

THE SOCIO-ENVIRONMENTAL EFFECTS OF FORESTRY ACTIVITIES, A STATISTICAL APPROACH IN ARIES AREA

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Manuscript received: 14.02.2018; Accepted paper: 22.06.2018;

Published online: 30.09.2018.

Abstract. *The awareness of the socio-environmental effects of forest exploitation is essential for better resource management and a sustainable management system for forestry. We started the present research with a theoretical documentation based on the knowledge of the legislation in the field and a descriptive analysis of the evolution of the forest fund of our country and the analyzed area. We strengthen the results of this research through the information obtained based on empirical research in the upper Aries river basin. For our statistical approach, we choose the questionnaire as a relevant research tool. The analysis was made using SPSS program, and statistical variables, including crosstable, the Spearman's correlation coefficient and the χ^2 (chi-square) test to test the relationship between two variables, both measured on a categorical scale. Through the qualitative analysis and interpretation of information obtained from the processing of questionnaires we intend to identify the main socio-environmental effects of forestry activity, the need to implement programs to exploit forest resources, the main factors that prevent exploitation of forest resources and also obtain relevant conclusions regarding measures needed to improve the area studied.*

Keywords: *forestry activities; social welfare; environment; strategic programs.*

1. INTRODUCTION

The forest provides important natural resources and ecosystem services essential to human well-being. Since ancient times, the forest has been the oldest form of shelter, food supply, a natural environment of survival, but with human evolution, forestry activity has developed. Today, due to excessive exploitation, we are confronted with major problems related to environmental disturbances, from global warming, to the disappearance of plant and animal species, to the illness of humans. We must be aware of the benefits of forests, so the forest supplies a large amount of oxygen and contributes to the reduction of greenhouse gases, fixes the soil, prevents landslides, helps preserve biodiversity and is also a recreational environment therapy [1]. Urbanization brings changes not only on the economic and social domain but especially on the environment, demographic changes, intensification of traffic, temperature fluctuations and, last but not least, environmental pollution [2].

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The beneficial effects of forests have been extensively studied by specialists in the field as: resources and services essential to people's well-being [3], habitat for biodiversity and a relaxing environment [4], contribute to climate regulation, carbon sequestration and radiation protection [5]. Forest exploitation, one of the oldest activities related forests, is an integral part of the general regeneration, management and care process of forests, to create the conditions for the development of more productive trees [6, 7]. However, anthropogenic activity, urbanization, unsustainable economic development, excessive exploitation of forests has recently put their mark on the socio-economic situation of the Romanian population [8].

In Romania, the forestry activity has been a basic activity of the economic environment since ancient times. Before 1948, 28% of the Romanian forests belonged to the Romanian state, 22% were private property, and about 50% were owned by religious and educational institutions, the so-called public property [9]. During the socialist period (1948-1989), forests from Romania were almost entirely owned by the state. After the fall of communism, the restitution and privatization of Romanian forests took place based on several laws and normative acts. Thus, Law 18/1991 on Forestry Fund has returned up to 350,000 hectares of forests to individuals regardless of the original historical location [10]. Law 1/2000 for the restoration of ownership of agricultural land and forestry completes Law 18/1991, which includes the return of forests to legal entities, churches, associations, municipalities, but has forced the area of forests returned to individuals to either 10 hectares, churches of 30 hectares and community members of 20 hectares [11].

The forest fund in Romania is the total area of forests, land used for afforestation, those that serve the needs of crop, production or forestry administration, ponds, streams, other forest land, including non-productive land. According to the latest data published by the National Institute of Statistics, the forestry fund of the Romania is 6,559 thousand hectares, which represents 27% of the country's surface, of which 6,404 thousand hectares represent the forests, and the rest of the area consists of forest roads and non-productive land. The surface of the forest fund in Romania has grown slightly during the period 1990-2016, thus in 2016 it is by 188 thousand hectares higher than in 1990 [12]. Also, the forest represents a job for a representative number of the population of the country, so in 2012 in the field of forestry 41,130 persons worked with about 11% more than in 2008 [13].

