

THE STRUCTURE AND POTENTIAL OF SMALL SCALE FORESTS IN THE NORTH-WEST OF CROATIA

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SUMMARY

In the Republic of Croatia almost one quarter (23%) of all forests and forest lands belong to private forest owners (593,027 ha). This research was prompted by the lack of empirical data concerning growing stock, areas, annual increment, annual felling and forest roads of private forests in the northwest of Croatia. Sustainable development of rural environments is one of the primary European Union goals. The area has good possibilities for rural development based on the forest industry on one hand and wood utilization with support of private forest owners' associations on the other. Forest management possibilities and other parameters of these forests indicate the insufficient use of these forests and of their immense potential. The main reason for neglecting this economic potential lies in the historical development and disregard of this issue by professional foresters in the past. According to recent estimates, there are 600,000 forest owners who manage their forest properties of 0.51 ha and leave the unused potential to forestry economic management. The research has shown that the average stand volume of 199 m³/ha is higher than the previous estimates of 45 m³/ha, and so the annual increment is 6.19 m³/ha (compared to the previous 4.7 m³/ha). The paper deals with the issues of development and results of the Forest Extension Service in this region, the establishment of private forest owners' associations, small scale forest characteristics compared with the EU member states, regional project research results, as well as the supporting and impeding factors.

Key words: small scale forests, management, potential, private owners, northwest Croatia

1 INTRODUCTION

The countries of south-eastern Europe have moved from a centrally planned economy to a market economy. In the past decade, the majority of private forests were state owned. Now, the situation has changed and private forests play an important role in the forest policy. The percentage of private forests in the region is as follows: Serbia 51%, Croatia 23%, Macedonia 10%, Bosnia 20%, and Albania 1%. Private forest management is an increasingly serious problem. In most countries, forests are either managed by state companies or are not managed at all. Private forest owners' associations are rarely established, and there is no operational Forest Extension Service. Most countries in the region share one common feature: their forests are a significant resource for the development of a market economy and private ownership. Although the share of private forests varies between 1% (Albania) and 51% (Serbia) and is going to increase when the restitution and privatization process is concluded, private forest owners are virtually unrepresented in the national forest policy due to a lack of organization (Glueck et al., 2010).

Primarily because of their specific nature, the issue of private forests should be viewed from several aspects, including management forms, legal framework, sociological aspects and organisational structure (Posavec, Vuletić, 2004). Private forest owners and a rising number of forest associations have for the past several years evolved into one of the most dynamic forestry fields. Legislative reforms and the activity of a specialized public enterprise, Forestry Extension Service, have brought about considerable changes and a revival of the private forestry sector. Regrettably, following the decision by the Croatian Government (Forest Law amendments, Official Gazette 124/2010), this service was abolished and was merged with Croatian Forests Ltd., a state company responsible for managing forests and forestland. This decision could affect further development and care of private forests in the Republic of Croatia.

The beginnings of the establishment of private forest owners' associations go back to 2004 when the first associations were founded in north-western and western Croatia. During 2008 the "Croatian Union of Private

Forest Owners' Associations'' was founded as an umbrella union comprising all the associations in the Republic of Croatia with its headquarters in Zagreb and with the goal of representing the interest of all forest owners. The Union currently represents 34 associations from the whole country. In accordance with the Associations Act (Official Gazette No. 88/2001) the association is defined as any form of a free and voluntary union of a number of natural or legal persons, for the purpose of protection of their interests and benefits, without the intention of generating profit. An association is a non-profit organization which spends its income strictly for the purpose of advancing the activities of the association.

Privately owned forests are not equally distributed; hence, 13% of private forests are in the lowland area, 82% are in the hilly-mountainous area of Croatia, and 5% are in the high- mountainous and pre-alpine area (Anon, 2006). Private forests are divided approximately into 1.5 million cadastral plots, which are owned by more than 600,000 forest owners. Accordingly, one forest owner has in his possession 2 cadastral plots sized 0.76 ha on average. The results of the First National Forest Inventory in the Republic of Croatia (Čavlović, 2010) have shown that the total area of forests and forestland is 2,580,826 ha while forested areas account for 2,377,686 ha, of which 77% are state owned and 23% are privately owned. According to the same source, the total growing stock is 552,146,000 m³, of which 84% is state owned and 16% is privately owned. This indicates the size and quality of the majority of private forests. The average growing stock in state forests is 255.84 m³/ha and in private forests it is 155.84 m³/ha. The annual cut in state forests is 7,325,000 m³ whereas in private forests it is 1,087,000 m³. As much as 84% of forests are dominated by deciduous tree species, while 16% of forestland is covered with conifers (Posavec, S., Čavlović, J., Šporčić 2005).

