INFLUENCE OF OWNERSHIP AND PROPERTY STRUCTURE ON WILLINGNESS OF PRIVATE FOREST OWNERS TO COOPERATE

UTJECAJ VLASNIČKE I POSJEDOVNE STRUKTURE NA SPREMNOST ŠUMOPOSJEDNIKA NA POVEZIVANJE

Špela PEZDEVŠEK MALOVRH[1], Lidija ZADNIK STIRN[1], Janez KRČ[1]

SUMMARY: Private forest management is, particularly in Slovenia, far from optimal. The reason lies in the diversity of ownership and property structure. In addition, Slovenian private forest owners are not adequately organized and associated to manage their forests. The willingness of private forest owners to cooperate was evaluated using the questionnaires. The sample (n=700) included equal shares of associated and non-associated owners. Forty-six percent of questionnaires were returned. The results of the survey analysis showed that 39.1 % of private forest owners were members of forestry associations (associated), 19.9 % owners showed willingness to cooperate i.e. to join a forestry association and 41.0 % of the sampled forest owners were unwilling to cooperate. Based on the data obtained through the survey we have studied the relationship between ownership and property conditions in regard to the willingness of forest owners to cooperate. The Chi-square test showed the statistical significance of the relationship between the size of forest property and the willingness of owners to cooperate. Further, the results of multivariate logistic regression showed that it is necessary to search for private forest owners who are willing to cooperate in the group of forest owners who are younger than 50 years, who own more than 10 ha of forest land and live in common household with the co-owners.

K e y w o r d s : private forests, forest owners' cooperation, ownership and property conditions, statistical models, bivariate and multivariate analysis, logistic regression

INTRODUCTION – Uvod

The study of private forest management has special importance due to the prevailing share of privately-owned forests in Europe. In Slovenia, for example, 73 % of forests are privately owned. Private forest management is, especially in Slovenia, far from optimal, which is a result of a diverse ownership and property structure. That diversity is displayed in a large number of owners (around 314.000) and co-owners (around 489.000), small forest property (on average < 3 ha) and fragmentation (3 plots on average) (The Slovenian Forest Service, 2005). Private forest management is further hindered by constant processes in the society which are related to an increasing number of owners due to partible inheritance and the diminishing sizes of forest property as well as a fall in the percentage of rural population, which indirectly influences the socio-economic structure of the population (P e z - d e v š e k M a l o v r h , 2006). Consequently, economical dependence of people on forests is decreasing, which is reflected in insufficient exploitation of natural resources as only two thirds of the potential timber removal in Slovenian private forests is implemented and less than half of silvicultural work according to forest management plans is carried out. (The Slovenian Forest Service Re-

[1] Asist. Špela Pezdevšek Malovrh, Biotehniška fakulteta, Oddelek za gozdarstvo, Večna pot 83, 1000 Ljubljana, spela.pezdevsek.malovrh@bf.uni-lj.si
[1] Prof. dr. Lidija Zadnik-Stirn, Biotehniška fakulteta, Oddelek za gozdarstvo, Večna pot 83, 1000 Ljubljana, lidija.zadnik@bf.uni-lj.si
[1] Doc.dr. Janez Krč, Biotehniška fakulteta, Oddelek za gozdarstvo, Večna pot 83, 1000 Ljubljana, janez.krc@bf.uni-lj.si

port, 2007, 2008). The effects of inefficient private forest management are reflected in the decreasing economic value of forests, low utilization of site potentials, lower exploitation of financial funds for forest investments, low value and marketing of timber and unutilised forest functions. In addition, forest owners tend to be passive and unwilling to cooperate (M o r i et. al., 2006).

Providing the owners with a fresh incentive for forest management is therefore one of the key issues of private forest resources mobilization. The solution lies in the activities related to encouraging cooperation among forest owners, which has become extremely important due to increased pressures of competition and a changing position in global markets, brought about by globalization and rapid economic progress and a dynamic market.

Several millions of forest owners are members of different forest associations. Their cooperation is not limited to an exchange of information and education but also results in better vertical cooperation between the owners and the government, commercial companies/-corporations, the market, etc. (K i t t r e d g e, 2005).

The experiences of the countries with a tradition of forest owners' cooperation (Sweden, Norway, Finland, Austria and Germany) reveal a story of success. Forestry cooperation among owners in private forests began in Scandinavia through forest owners' societies as early as 1910. Their aim was to provide certain services to their members, ranging from planning to performing silvicultural and harvesting works and logging (S e n n b l a t, 1989). Today the main goal of private forest owners' organizations is lobbying for the owners, primarily in the fields of forest policy, timber marketing and taxes as well as the transfer of ownership (V a l k o n e n, 2001, T o i v o n e n et al., 2005, W i l d - E c k et al., 2006).

Particularly encouraging for private forest management worldwide is the increasing number of associations for forest owners as a means of cooperation between forestry experts and forest owners since these associations provide technical and professional assistance, spread information and educate the owners in different fields of forest management. In addition, they spread the information about the development of forests and the rural areas among the laymen and increase the awareness of the importance of forests (L i n d e s t a v, et al., 2003, S t o r d a l et al., 2005, F e l i c i a n o, 2006, M e n d e s, 2006, P e z d e v š e k M a l o v r h, 2005, 2006, A v d i b e g o v i ć, et al. 2010).

The supposition is that the willingness of private forest owners to cooperate primarily depends on the personal interests, which are linked with the owner's needs and socio-economic status on the one hand, and are limited with the state of the forest and its size on the other. In the starting phase of joining forest owners and with some examples of good practice already present, it is crucial to find out which characteristics of forest owners and which conditions influence the owners' willingness to cooperate. Considering the diversity that characterizes Slovenian privately-owned forests we decided to focus our research on analysing how the age of forest owners and the ownership and property structure affect their willingness to cooperate; these factors had proved crucial in preliminary analyses.

