

ECONOMIC INSIGHT INTO FOREST ENTERPRISES IN THE CONTEXT OF REGIONAL DEVELOPMENT

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Abstract. Forest enterprises are a specific component of the state economy as their economic activity is bound to rural regions. Benefits of forest enterprises for a local economy are combination of social and economic benefits. The article presents the alternative approach to the quantification of the importance of forest enterprises for the regional development. The approach is based on identifying cash flows in the area of interest and benefits of forest enterprises and forestry for the local economy development in the Czech Republic.

Key words: economics, forestry, local multiplier, enterprises, region, Czech Republic.

Introduction

Relations between enterprises and regions are discussed in various regional theories (e.g. Armstrong, Taylor 2000). The most famous theory, which deals with benefits of enterprises for the local economy is the theory of localization. This theory is a part of the neoclassical economics theory. Von Thünen's theory of localization of agricultural activities from the year 1826 and Weber's classical theory of industrial localization from the year 1928 are considered as cornerstones for all the rest existing theories (Damborský, Wokoun 2010). Furthermore, the solution of the localization problem was extended for industrial enterprises (Lösch 1954) and there had been created various localization models (e.g. Hotelling 1929; Salop 1979), which are focused on different localization factors. North (1955) also dealt with localization theory and regional economic growth. The economic localization and its relation to the regional economy and politics was solved in the study of Armstrong and Taylor (2000), Sack (2002) and many others.

Localization is a process of place selection of specific socioeconomic activities. Every place has certain resources and on the other hand every activity is characterized by certain needs. The best localization of a given socioeconomic activity is done there where optimal resources are located (e.g. Shuman 2010).

Two basic questions are connected with localization (Maier, Todtling 2006): to what extent does localization of an enterprise have the impact on its economic result? and what is the influence of an enterprise on its surroundings? The paper deals particularly with the first question. In this case source is forest. The main localization factor is land. From a forestry-economic perspective, it is an important issue which creates benefits for the local economy because localization of individual enterprises is linked to forestry activities. Currently, the main benefits arise in field of recreational use of forests. The recreational forest function represents a direct utility value, thus it is derived from its direct usage. These activities can be commercial and their value is directly derived from the market value, alternatively it is possible to use administrative prices (Pearce 1993). However, in a majority of cases, these activities are not commercial, which makes their financial expression to be very problematic. Contemporary science has ample of explicit and implicit methods, by means of which forest function can be monetary expressed (e.g. Bateman 2011; Ninan, Inoue 2013). However, these methods represent only a theoretical basis and in most cases they cannot be used in practice.

In strive to fill the gap in practical framework for monetary evaluation of forestry functions, this paper contributes with alternative approach to the quantification of the importance of forest enterprises for the regional development and local economy based on evidence from the South Moravian part of the Czech Republic. The approach is based on identification of financial resources used for assuring of the recreational forest function of the interest area. Quantification will be structured upon data on fulfilling the recreational function of forest paths and the aesthetical forest function in the area of the Training Forest Enterprise “Masaryk Forest “Křtiny” (TFE Křtiny).

1. Material and methods

As an interest area was chosen the Training Forest Enterprise “Masaryk Forest “Křtiny” (here and after referred as “TFE Křtiny”). This enterprise is located near Brno, the second largest city in the Czech Republic (CR). Brno has about 400 thousand inhabitants. One third of the TFE Křtiny is located in the Protected Landscape Areas of Moravian Karst. The forests are sub-urban and widely used for recreation.

TFE Křtiny has the total area of 10,495 ha with forest cover of approximately 98%. The enterprise is divided into three forest districts – Vranov (3,345 ha of forest land), Habrůvka (7,006 ha of forest land) and Bílovice nad Svitavou (2,920 ha forest land). All three forest districts are situated at altitudes ranging from 210 to 575 m above sea level and feature a great variety of natural conditions. This area is covered mainly by mixed woods, with 46% coniferous and 54% deciduous tree species. There are about 116 forest types situated in 4 forest altitudinal vegetation zones (TFE 2016).