In Europe, Sweden has the highest growing stock (2.5 billion m³), followed by Germany (2.2 billion m³) and France and Finland (both about 1.7 billion m³). The mean volume in 1995 was approximately 140 m³/ha for all of European countries, and the net annual increment 711 million m³ (Hyttinen, P. 2001).

With 23% of privately owned forests, Croatia ranks among European countries with a very high share of state-owned forests and forestland. In comparison with Austria, Germany or Switzerland, for example, this definitely has specific significance which should be taken into account, particularly when forming forestry policy. Care for small-scale forests is an important and constituent part of modern forest-management policy, which is already in force in the majority of the European Union countries, and is implemented through various advisory institutions (Extension Services) and support.

2 RESEARCH METHODS

There has been very little sociological research into forest owners in Croatia to date. Therefore, research conducted in the area of the Zagreb County and the City of Zagreb (Čavlović, 2003) and (Posavec, Vuletić et al., 2010) will have a significant effect on the survey. The basic sociological characteristics of forest owners were studied using a sample of 216 respondents, which provides an essential framework for the description of a typical forest owner in north-western Croatia. In the opinion of the authors, this description should not be extended to other forest owners. According to the research, a typical forest owner usually comes from the ranks of the older rural population (over 60 years of age), as a rule works on their own agricultural property or is retired. The average forest owner has a lower level of education, a modest personal income, and is not interested in selling his forest. In general, he expresses little interest in his forest and is therefore not keen on enlarging his forest property. He does not use the potentials of his forest, does not want to invest work or money in his forest, and is sceptical with regard to forest owners' associations. In addition, many of them do not manage their forests at all, although most live relatively close to their property (at a distance of up to 5 km). Younger forest owners have so far not shown much interest in working or investing in their forest property, so officially not a single forest owner in the Republic of Croatia makes a living exclusively from his forest. This is also a reflection of the size of the property, which does not guarantee a steady and sufficient income.

This research focuses on private forests from the area of north-western Croatia. Forest management possibilities of private forests were investigated in three north-western counties: the Koprivnica-Križevci County, the Virovitica-Podravina County and the Bjelovar-Bilogora County. The study area is characterized by a large number of small plots, which constitute bigger or smaller forest complexes surrounded by arable land and meadows. Research items consist of small forest properties which make up forest complexes totalling 2.95 ha in size, and which consist of a larger number of cadastral plots. The terrain is intersected by water courses. The inclinations are mostly mild and the terrain is hilly, while in the southern part of the study area it is flat. The

lowest point of the study area is 80 m above sea level, and the highest point is 646 m above sea level. The forest stands are in the area of the Euro-Siberian – North-American region. The largest part of the study area is covered by forests of pedunculate oak and common hornbeam (ass. *Carpino betuli* – *Quercetum roboris*) and forests of sessile oak and common hornbeam (ass. *Festuco drymeiae* – *Carpinetum betuli*). In the sessile oak- common hornbeam belt there are a large number of stands dominated by common beech. These stands grow on loess and loess-like parent material, which allows for deep rooting.

Data were collected on the basis of the constructed and approved management programmes for privately owned forests totalling 10,868 ha. The following parameters were collected and processed: growing stock, increment, annual cut, surface area, number of forest owners, average plot and property size, health status, phytocenological features, accessibility of forests and biological regeneration. The obtained data were processed with Microsoft Excel and Statistica for Windows platforms. Descriptive statistics (arithmetic means, minimum, maximum) were made for all the analyzed variables (height increment, diameter increment). An HP iPAQ 214 Enterprise Handheld GPS measuring instrument was used to stake and identify the terrain.

Research objectives were set up with the goal of determining the following:

- 1) Possible management options for private forests in the northwest of Croatia (areas, growing stock, increment, annual cut)
- 2) Average plot sizes, number of forest owners and possibilities of enlarging small forest properties.

The obtained results will shed more light on the problem of private forest management and will indicate the basic characteristics of private forest owner development in Croatia on a smaller sample.

3 RESULTS

The investigated stands are characterized by heterogeneity in terms of age, quality, cover, technical values and other parameters, and range from a small number of well preserved stands of common beech, sessile oak and pedunculate oak with hornbeam to completely devastated forests accompanied by a broad variety of transitional forms.