Based on the present scientific approach we want to identify the main socio-environmental effects that the forestry exploitation activity has exerted on the population of the area in the upper Aries basin, one of the areas of Romania, known for the richness of natural resources. The area has been known for a long time due to the mining activity, but with the closure of the mines in the context of the lack of jobs, the inhabitants have focused on capitalizing on forest resources. At the same time, the interest of cross-border woodworking companies, such as Holzindustrie Schweighofer (Austria), was shown to exploit this resource. These activities proved to be abusive and sometimes illegal leading to the drastic reduction of forested areas, but also to the loss of jobs by the inhabitants of the area, the migration of the population outside the area, but also in other countries, the decrease of the living standard of the population.

The local needs and the insurance of social welfare need special support from the authorities by social programs adapted [14] and also projects for sustainable regional development. For the economic support of the local population and its traditional activities, it was initiated in 1996, the Mator Law (no. 33/1996 - text published in the Official Gazette of Romania, entered into force on May 23, 1996), but is still not applied. This provides for the restoration of some economic rights which their inhabitants had during the interwar period and which were canceled during the period of the regime totalitarian.

This ensures the continuation of the practice of traditional manufactures and the exchange of wood products with cereals necessary for the inhabitants of this area, which

provide the means of subsistence from the practice of woodworking in wood, shingles, beams, beams, barrels, poles, wooden forks, tool tails, wagons and other similar products. It is also granted annually, on the basis of the craftsman's authorization, by the leadership of the localities and forestry branches of the territorial branches of the Autonomous Romsilva Forest Company, 10 cubic meters of wooden material per foot, but no more than 15 cubic meters of family.

The main objective of our research is to identify the potential effects of forestry exploitation on economic and social development in the Aries area and also environmental ones. Thus, the paper approaches the main problems identified as a result of the excessive forestry activity in the Aries river basin and the socio-environmental effects of these. Also we intended to know if the population is aware of the existing social programs and if such programs are helpful in regional development and social welfare.

2. METHODOLOGY

The geographical area in which this study was conducted is located in the Aries River Basin, which overlaps the historical region known as the *Motilor Country*. The mentioned river has a length of 90 km in the mountain area, which represents $\frac{2}{3}$ of its total length (166 km). In the mountainous area, the analyzed area develops a basin surface of 1,755.8 km² and the water pavement joins imaginatively the line of the high heights: in the west Muncelul Peak (1,499 m), in the north the Peak Creata Plopilor (1,178 m) in the east Torsa Peak (899 m), and in the south, Bradisoru peak (1,043 m) [15].

The lithology of the area, mostly limestone, imposed a course on the hydrographic network with frequent changes of direction and a succession of gorges and ravines with sectors of the widening of the valley from a few meters to several hundred meters. The karst system has favored the development of rich hydro-drives that are discharged through bursts [16].

The area is intense anthropogenic, with a relatively high population density of approximately 45 inhabitants/km² (given that the average population density in the mountain area is 25 places/km²), with the large presence of human settlements. The geological evolution of the region favored the formation of non-ferrous resources such as the complex polymethyl sulphides from Rosia Poieni and the gold mines of Rosia Montana [17, 18].

This area was recognized a lot of time for the mining activity, but, after the change of the Romanian political regime this activity registered a clear decline. In these conditions of the lack of jobs, the inhabitants have focused on capitalizing on forest resources. The area of the forest fund in the Aries Valley's upper river basin represented in 1990 a percentage of 53.41% of the total area under study, and in 2016 the forest area of the analyzed area decreased to 46.53% (Fig. 1).

The annual exploitation rate estimated from remote sensing analyzes was approximately 4.65 km² for the period 1990-2016. Thus, the forest area in 2016 was 817 km², with 120.9 km² less than in 1990, when it was 937.9 km².

The method chosen for this research was the questionnaire. The questionnaire is one of three major methods of gathering information, along with interviewing and observation. It is a quantitative method that applies to a well-established sample, in order to gather the necessary information to understand and explain certain facts, interests, and opinions of the respondents [19].

