



## RESEARCH ON THE CHOICE OF EXPLOITATION TECHNOLOGIES IN THE CONTEXT OF FSC FOREST MANAGEMENT CERTIFICATION

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**Abstract:** The valorization of wood in accordance with the cultural and economic objectives of the logging activity requires both an appropriate design and organization of specific works, as well as compliance with forest certification principles. These two aspects are closely linked and must be managed together to ensure sustainable and responsible exploitation of forest resources. In this study, the main aim was to choose the optimal operating technologies, respecting principle 6 FSC (Forest Stewardship Council)-Environmental values and their impacts. The technical and economic analysis works were carried out on real data, taken from Forest District Gurghiu, Mures Forest Administration, Sirod felling area. Following the analysis carried out, the optimal operating technologies are with horses and with the logging tractor. Exploitation technologies must comply with applicable certification requirements and standards, thus including responsible resource management practices and minimising impact on biodiversity and other environmental values.

### Introduction

Forest certification has the potential to address different environmental issues, as well as to establish rules on sustainable forest management and risk reduction related to environmental issues (CERUTTI EL AL., 2011). In forest certification, several schemes are recognized and implemented worldwide, including the Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification (PEFC) (KATSUAKI AND YOSHINAO, 2018). The Program for the Endorsement of Forest Certification (PEFC) is an international forest certification scheme that promotes sustainable, ecological, economically viable and socially responsible forest management.

### Material and method

The present study was carried out within the felling area 679 Sirod, located in Management Unit VIII Sirod, administered by the Gurghiu Forest District, Mures County Forest Administration, Mures County, has an area of 55 ha and includes planning units 79C and 79H. The Management Unit is located in the Gurghiu Mountains massif, in the Eastern Carpathians region, Călimani-Gurghiu-Harghita district and has an area of 3337.1 ha.

