FORGING LINKS ELEMENTS CORRELATION BETWEEN GEOMETRY AND CONSTRUCTING FOREST ROADS. CASE STUDY

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Abstract

*The need for forest road construction and maintenance of existing ones is motivated by the need to ensure a transport network capable of serving all the needs of the forestry sector in close agreement with the technical, ecological and economic crisis (15***). The management and forest management, forest roads are the main access route within them.*

Using road transport over other modes of transport is justified by a number of advantages that have forest highways.

Location of study is located in the forest of the Forestry Remeţi of the Forestry Directorate Oradea.

Linking correlation between length profiles, respectively interprofiles and earthwork volume needed to be made, started to use the first stage of the method applied to determine the length of earthwork volumes. Based on geometrical and structural characteristics of forest road Ciripa-Stâna de Vale from its design, we proceeded to search and find correlations between them. Analyzing the correlation ratios obtained revealed a second degree polynomial correlations with distinct significance statistically. This second degree correlation polynomial of degree, notes that between the length of execution profiles and the related earthwork volume is no direct link, namely that the volume of work on a profile is directly related to its length.

*To ensure the proper functioning of sustainable forestry requires a refocusing on thinking, namely design, construction and maintenance of forest roads (16 ***), representing the highest share in all countries of the world, ranging from transport in the forest, they being considered ways and means of land transport.*

Key words: forest sector, forest roads, earthworks, geometric and structural characteristics, correlations

INTRODUCTION

The management and forest management, forest roads is the main way to access the most commonly used (17***). In order to establish solutions for both design and construction as well as maintenance and rational use of them in this paper has been studied a stretch of dirt road, and the results obtained are given some talks that may offer some solutions to the problems of work design. In Romania, the forest roads are considered basic ways to open forest basins.

The need for forest road construction and maintenance of existing ones is motivated by the need to ensure a transport network capable of serving all the needs of the forestry sector closely in line with current environmental requirements (Ionaşcu G., 1995; Lugoa AE, et al 2000). Thus

research on forest roads are made with the intention of showing some correlations between their geometrical characteristics and other features (earthwork volume) in order to improve design and construction works (Watkins R.Z., et al, 2003).

Forest roads network development correlates with the interests of production and protection of forests, ensuring better organization of work execution forestry and higher recovery and rational forest products (Olteanu N., 1996).

This study seeks to establish existence of correlations between some geometrical features of forest roads, to be studied in depth, and can be developed further concrete conclusions regarding their design.

Expansion of road transport over other modes of transport is justified (Belc F., 1999) through a series of advantages that the roads are forestry, including:

-provides easy opportunities of the network correlation with collection network;

-do not require large amounts of expensive materials for construction, possibly effective use of local materials (crushed stone, ballast stabilized earth, wood, etc.) (Gucinski H., et al, 2001);

-ensures continuity in the activities in the forestry sector;

-presents high transport capacity, with materials traveling both ways in terms of lower transport costs;

-ensures advantageous technical and economic prerequisites for upper and full exploitation of all forest products; (A.C.F., 2006)

MATERIAL AND METHODS

The study was conducted on a section of forest road chirp-Stana de Vale, 980,7m in length, located in the forest of Remeţi Forest District, UP II Molidiş and U.P. V Iad Valley of the Forestry Directorate Oradea, 2004-2006. This forest road connects the area Stâna de Vale and dam reservoirs Drăgan Valley (13***). The area of site this road is located in a mountainous region, with altitudes over 1000 m (figure 1).

To describe correlative links between the length profiles, respectively interprofilelor and earthwork volume needed to be made, was used in the first stage of the method applied to determine the length of earthwork volumes. This method is based on multiplying the area of each cross section with semisum (average) distance that separates adjacent profiles and relationships underlying the method is as follows (Olteanu N., 1996):

$$\Sigma V = S_1 \frac{d_{1-2}}{2} + S_2 \frac{d_{1-2} + d_{2-3}}{2} + \ldots + S_n \frac{d_{n-1} + d_n}{2}$$

Earthworks volume is determined in the first phase on interprofile, and then sum them to obtain the total volume of their (Bereziuc R., 1981).