To determine the theoretical background a secondary research based on review of domestic and foreign studies was used. In the practical part there were used secondary data in combination with some primary data collected from the information system of the TFE Křtiny, specifically from synthetic and analytic accounts. The reference period covered the years 2013 to 2015. These data were necessary for determination of costs related to traffic at forest roads and costs related to forest aesthetics.

The recreational function was evaluated from the perspective of territory use by visitors. This function is mostly fulfilled by forest roads and cycle paths. The survey of the number of visitors of the TFE Křtiny territory focused, among others, on determining the number of people using the forest roads and cycle paths. For the purpose of this research there were chosen the busiest roads in the forest road network and cycle paths located in three forest districts. The research was conducted in 2015.

In the Czech Republic, the term “forest transportation network” is stated in the Czech national standard (CNS) 73 6108 and in Forest road network (FRN), and it represents transport facilities serving for connection of forest complexes with network of public communications, for transportation of wood, people and materials for different purposes of forest economy and other purposes, for example, recreational. FRN is divided according to importance and purposes into four basic classes characterized by several parameters – maximal longitudinal decline, presence of roadway or another transport pavement, width of traffic line and total width in crown. The basic classes of forest roads are completed by forest paths and trails. Table 1 lists characteristics of the forest road network according to CNS 73 6108.

Table 1. Forest road network in the Czech Republic

Type	Class	Operational capacity	Min. crown width (m)	Max. decline (%)	Surface type	Purpose and usage
Forest transport roads	1L	Permanent	4,0	10-12	Dust-free roads, bitumen, concrete, hardened	Year round operation of transport by vehicle according to ČSN 73 6108
	2L1	Seasonal to permanent	3,5	10-12	Simple road with dusty surface or transport pavement	Seasonal transport of wood for vehicle according to ČSN 73 6108
	2L2	Seasonal	3,0	8-10	On bearing subsoils, without transport pavement	Seasonal transport of wood
Approaching roads and links	3L	Seasonal	3,0	8-10	Ground, can be also partial transport pavement	Approaching by tractors, transport by forwarders
	4L		1,5		Ground without removing humus	Approaching by tractors, horse

Source: Klč 2009.

In the Czech Republic, the total lengths of 160 thousands of km of FRN is created by a basic frame of 46.8 thousands of km of forest transport roads, which are used during the year by the forestry of the CR for permanent or seasonal transportation of wood by vehicles (Klč 2009). Density of the forest road network at the area of the TFE Křtiny can be calculated from the forest economy plan (FEP) and it also has been investigated in several studies, especially in bachelor or diploma theses (e.g. Douda 2007). The density of the FRN (d) represents the relationship between the length of the roads (l) and the forest area (F) that gravitates towards them and is expressed in number of metres per hectare (e.g. Hayati et al. 2012; Beneš 1986):

$$d = \frac{l}{F} \quad (1)$$

For determination of density only forest roads on forest land have been taken into account. The suggested density of forest roads according to type of land was defined by Beneš (1986) or Hayati et al. 2012.

From the informational system of the TFE Křtiny, there were investigated costs for repair and maintenance of forest roads for winter and summer maintenance separately and further cost of recreational infrastructure and costs for aesthetics of forest. Maintenance and repairs of forest roads are defined in CNS 73 6108. For the purpose of comparison in the international scales the exchange rate CZK/EUR for the period of 2013 to 2015 is necessary. The average exchange rates are shown in Table 2.

Table 2. The exchange rates for years 2013, 2014 and 2015

CZK/EUR	2013	2014	2015
Exchange rate	25.974	27.533	27.283

Source: Czech Statistical Office 2016.

2. Results

The forest road network of the TFE Křtiny was primarily created in order to support the forest management. However, since forests are located close to the city of Brno, they currently fulfil particular recreational function being destination for many visitors on the daily basis. The recreational potential of the area is strong and it is necessary to adjust the overall recreational infrastructure to it. The high visit rate of forests of the TFE Křtiny can be supported by monitoring of visit rate, which was carried out in the year 2015 at five chosen localities in months from June to October. Table 3 presents characteristics of monitored forest roads.

