Selected results of the survey focused on the economic assessment of forest ecosystem services

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ABSTRACT: A survey was conducted in the Training Forest Enterprise called Masaryk Forest in Křtiny (TFE Křtiny) in order to determine the extent of recreational use of the area, visitors' travel costs and their willingness to pay for services provided by the forest ecosystem of TFE Křtiny in the years 2013–2014. The aim of this paper is to evaluate the partial results of the research from 2013 and 2014 which was focused on the economic assessment of the recreational potential of the TFE MF Křtiny. The busiest roads in the forest road network and bike trails located in the Bílovice nad Svitavou forest district were selected. The results can be used to assess the impact of the forest enterprise on the economic and social development of the area, to measure the attractiveness, quality and facilities offered in the forest.

Keywords: forestry; questionnaire survey; recreational functions; methods of valuation

This paper evaluates partial results of a survey carried out in the Bílovice nad Svitavou forest district as part of a research project focused on the economic valuation of the recreational potential of the Training Forest Enterprise called Masaryk Forest in Křtiny (TFE Křtiny). The part of the research was focused on the willingness of visitors to the area to pay for the recreational use of forest hauling roads and bike trails located within a portion of the forest enterprise and an evaluation of the method used.

The aim of the paper is to compare partial results obtained by a questionnaire survey which took place in 2013 and 2014. The comparison of selected results focused on the willingness to pay (WTP) entrance fees to the TFE Křtiny, which was based on the contingent valuation method (CVM) and the travel cost method (TCM).

Ecosystem services are defined as direct and indirect benefits provided by ecosystems for the human well-being (Haines-Young, Potschin 2010, 2013; Teeb 2011).

The assessment of ecosystem services is the first step towards documenting changes in their nature and availability. In addition to the assessment of ecosystem services it is useful to be able to provide an economic quantification of these services (Busch et al. 2012). Requirements for the valuation of ecosystem services include the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions [European Commission (2013)].

The Training Forest Enterprise called Masaryk Forest in Křtiny is an organisational part of Mendel University in Brno and a special-purpose facility of its Faculty of Forestry and Wood Technology. The enterprise was founded in 1923. The total area is 10,495 ha. The forest cover is approximately 98%. The enterprise is divided into three forest districts – Vranov (3,345 ha of forest land), Habrůvka (4,006 ha of forest land), Bílovice nad Svitavou (2,920 ha of forest land, 3,640 ha of total land) (TFE 2014).

The forest district Bílovice nad Svitavou was chosen for research. This area is located near Brno, the second largest city in the Czech Republic. Forests of the Bílovice forest district are suburban forests and forest ecosystems mainly fulfil a recreational function.

According to the Common International Classification of Ecosystem Goods and Services (CICES) the recreational function can be classified as a cultural thematic category which includes all the non-material, and normally nonconsumptive, outputs of ecosystem that affect the physical and mental health of people (HAINES-YOUNG, POTSCHIN 2013).

MATERIAL AND METHODS

The method based on contingent valuation is used to measure the benefits of the area of interest. The contingent valuation method has been the focus of intensive study for several decades, resulting in a number of works describing theory and methods in relation to the valuation of natural resources, environmental amenities and public goods (see e.g. BATEMAN, WILLIS 2001; CHAMP et al. 2003; PEARCE et al. 2006; MAYOR et al. 2007; GARCIA et al. 2009).

The Travel Cost Method (TCM) is commonly used to estimate the consumer surplus associated with travelling to the recreational sites. This method is based on quantifying the environmental benefits of public goods or damage associated with the loss of these benefits that are derived from travel cost. The TCM is the oldest technique for measuring the willingness to pay for recreational benefits (e. g. CLAWSON 1959). Two models have been developed to take into account also the substitution (or complementary) relations between the sites and to quantify the environmental benefits which are assigned to a change in the quality of sites – Zonal Travel Cost Model (ZTCM) and Individual Travel Cost Model (ITCM). The total visitor costs associated with recreation include:
– the recreation fees in the territory,
– the transport costs which depend on the type of vehicle and transport distance from the place of residence,
– the time spent travelling,
– the length and frequency of visits.

