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Assessment of non-wood-producing functions of the forest as forest services to the public

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ABSTRACT: One of the elementary conditions for a successful incorporation of forest ecosystems into the socio-economic system, which also enables to determine the effectiveness of expenditure on environment conservation, is to define their value with possible subsequent valuation. The issue closely relates to the actual assessment of forest services to the public with respect to the non-wood-producing functions of the forest. A methodology was worked out for the assessment of forest services to the public with respect to the non-wood-producing functions of the forest, which makes it possible to characterize the influence of these forest services in time in the framework of the assessed forest ecosystems. The methodology was verified by a study of some forest ecosystems in the time period of 1993–2003.

Keywords: forest ecosystem; natural resource; valuation

Forest ecosystems are among the most important constituents of the environment in the Czech Republic. Today, practically all full social forest services have a character of environmental forest services that are funded both from public sources and from the proper market wood-producing forest service that fulfils the non-wood-producing functions even in this respect.

It is primarily for the purposes of estimating the effectiveness of expenditure from public budgets when it is required to define the value of the significance of forest services to the public with respect to the fulfilment of non-wood-producing functions of the forest. Particularly important is to assess the expenditure on environment conservation that is an inseparable part of the public expenditure.

An assessment based on the valuation of forest functions can be considered as a convincing method for the assessment of the significance of forest services to the public with respect to the fulfilment of non-wood-producing functions. It is however necessary that a consistent distinction is made between the significance of the non-wood-producing functions of the forests for the society and the assessment of forest services to the public in the framework of management of these non-wood-producing forest functions (with the primary classification of the forest into two fundamental blocks – production and non-production ones – being left as natural and traditional classification).

The value expression of forest services is to define the level of utility from a certain object (definition of forest service change) due to the influence of concrete forest services. The definition of the utility level of forest services will not do without the assessment of non-market forest services (non-wood-producing functions of the forest – sometimes also included in the so called social functions of the forest) and possible subsequent valuation in monetary terms. It is to note that the value and price are social categories that are rather complex in terms of their contents.

An assessment of social functions of the forest is very complicated not only because the forest itself is rather a complicated object whose functions in the society are multiple but also because the required forest services constantly develop along with the development of the society – closely related to the economic and social standard of the society, its culture, traditions and customs.

A distinction should be made between ecological functions of the forest that exist *per se*, not directly bound to the needs of the society required (and expressible) at a certain moment, and environmental functions of the forest, actually demanded by the society. Environmental services defined in this way have a concrete socio-economic impact in the society that can be measured on the basis of the actual measure of their use in the society.

The chosen method of assessment can be applied for the purposes to express the value of the forest service significance in a differentiated way, at all times with a purpose concretely defined. This means that it is possible to characterize the influence of forest services on forest ecosystems with respect to actually demanded and

defined environmental functions or to understand the actual demand of the society as insufficiently expressed, not considering all benefits of the forest in the framework of the economy × environment interaction. In this case, the significance of forest services for the forest can also be expressed by means of so called aggregative economic value of the forest that expresses both the total use value and the non-use value (e.g. subsistence). It is exactly the non-consideration of the influence of all forest effects that leads to the existing underestimation of the value of forest resources. The resources are allocated practically a zero or a very low value. Although the goods and the services do not have clearly defined prices at the present time, financial consequences are sufficiently obvious. Also, the range of benefits issuing from the forest existence will show only on a regional, national or international level and cannot have easily determinable market prices.

From this aspect, the hitherto market and price signals about the forest value can be considered insufficient since they reflect neither the actual value of the resources nor the degree of their rarity, indirectly incorporated into their standing offer.

Due to the above reasons, the given purpose – i.e. the definition of the significance of forest services to the public with respect to the non-wood-producing functions of the forest prefers the concept of the aggregative economic value of the forest.

