THE ECONOMIC AND ECOLOGICAL ADVANTAGES OBTAINED BY DIMINISHING THE DISTANCE OF THE WOOD COLLECTION. CASE STUDY

Timofte Adrian Ioan*, Timofte Claudia Simona**

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: adi_timofte@yahoo.com
**University of Oradea, Faculty of Law and Jurisprudence, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: clau_timofte@yahoo.com

Abstract

This paper presents some aspects in the case of the exploitation of the wood at large collection distances and compares labor, fuel costs and total operating costs in various situations given the accessibility of these parquet. As a case study, a difficult felling area was chosen because of the high degree of accessibility in which a progressive cutting is executed for high-volume trees. Collecting wood for the harvested operation would be a way to reduce the damage, to the detriment of the harvester by the winch, and in the paper the cost of collecting work and fuel was compared, as well as the total costs, depending on the degree of possible accessibility.

Key words: average distance, forest road, tractor road, cost of works, accessibility, costs, damages

INTRODUCTION

In Romania, the density of forest roads is well below the European average (about 6m/ha versus 28-32 forest road meters per hectare of forest). The same is true of plots and sub-plots, where collection routes are insufficient.

Wood exploitation must respect the four basic principles: environmental protection, forestry requirements (interaction between forestry and exploitation), economic efficiency and optimal use of wood. In terms of economic efficiency, there are situations when, at the moment, the exploiter does not get profit. To reduce operating costs, you need to analyze the factors involved in the exploitation process. One of the direct, technical-economic factors is the average collection distance. This can only be reduced by reducing the accessibility (from 5 to 1), or by building a road (permanent road), so that the primary platform is directly closer to the parquet. If the longitudinal slope (i_l) of the collecting road (tractor road) allows the construction of a secondary forest road (i_l <12%) on the same site the gain is very high: the collection distances for all existing or future parks in the area, and the cost of installing the new section is approx. 45% lower than if a new forest road sector were to be built. (***, 1999). This paper does not refer to the costs of fitting the forestry road to the tractor road. The costs and requirements for tractor road fitting are well-defined by the

teachers Ciubotaru (1998), Oprea and Sbera (2004). An analysis of the influence of the degree of accessibility according to the average tree volume (for tending operations) was made in the paper "The Influence of the Accessibility Grade upon the Technical-Economical Estimates for the Wood Exploitation" (Timofte, 2016).

MATERIAL AND METHOD

With the help of a programme realized in Microsoft Excel a simulation was made for the felling area no. 268, inventoried in 2016 and proposed for exploitation this year; the felling area is part of Aleşd Forest District, Bihor Forest Administration. This tree was chosen because it is at the last cutting, it is very far away from the forest road and it can be noticed the economic advantages that would have been achieved if the forest road was set up several decades ago, even before the first tending operations. The simulation shows the influence of forest roads and the reduction of collection distances on labor costs and fuels, as well as the profitability of mining operations in case of large collection distances.

In order to highlight this, the concrete way to reduce labor and fuel costs is to reduce the operation of tractors to collect wood.

General memory: the surface of felling area: 3.17 ha; average tree volume: 2.79 per beech, 2.00 per oak; age of the tree: 140 years; slope: 20^{o}; operating method: tree length system.

The structure of the wood to be exploited is given in Table 1.

Table 1

Structure of the wood for the felling area 268

No. crt.	Specifications	Unit	Group of species deciduous
1	Gross volume with bark	cm	751
2	The bark of the working wood	cm	33
3	Gross volume without bark	cm	718
	a - thick wood thing	cm	553
	b - thin wood	cm	10
	c - fire wood d >5 cm	cm	116
	d - tree branches d < 5 cm	cm	39
4	Gross volume per ha.	cm	237
5	No. of trees - total	-	348
	- per ha.	-	109.78
6	Average tree volume	cm/tree	2.16
7	Technological consumption and losses	%	2
		cm	15
8	Gross volume with bark for production	cm	736

In this tree is the last progressive cuts, the seed is installed on 95.6% of the surface. The maximum exploitation time is 4 months, being a restricted felling area (***, Order 1540/2011). The map for the felling area is shown in Figure 1.