For more details about TCM see e. g. FLEMING and COOK (2008); WILLIS and GARROD (2008); BREZOVSKÁ and HOLÉCY (2009). Further, for example GAROD and WILLIS (1999); ŠÁLKA et al. (2008); TRICE and WOOD (1986) provided comprehensive information about the methods used in economic valuation of the environment.

Table 1. Dates of questionnaire distribution

Month	2013	2014
July	15–21	14–20
August	12–18	11–17
September	16–22	15–21
October	14–20	13–19

The research project in the Bílovice nad Svitavou forest district to determine the willingness of visitors to pay for recreational use of the area was undertaken as part of the 2013 Development Project of the Faculty of Forestry and Wood Technology, Mendel University in Brno, implemented by Department of Forest and Forest Product Economics and Policy, Department of Landscape Management and Department of Geoinformation Technologies. Willingness to pay was ascertained using a survey performed with the help of four students of the Faculty of Forestry and Wood Technology, Mendel University in Brno, who distributed the questionnaires to visitors to the area and assisted recipients in filling them out. The survey took place at 4 locations. The monitoring by students took place one week from Monday to Sunday from 9 am to 5 pm from July to October 2013 and 2014. The busiest roads in the forest road network and bike trails located in the Bílovice nad Svitavou forest district were selected. Specifically, the following forest hauling roads were involved: Resslova (Red), Šumbera, Brněnka and the Bílovice – Obřany bike trail. Table 1. shows the survey dates.

To prepare the questionnaire, publications and case studies by foreign researchers were used (BATEMAN et al. 2002; PEYRON et al. 2002; CARSON, HANEMANN 2005; VERBIČ, SLABE-ERKER 2009). These sources agree that no universal research methodology to determine the willingness of respondents to pay for ecosystem services exists. Nevertheless according to CARSON and HANEMANN (2005), a survey of the willingness to pay for ecosystem services or goods should contain the following items:
– an introductory section that helps set the general context for the decision to be made,
– a detailed description of the service to be offered to the respondent,
– the institutional setting in which the service will be provided,
– the manner in which the service will be paid for,
– a method by which the survey elicits the respondent's preferences with respect to the service,
– debriefing questions why respondents answered certain questions the way that they did, and
– a set of questions regarding respondent characteristics including attitudes and demographic information.

According to BATEMAN et al. (2002), the questionnaire could include the following parts:
– purpose,
– attitudinal questions – seek the respondent's attitudes to general issues concerning the good or service,
– use of the good or service – determine what use the respondent makes of the good in order to test their familiarity with it and to distinguish users from non-users,
– the valuation scenario – this information makes up a scenario and it is this scenario that respondents will value (e. g. payment methods, value elicitation question, follow-up question),
– socio-economic characteristics.

Based on the above information and methodological instructions of the Organisation for Economic Co-operation and Development (OECD 2005) a questionnaire was drawn up which was used in the survey. The questionnaire reflected three parts of the research. The first part was focused on the socio-economic characteristics; the second one determined the recreational potential of the area. The third part was focused on the visitor's willingness. The questionnaire consisted of 22 questions. The introduction of the project and description of the main goal of the project are at the top of the first page. Gender specification follows. The first four questions are about socio-economic characteristics of respondents such as age, education, occupation and place of residence. The other nine questions deal with the use of the area of interest. How often visitors go there, what they do there, how to find the information about this place, which activities they do there, if there is a sufficient infrastructure there, etc. The next questions are based on the travel cost method. Four questions ask about respondents' journey – distance from the place of residence, type of transport, travel expenses and stay at the place. The next four questions are focused on the willingness to pay a fee to enter the area and how much they are willing to pay. The last question is for completion of the information. Respondents could write their own comments on the questionnaire.

Description, analysis, synthesis, comparison and elementary statistic method (correlation) were the methods applied in the present paper. The actual calculations and graphical representation of results were performed in MS Office Excel 2013.