Only 34,528 ha (6%) of the planned 591,633 ha of privately owned forests in Croatia are covered by management plans. The total value of operations is estimated at 16,215,038.77 €, or 27.40 €/ha. Forest management possibilities for private forests in north-western Croatia show that these forests have good silviculture and economic potentials. The average growing stock at 199 m³/ha is 45m³/ha greater than that in the area management plan, which amounts to 150 m³/ha on average for even-aged and selection forests. The annual current increment in these forests amounts to 67,273 m³, or 6.19 m³/ha on average, while the increment percentage amounts to 3.19%. The overall annual cut to be realized in the next 10 years is 321,629 m³, which represents an exceptional economic potential for this area.

With only 5.77 km/1,000 ha, the accessibility of forests in the study area is poor with regard to the redeployment of small forest properties. It is lower than the optimal accessibility for predominant EGTs (Ecological Management Types) (14.1-15.6 km/1000 ha), and thus represents an impeding factor for the accomplishment of the annual cut.

The average forest property consists of two cadastral plots averaging 0.25 ha in size, which indicates distinct fragmentation of a forest property (0.51 ha). This poses serious problems to the future management of these forests. The fact that there are no records of owners possessing forests over 100 ha is also a cause for concern. Future legal proposals will have to curb fragmentation of existing properties and stimulate their enlargement.

The following table shows the structure of privately-owned forests in the research polygon in relation to the forest property size. The majority of forest owners (75%) possess the smallest forests (less than one hectare).

Table 1: Survey of privately owned forests with regard to forest size

Forest property size	Structure of private owned forests with regard to forest size			
	Area	Number of forest owners	Forest property share	Forest owners share
	ha	persons	%	%
<1 ha	9842.07	38292	74.70	94.4
1 -5 ha	822.53	10539	23.13	5.5
5 – 10 ha	63.48	28	0.88	0.06
10 – 30 ha	50.02	6	0.46	0.01
30 – 100	89.90	3	0,83	0
>100 ha	0	0	0	0
Σ	10 868	48 868	100.00	100.00

Clearly, forest estates should be enlarged if the remaining forest complexes are to be preserved. This will additionally stimulate forest owners to apply sustainable management. If fragmentation of the existing property is not prevented, which some EU countries have already done, this potential might go unused due to the impossibility of managing and harvesting the timber volume. In turn, this might result in an even greater lack of interest by forest owners in their forests. The results of the 1st international public bid for wood assortments show that there is a market, but the economic crisis has slowed down this segment of forest management development.

Forest owners generally belong to an older population, live predominantly in rural, and only occasionally in urban environments; their properties of 0.51 ha on average are fragmented; felling usually follows the owner's needs or wishes, and not the rules of the profession; increments are relatively good, indicating that the forest soil is preserved and of good quality and that it has good potential (Šašek, 2009). According to the research conducted in Austria by Hogl, Pregernig and Weiss, about 90% of all proprietors hold less than 200 ha of forestland and almost 40% less than 3 ha (Hogl et al. 2005).

Both positive and negative factors that influence the establishment of private forest owners' associations were analyzed in order to conform to a research project by the European Forestry Institute EFI PRIFORT (Research into the organization of private forest owners' associations in the Western Balkan region)

Table 2: Impeding and supporting factors for the formation of private forest owners' interest associations (Glück, 2008)

Impeding factors	Supporting factors
<ul style="list-style-type: none"> - large number of members - small-scale forest properties - fragmented forest properties - low-value forest properties - historic development - cadastral problems - powerful public forest administration and state forest enterprise - lack of political will - restrictive legal regulations for private forest owners 	<ul style="list-style-type: none"> - obligatory membership - selective incentives - moral persuasion - education - training - specific forest program - reformulation of forest law - solution of cadastral problems

Research undertaken in the polygon of north-western Croatia has shown that private forest owners are prepared to associate for the purpose of managing their forests, as well as participate in education and training despite small and fragmented forest areas.

The situation is somewhat better in the EU, and particularly in Scandinavian countries, which have succeeded in the application of sustainable management in private forests. The size of forest properties in the EU ranges from 2 to 25 ha for smaller forest properties and from 25 to 100 ha for medium sized forest properties, whereas large forest owners with over 100 ha represent only 10% of the total area. In some European countries private forest owners are well organized and receive state subsidies. There are services in Europe similar to the Croatian Forest Extension Service, which advise forest owners on sustainable management in private forests. It should be

emphasized that some countries (e.g. Scandinavian countries) do not allow fragmentation of property, the purpose being to preserve coherent forest complexes. Management is easier because all forest co-owners are associated in a so-called family forestry form. The good prospects of this model are responsible for it becoming increasingly widespread in other countries. CEPF (Confederation of Private Forest Owners) also advocates so-called family forestry, which also involves younger generations. By learning about non-market forest functions from an early age, they raise their awareness about the importance of forests.