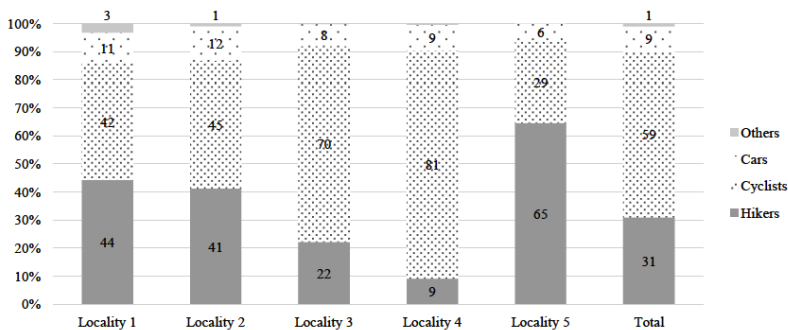
Table 3. Characteristics of monitored forest roads

Forest road	Road surface	Width of road (m)	Total number of visitors	Hourly average
Forest road 1	mineral aggregates	4	8,643	2
Forest road 2	mineral aggregates	4	19,295	5
Forest road 3	mineral aggregates	4	36,054	10
Forest road 4	macadam pavement	3	10,036	3
Forest road 5	mineral aggregates	4	14,784	4

The selected localities were visited by 88,812 visitors. The most frequented road is a forest road No. 3. It is primarily due to its morphology, distance from Brno, transport infrastructure, surface, and possible destination. The locality is closest to Brno, it is perfectly accessible by means of transport, because close to it there is also a train station and it has offers numerous parking services. The surface of this four meter road consists of threshing-floor. There is a bike trail, green touristic trail as well as nature trail. The most frequent group of users are cyclists, and the second one are hikers. Division of users in individual locations in the year 2015 is presented in Figure 1.

The category “others” includes horses, scooters, motorbikes, prams, in-line, wheelchairs etc. The user structure corresponds to the road type. However, there are differences among individual categories as it is shown in Figure 1. In three localities, that is, in localities No. 2, 3 and 4, cyclists prevail. In the case of the locality No. 4, cyclists are significantly prevailed. This is given by the fact that the important local bike trail passes through these localities. In the case of the locality No. 1, the ratio of hikers and cyclists is almost equal. However, in case of locality No. 5, hikers strongly prevail. There is a dense network of touristic trails for hikers in this part of the TFE Křtiny.

Figure 1. The structure of users of selected forest roads in 2015



The recreational load of the individual localities, that is, forest roads and cycle paths, leads to the increased expenses for repairs and maintenance of these trails, or other elements of the recreational infrastructure (i.e. benches, rest areas) and to the so-called forest aesthetic.

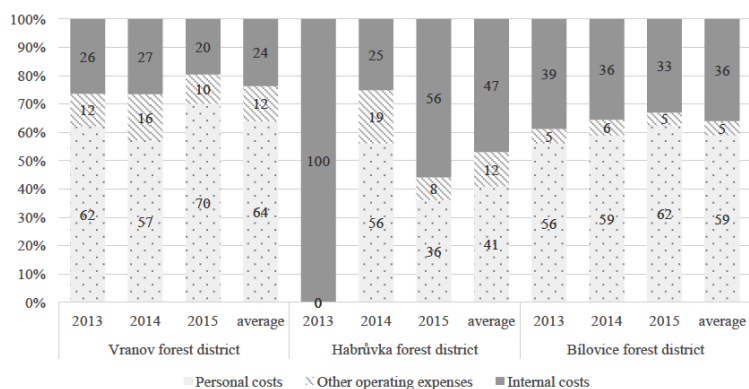
Costs on forest aesthetic in case of the TFE Křtiny include expenses for treatment of meadows and lookouts, the removal of branches from trees which extend into the trail, planting exotic trees and shrubs, running an arboretum etc. These expenses are recorded separately in the TFE Křtiny bookkeeping, and can thus be found directly. Unfortunately, these expenses cannot be assigned to the individual forest roads. Their structure in individual forest districts is shown in Table 4.