The aim of the paper is to find out, using of surveys analyzed by logistic regression, how certain characteristics linked with forest owners affect their willingness to cooperate and which group of private forest owners shows the highest willingness to join associations.

## Ownership and property structure in Slovenian forests
Vlasnička i posjedovna struktura šuma u Sloveniji

The property structure of Slovenian privately-owned forests was analysed on the basis of forest management plan 2001–2010. The analysis revealed that 58.4 % of owners have a forest property smaller than 1 ha and that this property accounts for 16.2 % of the forests in Slovenia. In terms of size such property is comparable to the property bigger than 30 ha, which is nonetheless owned by merely 0.6 % of all owners. Hence, the two categories of forest property, privately-owned forests smaller than 1 ha and those bigger than 30 ha, account for less than a third of all privately-owned forests in Slovenia. It can therefore be claimed that in Slovenia the most important categories in terms of size of property are those between 1 and 30 ha as they represent over a quarter of Slovenian forests size-wise as well as ownership-wise. Slightly over 6 % of private owners own between 5 and 9.99 ha which covers just below one fifth of private fo-

rests in Slovenia. The last quarter of private forests is the size range from 10 to 29.99 ha, owned by 3.7 % of forest owners.

Another important factor in property structure is the number of spatially separated plots. Namely, a certain forest property may not always be in one piece. Consequently, in forest management it is not only the size of the property that is important but also the fragmentation of property that is of major concern (M e d v e d, 2000). Based on prior research (W i n k l e r, G a š p e r š i č, 1987, M e d v e d, 1991, M e d v e d, 2000, P e z d e v š e k M a l o v r h, 2006) it has been established that the average number of spatially separated plots is increasing and according to the latest data, owners, on average, possess property on three different locations.

The situation in ownership structure was analysed on the basis of the data provided by the land and pro-
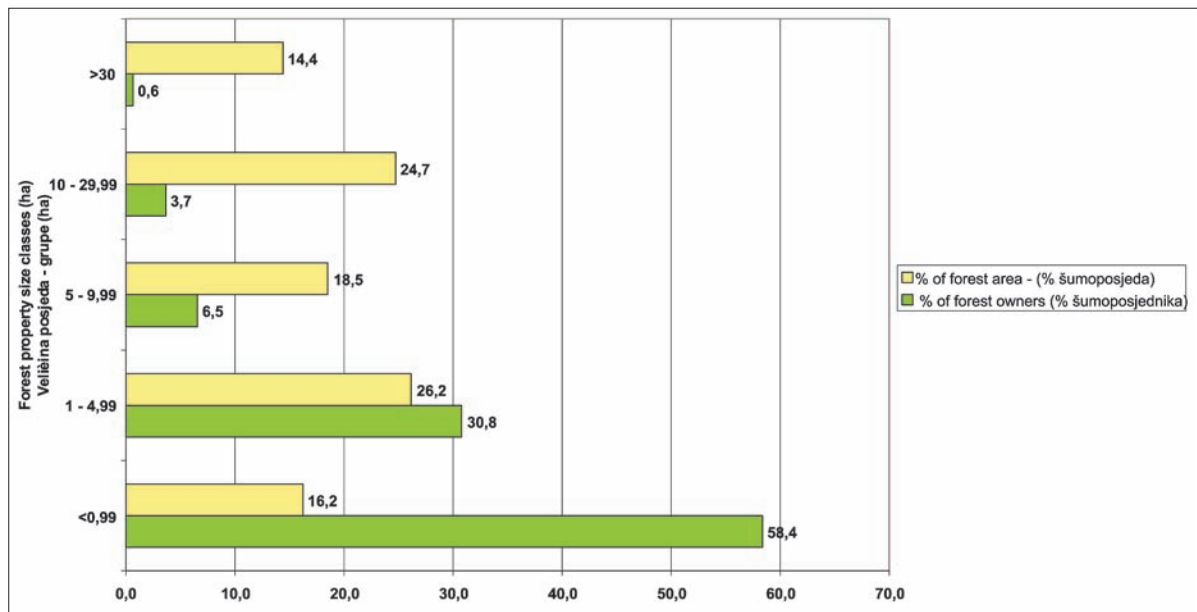
Graph 1.   Structure of the forest estate and forest area by size classes in Slovenia
Grafikon 1. Relativna struktura šumoposjednika i veličine njihovih posjeda u Sloveniji

perty register of the Land Survey Institute of the Republic of Slovenia. For every forest owner we analysed the form of ownership based on their cadaster unit and plot number for all plot numbers together. Ownership was studied in three categories: firstly, one owner with no co-owners, secondly, several owners, living in the same household and thirdly, several owners living in different households (M e d v e d , 2000). The general assumption was that owners living in common household, regardless of their number, have the same goals in forest management. The situation, however, differs where the co-owners live in different households; in these cases, the owners/co-owners does not generally share the needs and goals in forest management.

METHODS – Metode
Surveying forest owners – *Anketiranje šumoposjednika*

A questionnaire was used to test the willingness of private forest owners to cooperate. Due to varied natural and social circumstances, the survey was carried out on the territory of the entire country – so that the sample was representative. The regional units of The Slovenian Forest Service acted as territorial units for the survey. Within regional units we have focused on selected forest management units. In order to acquire an optimal distribution of sample units we have selected forest management units with different forms of private forest owners association. This system has enabled us to carry out a parallel survey of forest owners who are members of local associations on the one hand, and those who are not, on the other.

Sourcing from the data base –the *index* of forest owners – the forest owners were divided into five groups (*stratums*), based on the criterion of property size. In the process of choosing the sample, a separate sampling was carried out independently for each stratum (V e h o v a r , 2001). Within each stratum, the owners were proportionally divided into two groups, i.e. into owners who are members of different forms of cooperation and those who are not. Inside the two groups, the owners were categorized systematically. The survey was aimed at acquiring the following information about the forest owners: gender, age, level of education, place of residence, (the size and type of settlement), fragmentation of plots, economic status, property size, their membership in forestry associations (associated, willing to cooperate and unwilling to cooperate).