4 DISCUSSION

If conclusions about Croatian forestry were made only on the basis of the condition of private forests, then the image of Croatian forestry would be slightly different, particularly in relation to state forests. Until recently, it was thought that the average growing stock per hectare was a modest 80 m³/ha. This provided sufficient information about the condition of these forests in terms of their economic importance, and even more in terms of other beneficial (non-timber) forest functions, which are divided into social and ecological or protective functions (Prpić, 1992). A big problem of private forests in Croatia is that in the past several years, management programmes have been made for only small part of the private forests (6%), while the rest has remained unmanaged (Šašek, 2005). It has been a little more than five years since the first meeting of forest owners in Delnice in 2005 which was the basis for setting up the private forest sector reform, and where key problems were highlighted (fragmentation of property, social status of forest owners, disintegration of rural areas, mistrust of forest owners, incompetent operations, illegal felling, no control or sanctioning and disobedience of legal rules, etc.). One of the most important turning points for private forests took place when communication between forest owners and the profession was established, the associations were organized and concrete activities in the sense of revitalizing and regenerating small forest properties were launched. A great role in this process was played by the Extension Service, whose field activities encouraged private forest owners to actively participate in the management of their property.

The most common reasons for the establishment of forest owners' associations include the exchange of information on new forest policy measures concerning private forests, pooling resources for the purpose of joint planning and construction of forest infrastructure (for which the means are allocated in the Non-Wood Forest Functions Fund), and common interest in the prevention of illegal activities in forests (guarding forests, illegal use, maintenance of the existing forest roads, and similar). In this respect, the size of a forest property does not play any role. Forest owners unite mostly for the purpose of advancing the condition and preservation of their own forests, which the majority of them still regard as a special resource that needs to be preserved, regardless of its size. The main reason for forest owners' associations - joint representation in the market - has not yet been achieved. It is expected, however, that the enlargement of forest estates and a higher share of larger private forest properties following restitution process will stimulate interest grouping and will achieve a more successful joint appearance at the market. The private forest owners in the region build large "latent" groups in the sense of Mancur Olson's logic of collective action (Olson 1965). The high number of potential members can only be achieved if positive (individual economic advantages) or negative (compulsory membership) selective incentives are supplied to the potential members (Glueck et al., 2010).

The number of silvicultural treatments aimed at regenerating devastated private forest properties and achieving a positive turnaround has been increased. It has provided an example to others how and in what manner private forest revitalisation should be accomplished (Oršanić, 2003). Historically, soil use for agriculture has always had priority in these regions. The most valuable soils, i.e. deep soils with higher natural fertility, have been used for food production, while soils unsuitable for food production have been left to forests. This has led to the formation of a significant fund of so-called marginal soils, whose use in agriculture is unprofitable. If they no longer perform their function, they should be converted to their natural cover, which is a forest. Croatian forestry has been working on forestation of degraded forest sites for more than 150-years, especially in the Mediterranean region.

The average growing stock in the amount of 199 m³/ha, with an annual increment of 6.19 m³/ha (increment percentage of 3.19%) was recorded in the study area. The share of management classes per surface unit is as follows: black locust 24%, beech 22%, hornbeam 20%, black alder 10%, sessile oak 9%, linden 4%, and pedunculate oak 3%. Average accessibility is 5.77 km/1000 ha (min. 14.10, max. 15.6 km/1000 ha). Among

objective impeding factors for sustainable management of private forests are small size forest properties and fragmentation.

Research results show an immense but insufficiently explored potential of private forests. A discrepancy between the data of cadastre culture with the concrete condition in the field, as well as the lack of co-ordination between cadastral books and land registers, result in the impossibility of using resources from the Non-Wood Forest Functions Fund, solving property-rights relations and receiving state support for ownership issues. For forest owners, these procedures are exceptionally costly and de-stimulating in practice. We should definitely try to apply models used in the EU, in particular those relating to enlarging the property, preventing property fragmentation and stimulating family forestry. In that case, the size of the property would not play a decisive role in management as there would be no fragmentation.

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