institutional innovation in European private forestry: The emergence of forest owners' organizations. In: Innovation in Forestry: Territorial and Value Chain Relationships (Weiss, G., Pettenella, D., Ollongvist, P., Slee, B., eds.), CAB International, 68–86.

Mizaraite, D., Mizaras, S., 2005: The formation of small-scale forestry in countries with economies in transition: Observations from Lithuania. Small-scale Forest Economics, Management and Policy 4(4): 437–450.

Mori, J., Kotnik, I., Lesnik, T., 2006: Možnost sodelovanja Zavoda za gozdove Slovenije, Kmetijsko gozdarske zbornice Slovenije in Zveze lastnikov gozdov Slovenije za razvoj povezovanja lastnikov gozdov (Possible roles of the Slovenian Forest Service, the Chamber of Agriculture and Forestry of Slovenia and the Forest owners association of Slovenia in enhancing forest owners' associations and cooperation). Gozdarski vestnik 64(9): 476–502.

Nichiforel, L., Schanz, H., 2009: Property rights distribution and entrepreneurial rent-seeking in Romanian forestry: A perspective of private forest owners. European Journal of Forest Research 130(3): 369–381.

Ní Dhubháin, Á., Cobanova, R., Karppinen, H., Mizaraite, D., Ritter, E., Slee B., Wall, S., 2007: The values and objectives of private forest owners and their influence on forestry behaviour: The implications for entrepreneurship. Small-scale Forestry 6(4): 347–357.

Nonić, D., Bliss, J.C., Milijić, V., Petrović, N., Avdibegović, M., Mataruga, M., 2011: Challenges of organizing private forest owners in Serbia. Small-scale forestry 10(4): 435–455.

Nonić, D., Glavonjić, P., 2012: Organizing private forest owners in order to mobilize wood resources: Analysis of association models in Austria, Bavaria and Serbia (Organizovanje privatnih šumovlasnika u cilju mobilizacije drvnih resursa: analiza modela udruživanja u Austriji, Bavarskoj i Srbiji). Šumarstvo 3–4: 131–151.

Nonić, D., Milijić, V., Radosavljević, A., 2010: Development of private forestry sector in Serbia and its role in NFS/NFP processes. In: Proceedings of the 11th International Symposium on Legal aspects of European Forest Sustainable development, Zvolen, Slovakia, 90–101.

Nonić, D., Ranković, N., Glavonjić, P., Nedeljković, J., 2013: Typology of private forest owners in Serbia (Tipologija vlasnika privatnih šuma u Srbiji). Šumarstvo 3–4: 133–156.

Nonić, D., Petrović, N., Medarević, M., Glavonjić, P., Nedeljković, J., Stevanov, M., Orlović, S., Rakonjac, Lj., Đorđević, I., Poduška, Z., Nevenić, R., 2015: Forest Land Ownership Change in Serbia. COST Action FP1201 – FACESMAP Country Report, European Forest Institute Central- East and South-East European Regional Office, Vienna, 64 p.

NREAP, 2013: National renewable energy action plan of the Republic of Serbia, Ministry of Energy, Development and Environmental Protection, Belgrade, 159 p.

PE »Srbijašume«, 2013: Cross section of private forests based on data from the National Inventory and Temporary annual private forest management plans for 2013. Project: Organization of private forest owners in the Western Balkan countries, with special emphasis on Serbia. Internal documentation of PE »Srbijašume«, Belgrade.

Pezdevšek Malovrh, Š., Hodges, D.G., Marić, B., Avdibegović, M., 2011: Private forest owners expectations of interest associations: Comparative analysis between Slovenia and Bosnia-Herzegovina. Šumarski list 135(9–10): 1–10.

Pezdevšek Malovrh, Š., 2010: Influence of institutions and forms of cooperation on private forest management. PhD thesis, University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Forest Resources, Ljubljana.

Pezdevšek Malovrh, Š., Nonić, D., Glavonjić, P., Nedeljković, J., Avdibegović, M., Krč, J., 2015: Private forest owner typologies in Slovenia and Serbia: Targeting private forest owner groups for policy implementation. Small-scale Forestry 14(4): 423–440.

Pezdevšek Malovrh, Š., Zadnik Stirn, L., Krč, J. 2010: Influence of property and ownership conditions on willingness to cooperate. Šumarski list 134(3–4): 139–149.

Posavec, S., Avdibegović, M., Bećirović, Dž., Petrović, N., Stojanovska, M., Marčeta, D., Pezdevšek Malovrh, Š., 2015: Private forest owners' willingness to supply woody biomass in selected South-Eastern European countries. Biomass and Bioenergy 81: 144–153.

Rauch, P., Gronalt, M., 2005: Evaluating organisational designs in the forestry wood supply chain to support forest owners' cooperations. Small-scale Forest Economics, Management and Policy 4(1): 53–68.