RESULTS

Project outputs which include summaries and discussion about selected results of the survey focused on visitor willingness to pay for the recreational use of the Bílovice nad Svitavou forest district. The results are also represented graphically.

A total of 1,581 questionnaires in 2013 and 1,588 questionnaires in 2014 were distributed at 4 locations on the days indicated in the Material and Methodology section. Respondents did not always answer all questions. Broken down by sex, 44% of visitors were males and 56% females in 2013. Broken down by sex, 49% of visitors were males and 51% females in 2014. The most frequent category consisted of visitors at 26–39 years of age, who made up more than 36% of all respondents in 2013. The most frequent category consisted of visitors at 26–39 years of age in 2014, but in that year it was only 28% of all respondents. Fig. 1. indicates the number of questionnaires distributed in individual months.

In addition to the demonstrable correlation with weather conditions and summer holidays in July and August, the number of questionnaires filled out for individual months was influenced by the fact that the Bílovice forest district is a suburban forest area and, as such, visitors made repeated visits but filled out the questionnaire only once. This statement is documented in Fig. 2, which indicates the distance of the area from the respondents' place of residence.

The figure clearly shows that 65.4% (2013) and 48.9% (2014) of visitors live within 10 km of the area. This was also confirmed using the circle method, which classified visitors based upon their
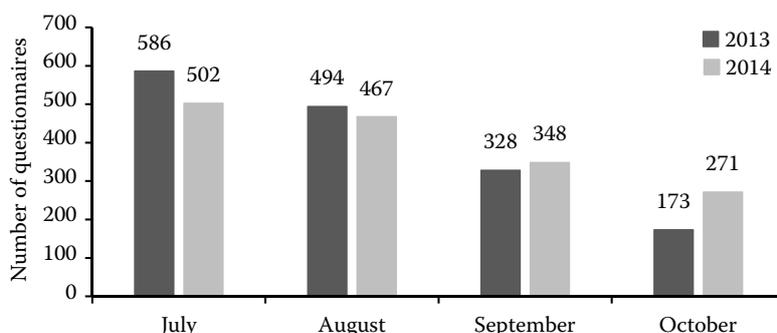

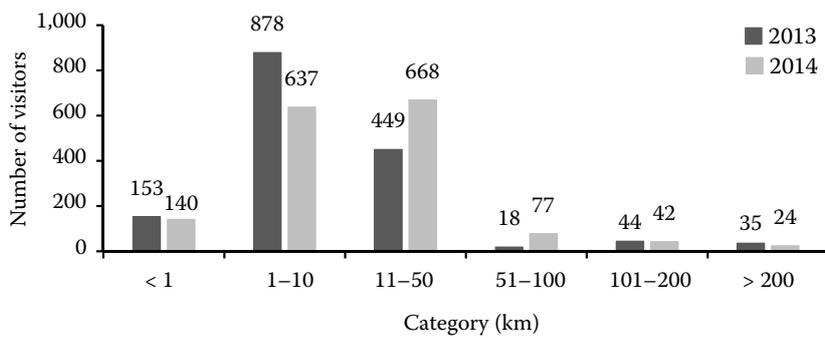Fig. 1. The number of questionnaires distributed to the forest district Bílovice nad Svitavou

Fig. 2. The distance from the place of visitor's residence

place of residence. Using this method, it was determined that almost 94% (2013) and 90% (2014) of visitors live within a 50 km radius of the area.

Fig. 3. shows a moderate correlation between visitors and transport distance to individual locations in the Bílovice forest district. The coefficient of determination is $R^2 = 0.4508$ and the correlation coefficient is $R = 0.6714$ for 2013. The coefficient of determination is $R^2 = 0.6946$ and the correlation coefficient is $R = 0.8334$ for 2014. The most attractive distance for visitors appears not to exceed 50 km from the place of residence.

The transport expense incurred by visitors is also dependent on the distance to the locality in the majority of cases. Travel costs were broken down into categories. The results are shown in Fig. 4.