A method suitable to express the value of social functions of the forest is based on the assessment of the functional capacity of forests, ensuing from the research results of the national project funded by the Ministry of Environment of the Czech Republic *Quantification and quantitative assessment of social functions of Czech forests as a basis for their valuation* – responsible participant VYSKOT (1996–2003) and supported by the institutional research at the Faculty of Forestry and Wood Technology, Mendel University of Agriculture and Forestry in Brno.

According to VYSKOT, the fundamental outputs to value the social functions of the forest are as follows:

– values of actual potentials of the forest stand functions according to primary management groups and stand types (functional capacities of the stands in optimally feasible conditions),
– values of actual effects of the functions of determined forest stands (functional capacities of the stands in actual conditions).

MATERIAL AND METHODS

Basic methodological approach

The methodological approach is partly based on methodologies already published, which are applied in a new way and specifically focused on the given purpose.

A possibility of the assessment of forest services to the public with respect to the fulfilment of non-wood-producing functions appears to be an analogical derivation from the fee for the exemption of forest land fulfilling the forest functions since these fees are in fact a certain valuation of the non-wood-producing functions of the forest.

Using the logic of the legislatively defined formula for the calculation of a fee for the permanent exemption, the formula can be transformed into the following basic form:

$$MFLP = \frac{CE \,.\, (f1 \,.\, k_{SP1} + f2 \,.\, k_{SP2} + ... fx \,.\, k_{SPx}}{0.02} \text{ (CZK/ha)}$$

where: $MFLP$ – non-wood-producing functions of forest stands,
CE – monetary expression of the associated value degree in CZK,
$f1$ to fx – value expression of concrete social functions of the forest,
k_{SP1} to k_{SPx} – factor of social want for particular functions.

A necessary prerequisite for the calculation of the natural resource price (non-wood-producing functions of the forest) considered in this way is a hypothetical assumption of the constant character of the rent effect and the variable of discount rate in time including an assumption of the infinite time horizon. Constant rent effect in each of the forest functions ($f1$–fx) expressed as from r_{BP} to r_{ZN} is considered as the basis of calculation; annual rent effect for functions from bioproduction forest function to sanitary-hygienic forest function. Then it is possible to derive a decrease or increase in the non-wood-producing function of forest stands on the basis of changes in the concrete social functions of the forest. It is also possible to introduce some deductions or supplementary charges into the calculation. The resulting calculation needs to be modified (decreased) by the value of the wood-producing function. A method suitable for the purpose is for example that by ŠIŠÁK et al. (2002). Author suggests to use – with some simplification – mean annual receipts for the supplied wood (reduced by a possible financial loss) as an objective indicator of the socio-economic significance of the wood-producing function.

Differentiation of individual forest stands is proposed by ŠIŠÁK et al. (2002) to be made from the ratio of forest stand prices according to the groups of forest types and on the basis of the valuation decree in force.

Monetary expression of the associated value degree

The CE value (monetary expression of the associated value degree in CZK) offers itself to be used also for the assessment of non-wood-producing functions of the forest at an identical level of average price of timber at roadside landing, annually set up by the Ministry of Agriculture for the calculation of the fee for the exemption of forest stands. It is obvious, however, that the use of the average price of timber at roadside landing for the assessment of the non-wood-producing functions of the forest is considerably problematic.

The assumption of equal significance of forest functions, although not indicating the equality of their values, can be accepted as a plausible thesis. The only problem still consists in the valuation of the value degree. If we introduced the price of wood-producing function of the forest into the calculation, we have to realize that there is no coherence between the average price of timber at roadside landing and for example the hydric and water-management forest function. It is therefore obvious that the operation of individual functions in the society is different with respect to their socio-economic contents.

It is rather difficult to find a uniform fitting indicator with a plausible expression. Regarding the ecosystem functions of the forest, there is a possibility of using indicators such as carbon binding, recreation, biodiversity protection, water quality or amount. But the proposed financially expressed indicators would be not verified by the market notwithstanding the fact that their plausibility for the society would be relatively low. More details on the monetary expression of the value degree can be found in MATĚJÍČEK (2001).