Statistical methods – *Statističke metode*

All collected data in our research was first analysed through the use of frequency distribution and crosstabulation. For the purpose of logistic regression, the analysed characteristics were then classified into two types of variables: the dependant variable and the independent variables. The dependant variable (response variable) Y represents the object of our research – "willingness to cooperate" and had three values: associated, willing to cooperate and unwilling to cooperate; Y is thus a nominal variable. The independent variables (explanatory variables) $X_1, X_2...$, explain the degree of willingness to cooperate. The independent variables comprise: owner's age,

141

size and fragmentation of the forest property, form of ownership and number of co-owners. These variables can either be continuous, discrete or attributive. The χ^2 test was used in order to find out whether there is a relationship between pairs of variables. Statistically significant relationship between two variables was defined where *p* value was less than 0.05. The χ^2 tests were performed by using the *SPSS for Windows 16.0* computer package.

Willingness of private forest owners for cooperation regarding the age of forest owners and the ownership and property structure was performed by the nominal logistic regression method (B a c k h a u s, 2004, G r i m m et. al, 2002, K o š m e l j, 2001a, K o š m e l j, 2001b, H o - s m e r, L e m e s h o w, 2000, A l b r i g h t et. al., 2000, N o r m a n, 2000), by means of the *Backward stepwise* algorithm (F i e l d, 2009) of the *SPSS for Windows 16.0* software package.

The nominal logistic regression is a generalised version of logistic regression. Logistic regression belongs to the generalised linear models, which are used for the prediction of binary dependant variables ("yes"/"no"). In our case, however, the dependant variable has three values – associated, willing to cooperate and unwilling to cooperate. This kind of statistical model is referred to as nominal logistic regression model. (K o š m e l j, V a d n a l, 2003). The last category of the independent variable was chosen to represent the reference cate-

gory. The estimation of the parameters in logistic regression is based on the method of maximum likelihood. The *Wald test* was used to establish the statistical significance of the correlation between the dependant variable and the independent variables. The uncharacteristic Wald test enables the exclusion of insignificant variables from the model, thus ridding the model of unnecessary, disturbing variables.

The logistic regression method was chosen due to the fact that it involves fewer statistical requirements than alternative methods, such as discriminant analysis, probit analysis, etc. Unlike the aforementioned analyses, the nominal logistic regression is not based on the assumption of linear correlation between the independent and the dependant variable nor the assumption of homoscedasticity. However, logistic regression has an inconvenience, namely, the multicollinearity (P o j e, 2003). Multicollinearity refers to a situation in which independent variables in a regression model are a linear combination of other independent variables. In logistic regression, to avoid multicollinearity, none of the independent variables of a multiple model may therefore represent a linear combination of other independent variables (J e s e n k o, 2007). The independent variables which are a linear combination of other independent variables are thus to be excluded from the model.

RESULTS AND DISCUSSION – Rezultati i rasprava
Basic information about sample- private forest owner
Osnovni podaci o anketiranima šumoposjednicima

The sample represents 322 forest owners, 75.8 % of whom are male and 24.2 % are female. The average age of the respondents is 54 years and the average level of education is completed primary education (31.7 %) or vocational school (32.6 %). The majority of respondents

(68.9 %) live in rural area, a hamlet or a small village of up to 500 inhabitants with neither shop nor post office, who generally belong to a village local community (82.9 %). More than half of the respondents (58.9 %) consider their economic status to be average.

General data relating to property conditions – *Opći podaci o strukturi šumoposjeda*

The mean area of forest holding of the respondents is 16.7 ha. The size of the smallest forest property is 0.1 ha, while the biggest forest property extends up to 150 ha. The respondents were classified depending on the size of their forest property into categories referred to as stratums. The stratums and the shares of the respondents per stratum are given in *Table 1*.

Table 1 shows that approximately the same number of forest owners from all stratums participated in the sur-

vey. The exception is the first stratum (up to 0.99 ha) with the share of only 5.9 %. Such small number of the respondents from the first stratum is due to several causes: some owners refused to take part in the survey or were not even aware that they own a forest, the address of some owners could not be found or it was impossible for us to contact them or they are deceased. The refusal of the owners of forest properties smaller than 1 ha to participate in the survey shows their inactiveness, lack of interest or negative attitude towards foresters and even the forest itself.

The respondents, generally know how many separate plots of forest they possess. Only 2.5 % of the respondents could not answer this question and were therefore excluded from the analyses relating to the

Table 1.   Size of forest property (stratum)
Tablica 1. Veličina posjeda (grupe)

	Stratum (ha) – *Grupe (ha)*				
	Up to 0.99 *Do 0,99*	1 to 4.99 *1 do 4,99*	5 to 9.99 *5 do 9,99*	10 to 29.99 *10 do 29,99*	Over 30 *Više od 30*
n	19	90	64	91	58
%	5.9	28.0	19.9	28.3	18.0

fragmentation of forest property. Forest holdings of most respondents are divided into several separate lots, 4.3 on the average. Such fragmentation is highly inconvenient for management. In fact, only 28.7 % of the respondents own undivided forest property, i.e. a forest property on only one location, whereas forest property of the other respondents is fragmented into two separate parcels (16.6 % of the respondents), three separate lots (12.1 %), four separate parcels (9.9 %) or more. The average number of separate parcels of forest property per stratum is given in Table 2. We can see that forest property becomes more fragmented, the bigger it gets.