The figure shows that 80% (2013) and 67% (2014) of visitors estimated their travel expenses for transportation to the area in question at less than CZK 50.
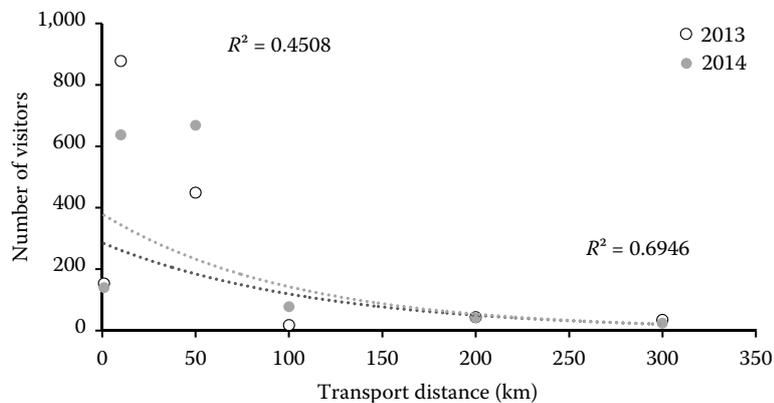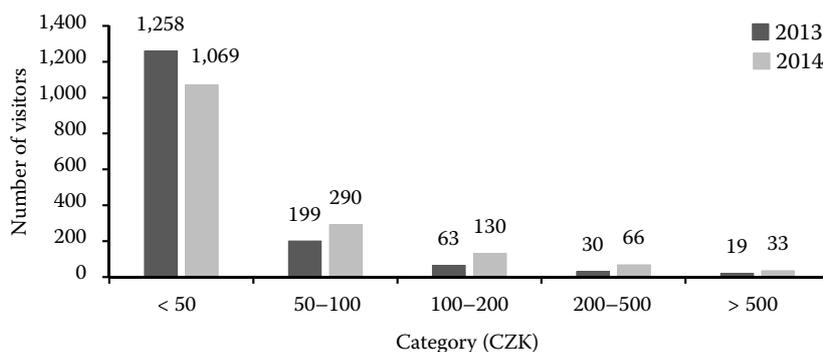
Fig. 5 shows a strong direct correlation between visitors and travel expenses to individual locations in the Bílovice forest district. The coefficient of determination is $R^2 = 0.9831$ and the correlation coefficient $R = 0.9915$ in 2013. The coefficient of determination is $R^2 = 0.9922$ and the correlation coefficient $R = 0.9961$ in 2014. It is clear that the travel expenses for 1,457 visitors in 2013 did not exceed CZK 100. Neither did the travel expenses in 2014 for 1,359 visitors exceed CZK 100.

Visitor willingness to pay for entry to the area and willingness to pay for recreational opportunities afforded by the forest ecosystems were also determined in the area. This portion of the questionnaire consisted of 4 questions. In the first question, respondents indicated whether they were willing to pay an entrance fee to a recreational area as a matter of principle. This first question formed the basis for the three subsequent questions. Only one-

Fig. 3. The dependence of visitors on the transport distance
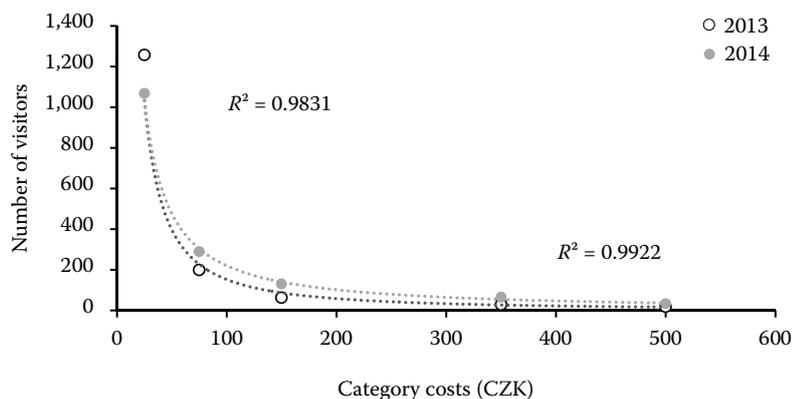

Fig. 4. Travel costs of visitors

Fig. 5. The dependence of visitors on travel costs

fourth of respondents expressed their willingness to pay an entrance fee to enter recreational areas.

