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БАГАТОКРИТЕРІАЛЬНИЙ ПІДХІД ДО МЕНЕДЖМЕНТУ ПРИВАТНИХ ЛІСІВ З УРАХУВАННЯМ ІНСТИТУЦІЙНИХ ЧИННИКІВ (АСОЦІАЦІЇ ТА УРЯДОВІ ОРГАНІЗАЦІЇ)

Розглянуто суспільні та інституційні проблеми сталого і багатоцільового лісового менеджменту. Йдеться про проблеми малої і фрагментованої власності на ділянки лісу, розподілені між великою кількістю власників і співвласників, що робить менеджмент приватних лісів неефективним і неконкурентним.

Щоб зробити його успішним, багато власників вирішили утворити асоціації приватних власників лісів. Але перш, ніж приватний власник стане членом асоціації, він/вона хотіли б знати про переваги і недоліки такого рішення. Використано два методи прийняття рішень – АНР і DEXi, аби дослідити які саме чинники є найважливішими для власників лісів у прийнятті рішення щодо вступу в асоціацію. Розглянуто приклад долини Мірна, де створена така асоціація. Розмір ділянки лісу теж взято до уваги.

У другій частині статті досліджено вплив двох інституцій (Палати сільського і лісового господарства Словенії і Служби лісів Словенії) на менеджмент лісів. Обидві інституції надають професійну підтримку власникам лісів. Визначено сильні і слабкі сторони, чинники ризику і можливості цих організацій щодо менеджменту приват-

них лісів, а також за допомогою SWOT і АНР методів аналізу досліджено, які ж чинники є найважливішими для приватних власників лісу.

Ключові слова: приватні власники лісів, асоціації, інституційний вплив, багатокритеріальне прийняття рішень, SWOT, АНР і DEXi методи

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A Multicriteria Approach to Private Forests Management regarding Institutional Factors (Associations and Governmental Organizations)

The paper is related to social and institutional problems of sustainable and multiple-use forest management. It deals with the problem of small and fragmented forest property distributed among a large number of forest owners and co-owners what makes the private forest management ineffective and non-competitive.

With the aim of making progress in private forest management, many owners have decided to establish associations of private forest owners. But before a forest owner becomes a member of an association he/she wishes to know the advantages and disadvantages of factors (alternatives) which influence his/her decision to join the association. In the paper, two multi-criteria decision making methods, AHP and DEXi, are employed to establish which factors are more important for private forest owners in making their decision whether to become a member of a private forest owners association or not. A real-life example from the Mirna Valley, where private forest owners formed an association, is presented. The size of forest is also taken into account.

In the second part of the paper we investigate the influence of two institutions (the Chamber of Agriculture and Forestry of Slovenia, and Slovenia Forest Service) on private forest management. Both institutions offer professional support to forest owners. The strength, weakness, opportunity and threat factors of these organizations in relation to the private forest management are determined and by the use of SWOT and AHP analysis it is studied which factors are more important for private forest owners.

Keywords: private forest owners, associations, institutional influence, multicriteria decision making, SWOT, AHP, DEXi method

1. Introduction

In forest management it is indispensable to create equilibrium of economic, ecological and social objectives, while taking into account the sustainability and multiple-use of forest ecosystems. Following this guideline, on one hand, the new ecosystem management paradigms and a very broad range of problems on a time and on a spatial scale and from organizational perspective are emerging. On the other hand, the forest ecosystem management decisions are influenced by forest experts, institutions and forest owners who should maintain and use the forest and want to maximize the expected profit from the forests, and the public as a whole who desires the benefits from the amenity values of those forests. In this paper we discuss only one segment of the extensive category of forest ecosystem management problems. In the first part of the paper we investigate the problem of small and fragmented forest property, and with it connected demands and needs of private forest owners to join an association. In the second part, however, the paper deals with the influence of institutions (two of them) on private forest management.

Small and fragmented forest property distributed among a large number of forest owners and co-owners is one of the main reasons for the low efficiency and a non-competitive position of private forest management. This problem is a typical characteristic of Slovenian forestry and also of many other countries. This is why