Table 2.   Average fragmentation of forest property
Tablica 2. Prosječni prostorno odvojeni kompleksi posjeda

	Stratum (ha) – *Grupe (ha)*				
	Up to 0.99 *Do 0,99*	1 to 4.99 *1 do 4,99*	5 to 9.99 *5 do 9,99*	10 to 29.99 *10 do 29,99*	Over 30 *Više od 30*
Average number of separate plots *Prosječni prostorno odvojeni kompleksi posjeda*	1.3	3.0	4.8	5.3	5.4

In fact, most undivided forest properties are found in the first stratum (72.2 %). The situation in this stratum is, as can well be expected, a prevailing number of undivided forest properties, generally too small to be fragmented. Only 16.7 % of the respondents from the first stratum own a forest property on two locations and only 11.1 % own a forest holding on three locations. The forest properties in the stratum of 1–4.99 ha already tend to be more fragmented; on the average, they are divided into three separate lots. Almost one third (30.3 %) of the respondents from the second stratum own an undivided forest property, 24.7 % own a forest property on two locations, while, surprisingly, as much as 12.4 % of the respondents own a forest property on more than six locations. Most fragmented forest properties fall under the middle category of 5 – 9.99 ha; in this stratum, only 8.9 % of forest properties are undivided. In the stratum 10 –29,99 ha, on the one hand, the share of undivided forest properties increases (27.8 %), whereas, on the other, half of the respondents (50 %) own a forest property on more than five locations. As for the forest properties of over 30 ha, 31.5 % are undivided, whereas 27.8 % are fragmented into more than six separate plots.

General data relating to ownership structure – *Opći podaci o vlasništvu*

The analysis of the ownership situation was performed on the sample of 308 respondents out of 322. This was due to the non-identical records on some plot numbers in different databases (Register on forest owners and the Land Survey Institute of the Republic of Slovenia).

More than half of the respondents (59.4 %) are the sole holders of their forest property (Table 3). As for the rest, they have co-owners; 18.8 % of these respondents share common household with their co-owners. The management of a private forest property is simpler where there is a sole holder or all joint owners share common household (which is the case in 78.2 % of the respondents). The rest of the respondents (21.8 %), do not share common household with the other co-owners. The management of such properties is more demanding as it involves constant coordination of interests of the joint owners.

On the average, the respondents who entered a co-owner relationship have 8 co-owners. More than half of these respondents (54.4 %) share their forest property with one co-owner, 10.4 % with two co-owners, and one particular forest property is shared by as many as 98 joint owners. Based on the frequency distribution of the number of co-owners, to simplify the data processing, the respondents were classified into three categories based on the number of co-owners; the categories and the share of respondents per category are given in *Table 4*.

Table 4 shows that 54.4 % of the respondents who are in a co-owner relationship share their forest property with one co-owner, 23.2 % with 2 to 5 joint owners and 22.4 % with more than 5 joint owners.

Among the respondents who live in common household with their co-owners, 84.5 % have only one co-owner and 15.5 % between 2 to 5 co-owners. As for the respondents who do not share common household with their co-owners, the situation is different. In this case,

Table 3.   Structure of the respondents by ownership
Tablica 3. Struktura anketiranih šumoposjednika prema obliku vlasništva

Form of ownership – *Oblik vlasništva*	n	%
Sole holder –*Vlasnik*	183	59.4
Joint owners – share common household *Suvlasnici žive u istom domaćinstvu*	58	18.8
Joint owners – do not share common household *Suvlasnici ne žive u istom domaćinstvu*	67	21.8

Table 4.   Structure of the respondents by number of co-owners
Tablica 4. Struktura anketiranih po broju suvlastnika

Number of co-owners – *Broj suvlasnika*	n	%
1 co-owner – *1 suvlasnik*	58	54.4
2 to 5 co-owners – *2 do 5 suvlasnika*	29	23.2
More than 5 co-owners – *Više od 5 suvlasnika*	28	22.4

the number of co-owners is higher, namely, there is a prevailing number of respondents who share their forest property with more than 5 co-owners (41.8 %), followed by the respondents with 2 to 5 co-owners, whereas the share of the respondents with one co-owner is 28.4 %.

The χ^2 test showed that the independent variables form of ownership and number of co-owners are statistically significantly correlated (χ^2 =44.993***, p=0.000). Due to a strong correlation of these two variables (r_s=0.973***) and a high VIF (VIF>5), in order to avoid the multicollinearity in the nominal logistic regression model, the variable number of co-owners was later on eliminated from the nominal logistic regression model.

Results of bivariate analysis – *Rezultati bivariatne analize*

The joint distribution of the dependent variable degree of willingness to cooperate and each individual independent variable (size and fragmentation of forest property and form of ownership) was displayed through the use of crosstabulation. Then, the χ^2 test was performed in order to test the statistical significance of relationship between each individual independent variable and the dependent variable willingness to cooperate. The impact was further investigated through the use of bivariate nominal logistic regression.

Influence of forest property size on the willingness to cooperate
Utjecaj veličine posjeda na spremnost za povezivanje

Increasing the forest property size (from the smallest to the biggest), the number of the owners who do not cooperate nor are willing to do so in the future decreases (Table 5). Owners of forest properties bigger than 30 ha are the most keen to cooperate with other forest owners (60.3 % already cooperate). The willingness to cooperate is primarily expressed by the owners from stratum 10 to 29.99 ha (26.4 %) and stratum 5 to 9.99 ha (21.9 %). The least interest to cooperate is shown by the owners of the properties smaller than 0.99 ha; only 10.5 % of them cooperate with other forest owners and only 5.3 % expressed the willingness to do so.