Willingness to pay was related to income. For that reason, respondents were further asked about their gross monthly income. The responses show that the gross monthly income of almost two-thirds of visitors is CZK 20,000 or less for both the years 2013 and 2014.

The two subsequent questions concerned the amount of fee to be charged for using the area. Results of answers to the first question, which asked respondents what percentage of their travel expenditure they would be willing to pay for entrance into the area if user fees were introduced, are shown in Fig. 6.

Though the number of responses in the first category, indicating visitors would be unwilling to pay any share of their travel expenditure for entrance

to the area, does not correspond fully to the results for whether visitors are willing to pay for entrance to the area, the graph shows the clear unwillingness to pay an entrance fee.

The last of the series of questions focused on the willingness to pay for recreational opportunities provided by TFE asked respondents what percentage of their income tax they would be willing to allocate for improving the recreational potential of the area. Fig. 7 depicts the responses.

The graph in Fig. 7 for two-year research shows that even given the chance to decide how the income (profit) tax they pay into the public coffers out of their salaries is used, in 2013 43% were unwilling to allocate even 1% of the tax amount for these recreational opportunities. It was 46% in 2014. In general, it may be stated that respondents
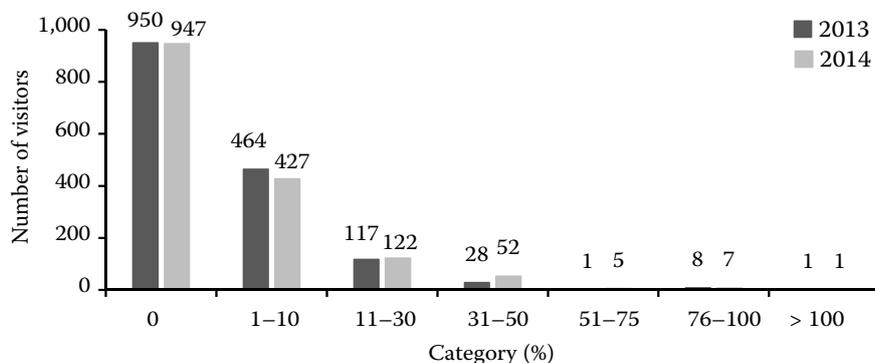

Fig. 6. A percentage share of travel costs the visitors are willing to pay for the entry into the area used for recreation
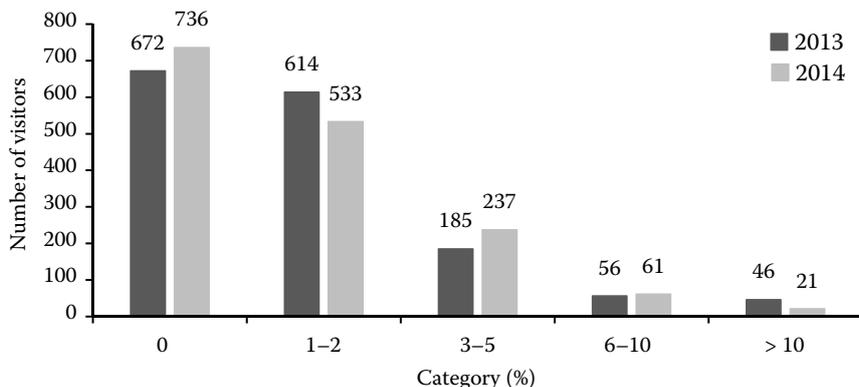

Fig. 7. A percentage share of the income tax the visitors are willing to allocate to improve the recreational function of the area of interest

would be willing to allocate a portion of their statutory levies for a specific area – in this case, to improve the recreational opportunities in the Training Forest Enterprise called Masaryk Forest in the Křtiny area.