A credible monetary expression of one value degree can be considered its determination by an expert method as a multidimensional value consisting of a number of constituents that assemble into a resulting value (separately for each function or for the combined/associated/effect).

The valuation of the associated effect for all social functions can be considered a method fitting for the given purpose.

Determination of the proper draft monetary expression of the value degree can be recommended on the basis of an expert analysis.

Proposal for the determination of the forest function social want factor

Functional capacities of forest stands can be obtained by determining the real potential and the real effect of particular forest ecosystems. However, the determination of the significance of a forest stand for the existing society, its socio-economic evaluation based on the requirement of people at a given place and at a given time needs to determine the weight of the concrete forest stands by using so called factor of social want of forest functions.

Important for determining the factor of social want of forest functions is that the forest and its functions are in principle renewable with possible changes being irreversible to a great extent. With respect to the lack of exact initial data, the factor should be based on a social consensus of the existing society. The introduction of the factor of social want into the calculation calls for a specification of the social valuation with respect to forest functions demanded by the society.

A plausible determination of the social want factor calls for a specification of individual forest functions and for an allocation of social want factors of its own to each of them.

A fitting determination of the factor of social want of forest functions is rather difficult with respect to its nature. Expert evaluation appears a realistic solution how to acquire the values of the social want factor for individual forest functions. Such an expert evaluation takes into account the level of current knowledge; important is the availability of information to individual experts. Resulting values of the factors can also be influenced by political negotiations.

With some advantage the proposal of the respective factors of social want of forest functions can be systematically bound to concrete forest regions and to Regional Plans of Forest Development.

Expert analysis

The function of experts and expert analyses is irreplaceable in the solution of problems in economic and social systems. Problems of expert-criterion choice are specific with their uniqueness and with their lack or absolute absence of objective quantitative information. Problems whose solution cannot be proposed and implemented by the decision-making entity itself and the solution of which calls for experts can be characterized as problems featuring complexity, shortage or absence of the objective quantitative information.

Problems defined like these include the determination of the significance of concrete forest ecosystems with respect to the importance of their non-wood-producing functions for the existing society. The use of expert estimates can be considered a workable solution in the absence of reliable information about the significance of individual forest functions. In the given example, the goal is to propose the monetary expression of the value degree and the factor of social want of forest functions – i.e. an expression of specific values (relative importance) of individual forest ecosystems for the contemporary society.

The involvement of experts is based on an assumption that such an expert is also a holder of a considerable amount of rationally processed information and an opinion crystallized within a group of experts can be considered as an opinion nearing a realistic solution of the problem (objectification of the subjective information). The term objectification needs to be understood conditionally – all objectifications conceived in this way are loaded with a certain measure of subjectivity.

According to KŘOVÁK and ZAMRAZILOVÁ (1989), any solution of this problem calls for a division into several stages: (1) identification of the issue, (2) measurement and calculation, (3) interpretation and decision-making, (4) implementation of the decision.

Regarding the fact that the values of characteristics cannot be determined objectively in the given case, the method of their allocation to the respective objects must be specified in advance. This means that with respect to the function of expert valuation of objects, the respective objects x_i must be allocated a value of the studied characteristics $f(x_i)$ so that the determined numerical relations between the values of the characteristics correspond with the studied empirical relations.

The *point method* is a method of subjective measurement, suitable to determine the factor of social want and leading to the determination of the relative importance of the characteristics. In this method, all objects $x_1 \in X_E$ are allocated a certain value $f(x_i)$ from a chosen point scale.

With respect to the complexity and ambiguous significance of the issue, methods suitable and commendable for the expert estimates are particularly iterative (multi-round) methods with the immediate personal interactions of experts.

The point method

The point method appears to be a method suitable for the conversion of purely qualitative characteristics to approximately quantitative ones. Experts allocate each variant a corresponding amount of points from the point scale. For better understanding the scale can be provided with additional descriptors that would verbally describe the significance of respective values on the scale.