The stratums were then regrouped in two categories by forest property size, namely forest property of the area of up to 10 ha and those bigger than 10 ha, and the bivariate nominal logistic regression was performed. The correlation between the size of forest property and the willingness of the owners to cooperate with other forest owners proved to be highly statistically significant (p=0,000) when comparing the owners who cooperate with those who are unwilling to do so. The owners with forest property smaller than 10 ha have 0.207 times smaller odds of "willingness to cooperate" than for the owner of bigger forest property (95 % confidence interval (CI) is 0.120–0.355). The influence of the size of forest property proved to be highly statistically significant (p=0,000) also when comparing the owners who are willing to cooperate with those unwilling. The odds for »willingness to cooperate« with the owners of forest properties up to 10 ha is 0.294 times smaller than

Table 5   Willingness to cooperate in relation to property size (χ^2 =58.734***)
*Tablica 5. Spremnost za povezivanje od zavisnosti od veličine posjeda (χ^2 =58,734***)*

Size of property (ha) *Veličina posjeda (ha)*	Willingness to cooperate *Spremnost za povezivanje*		
	Cooperates *Povezani*	Willing *Spremni*	Unwilling *Nisu spremni*
Up to 0.99 - *Do 0.99*	10.5 %	5.3 %	84,2 %
1 to 4.99 - *1 do 4.99*	21.1 %	15.6 %	63,3 %
5 to 9.99 - *5 do 9.99*	37.5 %	21.9 %	40,6 %
10 to 29.99 - *10 do 29.99*	50.5 %	26.4 %	23,1 %
Over 30 - *Više od 30*	60.3 %	19.0 %	20,7 %
Total – *Ukupno*	39.1 %	19.9 %	41.0 %

Table 6   Dependence of willingness to cooperate on the size of forest property
Tablica 6. Utjecaj veličine posjeda na spremnost za povezivanje

	B	Std. Error	Wald	df	Sig.	Exp(B)	95 % C.I. for EXP(B)	
							Lower	Upper
Willingness of the owner to cooperate: Cooperates/Unwilling – *Spremnost za povezivanje:Povezani/Nisu spremni*								
Up to 10 ha – *Do 10 ha*	-1.577	0.275	32.757	1	0.000	0.207	0.120	0.355
Over 10 ha – *Više od 10 ha*						1.000		
Willingness of the owner to cooperate:Willing/Unwilling – *Spremnost za povezivanje:Spremni /Nisu spremni*								
Up to 10 ha – *Do 10 ha*	-1.224	0.325	14.177	1	0.000	0.294	0.156	0.556
Over 10 ha – *Više od 10 ha*						1.000		
Willingness of the owner to cooperate: Cooperates/Willing – *Spremnost za povezivanje:Povezani/Spremni*								
Up to 10 ha – *Do 10 ha*	-0.353	0.309	1.307	1	0.253	0.703	0.384	1.287
Over 10 ha – *Više od 10 ha*						1.000		

that of owners with forest properties bigger than 10 ha (95 % CI is in this case 0.156–0.556).

Based on the results of the bivariate nominal logistic regression we conclude that the owners who own more

that 10 ha of forest show more interest for co-operation than the owners of smaller forest property (Table 6).

Influence of fragmentation on willingness to cooperate
Utjecaj usitnjenosti posjeda na spremnost za povezivanje

The independent variable fragmentation of the forest holding was initially discrete with a large number of values (1,2,3,....); for the purpose of crosstabulation, however, it has been transformed into a categorial variable and was assigned six categories. The crosstabulation showed that the owners of more fragmented forest properties tend to show greater interest for co-operation (they more often cooperate and they are also more willing to cooperate) than the owners of less fragmented forest properties. In fact, the smallest interest for co-operation was shown by the owners of undivided forest properties (36.7 % of them cooperate, whereas 16.7 % are willing to do so) and among the owners of forest properties on two locations 44.5 % cooperate and only 9.6 % are willing to cooperate, (Table 7).

However, the χ^2 test showed that there is no statistically ignificant relationship between the fragmentation of forest property and the willingness to cooperate (χ^2 =14.439, p=0.154).

Nevertheless, in spite of statistical insignificance of this relationship the influence of fragmentation of forest property on the willingness to cooperate was further analysed through the use of bivariate nominal logistic regression. The fragmentation categories were regrouped so that the variable only had two values: undivided forest property and fragmented forest property. The nominal logistic regression confirmed the results of the χ^2 test, showing a statistically insignificant relationship between fragmentation and the willingness of the owner to cooperate. Thus, the variable fragmentation was not considered in the multivariate nominal logistic regression model.

Table 7   *Fragmentation of forest property and willingness to cooperate* (χ^2 =14.439)

Tablica 7. Spremnost za povezivanje u zavisnosti od usitnjenosti poseda (χ^2 = 14,439)

Number of separate plots *Broj parcela*	Willingness to cooperate /*Spremnost za povezivanje*		
	Cooperates *Povezani*	Willing *Spremni*	Unwilling *Nisu spremni*
1	36.7 %	16.7 %	46.7 %
2	44.2 %	9.6 %	46.2 %
3	34.2 %	18.4 %	47.4 %
4	54.8 %	16.1 %	29.0 %
5	41.7 %	20.8 %	37.5 %
6 or more – *Više od 6*	35.4 %	30.4 %	34.2 %

Influence of form of ownership on willingness to cooperate
Utjecaj oblika vlasništva na spremnost za povezivanje

The biggest interest for co-operation was shown by the respondents who are joint owners of forest property and share common household with their co-owners. 53.4 % of them already cooperate (Table 8). Further, the biggest willingness for co-operation was expressed by the sole holders (20.8 %). The respondents who are joint owners and do not share common household with their co-owners are the least keen on co-operation; only 31.3 % cooperate and no more than 19.4 % are willing to do so.