Table 4. Structure of forest aesthetic costs and revenues

Item	Vranov forest district			Habrůvka forest district			Bílovice forest district		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
Material consumption	0	1,500	0	0	0	0	0	0	0
Other services	0	0	0	0	0	475	0	0	0
Staff costs	62,646	61,784	103,028	0	51,859	28,251	87,957	105,475	79,312
Compulsory social insurance	20,325	20,448	33,683	0	16,895	9,236	28,504	34,364	25,784
Other operating expenses	15,460	23,174	20,052	0	23,107	8,408	10,688	13,152	7,588
Internal costs	35,171	38,189	38,244	33,209	30,785	58,023	80,642	84,492	55,557
Total costs	133,602	145,095	195,007	33,209	122,646	104,393	207,791	237,483	168,241
Revenues – operating subsidy	0	56,351	31,965	0	0	0	9,515	9,927	10,202

The overall costs have an increasing tendency only in the Vranov forest district, in case of other two forest districts, that is Habrůvka forest district and Bílovice forest district they are decreasing. Table 4 also shows revenue, which is represented by operating grants from operational programs of the European Union and regional grants. It is clear from the Table that this revenue is very low in comparison with costs and it does not cover costs incurred by the performance of forest aesthetics. The item material consumption and other services which include work by external firms are negligible items. Figure 2 presents the ratio of individual costs to the overall costs.

Figure 2. Cost items in the individual forest district of the TFE Křtiny



The largest cost item of aesthetics of forests is in the majority of forest regions created by personal costs, which include wages of employees, eventually rewards for work on agreement, which is carried out outside of permanent employment, and costs related to compulsory health and social insurance. The second largest item is the internal costs regarding the activities within the enterprise or services from other economic centres.

Aside from the forest aesthetic costs, which are a separate accounting item in the bookkeeping, the expenses for repairs and maintenance of forest trails also enter into the costs for ensuring the recreational functionality of forest ecosystems. Table 5 states the length and density of forest road network in the TFE Křtiny divided according to individual forest regions. Forest classes 1L and 2L were taken into account. Road class 2L contains classes 2L1 and 2L2.

Table 5. The density of the forest road network

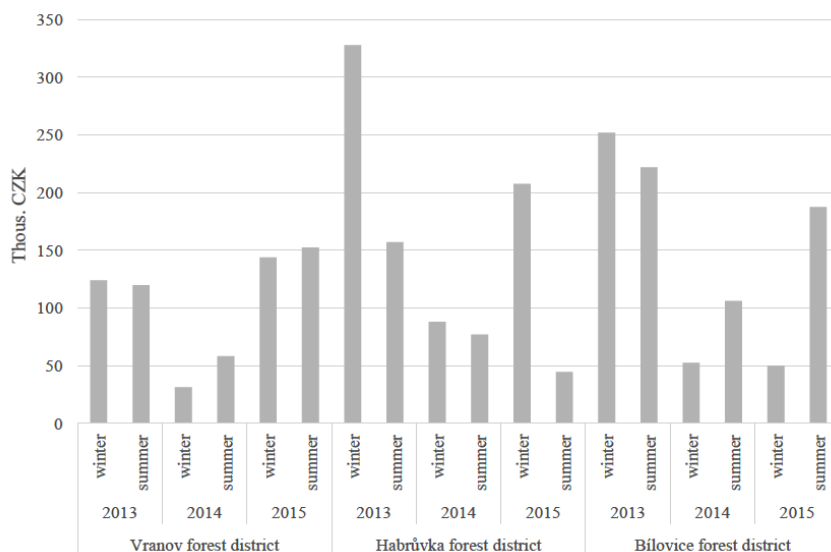
Road class	TFE Křtiny		Vranov forest district		Habrůvka forest district		Bilovice forest district	
	length (m)	density (m/ha)	length (m)	density (m/ha)	length (m)	density (m/ha)	length (m)	density (m/ha)
1L	105,375.7	10.4	34,712.9	10.7	47,074.9	11.4	23,588.0	13.5
2L	95,356.8	9.4	13,673.5	4.2	44,184.3	10.7	37,499.1	8.5
Total	200,732.6	19.8	48,386.3	14.9	91,259.2	22.1	61,087.1	22.0

Source: Douđa 2007.