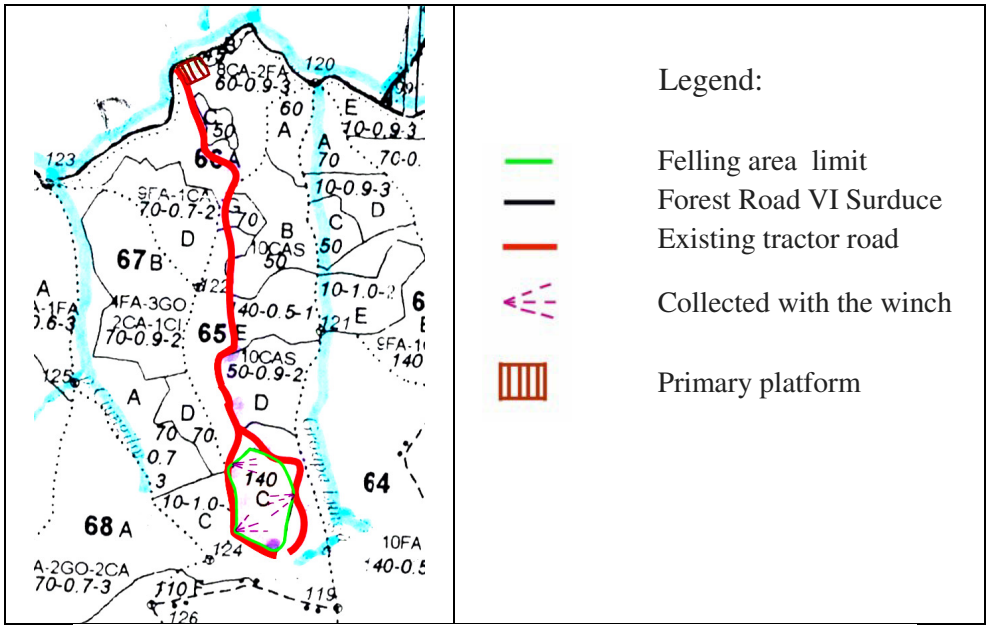


Fig. 1. The felling area map and exploitation solution (source: www.rosilva.ro)

On the basis of the time norms used in the exploitation of forests (Ciubotaru, 1996), the costs of the winch operation (solution no 2), the tractor collection, as well as the total expenses for the situation where the distance would be reduced average collection by making a secondary forest road.

Table 2

Labor costs, by degrees of accessibility

The grade of accessibility	The average collecting distance d_m, in m	Labor costs, in lei/cm		
		Hauling with forest tractor	Wood collecting	Total
5	1600	5.90	9.12	32.06
4	1250	4.89	8.11	30.70
3	750	3.67	6.88	29.04
2	375	2.79	6.01	27.85
1	125	2.26	5.48	27.14
	0*	0.00	3.22	24.07