Restitution, 2014: Overview of the number of requests received in the Directorate for restitution. Agency for Restitution, Republic of Serbia. http://www.restitucija.gov.rs/direkcija-za-restituciju.php. Accessed 28 August 2015.

Report of Public Forestry Service of Slovenia about forests for the year 2014, 2015: Zavod za gozdove Slovenije. http://www.zgs.si/slo/zavod/informacije_javnega_znacaja/letna_porocila/index.html. Accessed 08 February 2015.

Schaffner, S., 2008: Waldbesitzertypisierungen und ihre Relevanz für die Holzmobilisierung – Classifications of forest owners and their relevance for timber mobilization. Schweizerische Zeitschrift fur Forstwesen 159(12): 435–440.

Schwarzbauer, P., Thoroe, M., Boglio, D., Becker, G., Stern, T., Giry, C., 2010: Prospects for the market supply of wood and other forest products from areas with fragmented forest-ownership structures. Final study report, University of Natural Resources and Applied LifeSciences, Vienna (BOKU), Confederation of European Forest Owners (CEPF), Centre TecnològicForestal De Catalunya (CTFC), Albert-Ludwigs-Universität Freiburg (ALUFR), KompetenzzentrumHolz GmbH (Wood K plus), National Professional Center for Forest Ownership – Institute for ForestryDevelopment (CNPPF-IDF), 217 p.

Schwarzbauer, P., Stern T., 2010: Energy vs. material: Economic impacts of a »wood-for-energy scenario« on the forest-based sector in Austria – A simulation approach. Forest Policy and Economics 12(1): 31–38.

SMARS, 2007: Relational databases from the Landowner register. Ljubljana.

Suda, M., Warkotsch, W., 2002: Mit den forstwirtschaftlichen Zusammenschlüssen ins 21. Jahrhundert. AFZ/Der Wald 1: 6–9.

Stern, T., Weiss, G., Bostrom, C., Huber, W., Koch, S., Schwarzbauer, P., 2013: Identifying measures for wood mobilisation from fragmented forest ownerships based on case studies from eight European Regions. Jahrbuch der Österreichischen Gesellschaft für Agrarökonomie 22(1): 19–28.

Weiss, G., Gudurić, I., Wolfslehner, B., 2012: Review of forest owners' organizations in selected Eastern European countries. Food and Agriculture Organization of the United Nations (FAO), Rome, 57 p.

Wiersum, K., Elands, B., Hoogstra, M., 2005: Small scale forest ownership across Europe: characteristics and future potential. Small-scale Forest Economics, Management and Policy 4(1): 1–19.

Ziegenspeck, S., Härdter, U., Schraml, U., 2004: Lifestyles of private forest owners as an indication of social change. Forest Policy and Economics 6(5): 447–458.

Živojinović, I., Weiss, G., Lidestav, G., Feliciano, D., Hujala, T., Dobšinská, Z., Lawrence, A., Nybakk, E., Quiroga, S., Schraml, U., 2015: Forest land ownership change in Europe, COST Action FP1201 FACESMAP Country Reports-Joint Volume, EFICEEC-EFISEE Research Report, University of Natural Resources and Life Sciences (BOKU), Vienna, 693 p.

Authors' addresses:

Špela Pezdevšek Malovrh, PhD.*
e-mail: spela.pezdevsek.malovrh@bf.uni-lj.si
University of Ljubljana
Biotechnical Faculty
Večna pot 83
1000 Ljubljana
SLOVENIA

Peter Kumer, MSc.
e-mail: peter.kumer@zrc-sazu.si
Research Centre of the Slovenian
Academy of Sciences and Arts
Anton Melik Geographical Institute
Gosposka ulica 13
1000 Ljubljana
SLOVENIA

Predrag Glavonjić, PhD.
e-mail: predragglavonjic@yahoo.com
Prof. Dragan Nonić, PhD.
e-mail: dragan.nonic@sfb.bg.ac.rs
Jelena Nedeljković, PhD.
e-mail: jelena.nedeljkovic@sfb.bg.ac.rs
University of Belgrade
Faculty of Forestry
Kneza Višeslava 1
11000 Belgrade
SERBIA

Bratislav Kisin, MSc.
e-mail: bratislav.kisin@srbijasume.rs
State Enterprise for Forest management »Srbijašume«
M. Pupin Boulevard 113
11070 Belgrade
SERBIA

Mersudin Avdibegović
e-mail:mavdibegovic@gmail.com
University of Sarajevo
Faculty of Forestry
Zagrebačka 20
71000 Sarajevo
BOSNIA AND HERZEGOVINA

* Corresponding author

Received: February 02, 2016
Accepted: June 30, 2016