many owners have decided to establish associations of private forest owners. But before a forest owner becomes a member of an association he/she wishes to know the advantages and disadvantages of factors (alternatives, attributes) which influence his/her decision to join the association (Pezdevšek Malovrh and Krč, 2006). Undoubtedly, alternatives differ in their importance to private forest owners, and it is often difficult to ascertain how much more important one alternative is from the another. So, we are associated with a multi-criteria decision making problem. This problem, as such, has precipitated the development of interdisciplinary decision support models to determine the optimal multi-objective (multiattribute) private forest management decisions. Thus, in order to get the answer to how important is a particular alternative (factor) for the private forest owner, we generated a multicriteria model (Manrai, 1995). The model is based on multi-objective decision making methods and on private owners/institutions survey results (Zadnik, 2006 a). Since, it is a well-known fact that the size of the property influences the reasons for joining the owners' association (Medved and Pezdevšek Malovrh, 2006), in the model, we have first used cluster analysis (Zadnik, 2005) to split the private forest owners into four groups with regard to the size of the estate: private forest owners with 1-5 ha of forest, private forest owners with 5-10 ha of forest, private forest owners with 10-25 ha of forest and private forest owners with more than 25 ha of forest. Then the factors, like education, joint purchase of machinery, etc., which influence the owner whether he/she joins the association or not, are determined (Pezdevšek Malovrh, 2005 b). By the use of AHP (Saaty, 1994) and DEXi (Špendl et al., 1996) methods we found out which factors are more important for the private forest owner and have a decisive influence on joining the association. The input data for AHP and DEXi were obtained by carrying out surveys with private forest owners. Through surveys the forest owners expressed their preferences on the determined influential factors. As an application of the model, a real-life example of private forest owners from the Mirna Valley is presented (Pezdevšek Malovrh, 2005 a).

In the second part of the paper we investigate the influence of two institutions on private forest management. Both institutions offer professional support to forest owners. First the SWOT (strength, weakness, opportunity and threat) factors for such a support were established (Mihelič, 2007). Employees of both institutions working in forest sector were interviewed. We generated two surveys for this interview, one in which the employees expressed their opinion about the given SWOT factors, and one by which they were asked to make a pairwise comparison of SWOT factors. In this way we obtained the data which were then analyzed by the use of AHP analysis. The results explain which factors used by considered institutions to support the management of private forests are more important for private forest owners. The application of the presented methodology was completed for two institutions: the Chamber of Agriculture and Forestry of Slovenia, and Slovenia Forest Service.

2. Methodology used

The methods employed within this paper are AHP, DEXi and SWOT. All these methods are procedures used to analyze the multicriteria problems which can be presented in a hierarchical structure.

2.1. Multicriteria decision making

Decision making is an important area of managing any system. It deals with strategies (decisions, alternative paths, alternatives, different projects,...) and objectives (goals) in the perspective of a changing environment. Further, it requires careful consideration and evaluation of the external and internal factors. Equally important is the assessment of opportunities, threats, strengths and weaknesses of the strategic paths under consideration. Thus, the decision making process involves the following steps:

- being conscious of opportunity. The decision makers must be fully equipped with all relevant facts, figures, and data. They must be aware of the present and of future opportunities of strategies under consideration, and of their strengths and weaknesses in relation to competitive alternatives;
- establishing objectives. After being aware of the environment in which the strategy should be undertaken, objectives of the strategy are to be established;
- evaluating alternative strategies. The opportunities and threats, and strengths and weaknesses of each strategy are to be properly evaluated and their relative advantage is to be analyzed;
- selecting the optimal alternative and course of action. After careful evaluation of various possible alternatives, the alternative which suits the objectives best and is practically possible to implement is to be selected.

Taking into consideration the steps of a decision making process, it is proclaimed that this process, as such, presents a multiple criteria problem.

Multi-criteria decision making is based on the fact that the choice of a solution is affected by numerous criteria, the importance of which varies and which are of hierarchical structure, i.e., they can be presented at different levels (Špendl et al., 1996). A decision making problem is thus broken down into smaller subordinate problems (parameters, criteria, attributes), and these are then assessed separately for each parameter. The final assessment is obtained by means of a specific combining procedure (Figure 1).

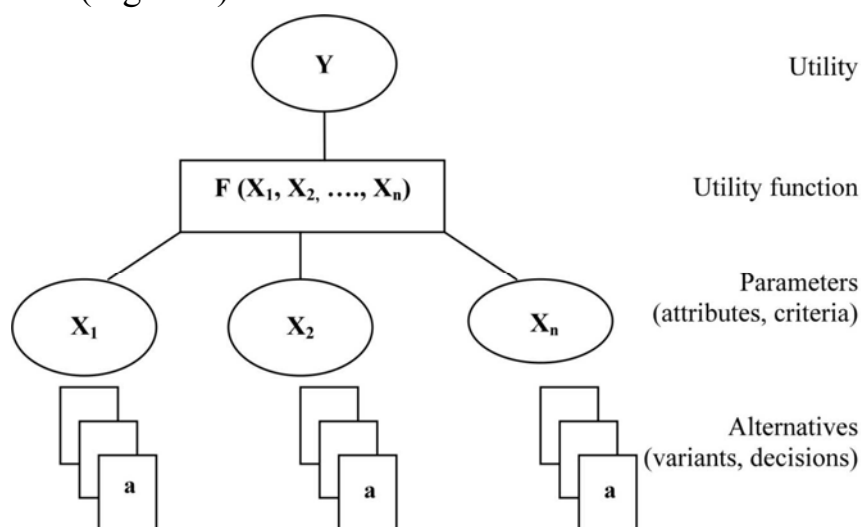


Figure 1: The multi-criteria decision making model (Špendl et al., 1996)

As evident from Figure 1, the model is formed by means of parameters (attributes), X_i . These are variables which represent subordinate problems of a decision making process (attributes which define the quality of alternatives). Utility function F is a rule according to which the values of individual parameters are

combined to form variable Y , which represents a final assessment of usefulness of alternatives. Alternatives are described according to basic parameters by values a_i . On the basis of these values, the utility function provides a final assessment of each alternative.