According to the research of optimal accessibility of uplands carried out by Beneš (1986), the required density of transport roads moves in the range of 13.6-37.9 m/ha. The average density of transport roads should be 20 m/ha. On the basis of this research, Hayati et al. (2012) recommends the optimal density of transport roads for uplands to be 21.5 m/ha. The experimental area belongs

to category of uplands. The forest road density is 19.8 m per hectare and thus approaching to the optimum. To secure suitable local material for the repair and construction of forest roads, TFE Křtiny runs a quarry (TFE 2016). Forest roads maintenance can be divided into summer and winter maintenance, which are entered into the bookkeeping as a total for all forest roads; additional expenses for individual roads are further laid out, allowing for direct assignment to each road. The comparison of expenditures for winter and summer maintenance for individual forest district is presented in Figure 3.

Figure 3. The expenditures of the winter and summer maintenance of the TFE Křtiny



The TFE Křtiny spent approximately 1.2 mil. CZK for repairs and maintenance of forest roads in 2013. 59% of these expenditures were expenditures for winter maintenance, 41% were for summer maintenance. In the year 2014 there was spent only approximately 413 thousands CZK, 42% of which accounted for winter maintenance. In the year 2015 the enterprise spent 786 thousand CZK, and winter maintenance caused 51% of these expenditures. Figure 4 states the percentage ratio of individual expenditures for repair and maintenance of roads for years 2013 to 2015 cumulated for the TFE Křtiny.

Figure 4. The percentage of expenditures on maintenance of forest roads of the TFE Křtiny

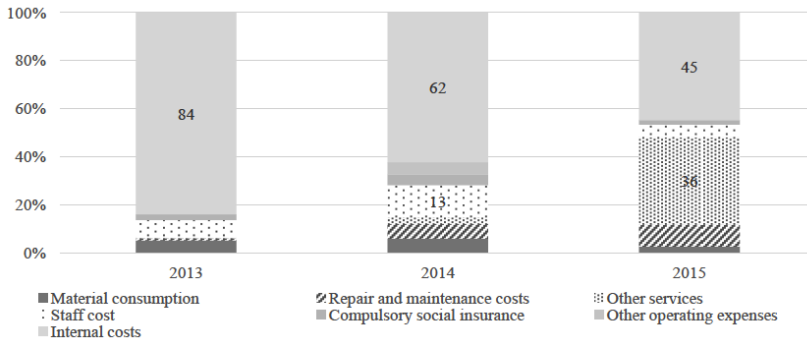


Figure 4 clearly shows the trend of costs in time. In the year 2013 the majority of repairs and maintenance (approx. 84%) was provided by own resources, the second biggest item was the costs for employees. In the year 2014 and subsequently in 2015, the enterprise started to use external suppliers for this activity, which caused increase of costs for other services by 98% in 2015 in comparison to 2013.

4. Discussion

Currently, the survival of enterprises depends not only on the economic performance but also it is necessary to demonstrate a positive attitude of enterprises to various stakeholders who are affected by the activities of the enterprise. In other words, enterprises are facing increasing pressure from their environment to act in a socially responsible way (Bučiūniene, Kazlauskaitė 2012).

The changes in the social and economic area in the late 1990s have led to a greater appreciation for natural beauty and living in the nature. Today, however, the consumerist society allows welfare due to which people can visit nature as they please. The direct everyday experience of nature has disappeared; however, so has the thinking of nature in terms of its benefits – a tree is no longer just wood for fuel, but also an aesthetic object (Stibral 2005). In addition, the understanding of forest roads has changed. Nowadays, forest roads serve, aside from activities related to growing wood, lumbering, and transportation of wood, also for a variety of other purposes, such as recreational ones (e.g. Forman et al. 2003).

In the CR business entities in forest management more likely concentrate on larger units, but there are also numerous business entities of local significance, the activities of which can markedly contribute to the development of the region. The TFE Křtiny is one of the enterprises that were selected as the case study analysis. This enterprise brings many benefits to the region as well

as to the local economy. One of them is also fulfilment of the recreational forest function, which is the most socioeconomic function of forests here. The reason is that forest lands are located close to the second largest city in the Czech Republic – Brno. By ensuring the ability to use the forests for recreational purposes, TFE Křtiny contributes to the development of the region from the economic and social perspective.