DISCUSSION

Recreation is one of the numerous services provided by ecosystems (Zandersen, Tol 2009). The techniques used to estimate the value of recreational activities can be divided into two main groups, namely revealed preference and stated preference techniques. Revealed preference techniques rely on the analysis of observable behaviour and include the hedonic technique, the travel cost method and demand dependency. On the other hand, stated preference techniques are based on individuals' responses to surveys and questionnaires relating to hypothetical situations (Mayor et al. 2007). Choice experiments and contingent valuation are the two main stated preference valuation techniques – the travel cost model and contingent valuation. The survey carried out in the Training Forest Enterprise called Masaryk Forest in Křtiny employed both the travel expenditure method and the contingent method. The text includes only results of the contingent valuation of the recreational function of forest ecosystems based upon the willingness of respondents to pay for services for using hauling roads and bike trails in the Bílovice nad Svitavou forest district.

Willingness to pay is a measure used to assess the value that people place on goods and services and can be especially important when gauging public opinion on non-market items (Mitchell, Carson 1989).

A big problem for surveys focusing on the willingness to pay is a lack of trustworthiness of survey results, i.e. whether the respondents would actually pay the amount indicated (see e.g. Carson, Hanemann 2005). For this reason, the Bílovice forest district questionnaire did not determine an exact amount visitors would be willing to pay (as for example in studies of Rollins Dumitras 2005; Bartczak et al. 2008; Zandersen, Tol 2009), but instead used graded categories or percentage shares of income, or the willingness to contribute a particular share of the income tax payment.

The results of the survey of the Bílovice nad Svitavou forest district showed that visitors are not willing to pay for the recreational opportunities provided them by these areas. Researchers abroad focusing on the evaluation of ecosystem functions

via the contingent method have reached the same conclusion (Mayor et al. 2007). The main reason for this lies in the fact that the recreational function of forest ecosystems represents a public asset. Mayor et al. (2007), Carson and Hanemann (2005) also reached the same conclusion. In accordance with Act 289/1995 Coll. on the Forests and amending certain Acts (the Forest Act), as amended, everyone has the right to access forests and forest owners have no right to permanently prohibit access. For the reasons indicated above, the introduction of user fees for entry to the Training Forest Enterprise called Masaryk Forest in Křtiny would not be possible and would surely face resistance on the part of forest visitors and impact the area's use in a negative manner.

Despite the problems mentioned above, the results of this analysis can also have practical uses. According to Bateman et al. (2002) the results of the valuation based on willingness to pay can be used for example for demonstrating the economic value of environmental and cultural assets, cost-benefit analysis, setting priorities for environmental policy, design of economic instruments, green national accounting, and resource damage assessment. As Mayor et al. (2007) indicated, the determination of visitor willingness to pay for the use of forests could contribute to measuring the attractiveness, quality and facilities offered in forests and could represent an argument for obtaining contributions to forest management for forests primarily used for recreational purposes.

Because of problems which have been found with the use of contingent method for valuing the recreational function of forest ecosystems described in this paper, a hypothesis stated at the initiation of the Development Project was confirmed: that current science and valuation practice employ a number of methods to attach a monetary value to non-market forest functions, but all valuations primarily remain on the theoretical level. That is why the research group sought an alternative way to value the recreational potential of the area based upon relevant economic data. This means of valuation is based upon the quantification of Training Forest Enterprise called Masaryk Forest in Křtiny cash flow into the individual ecosystem services provided by the Bílovice nad Svitavou forest district. The methodological approach is based upon the multiplier effect and the so-called local multiplier may thus be the basis of the procedure (Březina et al. 2013; Hlaváčková, Šafařík 2013).