In the case of multi-criteria decision making, two notions are encountered:

- preferential relation $S; x_1 S x_2$; i.e. x_1 is preferred to x_2
- utility function – $F(x_i)$, which determines the degree of suitability (preference, priority) of parameter x_i .

In actual cases we know what we prefer, but we are unable to assign a certain value to a solution (the utility function is not known). What is needed, then, is a procedure which converts preference relation into utility function. One of the procedures which make this possible is the AHP method.

2.2. Analytic hierarchy process (AHP)

In problems dealing with multiple and conflictive objectives (goals, factors) of the alternatives, and above all with objectives of different importance Saaty's analytic hierarchy process, assigned as AHP method is employed to determine the best alternative. AHP can incorporate mixed data that may include both qualitative and quantitative judgments, and is capable of analyzing multiple factors (parameters, attributes, criteria). AHP is based on a gradual mutual comparison of two objectives (pairwise comparison) at the same level. A scale from 1 to 9 is used for making the comparison, where, for example, 1 means that two objectives are of equal importance, 3 means that judgments slightly favor one objective over another, ..., 9 means that favouring one objective over another is of the highest possible order of affirmation, 2, 4, 6 and 8 are intermediate values, while the reciprocals of these values tell that if objective k has one of reasonable assumptions of the above nonzero numbers assigned to it when compared with objective j , then j has the reciprocal value when compared with k (Saaty, 1994, Saaty, 2005).

Comparisons between individual objectives are gathered in a pairwise comparison matrix A . Each objective k is associated with a weight w_k . The weights ratio of the objectives k and j is written as intensity of importance:

$$a_{kj} = \frac{w_k}{w_j} \quad (1)$$

The matrix $A = [a_{kj}]$, ($k = 1, 2, \dots, K, j = 1, 2, \dots, K$) if there are K objectives. By entering the estimated values a_{kj} into the matrix we get the pairwise comparison matrix A . The pairwise comparison matrix A is a square, positive and reciprocal matrix, its diagonal values equal 1 and symmetrical values are inverse: $a_{kj} = 1/a_{jk}$.

$$A = [A] = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1K} \\ \vdots & & & \vdots \\ a_{K1} & a_{K2} & \cdots & a_{KK} \end{bmatrix} = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \cdots & \frac{w_1}{w_K} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & & \frac{w_2}{w_K} \\ \vdots & & & \vdots \\ \frac{w_K}{w_1} & \frac{w_K}{w_2} & \cdots & \frac{w_K}{w_K} \end{bmatrix}. \quad (2)$$

Since, in practice, we never encounter perfectly consistent estimations (Saaty, 2005), we proved the consistency as described in Winston (1994), using the consistency index. Further, the vector of weights $w = (w_1, w_2, \dots, w_K)$ is calculated with multiple squaring of matrix A to the satisfactory exponent, i.e., $A, A^2, (A^2)^2$, etc. and then the lines are summed up and the values normalized (Winston, 1994). The vector of weights $w = (w_1, w_2, \dots, w_K)$ is therefore scaled between 0 and 1, $\sum w_k = 1$, and calculated by the following equation:

$$w_k = \frac{\sum_{j=1}^K a_{kj}}{\sum_{k=1}^K \left(\sum_{j=1}^K a_{kj} \right)}. \quad (3)$$

Utility vector w can also be obtained by searching for eigenvalues λ of matrix A : $Aw = \lambda_{\max} w$, where $\lambda_{\max}$ is the maximum eigenvalue of matrix A and w is the corresponding eigenvector. In practical cases, this tends to be a complex calculation procedure. The eigenvector which belongs to the maximum eigenvalues of positive reciprocal matrices can be obtained in various ways:

- method of powers – the matrix is put to a sufficiently high power, the values are then added and normalized by lines
- normalization – the matrix is normalized so that the sum according to columns is 1, and the average element in the line is calculated.

The eigenvalues which correspond to the eigenvector are obtained as:

$$\lambda_{\max} = \frac{1}{K} \sum_{i=1}^K \frac{(Aw)_i}{w_i} \quad (4)$$

The measure of inconsistency is defined by the difference $(\lambda_{\max} - K)$. It is expressed by the consistency index

$$CI: CI = (\lambda_{\max} - K) / (K - 1). \quad (5)$$

A random index is then introduced, which is given in tabular form (Winston, 1994)

K	1	2	3	4	5	6	7	8	9	10
RI	0	0	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,51

and inconsistency (CR quotient) is calculated as: $CR = CI / RI$. If $CR < 0.1$, the matrix is sufficiently consistent. In the opposite case, the matrix should be corrected; otherwise the results will not be correct. For the purpose of this paper we used AHP as implemented in the program Expert Choice.