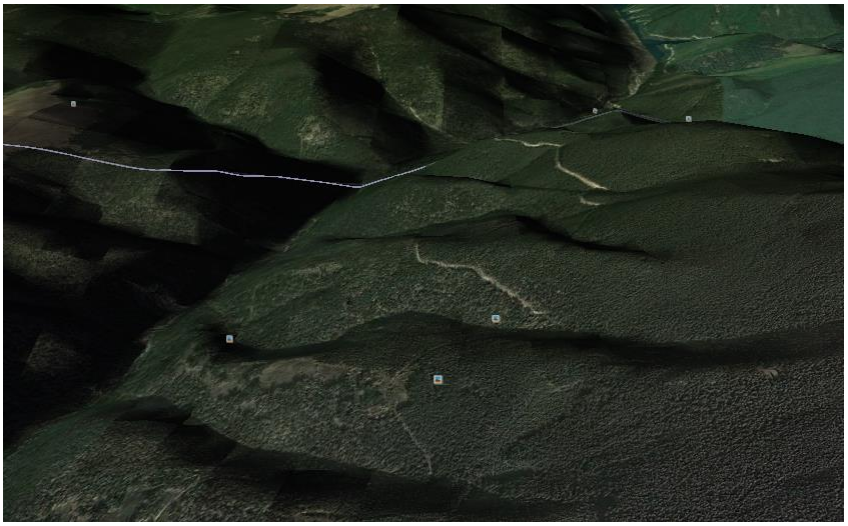

Fig.1 Satellite image of forest road studied (www.googleearth.com)

The length of the profile and volume of the corresponding earthwork are shown in the table 1.

Table 1

Length profiles (interprofiles) and their associated earthworks volume

No. crt.	Lenght profile (m)	Volume (m^3)	No. crt.	Lenght profile (m)	Volume (m^3)
1	32,7	2,8	21	32,5	17,8
2	25,7	34,9	22	37,2	4,6
3	30,8	15,2	23	29,7	1,9
4	40,7	4,4	24	35,1	1,6
5	19,3	6,4	25	31,5	2,9
6	26,8	36,6	26	20,5	0,4
7	34,3	3,1	27	22,8	56,6
8	29,8	24,7	28	28,9	95
9	43,9	19,3	29	8,3	14,8
10	35,9	2,9	30	6,7	1,7
11	26,2	5,1	31	12,7	21,2
12	31,4	40,1	32	25,2	8,9
13	28,7	30,1	33	28,9	16,4
14	31,4	45,5	34	24,5	2
15	32,8	12,8	35	11,0	3,9
16	18,2	1,9	36	13,2	13,7
17	16,3	2,2	37	14,4	11,3
18	20,3	0,9	38	20,7	7
19	29,8	2,4	39	32,0	86,1
20	32,3	1,9	-	-	-

Based on geometrical and structural characteristics of forest road Ciripa-Stâna de Vale from its design, we proceeded to search and find correlations between them, which help improve the design process of forest roads, following all aspects targeting this activity (technical, environmental, social, etc.) (Horvat, D. 1994).

RESULTS AND DISCUSSION

In order to identify possible links between the geometrical and structural correlative of this forest road were considered two characteristic parameters, namely the length of execution profiles and the related earthwork volume.

Analysing the correlation ratios obtained correlations revealed a second degree polynomial, with a ratio of correlation R = 0.5002 (figure 2), so with a distinct meaning (Giurgiu V., 1972) of statistically that allows drawing conclusions on the issue studied.