The recreational use of the area brings also the impact on the forest economy in this area. The increasing importance of recreation has the impact on all activities of the forest enterprise. Apart from benefits in the form of development of the region, the recreational function results in higher costs for forest managers especially due to usage of forest roads and fulfilling the aesthetical forest function.

According to Chan et al. (2012), recreation function concretely provides many important benefits and contributions to physical and psychological well-being. Forest aesthetic values are linked directly to how we as humans perceive the forests. This agrees with the theories and research on environmental psychology (White et al. 2010; Buchecker, Degenhart 2015, etc.). The importance of the forest aesthetics can be illustrated by the publication of the German forester and politician, Heinrich von Salish (1902).

The Training Forest Enterprise Masaryk Forest Křtiny is developing the aesthetic functions of forests, particularly through maintaining lookouts into the surrounding areas, tending to forest meadows, planting exotic trees and shrubs, building forest wells, monuments, memorial plaques etc. (TFE 2016). The enterprise understands, that the recreational use is tied to the use of forest roads and trails, which must thus fulfil certain qualitative and quantitative requirements of the users; therefore, resources are being expended yearly to provide repairs, maintenance and innovation to the forest trails.

To understand recreational requirements we need the detailed information about area usage and the preferences of different target groups (Chiesura 2004). Monitoring and analysing the flows of visitor in areas provides a clue to understanding visitor behaviour which, in turn, is needed for effective management of these areas (Mckercher Lau 2008; Muhar et al. 2002). The visit rate in the interest area was monitored on the most important forest roads. Monitoring of the visit rate proved high recreational load on forest roads in the area of the TFE Křtiny.

The current increased requirements for forest roads and trails used for recreational purposes are documented by a number of studies. For instance, Dvorščák (2004) states, that the population's requirements for recreation in the forest environment grow, since a stay in the forest environment in their free time has become an indispensable component of people's lives, and forest roads and pathways allow daily recreation and relaxation in the forest landscape. Hay

(1998) notes that good quality of forest roads can significantly increase the recreational potential of a region. Quality forest roads allow easier walking and cycling in previously inaccessible parts of the forest and facilitate the implementation of gamekeeper measures (Hay 1998). In the territory of the TFE Křtiny, the users utilize roads from categories No. 1 and No. 2L for recreation, as these are regularly maintained, equipped with aesthetic elements and recreational infrastructure.

Benefits of forest enterprises for a local economy are combination of social and economic benefits. The major effects of roads on local economies, however, would be expected to result from the economic activity those roads support by providing access to the national forest and to communities in or near it. That activity includes logging, silvicultural operations, and recreation, among others.

Conclusions

Forests as a part of the human environment represent areas used for recreational activities of a great number of people. Forest communications (especially forest roads) are necessary for the management of the forests but nowadays they are increasingly used for recreational purposes. There exist many methods, which try to evaluate the recreational forest function of ecosystems, however, the majority of them are based only on a theory and it is not possible to use the importance of the enterprise for development of the region. The paper brings the bases for the support and assessment of the benefits of forest enterprises for local economy and regional development. There is an effort to find an alternative approach, which would enable quantification of benefits of a forest enterprise for a local economy.

The presented research is based upon a case study carried out in the area of the Training Forest Enterprise Masaryk Forest Křtiny and investigating the extent of the impact of the enterprise localization on economic results, specifically what expenditures are connected with it. The area of the TFE Křtiny is a very attractive place thanks to its location and facilities. However, fulfilment of the recreational and aesthetical function brings the enterprise increased costs for their assurance.

The paper suggests a possibility of new methodological approach to evaluation of benefits of a forest enterprise for a local economy. The approach is based on identifying the cash flows in the area of interest and benefits of forest, enterprises and forestry for the local economy development. The paper brings a possibility for further research in the given area. For example, if the visit rate was monitored for several years and as well as costs for the recreational and aesthetical function, it would be possible to find out dependency of the visit rate on costs for repairs and maintenance of forest roads and the ratio of costs for this function by the regression analysis and historical data from the accounting system.

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