2.3. DEXi

DEXi is a multi-criteria decision method which is based on the construction of a decision problem in a hierarchical structure of attributes. In contrast with AHP, DEXi uses qualitative attributes. Each attribute in hierarchy is defined as a discrete variable which can take its values from a set of symbols. These symbols need to be defined for each attribute separately and typically consist of words like not important, very important ... In DEXi, the use of a qualitative attribute requires a different approach to aggregation than AHP. As opposed to using weights, the aggregation is carried out by decision rules. These are simple "if-then" rules defined by the designer, with which the utility function is expressed point-by-point for all possible combinations of alternative values. For the purpose of this paper we used DEXi as implemented in the program DEXi (Špendl et al., 1996).

2.4. SWOT analysis

SWOT analysis means analysis and assessment of comparative strengths and weaknesses of a strategy in relation to competitive strategies, and environmental opportunities and threats which the strategy under consideration may face. SWOT analysis is, as such, a systematic study and identification of those aspects of the strategy that best suit, in our case, sustainability, maximal expected profit, refers to ecological objectives, and respects the forest owner's acceptance of the examined alternatives. SWOT should be based on logic and relational thinking such that the selected strategy improves the strategy's strength and opportunities and at the same time reduces the weaknesses and threats.

Strength is a distinct superiority (competitive advantage) of technical knowledge, financial resources, skill of the people, image of products and services, access to best network, of discipline and morale. Weakness is the incapability, limitation and deficiency in resources such as technical, financial, manpower, skills, image and distribution patterns of the alternative under examination. It refers to constraints and obstacles of the alternative. Corporate weaknesses and strengths are a matter of how the alternative can achieve best results compared to other, similar competitive alternatives. Weaknesses and strengths of the alternative present internal forces and factors required to be studied and assessed with the goal to evaluate and rank the alternatives under consideration.

Opportunities and threats are the external factors of the examined strategies. These factors are changing with the change of governmental, industrial, monetary and market policy, including the changes of legal and social environment. Environmental opportunity is an area in which the particular strategy would enjoy a competitive advantage. Proper analysis of the environment, identification of new market, new and improved customer groups and new relationship could present opportunity for the strategy. Threat is an unfavorable environment for the strategy. Increased bargaining power of users and suppliers, quick change of government policy, rules and regulations may pose a serious threat to the strategy undertaken.

SWOT analysis is nowadays very important for decision making. Such analysis can be undertaken effectively through brainstorming session with participation of experts and users of the environment, land, firm, etc. involved in the strategy. SWOT analysis has many advantages. Within SWOT internal and external factors are analyzed and summarized in order to attain a systematic decision situation. There are also several shortcomings of using SWOT. SWOT results in listing and quantitative examination of internal and external factors, and groups the factors in strength, weakness, opportunity and threat groups, but it is not able to identify or analytically determine the most significant factor or group in relation to the examined strategy. In order to get a qualitative information, to yield analytically determined priorities for the factors and groups included in SWOT analysis and to make them commensurable we have integrated SWOT analysis with AHP when measuring the institutional influence on private forest management (Zadnik, 2006 b). The problem is organized in a hierarchical structure around the concept of objectives (in our case SWOT groups: strengths, weaknesses, opportunities, threats), and attributes (in our case SWOT factors), within a two level hierarchy (Fig-

re 2). The first level is viewed as objective/group level. These groups are not directly measurable by themselves, but are presented by factors which are found at the second level. The factors define the effect of the SWOT group.