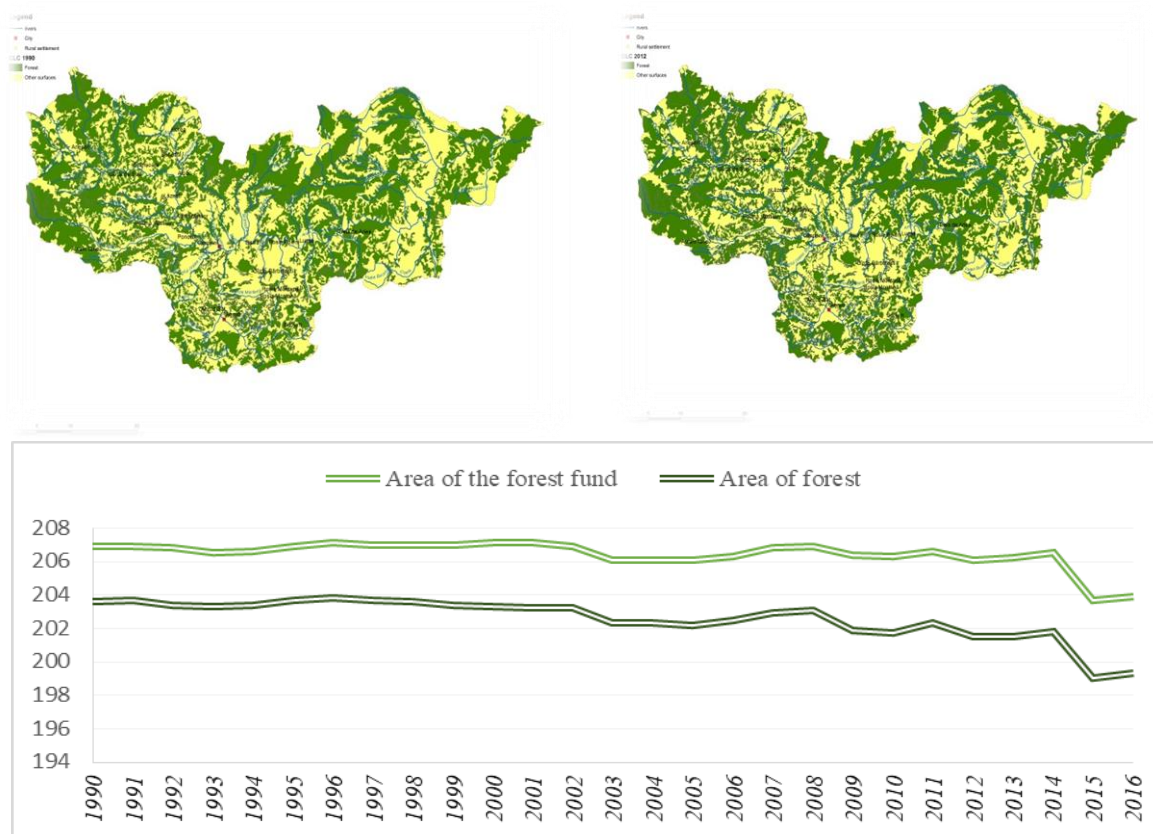


Figure 1. Evolution of forest areas in the Aries area during 1990-2016.

Source: www.insse.ro

To process the information obtained from the questionnaires, a database was created with all the answers received using Excel. Statistical analyzes and graphical representations were made using SPSS. For the crossover analysis of questions, we used several techniques, including crosstable, Spearman's correlation coefficient, and χ^2 (chi-square) to test the relationship between two variables, both measured on a scale of type category. The χ^2 (chi-square) test calculates the difference between the observed and expected frequencies for each of the cells of the contingency table of the two variables [17].

This scientific approach aims to answer the following research questions: Q1: What are the main economic difficulties faced by the population of the research area as a result of the forest exploitation activity? Q2: How well is the Mofor Law known to the population of the research area and whether its implementation would improve the socio-economic status of the population in the area? Q3: Is there a correlation between the actions of a future program for the exploitation of wood resources and the need for such a program? Q4: There are differences of opinion as to the factors that could hinder the use of forest resources in the area? Q5: What are the effects of deforestation in the area on the environment and what improvement measures could be taken? Q6: Are there differences of opinion on the optimal strategy for harnessing forest resources?