The χ^2 test showed that the willingness to cooperate is not statistically significantly related to the form of ownership (χ^2 =7.634, p=0.106). Nevertheless, the bivariate nominal logistic regression was further investigated (Table 9). The bivariate nominal logistic regression showed that dependence/influence of the form of ownership

Table 8   Willingness to cooperate per form of ownership (χ^2 =7.634)

Tablica 8. Spremnost za povezivanje prema obliku vlasništva (χ^2 = 7,634)

Form of ownership *Oblika vlasništva*	Willingness to cooperate/*Spremnost za povezivanje*		
	Cooperates *Povezani*	Willing *Spremni*	Unwilling *Nisu spremni*
Sole holder – *Vlasnik*	37.2 %	20.8 %	42.1 %
Joint owners – share common household *Suvlasnici žive u istom domaćinstvu*	53.4 %	17.2 %	29.3 %
Joint owners – do not share common household *Suvlasnici ne žive u istom domaćinstvu*	31.3 %	19.4 %	49.3 %

on the willingness to cooperate is statistically significant (p=0.010) only when comparing the respondents who are willing to cooperate with those unwilling under the consideration of the following two forms of ownership: the respondent is a joint owner and shares common household with his co-owners, and the respondent is a joint owner and does not share common household with all co-owners. In fact, the odds of "willingness to coope-

rate" for joint owners who live in common household with their co-owners is 2.866 times higher than of those who do not share common household with all their co-owners (95 % CI is in such case 1.280–6.414). For all the other combinations, the influence of the form of ownership on the dependant variable proved to be statistically insignificant. The variable form of ownership was also considered in the multivariate regression model later on.

Table 9   Dependence of willingness to cooperate on the form of ownership
Tablica 9. Utjecaj oblika vlasništva na spremnost za povezivanje

	B	Std. Error	Wald	df	Sig.	Exp(B)	95 % C.I. for EXP(B)	
							Lower	Upper
Willingness of the owner to cooperate: Cooperates/Unwilling – *Spremnost za povezivanje:Povezani/Nisu spremni*								
Sole holder – *Vlasnik*	0.341	0.325	1.098	1	0.295	1.406	0.743	2.660
Joint owners – share common household *Suvlasnici žive u istom domaćinstvu*	1.053	0.411	6.558	1	0.010	2.866	1.280	6.414
Joint owners – do not share common household *Suvlasnici ne žive u istom domaćinstvu*						1.000		
Willingness of the owner to cooperate:Willing/Unwilling – *Spremnost za povezivanje:Spremni/Nisu spremni*								
Sole holder – *Vlasnik*	0.264	0.382	0.479	1	0.489	1.303	0.616	2.755
Joint owners – share common household *Suvlasnici žive u istom domaćinstvu*	0.401	0.516	0.604	1	0.437	1.493	0.543	4.104
Joint owners – do not share common household *Suvlasnici ne žive u istom domaćinstvu*						1.000		
Willingness of the owner to cooperate:Cooperates/Willing – *Spremnost za povezivanje:Povezani/Spremni*								
Sole holder – *Vlasnik*	-0.076	0.406	0.035	1	0.851	0.926	0.418	2.053
Joint owners – share common household *Suvlasnici žive u istom domaćinstvu*	-0.652	0.507	1.655	1	0.198	0.521	0.193	1.407
Joint owners – do not share common household *Suvlasnici ne žive u istom domaćinstvu*						1.000		

Multivariate logistic regression – *Multivariatni model logističke regresije*

In order to find out the differences between the owners who cooperate with other forest owners and those who are willing to cooperate and those unwilling, a multivariate model of logistic regression was performed. The following independent variables were considered in this model: the size of forest property (up to 10 ha and over 10 ha), the form of ownership (sole holder, co-owners who share common household, co-owners who do not all share common household) as well as the owner's age (under 50 and over 50). The results of the multivariate nominal logistic regression are given in Table 10. Let us first compare the associated owners with those who are unwilling to cooperate. The most influential factor here is the size of property (p=0.000), followed by age (p=0.002) and type of ownership where several owners live in common household with the co-owners (p=0.007). Owners with a smaller property (up to 10 ha) are thus less likely to show willingness to cooperate (95 % CI is in such case 0.097–0.320), the odds being 0.176 lower compared to owners with bigger property; owners aged under 50 showed 2.452 times higher

tendency to be willing to cooperate (95 % CI is in such case 1,381–4,351) than those aged over 50; and owners who share common household with the co-owners are 3.446 times more likely to be willing to cooperate (95 % CI is in such case 1.407–8-441) compared to owners who do not share the household with the co-owners. The comparison of the willing and unwilling to cooperate revealed a significant statistical influence of the size of property (p=0.000) and age (0.006). Owners with smaller property (up to 10ha) display 0.239 times lower tendency to cooperate (95 % CI is in such case 0.120–0.478) compared to owners with a bigger property; furthermore, owners aged under 50 are 2.539 times more likely to be willing to cooperate than older owners (95 % CI is in such case 1.302–4.950).

Table 10   Results of multivariate nominal logistic regression
Tablica 10. Rezultati multivariatne nominalne logističke regresije

	B	Std. Error	Wald	df	Sig.	Exp(B)	95 % CI	
							Lower	Upper
Willingness of the owner to cooperate: Cooperates/Unwilling – Spremnost za povezivanje: Povezani/Nisu spremni								
Size of forest property – Veličina posjeda								
Up to 10 ha – Do 10 ha	-1.738	0.305	32.484	1	0.000	0.176	0.097	0.320
Over 10 ha – Više od 10						1.000		
Form of ownership – Oblika vlasništva								
Sole holder – Vlasnik	0.454	0.362	1.571	1	0.210	1.575	0.774	3.205
Joint owners – share common household Suvlasnici žive u istom domaćinstvu	1.237	0.457	7.329	1	0.007	3.446	1.407	8.441
Joint owners – do not share common household Suvlasnici ne žive u istom domaćinstvu						1.000		
Age – Starost								
Under 50 let – Do 50 godina	0.897	0.293	9.384	1	0.002	2.452	1.381	4.351
Over 50 let – Više od 50 godina						1.000		
Willingness of the owner to cooperate: Willing/Unwilling – Spremnost za povezivanje: Spremni/Nisu spremni								
Size of forest property – Veličina posjeda								
Up to 10 ha – Do 10 ha	-0.307	0.326	0.886	1	0.347	0.736	0.388	1.394
Over 10 ha – Više od 10						1.000		
Form of ownership – Oblika vlasništva								
Sole holder – Vlasnik	-0.059	0.427	0.019	1	0.890	0.942	0.408	2.177
Joint owners – share common household Suvlasnici žive u istom domaćinstvu	0.538	0.525	1.048	1	0.306	1.712	0.612	4.793
Joint owners – do not share common household Suvlasnici ne žive u istom domaćinstvu						1.000		
Age – Starost								
Under 50 let – Do 50 godina	-0.035	0.324	0.012	1	0.914	0.966	0.512	1.822
Over 50 let – Više od 50 godina						1.000		
Willingness of the owner to cooperate: Cooperates/Willing – Spremnost za povezivanje: Povezani/Spremni								
Size of forest property – Veličina posjeda								
Up to 10 ha – Do 10 ha	-1.431	0.353	16.388	1	0.000	0.239	0.120	0.478
Over 10 ha – Više od 10						1.000		
Form of ownership – Oblika vlasništva								
Sole holder – Vlasnik	0.514	0.425	1.457	1	0.227	1.671	0.726	3.848
Joint owners – share common household Suvlasnici žive u istom domaćinstvu	0.700	0.559	1.566	1	0.211	2.013	0.673	6.022
Joint owners – do not share common household Suvlasnici ne žive u istom domaćinstvu						1.000		
Age – Starost								
Under 50 let – Do 50 godina	0.932	0.341	7.476	1	0.006	2.539	1.302	4.950
Over 50 let – Više od 50 godina						1.000		