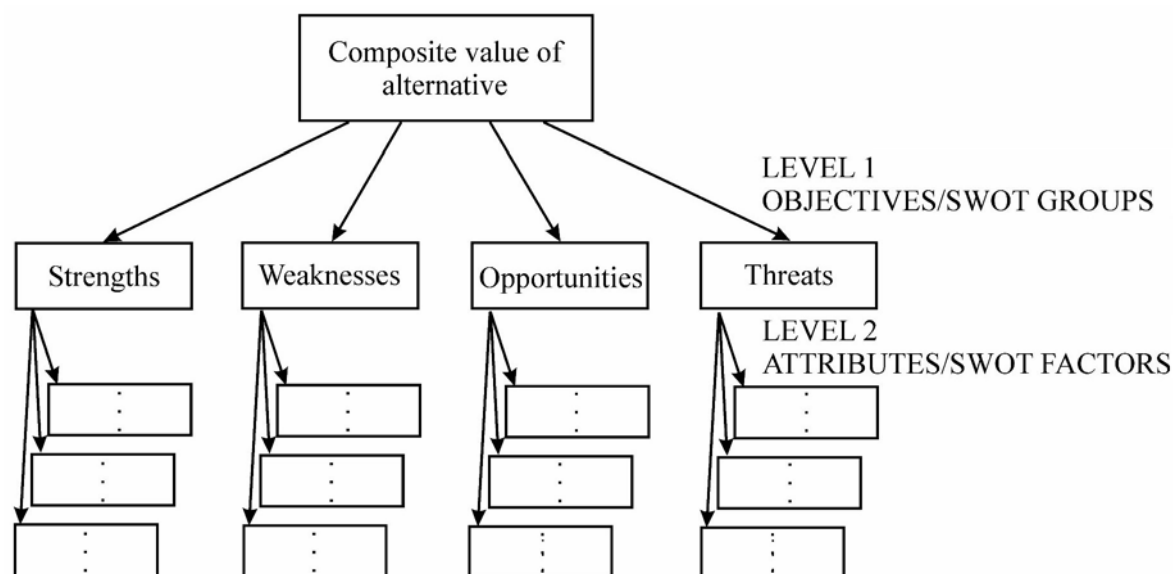


Figure 2: Factor's and group's hierarchy for composite value of institutions in SWOT (Zadnik, 2006 b)

3. Application 1: Assessment of factors which influence the forest owners in the Mirna Valley to join associations

Private forest owners of the Mirna Valley, Slovenia decided to join a forest owner association, aiming to improve competitiveness of the private forestry sector. But every new member wants to know which alternatives are important for his decision to join the association. A survey was carried out on the pattern of 40 members. With the information obtained from the interviewed members of the association, mutual comparisons were assessed and a pairwise comparison matrix was formed for each level of the decision tree. The data are found in Pezdevšek Malovrh, 2005 b).

The private forest owners were split into four groups according to the size of the estate and the alternatives, i.e., the reasons why private forest owners became members of the association: education, counseling, cooperation in elaboration of forest management plans, conclusion of timber sale contracts, joint purchase of machinery, equipment and literature are shown in a hierarchical way in Figure 3. The analysis which we made with the AHP method in the program Expert Choice (results are given in Figure 3) showed that for the private forest owners the most rewarding alternative regarding the criteria was education; counseling took second place, followed by cooperation in elaboration of forest management plans, then came conclusion of timber sale contracts, while joint purchase of machinery, equipment and literature were stated as the least important for the owner's decision to join the association.

When we compared the private forest owners by property size we discovered that there were only minor differences between them. The most important factor why owners became members of the association was education, since private

forest owners wish to improve their knowledge on safe work in the forest and on silviculture, and become acquainted with new technologies. The second factor that was important for all of the owners was receiving counseling about the timber market and being informed about the best contractors.

The difference between owners with regard to the size of the property was obvious with respect to the following two factors: cooperation in elaboration of forest management plans and conclusion of timber sale contracts. For small (1-5 ha) and for big (+25ha) forest owners cooperation in the elaboration of forest management plans was more important than for the other owners.

Concluding timber sale contracts was more important to all small proprietors than to the biggest ones (+25 ha). A joint purchase of machinery, equipment and literature was the least important for all proprietors regardless of the size of the property.

Further we made with the data of the same alternatives and owners, an evaluation analysis by the use of DEXi. The results (Figure 4) show that the most important alternatives for private forest owners are education and counseling, less important is conclusion of timber sale contracts and not important for the owners are cooperation in elaboration of forest management plans and a joint purchase of machinery, equipment and literature.