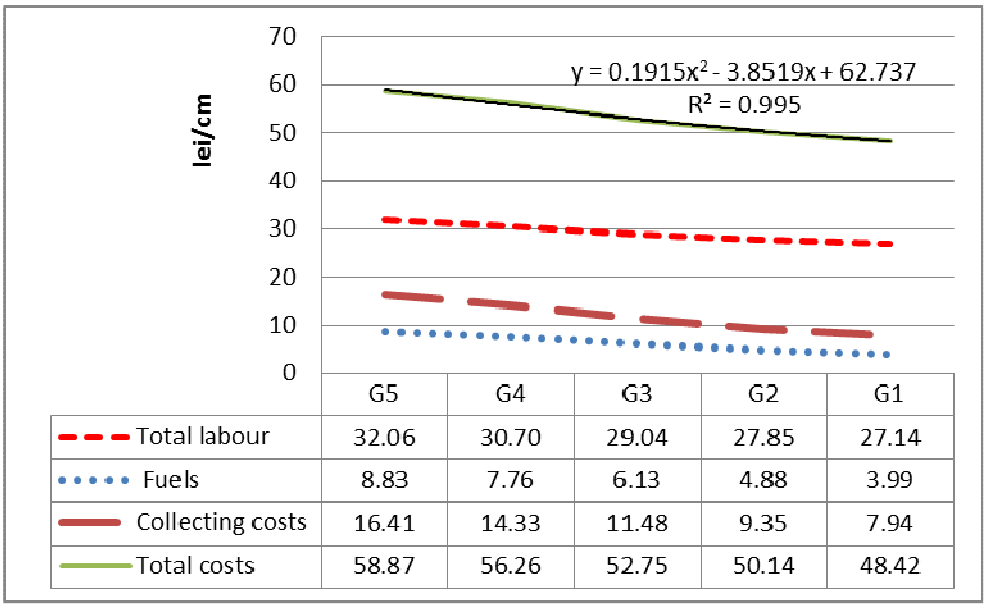
*an average distance of 0 would be achieved when the forest road reaches the felling area

Table 3

Expenditure needed for fuels and lubricants, by degrees of accessibility

The grade of accessibility	Costs of fuels and lubricants, in lei/cm		
	Hauling with forest tractor	Wood collecting	Total
5	5.87	7.30	8.83
4	4.79	6.22	7.76
3	3.17	4.60	6.13
2	1.92	3.35	4.88
1	1.04	2.46	3.99
	0.00	1.42	2.96

Figure 2 shows the decrease of the exploitation costs by degrees of accessibility.



	G5	G4	G3	G2	G1
Total labour	32.06	30.70	29.04	27.85	27.14
Fuels	8.83	7.76	6.13	4.88	3.99
Collecting costs	16.41	14.33	11.48	9.35	7.94
Total costs	58.87	56.26	52.75	50.14	48.42

Fig. 2. Representation of the unit tariffs regarding the exploitation costs, by degrees of accessibility (G1-G5)

Drawing up the exploitation estimate for the wood-based solution with horses (solution No. 2) and, of course, changing the exploitation method from 'tree length system' to 'short wood system' resulted in the following values for the 5th degree of accessibility (Fig. 3).

For accessibility grades 1-4, in the case of the forestry road, for wood collection with horses and hauling with forest tractor are shown in Table 4.

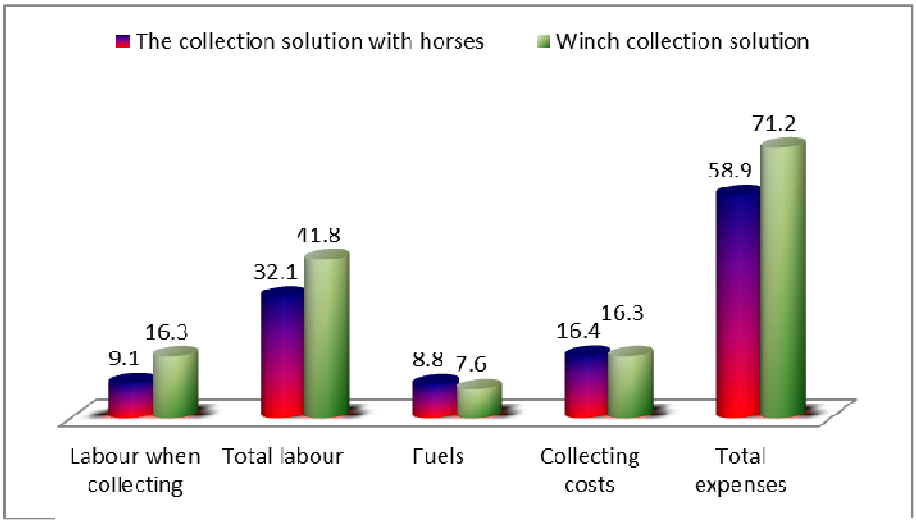


Fig. 3. Representation of the unit tariffs regarding the expenses with forestry tractor when collecting (labour +diesel oil), on grade of accessibility G5