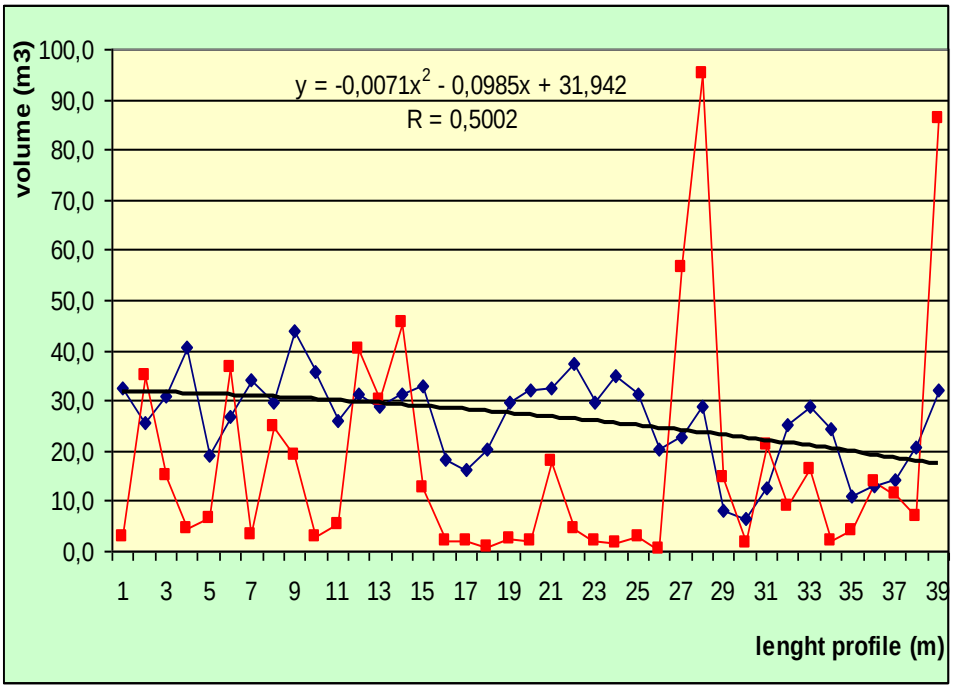

Fig.2 Graphical representation of the polynomial correlation between the length and volume of earthworks profiles

This *second degree polynomial correlations*, with the resulting regression equation y = -0,0071x2 - 0,0985x + 31,942 notes that between

the length of execution profiles and the related earthwork volume is no direct link, namely that the volume of work the profile is directly related to its length.

CONCLUSIONS

To ensure the proper functioning of sustainable forestry requires a refocusing on thinking, namely design, construction and maintenance of forest roads (14***), representing the highest share in all countries of the world, ranging from transport in the forest, they being considered ways and means of land transport. One possibility could be the use of GIS technology in the selection and management of routes (Akay AE, et al, 2008).

From regression equations of two pairs of factors best results are obtained using polynomial of degree correlations, which are distinct statistically significant, which indicates the existence of interdependence between the volume of earthworks and length profiles that they are executed.

These studies aimed at the design and implementation issues of forest roads are intended to demonstrate that the equipment can be removed forest roads overuse stands (Eskioglou P., et al, 1996), provided improvement fund production structure, low loss material all higher valued wood and forest products.

REFERENCES

1. Akay A. E., O. Erdas, M. Reis, A. Yuksel, 2008, Estimating sediment yield from a forest road network by using a sediment prediction model and GIS techniques, Building and Environment, Volume 43, Issue 5, Elsevier Press, pp 687–695
2. A.C.F., 2006, Construcţiile forestiere în contextul gospodăririi durabile a pădurilor, Editura Lux Libris, Braşov, 352p.
3. Belc F., 1999, Căi de comunicaţie terestre. Elemente de proiectare, Editura Orizonturi Universitare, Timişoara, 254p.
4. Bereziuc R., 1981, Drumuri Forestiere, Editura Didactică şi Pedagogică, Bucureşti,336p.
5. Eskioglou P., P. N., Efthymiou,1996, Alternative stabilization methods of forest roads for an efficient and gentle mechanization of wood harvesting systems, FAO/ECE/ILO - Seminar on Environmentally sound forest roads and wood transport, Sinaia, Romania
6. Giurgiu V., 1972, Metode ale statisticii matematice aplicate în silvicultură, Editura Ceres, Bucureşti 566 p
7. Gucinski H., M. J. Furniss, R. R. Ziemer, M. H. Brookes, 2001, Forest Roads: A Synthesis of Scientific Information, U.S. Department of Agriculture-Forest Service, Pacific Northwest Research Station Portland, Oregon
8. Horvat D., 1994, An exponential correlation model for penetrating characteristics of soil and wheel slip curve. Proc. FORSITRISK, Feldafing/Munich

9. Ionaşcu Gh., 1995, Transporturi forestiere, Universitatea "Transilvania" Braşov, 364p.
10. Lugoa A. E, H. Gucinski, 2000, Forest Ecology and Management, Vol. 133, Issue 3, pp 249–262
11. Olteanu N.,1996, Proiectarea drumurilor forestiere, Editura Lux Libris, Braşov, pp 194-197
12. Watkins R. Z., J. Chen, J. Pickens, K. D. Brosofske,2003, Conservation Biology, Vol. 17, Issue 2, pp 411–419
13. *** Amenajamentul O.S. Remeţi
14. ***Normativ departamental PD 67/80 (Ordin nr. 560/1999) privind proiectarea drumurilor forestiere pentru circulaţia autovehiculelor
15. *** Revista Meridiane Forestiere, nr. 1/ 2007, pp 18-23
16. *** Revista Meridiane Forestiere, nr. 4/ 2006, pp 9-11
17. *** Revista Pădurilor, nr. 6/ 2006, pp 33-37