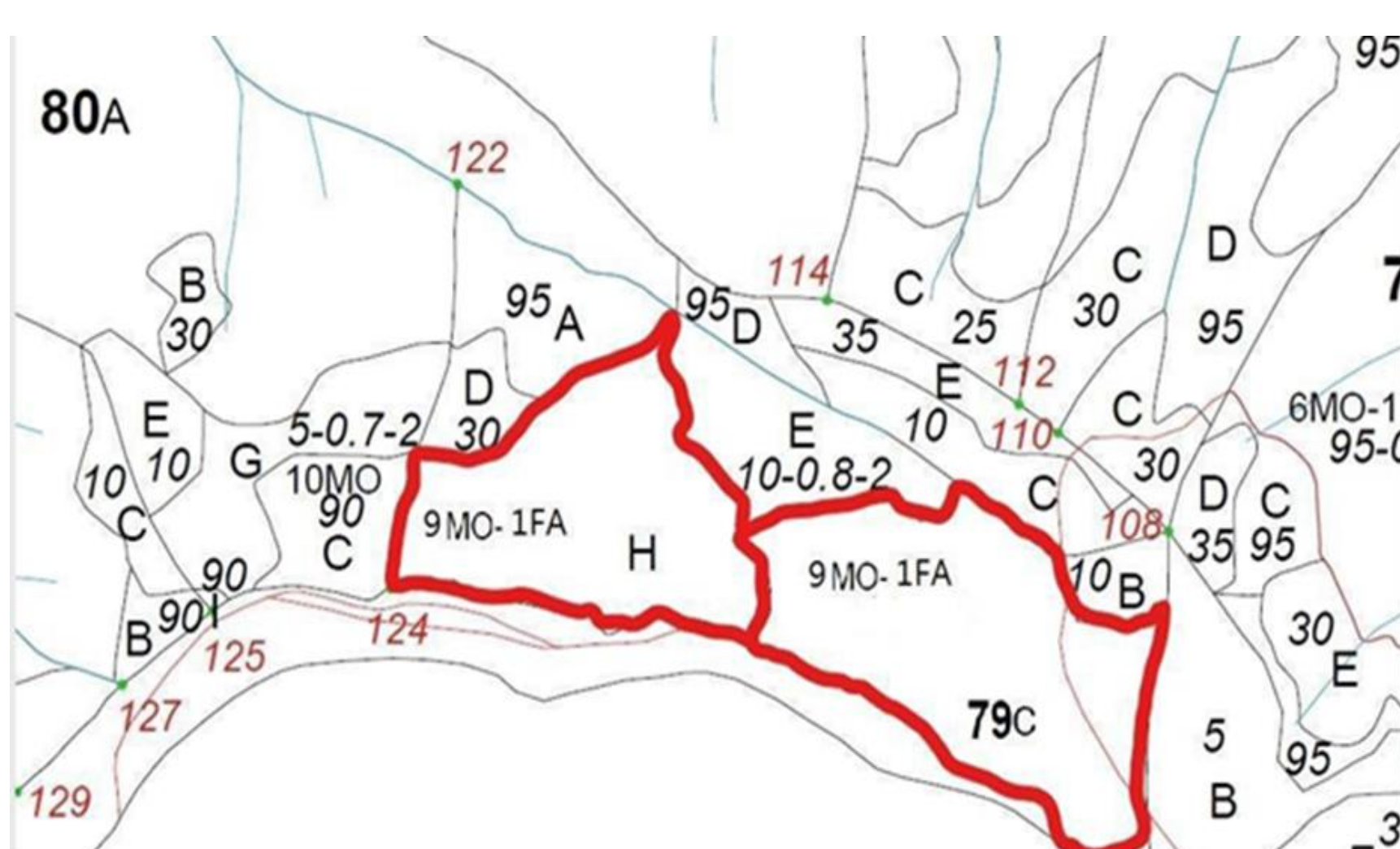


Fig. 1. Sketch of the felling area

The means of work that were adopted for the logging process within the 689 Sirod felling area were: for felling trees: Husqvarna chainsaw, model 562 XP, for collection: T.A.F. model 690 PE, produced by IRUM Reghin and attachments.

### Conclusion

The logging process can be carried out with the help of multifunctional machines, logging tractors, cable-way for logging and couplings, but requires great care to avoid soil erosion, reducing damage to seeds, standing trees and other environmental problems. Forest certification plays an important role in forest management and especially in the logging process, thus imposing different principles to identify key issues. By complying with FSC principle 6 and where adverse impacts on environmental values occur, measures are taken to halt further degradation and adverse effects are reduced or remedied.

Harvesting technologies should be chosen for each parcel so as to minimise the impact on forest biodiversity, be compatible with the principles of sustainable forest resource management, which include the regeneration and restoration of affected forests and ensure the sustainable use of wood and other forest products, and be designed to minimise soil erosion, water pollution and other negative impacts on soil quality and water resources.

### Results and discussions

Depending on the act of valorization for the Sirod parcel, the structure of the timber to be exploited was established. For the correct application of harvesting technology, the dimensional structure of the marked timber must be taken into account to a large extent (Covrig, 2016) which refers to the volumes of thick, thin and small wood as well as technological consumption.

Table 1.2. The process of collecting

Traseul	Lungimea (m)	Inclinarea medie (%)	Volumul rășinoase (mc)	Volumul foioase (mc)	Mijloace de colectare posibile de folosit
A-I	1300	20	796	28	Funicular Atelaj TAF
C-C'	170	19	124.8	4.4	Funicular Atelaj TAF
D-D'	100	24	61.5	2.2	Funicular Atelaj TAF
E-E'	100	26	62.8	2.6	Funicular Atelaj TAF
F-F'	200	26	195.6	1.7	Funicular Atelaj TAF
G-G'	100	19	75.9	2.7	Funicular Atelaj TAF
H-H'	120	22	75.2	0.6	Funicular Atelaj