Table 4

Exploitation costs by accessibility grades 1-4, when collecting with horses

The grade of accessibility	The average collecting distance d_m, in m	Costs with…, in lei/cm				
		Labour when collecting	Total labour	Fuels	Collecting costs	Total expenses
4	1250	15.3	40.4	6.6	15.3	68.5
3	750	14.1	38.8	4.9	14.1	64.8
2	375	13.2	37.6	3.6	13.2	61.9
1	125	12.7	36.9	2.8	12.7	60.3
	0	10.4	33.8	1.8	10.4	53.7

CONCLUSIONS AND PROPOSALS

Comparing the values obtained in Tables 3 (with horses) and 4 (with winch) regarding total operating costs (last column) it can be noticed that the costs differ in accessibility degrees between 11.55 and 12.35 lei/cm. Therefore, the degree of accessibility influences very little the cost differences between the two ways of collecting the wood, the amplitude of variation being of 0.8 lei /cm.

On the other hand, the reduction of the collection distances with the tractors through the construction of forestry roads is significant, reducing the total expenses by 28.5% (solution no 1 - collecting wood with winch), respectively by 15.3% (solution no 2 - collection with horses).

The construction of a new forest road accesses several stands near the road, the role of the forestry being to determine the priority of these secondary roads. In their absence, the expenses needed to care for the forest, to extract the wood, to install a new tree, a new generation will be very large. For the analyzed case study, the construction of a forestry road in the area would have access to the whole area between the Long Groapa Valley and the Ciungilor Valley, namely the parcels 65-68, and partly the parcels 63,64,69. From a forestry point of view, increasing economic efficiency may be a disadvantage because an increase in the degree of mechanization increases the damage. It can be seen from Fig. 2 that labor is between 43.9% (for G1) and 45.5% (for G5) of the total operating costs.

And from an ecological point of view, by setting up a forest road instead of a tractor road, the damage to the adjacent trees and the soil on the part between the felling area and the current position of the primary platform will be reduced, even if the distance will be higher.

For felling area in which the trees exceed 1.5-2 cubic meters, it is recommended to collect the whole of the tractor using the tree length system, but for cuts or extras with smaller volumes, it is possible to carry out the harvesting and harvesting works to protect the seed, trees and soil, but the parts should be smaller by applying the 'short wood' system. Even if some believe that horses should not be used in the forest (Romania has been criticized for using horses for collecting wood), there are currently areas where harvested horses are an ecological solution that brings less damage to the existing seed.

REFERENCES

1. Ciubotaru A., 1996, Elemente de proiectare şi organizare a exploatării pădurilor, Ediţia a II-a. Ed. Lux Libris, Braşov
2. Oprea I., Sbera I., 2004, Tehnologia exploatării lemnului. Ed. Tridona, Oltenița
3. Timofte A.I., Timofte C.S., 2016, The Influence of the Accessibility Grade upon the Technical-Economical Estimates for the Wood Exploitation. The Annals of the University of Oradea, Economic Sciences, Tom XXV
4. ***, Amenajamentul U.P. 3, O. S. Aleșd, D.S. Bihor
5. ***, 1999, Ordinului nr. 560 din 21.06.1999 emis de M.A.P.P.M. care reactualizează Normativul departamentului PD 67/80 privind proiectarea drumurilor forestiere pentru circulaţia autovehiculelor
6. ***, 2011, Ordinul 1540/2011 - Norme privind stabilirea termenelor, modalităţilor şi perioadelor de exploatare a mesei lemnoase din păduri şi din vegetaţia forestieră din afara fondului forestier naţional
7. ***, 2017, Norme tehnice, tarife orare 2017, folosite în exploatarea lemnului
8. ***, 2017, www.rosilva.ro – APV 1034678, DS BIHOR, consultat în 07.03.2017