The questionnaire was sent to 200 inhabitants of the Aries area over a three-month period (January-April 2018) and we obtained validated questionnaires from 120 people, whose geographical distribution is represented in Fig. 2.

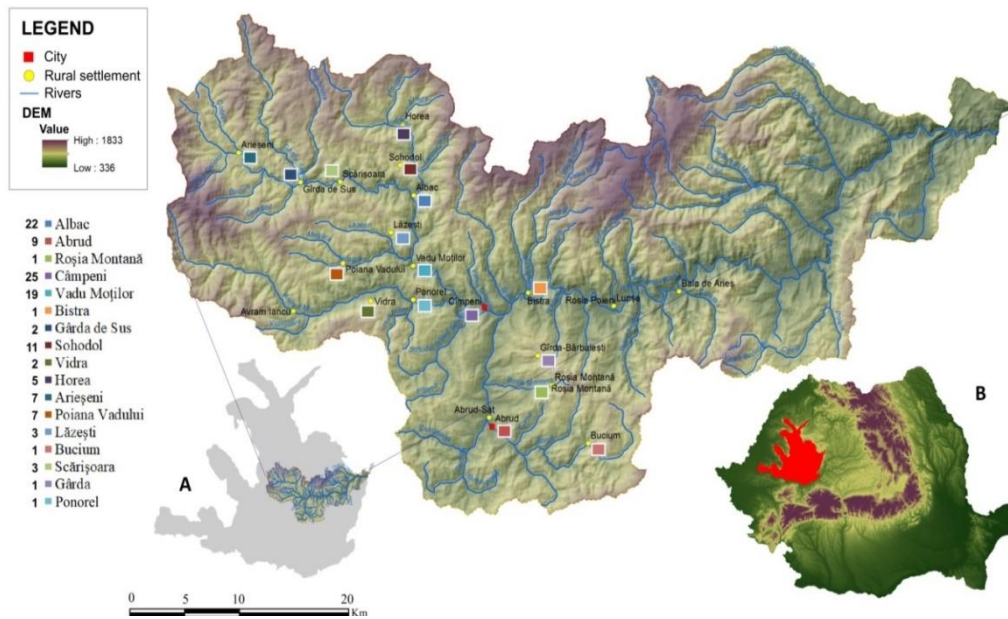


Figure 2. Geographic distribution of respondents to the questionnaire

From the previous graph we can see a balanced distribution of the respondents from the localities targeted by the study. As far as the profile of respondents is concerned, they can be classified according to their age, gender and occupation is represented in Table 1.

Table 1. Crosstable analysis of items: age, gender, occupation.

		Age						Total
Gender	Occupation	> 20 years	21-30	31-40	41-50	51-60	<60 years	
Male	Student	0	2	0	0	0	0	2
	Employee	0	3	9	8	3	1	24
	Unemployed	0	0	2	3	0	0	5
	Entrepreneur/investor	0	0	1	1	1	0	3
	Pensioner	0	0	0	0	0	4	4
	Household	1	1	3	4	2	2	13
Total		1	6	15	16	6	7	51
Female	Student	0	4	0	0	0	0	4
	Employee	0	2	13	9	1	2	27
	Unemployed	1	3	4	7	6	0	21
	Entrepreneur/investor	0	0	2	1	0	0	3
	Pensioner	0	0	0	1	3	8	12
	Household	0	0	1	0	0	1	2
Total		1	9	20	18	10	11	69
Occupation	Student	0	6	0	0	0	0	6
	Employee	0	5	22	17	4	3	51
	Unemployed	1	3	6	10	6	0	26
	Entrepreneur/investor	0	0	3	2	1	0	6
	Pensioner	0	0	0	1	3	12	16
	Household	1	1	4	4	2	3	15
Grand Total		2	15	35	34	16	18	120

From the crosstable analysis of the three items through the contingency table it is noted that the majority of respondents both male and female respondents are employments, their share in the total number of respondents being 42.5%.