In Table 1.2. the means that can be used in the process of collecting wood material from the Sirod felling area are presented. Due to the fact that in the chosen felling area the treatment is represented by accidental cuts I and no restrictions are imposed, the maximum duration of harvesting and collection will be 3 months. In the case of operations in the wood collection process, the approach of the wood material will be carried out with the help of the logging tractor (TAF), due to the fact that previously built roads exist, and this operation does not require additional expenses for the construction of new routes. Also, routes C-C', D-D', E-E', F-F' and G-G' intersect with route A-I, and by using another means that performs removal-close operations, it also involves the operation of tying and untying the load. In the case of using cable-way for logging, in this felling area their use is not economical, due to the fact that the volume to be removed from these routes is relatively small.

Table 1.1. Structure of the timber

Nr. crt.	Specificatii	UM	Total	Specia sau grupa de specii	
				MO	Fa
1	Vol. Brut cu coaja	m <sup>3</sup>	841	812	29
2	Coaja lemnului de lucru	m <sup>3</sup>	63	62	1.00
	Vol. brut fara coaja	m <sup>3</sup>	778	750	28.00
3	a) lemn lucru gros	m <sup>3</sup>	615	604	11.00
	b) lemn lucru subtire	m <sup>3</sup>	10	6	4.00
	c) lemn de foc d>5cm	m <sup>3</sup>	117	107	10.00
	d) craici d<5cm	m <sup>3</sup>	36	33	3.00
4	Vol. Brut la ha	m <sup>3</sup>	15.29	14.76	0.53
5	Nr. de arbori -total	buc.	776	687	89.00
	-la ha	buc.	14	12.5	1.50
6	Vol. Arborelui mediu	m <sup>3</sup>	1.08	1.18	0.33
7	Taxa forestiera-totala	lei	92216.23	89108.88	3107.35
	-la m.c.	lei	216.89	109.74	107.15
		%	5	3	2
8	Consumuri tehnologice si pierderi	m <sup>3</sup>	24.94	24.36	0.58
9	Vol. Brut cu coaja pentru productie	m <sup>3</sup>	816.06	787.64	28.42
10	Volumul lemnului marunt >5 cm si 1/2 din craici	m <sup>3</sup>	145	129.5	15.50
	Vol. brut cu coaja gros si subtire	m <sup>3</sup>	671.06	658.14	12.92
11	a) lemn gros	m <sup>3</sup>	659.34	650.56	8.78
	b) lemn subtire	m <sup>3</sup>	11.72	7.58	4.14
	Vol net gros si subtire comerciable	m <sup>3</sup>	753.06	727.22	25.84
12	a) lemn gros comerciable	m <sup>3</sup>	596.94	590.6	6.34
	b) lemn subtire comerciable	m <sup>3</sup>	11.12	7.12	4
	c) lemn steri	m <sup>3</sup>	145	129.5	15.5
	d) craici	m <sup>3</sup>	236.14	209.14	26.35

In Table 1.1. the calculations resulted in a gross volume without bark for spruce species of 750 m<sup>3</sup> and for beech 28 m<sup>3</sup>. Also, the amount of total marketable thick and thin wood was 753.06 m<sup>3</sup>, of which 727.22 m<sup>3</sup> spruce and 25.84 m<sup>3</sup> beech.