CONCLUSIONS – Zaključci

The survey of 322 forest owners who were proportionally selected for the sample (i.e. half of them associated and half non-associated) revealed that 39.1 % of the owners were associated, 19.9 % were willing to join a forestry association and 41.0 % were unwilling to do so. The statistical model of bivariate analysis, the χ^2 test was used to establish a potential correlation between ownership and property conditions and the willingness of owners to cooperate. The analysis showed a connection between the size of forest property and the owners' willingness to

cooperate in forestry associations. A multivariate model of nominal logistic regression was used to compare the three categories: the associated owners, owners who are unwilling to cooperate and those who are willing to join a forestry association. The model included all statistically characteristic variables from the bivariate logistic regression models as well as the age of the owners. The results show that the non-associated and the unwilling to cooperate differ most significantly in the size of forest property (p=0.000), age (p=0.002) and the ownership type where

several owners share common household (p=0.007). The discrepancy between the willing to cooperate and the un-willing is most strongly pronounced in the size of forest property (p=0.000) and age (p=0.006) while no such differences can be observed between the associated owners and those willing to cooperate.

It can be concluded that private forest owners who are the most willing to cooperate in forestry associations are younger than 50 years, own more than 10 ha of forest land and live in common household with the co-owners.

REFERENCES – Literatura

Albright, S.C., W. L. Winston, C. J. Zappe, 2000: Managerial statistics. Duxburry, Thomson learning, Pacific Grove, 937 pp.

Avdibegović, M., N. Petrović, D. Nonić, S. Posavec, B. Marić, D. Vuletić, 2010: Spremnost privatnih šumoposjednika u Hrvatskoj, Srbiji i Bosni i Hercegovini na suradnju pri izgradnji i održavanju šumskih cesta, Šum. list 1–2/2010, str. 55–64, Zagreb.

Backhaus, K., Erichson, B., Plinke, W., Weiber, R., 1994: Multivariate Analysemethoden. Berling, Springer Verlag, 575 str, Berlin.

Feliciano, M. S. D., 2006: Effectiveness Assessment of Forest Owners Organisations from the North and Centre of Portugal, U: S. Wall (ur)., Small-scale forestry and rural development, Galway-Mayo Institute of technology, 51–61., Galway.

Field, A., 2009: Discovering statistics using SPSS, Sage Publication, 821 str., London.

Grimm, L. G., P. R. Yarnold, 2002: Reading and understanding multivariate statistics. American Psychological Association, Washington, DC., 373 pp.

Hosmer, D. W., S. Lemeshow, 2000: Applied Logistic Regression, A Wiley-Interscience Publication, 375 str., New York.

Jesenko, J., M. Jesenko, 2007: Multivariatne statistične metode, Moderna organizacija, 345 str, Kranj.

Kittredge, D. B, 2005: The cooperation of private forest owners on scale larger than one individual property: international examples and potential application in the United States, Forest Policy and Economics, 7: 671–688.

Košmelj, K., 2001a: Osnove logistične regresije (1. del), Zb. Bioteh. Fak, 77. (2): 271–238., Ljubljana.

Košmelj, K., 2001b: Osnove logistične regresije (2. del), Zb. Bioteh.Fak, 77. (2): 239–245., Ljubljana.

Košmelj, K., K. Vadnal, 2003: Uporaba modelov logistične regresije za analizo povpraševanja po socialnih storitvah kot dopolnilnih dejavnosti na kmetiji, Zb. Bioteh. Fak, 81. (2): 221–232., Ljubljana.

Lindestav, G., C. Berlin, T. Nordfjell, 2003: Swedish non-industrial private forest owners in transformation, U: R. Robek (ur.), Forest Operation Improvments in Farm Forestry in Slovenia, 129–137 str., Rome.

Medved, M., 1991: Vključevanje lastnikov gozdov v gozdno proizvodnjo, Magisterij, Univerza v Ljubljani, Biotehniška fakulteta, Oddelek za gozdarstvo in obnovljive gozdne vire.

Medved, M., 2000: Gozdnogospodarske posledice posestne sestave slovenskih zasebnih gozdov. Disertacija, Univerza v Ljubljani, Biotehniška fakulteta, Oddelek za gozdarstvo in obnovljive gozdne vire.

Mendes, A. M. S. C. M., 2006: Forest Owners Organizations in Portugal, U: S. Wall (ur), Small-scale forestry and rural development, Galway-Mayo Institute of technology, 289–304, Galway.