The paper was designed to confirm the above statements. The valuation methods recently used in

practice are very subjective. The results which confirmed that it was necessary to seek other methods for valuing environmental goods and services were chosen for this paper. Further results from research on the new approach to evaluating benefits from the forest enterprises to the local economy will be published in other articles. The design of the questionnaire used in research was realized according to the methodological instructions of OECD (2005) and further recommendations. One part of the questionnaire was focused on identifying the potential of the recreational area and the other part on willingness to pay. The economic data of the research were selected for this article. Most of the reviewed studies and publications did not report about numbers of questions asked in questionnaires (see e.g. FLEMING, COOK 2008; BREZOVSKÁ, HOLÉCY 2009).

The questions should be clear and precise, and if possible, with the selection of alternative answers (BURGESS 2001). Open-ended questions are preferred for the contingent valuation method (MITCHEL, CARSON 1989; GARCIA et al. 2009). The open-ended format is also preferable because it provides more information about individuals' preferences, in comparison with a dichotomous layout (MITCHEL, CARSON 1989). For comparison the approaches to the questionnaire designed see e.g. ARMBRECHT (2014). The questions and their scope have to be designed with the time constrains of the respondents (OECD 2005). Since the respondents conducted a standardized interview in the time of their recreational activities, it was not desirable to interview the respondents and exceed their available time. The questionnaire was therefore designed with the time possibility of respondents to interview them in a period not exceeding 30 minutes. Questions were formulated so that the number needed to cover those topics was as small as possible, as recommended by the OECD methodology.

CONCLUSIONS

This article represents a contribution to the research literature on the valuation of forest ecosystem services, above all providing a basis for placing an economic value on the actual cash flow from the recreational use of the area in question. The objective of the paper has been to evaluate the results of a portion of a questionnaire survey undertaken in the Bílovice nad Svitavou area from July to October of 2013 as part of work on the Development Project of the Faculty of Forestry and Wood Technology,

Mendel University in Brno. The research was done in the same period in 2014. In 2015, the research efforts will continue in the framework of the Internal Grant Agency project of the Faculty of Forestry and Wood Technology at Mendel University in Brno.

The methodological approach was based upon the contingent valuation method and travel cost method used to measure willingness to pay for services provided by ecosystems. Publications and case studies by foreign researchers served as a basis for the preparation of the questionnaire. The questionnaire consisted of 22 questions in total. The comparison of results between the two periods allowed evaluating the answers of respondents according to the set of questions for the contingent method and the travel cost method. Similar answers for both years were the most responded question categories. An exception was the question (the distance between the visited place and the residence place) focused on the travel dost method. The most frequently replied category was 1–10 km in 2013 and 11–50 km in 2014.

The research shows that in general the visitors to the Training Forest Enterprise called Masaryk Forest in Křtiny are not willing to pay for recreational use of forest hauling roads and bike trails. But given the choice they would be willing to target a portion of their statutory levies for the improvement of recreational opportunities offered by the Training Forest Enterprise called Masaryk Forest in Křtiny.

Data collected from questions based on the travel cost method and willingness to pay method can be used as a source of information for the calculation of local multiplier, which is a subject for further research in the territory of the Training Forest Enterprise called Masaryk Forest in Křtiny.

This methodology is based on the application of the Kahn-Keynesian multiplier, used to assess the socio-economic benefits of forestry for the local economy, and finds the cash flows from the TFE Křtiny for local residents and businesses. The research will allow quantifying how intensely and efficiently the area used for recreation contributes to the local economy of the region and contributes to its overall development.

Outputs will be useful in assessing the significance of forest enterprises for the local economy, quantification of forest functions and management of the Training Forest Enterprise called Masaryk Forest in Křtiny in decisions in support of the recreational use of forests.

The research is based on the requirements of strategic documents for increasing the benefit of forestry to rural development. These requirements are set out in international strategic documents

(Agenda 21) and national strategic documents (Local Agenda 21). It is a strategy and an action plan for the development of municipalities and regions linking economic and social aspects in the areas of environment in collaboration with the public.

From the perspective of the Czech Republic it is a requirement to increase the contribution of forests and forestry to rural development listed for example in Key Action 13 of the National Forestry Programme II (for more details see ÚHÚL 2015).

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