3. RESULTS AND DISCUSSION

Regarding the main economic difficulties faced by the population of the research area as a result of the forest exploitation activity (Q1), the analysis revealed that 58% of the respondents considered that the lack of jobs is the main difficulty faced by the population of the studied area, followed by deforestation (17%) and lower wages (12%) (see figure 3).

Other problems are the lack of investments, non-promotion of tourism and poor infrastructure.

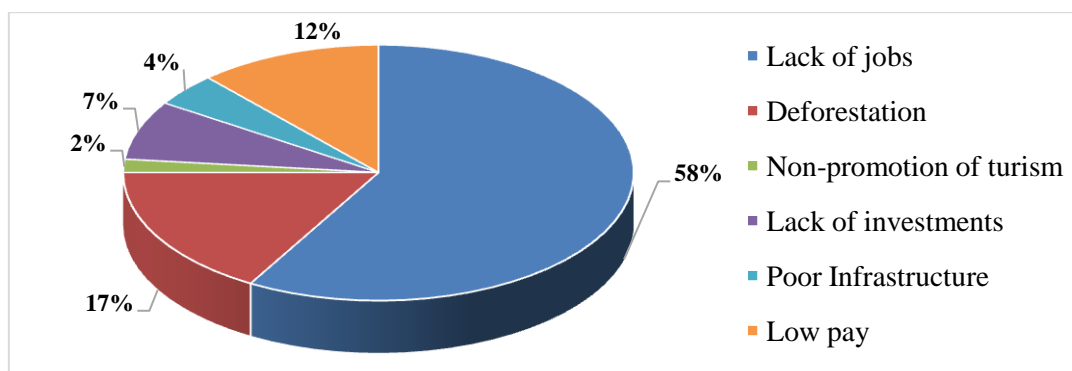


Figure 3. Respondents' views on the main economic difficulties with which the population of the analyzed area is facing.

The knowledge of the Motilor Law by the participants of our study (Q2), 55 respondents (46%) know the existence of this law and 45% (54/120) consider that the implementation of this law would improve the socio-economic population of the area. All the responses about the knowledge and the implementation of the Motilor Law are represented in Table 2.

Table 2. Crosstable analysis of items related to implementation of the *Motilor Law*

Count of Questionnaire number	Do you know / have heard about the <i>Motilor law</i> (Law 33/1996)			Grand Total
	Yes	No	No answer	
The implementation of the <i>Motilor Law</i> would improve the overall socio-economic state				
Yes	48	5	1	54
No	4	1	1	6
No answer	3	38	19	60
Grand Total	55	44	21	120

The Chi-Square test (Sig = 0.000) is significant and points out that there is no link between the two variables in the sense that respondents who know the motif law believe in its effects (improving the socio-economic status of the population in the area), table 3.

Table 3. The Chi-square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	82.029 ^a	4	.000
Likelihood Ratio	97.437	4	.000
Linear-by-Linear Association	66.015	1	.000
N of Valid Cases	120		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is 1.05.

The analysis of a possible link between future strategic programs for the optimal use of forest resources and the need for such a program (Q3) is demonstrated by a contingency table (table 4) outlining future forest resource exploitation programs, such as the implementation of the Motilor Law, the judicious exploitation of the forest fund existing reforestation of deforested areas and the need for such a program with five predefined response variants from 1 (none at all) to 5 (very much).

Table 4. Crosstable analysis of items related to correlation between the actions of future programs to capitalize on forest resources

	Implementation of <i>Motilor Law</i>	Judicious use of existing forestry fund	Reforestation of deforested areas	No answer	Grand Total
None at all	2	-	7	1	10
To a small extent	2	4	5	2	13
Neither small nor large	6	4	5	4	19
To a great extent	3	5	7		15
Very great extent	19	20	14	10	63
Grand Total	32	33	38	17	120

As can be seen, a majority of 52.5% of the total respondents (63/120) consider it necessary to a great extent a program for utilization of the current forest resources for the analyzed area. Of these, 30% believe it is necessary to implement the Motilor Law, 32% of the judicious use of the existing forestry fund, 22% of the respondents considered that the reforestation of the grazed areas is a potential program necessary for the redevelopment of the area. Percentages of 16% of respondents agree on the need for a resource exploitation program but have not nominated such a program, preferring not to answer question 8.