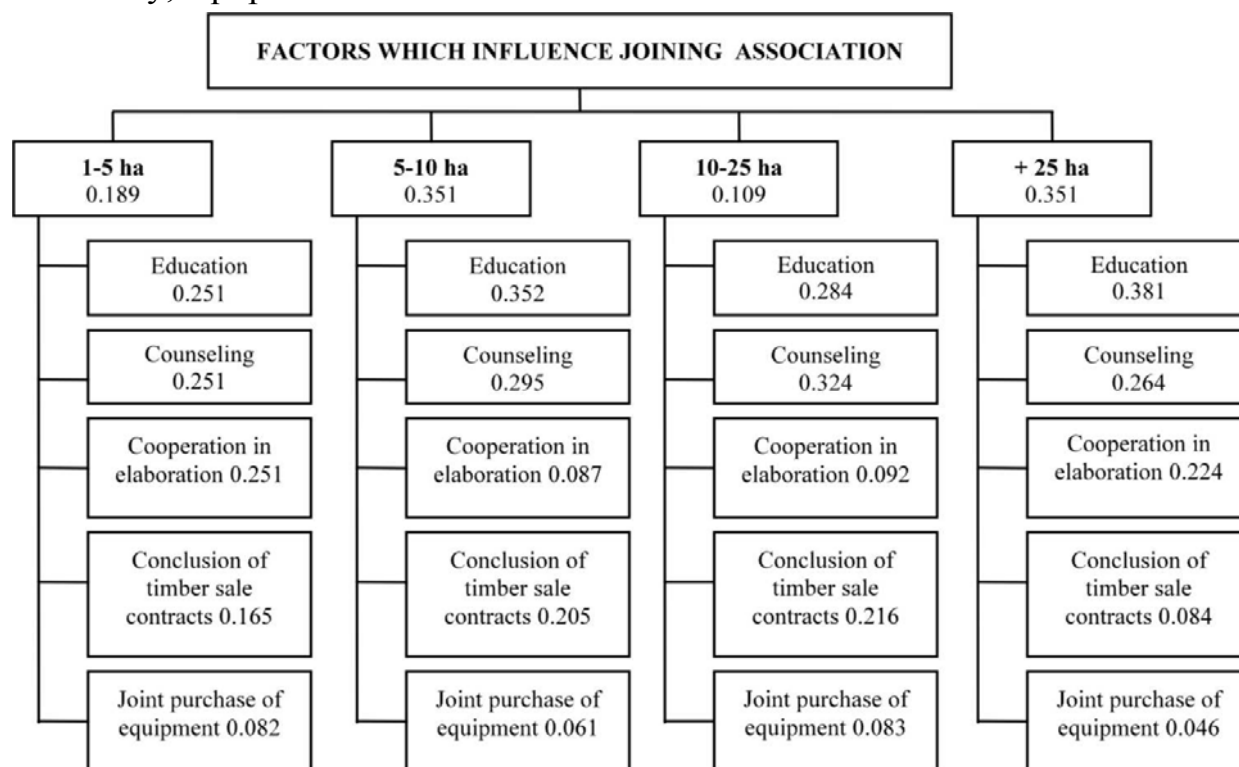


Figure 3: Results of evaluation with AHP (Pezdevšek Malovrh, 2005 b)

	1- 5 ha	5-10 ha	10-25 ha	+ 25 ha	Attributes	Result
Education	0.251	0.352	0.284	0.381	0.189	0.336
Counseling	0.251	0.295	0.324	0.264	0.351	0.279
Cooperation in elaboration	0.251	0.087	0.092	0.224	0.109	0.167
Conclusion of timber sale contracts	0.165	0.205	0.216	0.084	0.351	0.156
Joint purchase of equipment	0.082	0.061	0.083	0.046		0.062

	Education	Counseling	Cooperation in elaboration	Conclusion of timber sale contracts	Joint purchase of equipment
Factors	very important	very important	not important	less important	not important
1- 5 ha	less important	very important	not important	less important	not important
5-10 ha	very important	very important	not important	not important	not important
10-25 ha	less important	very important	not important	not important	not important
+ 25 ha	very important	less important	not important	very important	not important

Figure 4: Results of evaluation with DEXi (Pezdevšek Malovrh, 2005 b)

If we compare private forest owners with regard to property size we see that education and counseling are important for all owners. Conclusion of timber sale contracts is only important for owners with property sized 1-5 ha and for those with the largest property (+ 25 ha). For small proprietors the conclusion of timber sale contracts is important because they carry out tree felling in longer time intervals and thus have only scant information about the timber market. But this factor is also important for big proprietors (+ 25 ha) because they sell timber during the whole year and need to get a fair price during this whole period. Cooperation in elaboration of forest management plans and a joint purchase of machinery, equipment and literature are not important for private forest owners.

4. Application 2: Assessment of factors which influence the two institutions in Slovenia in supporting the private forest management

We investigate the influence of the Chamber of Agriculture and Forestry of Slovenia, and Slovenia Forest Service) on private forest management. Both institutions offer professional support to forest owners. The main goal of both organizations is to help and give advice to the owners. Most of the employees in these two organizations primary work with farmers (more than 200). Just some of them are specialized in forestry and give support to private forest owners regarding the sustainable and multiple-use forest management. The survey included all employees specialized in forestry.

Through the personal interview conducted with these employees and some other experts (Mihelič, 2007) we determined which SWOT (strength, weakness, opportunity and threat) factors are present in these organizations in relation to the private forest management. These factors are given in Figure 5 in the SWOT factor boxes.

In order to assess the SWOT factors by SWOT/AHP model the employees of the organizations skilled in forestry were asked to make their judgements via pairwise comparisons between four SWOT groups, and within SWOT factors, i.e., pairwise comparisons of seven factors of strengths, pairwise comparisons of six factors of weaknesses, pairwise comparisons of seven factors of opportunities, and pairwise comparisons of five factors of threats. The estimates from their pairwise comparisons are given in matrices (Mihelič, 2007). Here we show only the matrix of pairwise comparisons between four SWOT groups, where group strengths is assigned as S, weaknesses as W, opportunities as O, threats as T.