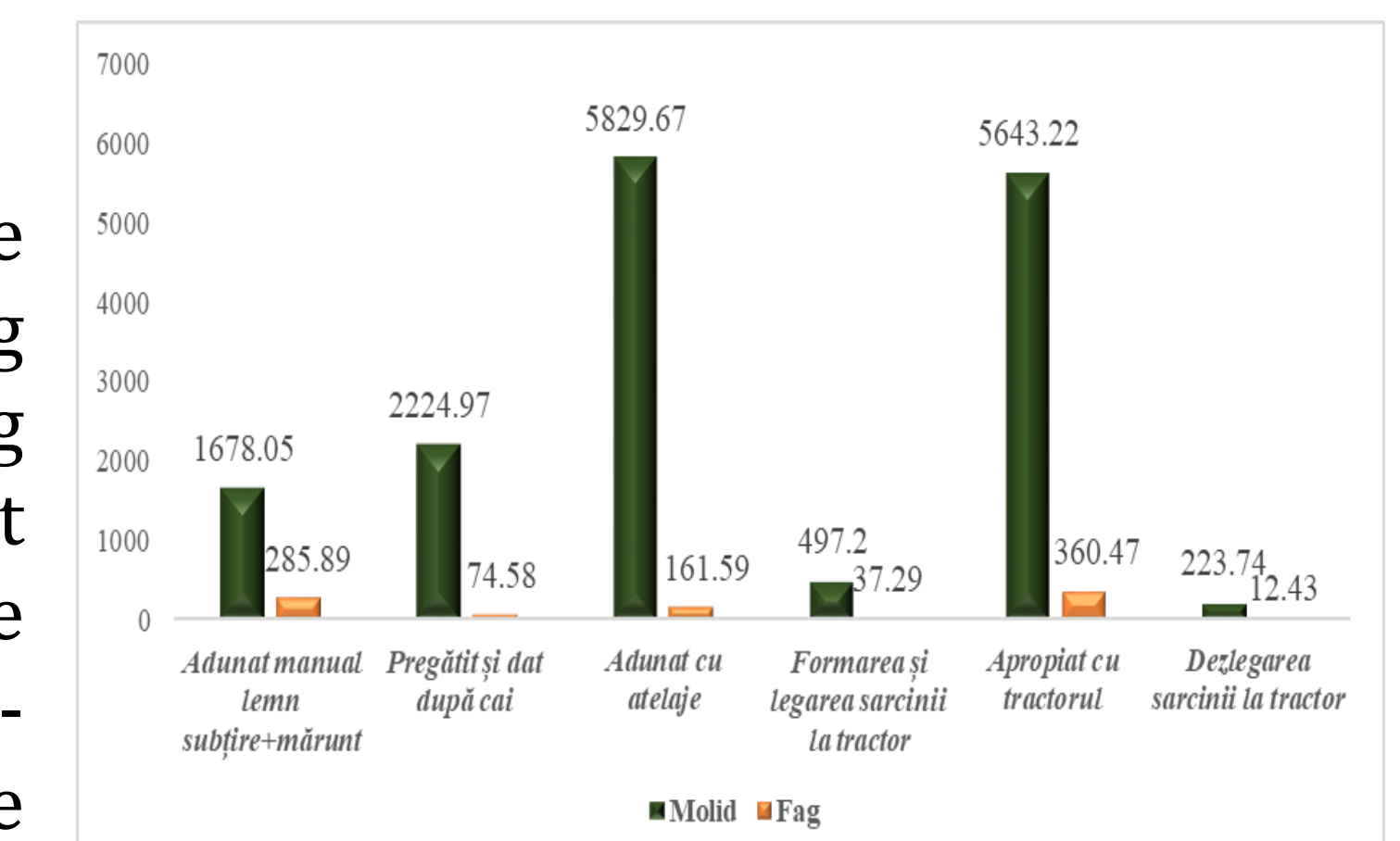


Fig. 2. evaluation of the costs of technological works

Following the evaluation of the costs of technological works, it resulted in a value of 17029.1 lei of labor regarding the operations of manually gathering thin and small wood, prepared and given after horses, gathered with couplings, forming and tying the load to the tractor, close to the tractor and untying the load on the logging tractor. Following the analysis carried out, the attachments, although they represent a rudimentary means, given the nature of felling, respectively accidental products I, will be used for the collection process, it is much easier to pass between trees, thus being suitable both from a silvotechnical point of view, having a low degree of damage to the trees remaining on the footing, and from an ecological point of view.