Regarding the factors that could prevent the utilization of forest resources in the area (Q4), the state of the infrastructure gets the majority share with 47 responses from the 120 respondents and only 11 respondents consider the high costs as a negative factor in capitalizing the forest resources in the area (Table 5).

Table 5. Opinion on the factors what could prevent the exploitation of forest resources

		Gender			
		Female		Male	
		Count	Column N (%)	Count	Column N (%)
Exploitation of forest resources	The natural frame	10	20.4	16	23.2
	The state of the transport infrastructure	21	42.9	26	37.7
	Business competition	16	32.7	29	42.0
	High costs	5	10.2	6	8.7
	Inefficient investments	5	10.2	8	11.6
	No impediment	4	8.2	4	5.8
Chi-square	1.904				
df	6				
Sig.	.928				

Applying the chi-square test on two nominal variables revealed that the hypothesis investigated: There is no link between factors that could prevent the exploitation of forest resources in the area and the respondents' gender does not confirm what shows that persons irrespective of gender have the same opinion on the factors that prevent the use of forest resources (Table 5). The contingency tables applied to the multiple-answer questions that wanted to know the respondents' opinion on how the deforestation affected the area and the measures that they consider necessary to improve this situation (regarding Q5) are presented

in table no. 6. Of the 100 respondents who consider that deforestation affects the environment 69% identified the effects of these landslides, 17% of the fall of mountain versants, 24% the increase of the river flows, 3% of the clogging of the anthropic lakes and 3% of the changes of river courses and 15% consider other environmental impacts (see the Table 6).

Table 6. Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N*	%	N	%	N	%
Landslides	83	69.2	37	30.8	120	100.0
Fall of mountain versants	20	16.7	100	83.3	120	100.0
Increase of the river flows	29	24.2	91	75.8	120	100.0
Clogging of the anthropic lakes	4	3.3	116	96.7	120	100.0
Changes of river courses	4	3.3	116	96.7	120	100.0
Other	18	15.0	102	85.0	120	100.0

*N-number of cases

Among the measures needed to improve the area, the respondents to the questionnaire consider the major redevelopment, the use of advanced woodworking technologies and woodworking, the implementation of investment programs, the permanent monitoring of the state of the environment. Respondents' opinion (Q6) on how to exploit the forest resources emphasizes that regardless of gender respondents as an option reforestation of deforested areas (70% of man and 65% of women chose this option). The representation of the other variants chosen by the other participants of the study is presented in Table 7.

Table 7. Crosstable items gender and recovery of forest resources

		Gender			
		Male		Female	
		Count	Column N (%)	Count	Column N (%)
Recovery of forest resources	Implementation of Moșilor Law	10	20.0	22	31.9
	Judicious use of existing forestry fund	18	36.0	24	34.8
	Reforestation of deforested areas	35	70.0	45	65.2
	No answer	6	12.0	10	14.5
Chi-square	2.557				
df	4				
Sig.	.634				

By applying the chi-square test, we notice that we invalidate the research assumption, that women have other responses than men in terms of harnessing forest resources. Thus, as we can see, responses are roughly the same regardless of the gender of the respondents.

4. CONCLUSIONS

The study highlights the main socio-economic and environmental problems affecting the population of the studied area, namely the lack of jobs, deforestation, lower wages, the lack of investments, non-promotion of tourism and poor infrastructure. With the closure of the mines, the exploitation of the forest fund has expanded, which has generated a number of undesirable long-term socio-environmental effects in the Aries area. The massive and chaotic

exploitation of forests is a fact generalized in Romania, but their effects are more visible in the areas with considerable forest background.

Our research on the socio-environmental effects of forestry activities has revealed that it is necessary to implement future strategic programs in order to optimize the exploitation of forest resources and also to increase the socio-economic welfare of the population. Thus, such a program, considered necessary to be implemented for the socio-economic and environmental improvement, is the Mitor Law, which has been enacted and enforced since 1996 but is still not applied. Forest exploitation activity, alongside socio-economic issues also has a significant impact on the environment. Thus, in the case of the massive deforestation of the forest fund, an intensification of the geomorphological processes of the slope (ravelling, torrentiality, collapses, instability of the slope, etc.), the modification of the river flow regime, the clogging of the dam lakes are also part of the consequences of the existing state in region. Thus, a sustainable forest management is needed through the judicious use of the existing forestry fund and reforestation of the grubbed-up areas, in order to improve the socio-environmental aspects of the development of the studied area.