If a chosen expert group p valuates the chosen forest function characteristics by using the point method (with an identical point scale), then the following relation will hold good according to KŘOVÁK and ZAMRAZILOVÁ (1989):

$$x_i = \Sigma\, k_j\, x_{ij} \qquad i = 1, 2, ..., n$$

where: k_j – coefficient of the competence of the j-th expert, $j = 1,2,....,p$, for which $\Sigma\, k_j = 1$,
x_{ij} – point valuation of the i-th variant by the j-th expert, $i = 1,2,.....,n$, $j = 1,2,.....,p$,
p – number of experts,
n – number of variants.

In this case, it is recommended that all experts be considered to have the same competence; then the form of the above formula will be that of an ordinary average of individual expert valuations:

Table 1. Real effects of social forest functions of the assessed stand parts expressed in relative numbers (reduced real potential – real potential of forest function after the use of function-reducing criteria and weights) as in 1993 (FMP of 1 January 1993)

Stand part	Real stand type (ST)	MGS	Reduced real potential of forest functions RP_{FL}						
			BP	ES	HV	ES	SR	ZH	Σ red. RP_{FL}
303A3	M5P9x	1	0.81	2.34	3	3	1.07	2.2	12.42
303A5	M5P9x	1	1.2	2.2	3	3.95	1.46	3.04	14.85
303A17	M5P9x	1	1.85	3.6	2.19	4.25	1.82	3.4	17.11
303B9	D6	31	5	2	0.95	3	2.82	5	18.77
303B17	D6	41	4.78	1.88	1.7	2.73	3	4.55	18.64
303C3	D6	31	2.02	1.17	1	1.8	1.60	2.75	10.35
303C6	M5P9x	1	1.14	3.16	2.82	3.65	1.52	2.92	15.21
303C17	D6	31	4.62	1.8	0.73	2.55	2.73	4.25	16.69
303D4	D5	21	1.32	1.34	3	1.95	1.71	2.4	11.72
303D8	D6	35	3.95	4	1	3	2.82	5	19.77
303D17	M5P9x	1	1.85	3.6	2.19	4.25	1.82	3.4	17.11
303F3	M1P8	29	1.62	1.76	1	1.8	2.14	2.75	11.06
304A5	D6	31	2.85	1.58	0.94	2.19	2.28	3.65	13.49
304A7	D6	31	3.8	2	1	3	2.91	5	17.71
304A10	D6	31	5	2	0.95	3	2.82	5	18.77
304A17	D6	31	4.78	1.88	0.85	2.73	3	4.55	17.70
304B9	D6	31	5	2	0.95	3	2.82	5	18.77
304D7	D6	31	3.95	2	1	3	2.82	5	17.77
305A3	D6	31	3.52	1.2	0.97	1.71	1.65	2.68	11.73
305A9	D6	31	5	2	0.95	3	2.82	5	18.77
305A17	M5P9x	1	1.79	3.6	1.95	3.95	1.7	3.16	16.15
306A11	D6	31	5	2	0.95	3	2.82	5	18.77
306A17	M5P9x	1	1.85	3.6	2.19	4.25	1.82	3.4	17.11
307A12	M5P9x	1	2	4	2.91	5	1.82	4	19.73
307B12	M5P9x	1	2	4	2.91	5	1.82	4	19.73
308A13	M5P9x	1	1.88	3.76	2.55	4.55	2	3.76	18.5

MGS – management groups of stands, BP – bioproduction forest function, ES – ecological-stabilization forest function; HV – hydric-water management forest function, ES – edaphic-soil conservation forest function, SR – social-recreational forest function, ZH – sanitary-hygienic forest function

$$x_i = \frac{\sum_{j=1}^{p} x_{ij}}{p}$$

where: $i = 1, 2, ..., n$

The above formula of ordinary average of individual expert valuations will be used to calculate the average point valuations.

