SOME ASPECTS RAISING DETAILS OF THE FORESTRY SECTOR VECTOR USING HIGH TECH DATA COLLECTION

Crainic Ghiţă Cristian*

**University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail:gccrainic@yahoo.com*

Abstract

Closure details of the forestry sector is a complex process that is done during the project planning of the forest or the various actions for the recovery of ownership of areas under forest vegetation in the national forest fund, by the owners of law.

Using modern technologies to achieve these goals is a way to streamline the activities of these results is characterized by a high precision, the final products obtained varied depending on need and that the consumer needs.

Although modern logistics in the sector land measurement effort requires substantial economic benefits from modern technology requires the implementation of collection and processing of data and that of obtaining and archiving their final products.

Key words: modern technology**,** land measurements, forestry sector, GNSS technology, conventional technology, results, final products.

INTRODUCTION

Lifting geodetic networks are created in order to ensure the number of points needed topographic and survey measurements of detail. Geodetic networks lifting points are determined by intersections before, the intersection back, intersections combined with traverse total station, GPS technology, using the points of geodetic network support and stuff. Lifting a geodetic network density is established in relation to the surface on which is carried out and their purpose. Lifting geodetic networks is projected so as to ensure the determination of points which delimit the territorial administrative units and within the built-up area, as well as those that define parcels / property bodies. It will provide a density of at least 1 point/kmp in area of plain,hilly areas 1 point/2kmp and 1 point / 5 kmp in mountain areas. Realizing the field will be imposed with a density of land and density configuration details (primarily property limits). Realizing will be, by nature of the soil, with landmarks, reference points and standard marks. In within the built-up area in asphalt or concrete areas can be materializing metal stake and 25 mm diameter and 15 cm long beaten to the ground, providing a minimum density points 4 points/kmp.

For each point will ensure visible materialized by at least two points of geodetic network thicken and lifting or geodetic support network.

Regardless of the tools and the techniques used to carry network geodetic measurements shall be compensated lifting the network forced the networks of support points and thicken.

The standard deviation for the determination of a point must not exceed:

± 10 cm in within the built-up area;

± 20 cm in outside bilt-over areas in the plain areas;

±30 cm in outside bilt-over areas in the hilly areas;

±50 cm outside bilt-over areas in the mountain.

It is defined by relations:

$$s_x = s_0 \sqrt{Q_{xx_i}} \quad (1)$$

$$s_y = s_0 \sqrt{Q_{yy_i}} \quad (2)$$

where:

-Q_{xx} , Q_{yy} - main diagonal elements of matrix co-factors (weight coefficients) of the unknowns that X and Y coordinates corresponding to the point i;

-s_0 - standard deviation of unit weight (Norme tehnice pentru introducerea Cadastrului general).

MATERIAL AND METHODS

This case study was conducted in the management unit I Sâniob in the area of 1780.4 hectares which is managed by the Forest District Săcuieni of County Forest Administration Oradea.

Forest stands are located on the beam constituent communes Diosig, Sălard, Ciuhoi and Săcuieni in Bihor county.

Geographical management unit is found in the north-west of Bihor county.

To realize the case study have used a number of materials required as follows:

-Network support of Bihor county made with GNSS technology;

-Network support of Bihor County thicken, made with GNSS technology;

-Scale topographic map 1: 25 000;

-Forest planning map afferent U.P. I Siniob, O.S. Săcuieni, D.S. Oradea, scale 1: 20 000;

-Management plan of U.P. I Sîniob, O.S. Săcuieni, D.S. Oradea - general studies.

-4 GPS receivers R3 with accessories;

-GPS navigation Pocket LOOX N520 Fujitsu Siemens;

-Total Station Trimble 3605;

-Trimble Data Transfer;

-Trimble Total Control;

-Map Sys PDA 2.0;

-Terramodel 10.3;

-Topo Sys 5.0;

-Map Sys 7.0.

To carry out case studies to raise details of the forestry sector using modern technologies vector data collection were used several methods which are listed below.

Observation research method was used to identify the land (occupied by forest vegetation) which was the subject of study.

Experiment was used as a research method in this case study to facilitate the introduction of modern technologies to achieve geo-topo-photogrammetric works in forestry.

Following have experienced a number of possibilities to work in terms of removal in the forestry sector using various materials and technologies work, and that in pursuing the optimization of efficiency activities.

Simulation and modeling of the research methods were applied in the light use of specialized software endeavoring to obtain similar patterns of land and that objective reality abstraction some particular aspects of importance for forestry.

Therefore to obtain positive results, the achievement of a comprehensive case study which is subsequently generalized features of the final product that is applied on large areas.

Comparison - to compare results obtained with different technologies work.