Mori, J., I. Kotnik, T. Lesnik, 2006: Možnosti sodelovanja Zavoda za gozdove Slovenije, Kmetijsko gozdarske zbornice Slovenije in Zveze lastnikov gozdov Slovenije za razvoj povezovanja lastnikov gozdov, Gozdarski vestnik, 64. (10): 476–502, Ljubljana.

Norman, G. R., 2000: Biostatistics. Decker Inc., London, 324 pp.

Pezdevšek Malovrh, Š., 2005: Pomen povezovanja lastnikov gozdov za razvoj podeželja (študij primera: Društvo lastnikov gozdov mirenske doline.), Gozdarski vestnik, 63. (5–6): 269–280, Ljubljana.

Pezdevšek Malovrh, Š., 2006: Povezovanje lastnikov gozdov kot ukrep za povečanje konkurenčnosti v zasebnih gozdovih ob uvajanju sodobnih tehnologij, Gozdarski vestnik, 64. (10): 451–462, Ljubljana.

Poje, A., 2003: Ekonomska svoboda in gospodarska uspešnost v tranzicijskih državah. Diplomsko delo, Univerza v Ljubljani, Ekonomska fakulteta.

Poročilo Zavoda za gozdove Slovenije o gozdovih za leto 2007., 2008: Zavod za gozdove Slovenije, Ljubljana.

Sennblat, G., 1989: Small-Scale Operations in Private Forestry, Small Scale Forestry, 89. (1): 3–13.

S t o r d a l , S., L. G u d b r a n d , F. J. H a i r , 2005: Differences in Management and Risk Characteristics of forest Owners in Eastern Norway and the Role of Forest Owners Associations, U: S. Mizaras (ur.), Small-Scale Forestry in a Changing Environment, 242–259, Vilnius.

T o i v o n e n , R., 2005: The Challenge of Information Service Development for Private Forest Owners: The Estonia and Finland Cases, Small-scale Forest Economics, Management and Policy, 4. (4): 451–470.

V a l k o n e n , J., 2001: Analysis of the European Small-scale Forestry, European Small-Scale Forestry and its Challenges for the Development of Wood Harvesting Technology, TTS Institute's Publications, 101–120, Helsinki.

V e h o v a r , V., 2001: Vzorčenje v anketah. Knjižna zbirka Profesija, Fakulteta za družbene vede, 189 str., Ljubljana.

W i l d - E c k et.al., 2006: Extension of Private Forest Owners: Insights from a Representative Opinion Poll in Switzerland, Small-scale Forest Economics, Management and Policy, 5. (2): 161–174.

W i n k l e r , I., F. G a š p e r š i č , 1987: Zasebni gozdovi v Sloveniji – stanje in novejša gibanja. Biotehniška fakulteta, Oddelek za gozdarstvo in Inštitut za gozdno in lesno gospodarstvo, Strokovna in znanstvena dela, 94, 116 str., Ljubljana.

Zavod za gozdove Slovenije, 2005: Skrbno z gozdom, v dobro narave in ljudi, v: B. Debevec (ur.), Zavod za gozdove Slovenije, Ljubljana, 11 str.

SAŽETAK: Gospodarenje privatnim šumama, posebice u Sloveniji, nije optimalno. Na to najviše utječe i raznolika vlasnička i posjedovna struktura. Šumoposjednike u gospodarenju njihovim šumama posebice ograničava mali i usitnjeni šumski posjed s velikim brojem vlasnika i suvlasnika. Zbog toga je značajno da se šumoposjednici počinju udruživati u različite organizacijske oblike povezivanja.

Predviđamo da spremnost šumoposjednika za povezivanje ponajprije ovisi od neposrednih ekonomskih i socijalnih interesa šumoposjednika te od veličine i stanja njihovog šumskog posjeda. Spremnost šumoposjednika za povezivanje utvrđivali smo anketiranjem. Zbog različitih prirodnih i društvenih prilika, posjednike šuma anketirali smo u cijeloj Sloveniji. Na temelju indeksa šumoposjednika, posjednike smo podijeli u pet grupa po veličini posjeda. Unutar ovih grupa podjelili smo ih na povezane i nepovezane. Uzorak ispitanika (n= 700) predstavljali su sustavno izabrani šumoposjednici. Na anketu je odgovorilo 46 % ispitanika. Uzorak je obuhvatio 322 pretežito muška šumoposjednika. Prosječna starost anketiranih vlasnika je 54 godina, s prosječno završenom osnovnom ili trogodišnjom srednjom školom. Većina anketiranih šumoposjednika živi u ruralnim sredinama. Prosječni šumski posjed iznosi 16,7 ha i nalazi se u 4,3 prostorno odvojena kompleksa. Prevladava oblik vlasništva bez suvlasništva, a šumoposjednici koji su u suvlasništvu imaju prosječno osam suvlasnika. U uzorku je 39,1 % anketiranih šumovlasnika već uključeno u različite oblike povezivanja, 19,9 % ih je spremno uključiti se u različite oblike povezivanja, dok 41 % šumoposjednika povezivanje ne interesira. Rezultati bivarijantne analize ukazuju na povezanost spremnosti za povezivanjem šumoposjednika i veličine njegovoga posjeda. Veću spremnost za povezivanje pokazuju šumoposjednici koji imaju više od 10 ha šuma. Rezultati multivarijantne analize pokazuju da se šumoposjednici koji pokazuju spremnost za povezivanje i šumoposjednici koji nisu spremni za povezivanje, razlikuju po veličini posjeda, starosti i obliku vlasništva (vlasnika je više i svi žive u istom kućanstvu). Rezultati istraživanja pokazali su da treba šumoposjednike koji su spremni za povezivanje tražiti u grupi šumoposjednika koji su stari do 50 godina, imaju šumski posjed veći od 10 ha i koji sa suvlasnicima žive u istom kućanstvu.

K l j u č n e   r i j e č i : privatna šuma, suradnja i povezivanje šumoposjednika, vlasnička i posjedovna struktura, statistički modeli, bivariatna i multivariatna analiza, logistička regresija