An approach suitable for the purpose is so called participative approach. The main feature of participative approach is working in a group, which enables to influence opinions of individual participants. Individuals are made acquainted with the opinions of the others and can change their original standpoints under the influence of this new information. Therefore the approach is sometimes also called a transformation approach since the values expressed at the beginning of the process may markedly differ from those that are agreed on at the end of the conference. However, there is a risk of the resulting opinion being affected by dominant or more communicative persons to a greater extent. The smaller the group, the greater the risk. Problematic also remains the question of sample representativeness.

RESULTS AND DISCUSSION

The valuation was applied in a chosen locality in order to verify its suitability for the assessment of social forest functions on the basis of their real potentials and real effects.

The locality

With respect to the significant fulfilment of non-wood-producing functions of the forest the chosen locality was a part of the Josefovské údolí National Nature Reserve (NNR), situated in the Bílovice forest district within the forest complex managed by the Masaryk Forest Training Forest Enterprise in Křtiny. The locality is an important recreational zone.

Assessment of social forest functions on the basis of their real potentials and real effects

The following calculations of social forest functions (locality of the Josefovské údolí National Nature Reserve – NNR, Bílovice forest district) on the basis of their real potentials and real effects make a comparison of stand condition development in 1993 (forest management plan – FMP of 1 January 1993) and in 2003 (FMP of 1 January 2003) including the assessment of social forest functions on the basis of their real potentials and real effects in 2003 with a hypothetical consideration of the natural composition of woody species (calculations with a hypothetical consideration of natural species composition are presented only for some stand parts in which the percentage of existing site-corresponding tree species is below 50% and the representation of geographically non-autochthonous species is below 10%). The percentage of natural species composition and that of geographically non-autochthonous tree species are based on SIMON (2001).

The values of real effects of the social functions of monitored stand parts in relative numbers (reduced potential) in 1993 are presented in Table 1.

Evaluation of social forest functions on the basis of their real potentials and real effects in 2003 (FMP of 1 January 2003)

Table 2 presents some stand parts in the locality of Josefovské údolí NNR, Bílovice forest district, with:

Table 2. Real effects of social functions of the assessed stand parts in relative numbers (reduced real potential) as in 2003 (FMP of 1 January 2003)

Stand part	Real stand type (ST)	MGS	Reduced real potential of forest functions RP_{FL}						
			BP	ES	HV	ES	SR	ZH	Σ red. RP_{FL}
303Da9[1]	D6	35	5.00	4.00	0.95	3.00	2.82	5	20.77
303Fa4a[2]	D1P8	29	1.76	1.34	1.00	1.95	2.28	3	11.33
303Fa4b[2]	M1P8	29	1.76	2.01	1.00	1.95	2.28	3	12.00
307Ba13[3]	M5P9x	1	2.00	4.00	2.91	5.00	1.82	4	19.73

[1]Identified as 303D8 in the FMP of 1 January 1993, [2]identified as 303F3 in the FMP of 1 January 1993, [3]identified as 307B12 in the FMP of 1 January 1993

Table 3. Real effects of social functions of the assessed stand part in relative numbers (reduced real potential) as in 2003 (FMP of 1 January 2003)

Stand part	Real stand type (ST)	MGS	Reduced real potential of forest functions RP_{FL}						
			BP	ES	HV	ES	SR	ZH	Σ red. RP_{FL}
305Da1	M8P9x	29	0.94	2.96	1.2	0.56	0.35	0.57	6.58
*	–	–	0.06	0.08	0.2	0.06	0.05	0.04	0.49

*Reduced real potential before afforestation

Table 4. Real effects of social functions of the assessed stand parts in relative numbers (reduced real potential) as in 2003 (FMP of 1 January 2003)

Stand part	Real stand type (ST)	MGS	Reduced real potential of forest functions RP_{FL}						
			BP	ES	HV	ES	SR	ZH	Σ red. RP_{FL}
303D8	Z5Z6	35	4.00	5.00	1.90	3.0	2.82	4.0	20.72
303F3	M8P1	29	1.76	2.01	2.00	1.3	2.28	1.8	11.15
307B12	M5P9x	1	2.00	4.00	2.91	5.0	1.82	4.0	19.73

– less than 50% of the existing tree species composition corresponding to the site and the representation of geographically non-autochthonous woody species being less than 10%,
– pure stands or other stands whose species composition does not correspond to the site, or a mixture of woody species with 10–15% of geographically non-autochthonous species.