As a general conclusion, we can point out that we foresee some solutions regarding the economic and social revitalization of the area, provided by a sustainable forest management, the application of Mitor Law and the tourism development, all involving the authorities through the implementation of viable projects including infrastructure and involvement of existing human resources.

REFERENCES

- [1] Ispas, S., Pehoiu, G., Simion, T., Contributions to the knowledge of soil pollution with fluorine, *Economics, Education and Legislation Conference Proceedings, International Multidisciplinary Scientific GeoConference-SGEM*, **II**, 1055, 2011.
- [2] Guan, H., Wei, H., He, X., Ren, Z., An, B., *Annals of Forest Research*, **60**(2), 327, 2017.
- [3] Dragoi, M., Palaghianu, C., Miron-Onciul, M., *Annals of Forest Research*, **58**(2), 333, 2015.
- [4] Young, B., *IGBP Report no. 53 / IHDP report no. 19*, Stockholm: IGBP Secretariat, 2005.
- [5] Land use, land-use change, and forestry - *IPCC Special Report - Summary for policymakers*, IPCC, 2000.
- [6] Horodnic, S., *The bases of wood exploitation*, Suceava University Publishing, Suceava, 2003.
- [7] Davis, L.S., Johanson, K.N., *Forest Management*, McGraw-Hill, New York, 1987.
- [8] Bostan, I., Grosu, V., *Revista de cercetare si interventie sociala*, **31**(1), 7, 2010.
- [9] Ioras, F., Abrudan, I. V., *International Forestry Review*, **8**(3), 361, 2006.
- [10] Mantescu, L., Vasile, M., *Romanian Sociology*, **7**(2), 95, 2009.
- [11] Griffiths, P., Kuemmerle, T., Kennedy, R. E., Abrudan, I. V., Knorn, J., Hostert, P., *Remote Sensing of Environment*, **118**, 199, 2012.
- [12] ***** <http://statistici.insse.ro/shop/index.jsp?page=tempo3&lang=ro&ind=AGR301A> (Accessed on May 15th 2018)
- [13] ***** www.insse.ro (Accessed on May 18th 2018)
- [14] Cojocaru, S., *Journal for the Study of Religions and Ideologies*, **5**(13), 32, 2010.
- [15] ***** Aquaproject Bucharest, *Atlas of Water Cadastre in Romania. Part I. Morphohydrographic data on the surface hydrographic network*, Bucharest, 1992.

- [16] Oancea, D., Velcea, V., Geography of Romania, 3rd Volume - Romanian Carpathians and Depression of Transylvania, Academiei RSR, Bucharest, 1987.
- [17] Pehoiu, G., Murarescu, O., Coman, D. M., Stanescu, S. G., Coman, M. D., *Journal of Science and Arts*, **18**(2), 489, 2018.
- [18] Murarescu, O., Pehoiu, G., Water Resources in Upper Ialomita River Basin (Carpathians, Subcarpathians, Romania), *Proceedings of the 5th IASME/WSEAS Int. Conf. on Water Resources, Hydraulics & Hydrology/Proceedings of the 4th IASME/WSEAS Int. Conf. on Geology and Seismology: Water and Geoscience*, Book Series: Energy and Environmental Engineering, 84, 2010.
- [19] Sales-Wuillemin, E., *Méthodologie de l'enquête*. In: Bromberg, M., Trognon, A. (Eds.) *Psychologie Sociale 1*, Presses Universitaires de France, Paris, 2006.
- [20] ***** Ministry of Environment, Waters and Forests (2015) *The Report on the Condition of the Romanian Forests*, available at www.mmediu.ro/app/webroot/uploads/files/2016-12-16_Raport_Starea_padurilor_2015.pdf (Accessed on May 3rd, 2018).