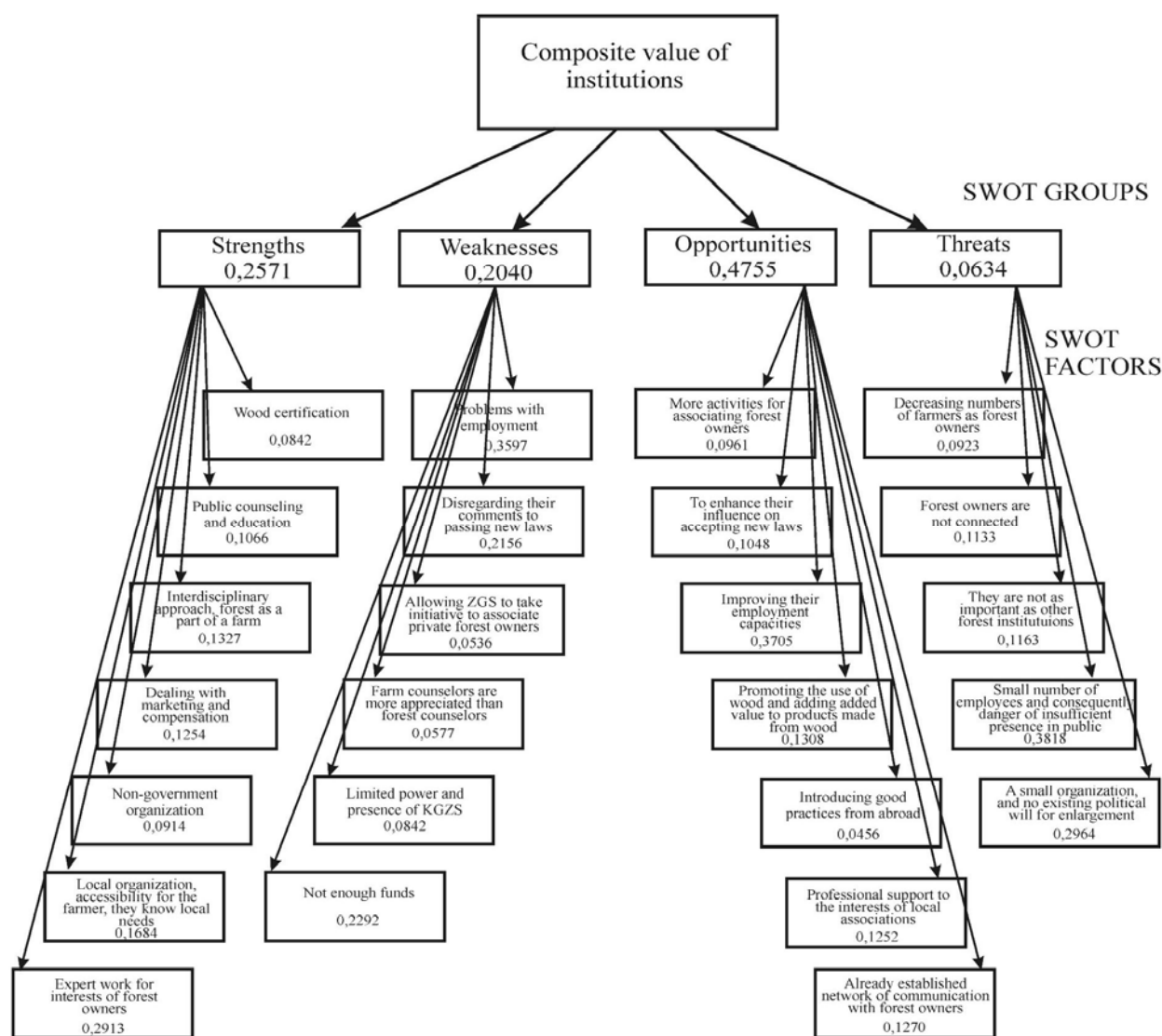


Figure 5: SWOT factors and SWOT groups with their relative importance obtained by AHP method

$$\begin{array}{c}
 S \\
 W \\
 O \\
 T
 \end{array}
 \begin{bmatrix}
 1 & 2 & 1/3 & 4 \\
 1/2 & 1 & 1/2 & 5 \\
 3 & 2 & 1 & 6 \\
 1/4 & 1/5 & 1/6 & 1
 \end{bmatrix}
 \rightarrow \dots \rightarrow
 \begin{bmatrix}
 0,2571 \\
 0,2040 \\
 0,4755 \\
 0,0634
 \end{bmatrix}$$

All other data and calculations are similar. Calculations were made by the use of Expert choice program. The results are gathered in the relevant boxes in Figure 5.

The most important strength for the organizations is expert work for forest owners, followed by local organization, which must be accessible to farmers. Here we have to emphasize that it is hard to distinguish between farmers and forest owners since farmers usually also have forests. Due to this fact, interdisciplinary approach, i.e. forest is a part of a farm, is also important, because forests are in these two organizations treated as an integral part of a farm. Important strength of the organizations is also wood certification, which was an important project running for several years and is now in its implementation phase. Many employees consider public counseling, especially in marketing and compensation important.

The main weakness is employment. There are not enough people employed in forestry sector in order to support the forest owners in forest management and to initiate forest owners associations. Employees of these two organizations also put a lot of energy in proposals of new laws, but their ideas are almost always overlooked, which causes considerable apathy and frustration among the employees. Because of a lack of funds forest counselors are not regarded as important as their farm counterparts. Because of the lack of employees everyone has to do everything. They help each other and thus, their work is not specialized. They work on everything from dealing with wood certification and education of forest owners to lobbying for new legislation.