Table 3 presents the values of real effects of social forest functions for a newly arisen part of the stand in the locality of the envisaged National Nature Reserve Býčí skála, Bílovice forest district – afforestation of a former meadow in the floodplain of the Křtinský potok.

Evaluation of social forest functions on the basis of their real potentials and real effects in 2003 with a hypothetical consideration of the natural composition of woody species

Table 4 presents the chosen parts of stands in the locality of Josefovské údolí NNR, Bílovice forest district, with less than 50% of site-corresponding tree species composition and representation of geographically non-autochthonous woody species below 10%. However, the calculation is made with a hypothetically natural tree species composition (with other data being preserved).

CONCLUSION

The expression of the aggregative real potential of forest functions in the locality of Josefovské údolí NNR provides a true characteristic of the significance of forest ecosystems with respect to the importance of their functions. Useful is a possibility to monitor the stand development in time. A time period chosen for the given case was one decade.

In general, the aggregative real social potential of the studied stands is average (with an exception of stand part 303D8 – high potential). The local "factor of the topical social interest" is very high, though.

The stands in question generally reached high values of real functional effects (capacity of the actual stand to fulfil the real potential) already in 1993 with a certain exception being only young stand groups of age classes 3 and 4, little important in terms of their size, in which the real effects ranged from 40.5–100%. In stand groups more significant in terms of their size at a stage of high forest, the values of real functional effects ranged from 55–100%. The highest values of the potential fulfilment were achieved in the hydric-water management function (min. 73%), and on the other hand, the lowest values of the potential were recorded in the bioproduction forest function (min. 40.5%).

The valuation of social forest functions as in 2003 was calculated in some stand groups with respect to a possibility of expressing the changes in time, which included the hypothetical consideration of natural tree species composition in 2003. The calculation was made for the parts of stands with less than 50% of site-corresponding woods of the existing species composition and with the representation of geographically non-autochthonous woody species below 10%, or for the parts of stands with monocultures or other stands whose species composition does not correspond to site requirements or where the tree mixture exhibits less than 10–15% of geographically non-autochthonous species.

It follows from the results that the changes are recorded especially in younger stands in which the values of reduced real potentials of the functions are usually increasing. In the case of the hypothetical consideration of natural tree species composition we can see how a change in the species composition can change also the individual parameters of the real potential of the functions.

With the exception of stand group 307B12, the stands in question would be observed to have the increased real potentials in the ecological-stabilization forest function and in the hydric-water management function, with a certain decrease being observed in the sanitary-hygienic forest function.

A very high increase of real potential was recorded after the afforestation of the former meadow in the alluvium of the Křtinský potok – stand part 305 Da1 (included in the envisaged NNR Býčí skála).

After having applied the method in the chosen locality we can draw a conclusion that the expression of the aggregative real potential of forest functions is a useful way to specify the value expression of the significance of forest services to the public with respect to the fulfilment of non-wood-producing functions of the forest. The possibility to monitor the changes at a certain place and at a certain time will also facilitate to estimate the effectiveness of costs expended for environment conservation.

Although the application of the aggregative real potential of forest functions in the locality of Josefovské údolí NNR shows the suitability of its use as a tool to express the forest services to the public at a concrete place and at a concrete time, it is obvious that the given purpose would call for a complementation with the factor of social want

of forest functions and for a determination of the value degree.

The presented methodology will enable to provide acceptable results for the solution of problems related to the public concern with the development of useful forest functions and also for the support of sustainable forest management.

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Hodnocení mimoprodukčních funkcí lesa jako lesnických služeb pro veřejnost

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ABSTRAKT: Jednou ze základních podmínek úspěšného vtažení lesních ekosystémů do sociálně-ekonomického systému, umožňujícího rovněž stanovení efektivnosti výdajů na ochranu životního prostředí, je jejich hodnotové vyjádření s případným následným oceněním. Problematika je úzce spjata s reálným hodnocením lesnických služeb veřejnosti z hlediska mimoprodukčních funkcí lesa. K hodnocení lesnických služeb veřejnosti z hlediska mimoprodukčních funkcí lesa byla zpracována metodika, umožňující v čase zachytit vliv těchto lesnických služeb v rámci posuzovaných lesních ekosystémů. K ověření metodiky byly sledovány vymezené lesní ekosystémy v časovém období 1993–2003.

Klíčová slova: lesní ekosystém; přírodní zdroj; oceňování

Cílem příspěvku bylo navrhnout metodiku vhodnou k řešení dané problematiky a ověřit její použitelnost při aplikaci na zvolené lokalitě Národní přírodní rezervace (NPR) Josefovské údolí v časovém období 1993–2003.

Jako přesvědčivý způsob hodnocení významu lesnických služeb veřejnosti z hlediska plnění mimoprodukčních funkcí lze pokládat hodnocení na základě oceňování funkcí lesa. Je však nutné důsledně rozlišovat mezi významem mimoprodukčních funkcí lesů pro společnost a hodnocením lesnických služeb veřejnosti v rámci péče o tyto mimoprodukční funkce (základní členění lesa na dva základní bloky – produkční a mimoprodukční je ponecháno jako členění již zažité).

Vyjádření stupně užitku lesnických služeb se neobejde bez hodnocení netržních služeb lesa (mimoprodukčních funkcí, někdy také pojatých v rámci tzv. celospolečenských funkcí lesa) a případného následného ocenění v peněžní formě.

Vhodným způsobem pro vyjádření stupně užitku lesnických služeb je tuto veličinu získat na základě hodnocení funkčních schopností lesů vycházejícího z výsledků řešení státního projektu Ministerstva životního prostředí ČR *Kvantifikace a kvantitativní hodnocení celospolečenských funkcí lesů ČR jako podklad pro jejich oceňování* – odpovědný řešitel VYSKOT (1996–2003) s podporou institucionálního výzkumu Lesnické a dřevařské fakulty Mendelovy zemědělské a lesnické univerzity v Brně.

Stanovením reálného potenciálu a reálného efektu jednotlivých lesních ekosystémů obdržíme funkční

schopnosti porostů. Pro určení významu lesního porostu pro stávající společnost, jeho společenské sociálně-ekonomické hodnocení vycházející z potřeb člověka v daném místě a čase je však nezbytné určit váhu konkrétních lesních porostů tzv. faktorem společenské potřeby funkcí lesů.

Věrohodné určení faktoru společenské potřeby je zapotřebí specifikovat pro jednotlivé funkce lesů a přiřadit každé funkci její vlastní faktory společenské potřeby.

Pro věrohodné peněžní vyjádření jednoho hodnotového stupně lze pokládat jeho stanovení jako vícedimenzionální hodnotu tvořenou řadou složek, jež se sestaví do výsledné hodnoty (pro každou funkci zvlášť nebo za sdružený efekt). Vzhledem k danému účelu lze předpokládat jako vhodný způsob ocenění sdruženého efektu za všechny celospolečenské funkce.

Pro stanovení peněžního vyjádření hodnotového stupně a faktoru společenské potřeby funkcí lesů – vyjádření specifických hodnot (relativní důležitosti) jednotlivých lesních ekosystémů pro současnou společnost – lze za schůdné řešení pokládat využití expertních odhadů.

Nutným předpokladem pro následný výpočet ceny přírodního zdroje (mimoprodukčních funkcí lesa) je hypotetický předpoklad konstantnosti rentního efektu a veličiny diskontní míry v čase včetně předpokladu nekonečného časového horizontu. Pak lze na základě změn konkrétních celospolečenských funkcí lesa v čase a místě odvodit jejich pokles či vzestup.