Enhancing the influence on accepting new laws and increasing the number of employees are seen as very important opportunities. The organization considers the influence on legislation as an important assignment. They hope to expand their tasks and gain more money by taking an active role in policy making. The expansion of these organizations depends on new laws that give more weight on forest owners' associations. Thus, in the future the organizations are focused on activities for associating forest owners, on promotion of wood and on introducing good practices from abroad. Professional support to the interests of local associations is a task that is very important and also very demanding, as there is needed considerable communication with forest owners and a lot of paper work. In this sense, the already established network of communication with forest owners is an important factor.

The main threats to organizations are posed by the size of the organization. A very important threat to organizations is bad relations between forest owners and a decreasing number of farmers as forest owners. Forest owners are very weakly connected, some do not want to be connected, some have bad experience from the past and others just do not care about their forest. There is a prevalent opinion, that farmers are very good forest owners, because they are connected to the forest and can work in it with their existing equipment. The forest is also an important part of the farm, and farmers see it as a kind of a long-term investment.

4. Conclusions

The presented approach is new for this kind of social problems in private forest management. From the methodological point of view it encompasses a combination of SWOT analysis, analytic hierarchy process, DEXi and analysis of the surveys. These methods are of great assistance with almost all decision making problems. Some methods considered are rather old and simple, like SWOT analysis, but can provide us with insight into problems. When using SWOT analysis we are being forced to think creatively, to look at problems from different angles and to come up with creative and thought-out solutions to a specific problem.

Methods like AHP and DEXi give us the possibility to take problems, think about them, compare alternatives and together with other people try to determine, which of the given alternatives is best, most important, or most desired. Out of a large pool of data obtained in the interviews with decision makers, through calculations the optimal alternatives are determined. We must however emphasize that with mathematical modeling a lot of attention has to be given to content, analysis and critical evaluation of the criteria used.

Both AHP and DEXi use hierarchical decomposition for developing decision models. The structure of attributes is identical, but the methodologies use different techniques for describing the options and aggregating the values of input attributes into the final result. The AHP uses comparison matrices, while DEXi is based on decision rules that aggregate qualitative values. When comparing the results of evaluation, DEXi gives very comprehensible symbolic results, while AHP produces a numeric evaluation. So the DEXi method evaluates several factors with the same values, while AHP determines a unique value for every project. The results of evaluation with both methodologies were almost the same, excluding cooperation in elaboration of forest management plans. DEXi with its qualitative values is suitable for modeling problems that are by their nature qualitative and would be difficult to describe with numbers.

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РОЗВИТОК ІННОВАЦІЙНОГО ПІДПРИЄМНИЦТВА В УМОВАХ ТРАНСФОРМАЦІЙНОЇ ЕКОНОМІКИ

Досліджено особливості розвитку інноваційного підприємництва в контексті перебігу трансформаційних процесів в економіках країн ЄС, США та України. Аналізується система державної підтримки інноваційних підприємств, створення спеціалізованих програм розвитку та використання інкубаторних технологій.

Ключові слова: інновація, інноваційне підприємництво, науково-технічний інкубатор.

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The innovative business development in conditions of transitional economy

The characteristics of innovative entrepreneurship development in the context of transitional processes in the EU, USA and Ukraine economies are studied in the article. The state support system of innovative enterprises, the establishment of specialized development programmes and the usage of incubation technologies are also examined.

Keywords: innovation, innovative entrepreneurship, science and technology incubator.

Місце і значення малого підприємництва в трансформаційній економіці визначається тим, що це особливий сектор економіки, який становить основу дрібного виробництва, здійснює швидку окупність затрат і широку свободу ринкового вибору, визначає темпи економічного розвитку, структуру та якісну характеристику ВВП, забезпечує насиченість товарами, послугами та додатковими робочими місцями [5].

Розвиток малого та середнього підприємництва є необхідною умовою переходу всієї економіки на ринкові засади господарювання, ефективної реструктуризації виробництва та підприємств, розв'язання проблем зайнятості, зростання рівня життя населення. Без розвитку малого підприємництва неможливе формування середнього класу, тобто створення надійного фундаменту демократичного суспільства. Малий бізнес має найнижчі інвестиційні потреби, характеризується найшвидшим обігом капіталу. Світовий досвід показує, що він забезпечує у два-три рази більшу ефективність виробничих капіталовкладень і за обсягом коштів, і за терміном віддачі [7]. У рамках ринкової трансформації держава має основним завданням перехід на інноваційну модель розвитку з метою завершення структурної перебудови економіки і прискорення темпів її росту, досягнення високої конкурентоспроможності на світовому ринку шляхом збільшення частки експорту високотехнологічної продукції в його загальній структурі, поступове забезпечення необхідних темпів імпортозаміщення, розумного використання всіх ресурсів. Власне через це виникає необхідність активізації інноваційної діяльності в малому підприємстві, а також уточнення її економічної сутності. Тобто, в цьому ви-