Z hodnocení funkční schopnosti porostů vyplývá, že v souhrnu je celkový reálný celospolečenský potenciál sledovaných porostů průměrný (kromě porostní skupiny 303D8 – potenciál vysoký). Z hlediska místních podmínek však působí „faktor společenské potřeby“, který je ve sledovaném území velmi vysoký.

Předmětné porosty dosahovaly již k datu roku 1993 (tab. 1) vesměs vysokých hodnot úrovně reálných funkčních efektů (schopnosti aktuálního porostu plnit reálný potenciál). Určitou výjimkou byly pouze mladší porostní skupiny (plošně však málo významné) 3. a 4. věkového stupně, kde se reálné efekty pohybovaly v rozmezí hodnot 40,5–100 %. V plošně významnějších porostních skupinách ve stadiu kmenoviny se hodnoty úrovně reálných funkčních efektů pohybovaly mezi 55–100 %. Nejvyšších hodnot naplnění potenciálu bylo dosaženo v případě funkce hydricko-vodohospodářské (minimálně 73 %), naopak nejnižších hodnot potenciálu bylo dosaženo v případě funkce bioprodukční (minimálně 40,5 %).

Vzhledem k možnosti vyjádření změn v čase bylo vypočteno u vybraných porostních skupin hodnocení celospolečenských funkcí lesa k datu roku 2003 (tab. 2 a 3) včetně hypotetické úvahy přirozené druhové skladby k roku 2003 (tab. 4). K výpočtům byly zvoleny porostní skupiny, kde pouze méně než 50 % dřevin současné druhové skladby odpovídá stanovišti a zastoupení geograficky nepůvodních dřevin je menší než 10 %, event. porostní skupiny s monokulturou nebo jiné porosty, jejichž druhová skladba neodpovídá stanovišti, nebo je zde směs dřevin s podílem 10–50 % geograficky nepůvodních dřevin.

Z uvedených výsledků je zřejmé, že změny jsou patrné zejména u věkově mladších porostů, kdy většinou dochází k nárůstu hodnot redukovaných reálných potenciálů funkcí. V případě hypotetické úvahy přirozené druhové skladby je názorně vidět, jak lze změnou druhové skladby změnit i jednotlivé parametry reálného potenciálu funkcí.

Mimo porostní skupiny 307B12 by u dotčených porostů došlo zejména k nárůstu reálného potenciálu u funkcí ekologicko-stabilizační a hydricko-vodohospodářské, určitý pokles je však zřejmý především u funkce zdravotně-hygienické.

Velmi vysoký nárůst reálného potenciálu vznikl zalesněním zalesnění bývalé louky v údolní nivě Křtinského potoka – porostní skupina 305Da1 (součást navrhované NPR Býčí skála).

Na základě dosažených výsledků na zvoleném území lze konstatovat, že vyjádření celkového reálného potenciálu funkcí lesů je vhodnou cestou ke specifikaci hodnotového vyjádření významu lesnických služeb veřejnosti z hlediska plnění mimoprodukčních funkcí lesa. Právě umožnění změn v čase napomůže rovněž k posouzení efektivnosti nákladů vynaložených na ochranu životního prostředí.

Přestože tak aplikace celkového reálného potenciálu funkcí lesů na lokalitě NPR Josefovské údolí ukazuje vhodnost jejího použití jako nástroje k vyjádření lesnických služeb veřejnosti v konkrétním čase a místě, je zřejmé, že pro daný účel je nezbytné doplnění faktoru společenské potřeby funkcí lesů a stanovení hodnotového stupně.

Předložená metodika pak umožní poskytovat přijatelné výsledky při řešení problémů spojených s veřejným zájmem na rozvoji prospěšných funkcí lesa a rovněž k podpoře trvale udržitelného obhospodařování lesa.

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