To highlight the peculiarities of modern technology to collect data by vector methods were examined possibilities of lifting the details related to the compartment 46 and that determination of its surface.

Compartment 46 is located inside the forest massif and observation were carried out vegetation season.

Following two methods were used to waive the details, that the fast static method GNSS technology and the associated traverse total station with conventional technology afferent radially.

To achieve these works have been used a number of points on the support network of Bihor county, points were determined with modern technologies combined in several phases of work.

In the experimental device developed case study where we conduct research in terrestrial measurements applied in forestry since 2002, there is sufficient specific landmark.

RESULTS AND DISCUSSION

Considering the fact that the topography in the area of low hills and plains mostly has a rectangular shape studied is a rectangular plot, which allows high precision determination of its planimetrical position.

Compartment surface also will be determined with high precision.

With the lifting of the details related to works u.a. 46 I got a series of results that are presented in table 1.

Table 1

Inventory coordinates and associated standard deviations characteristic points determined GNSS technology - fast static method inside the massive forest

No.point	X(m)	Sx(m)	Y(m)	Sy(m)	Sxy(m)	Z(m)	Sz(m)
146	644871.113	0.068	279203.788	0.049	0.084	204.291	0.081
246	645261.498	0.043	279072.182	0.031	0.053	213.180	0.047
346	645395.522	0.030	279493.014	0.024	0.038	210.098	0.035
446	645017.129	0.059	279627.680	0.057	0.082	206.974	0.082

Using Trimble Total Control program were getting points determined - figure 1 and that standard deviations corresponding in the national reference - 1970 Stereo planimetry coordinates and that the Black Sea in 1975 for quotation - table 1.

To determine the standard deviation of planimetry for the calculated points we used the equation no. 3.

$$S_{xy} = \sqrt{S_x^2 + S_y^2} \qquad (3)$$

where:

s_x - standard deviation of the point on the axis OX;

s_y - standard deviation of the point on the axis OY.

Table 2

Racing details with modern technology inside the forest massifs

No. point	**GPS** - fast static			**Total station** - radiate		
	X (m)	Y(m)	Z(m)	X (m)	Y(m)	Z(m)
0	*1*	*2*	*3*	*4*	*5*	*6*
146	644871.113	279203.788	204.291	644871.846	279203.649	203.390
246	645261.498	279072.182	213.180	645261.565	279072.387	213.208
346	645395.522	279493.014	210.098	645395.486	279492.995	210.100
446	645017.129	279627.680	206.974	645016.750	279627.767	206.950

Analyzing data from the table 2 and that the diagram in fig. 2 it is noted that all the characteristic points are determined altimetric and planimetry standard deviations below the tolerance even within the built-up area (<10 cm).

Fig. 1. Racing details GNSS technology fast static method

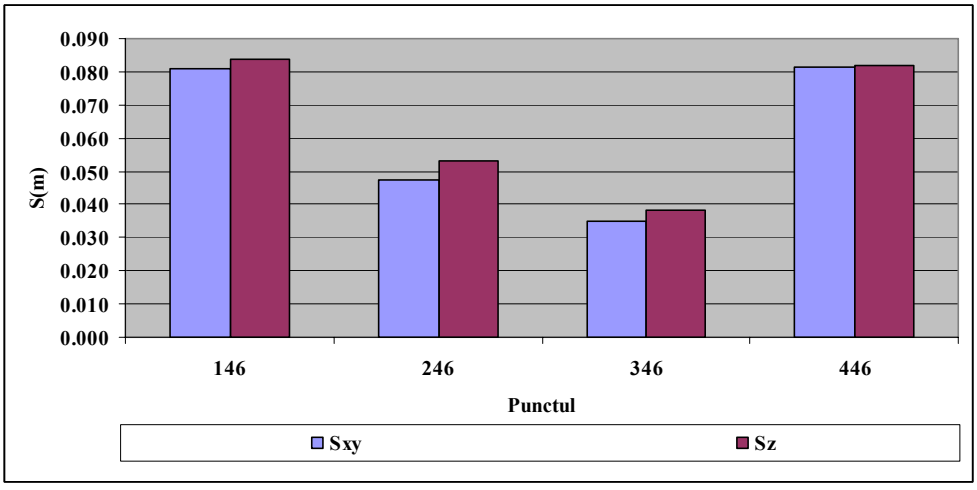

Fig. 2. Standard deviations planimetry and altimetric coordinates corresponding characteristic points determined

Also notes that paragraphs 246 and 346 can be considered as points of dense network support as standard deviations altimetric and planimetry are lower as tolerance - respective <5 cm (technical standards).

Parcel area 46 determined by the analytical method Mapsys 7.0 program is S = 180,993.01 m^2 and perimeter P = 1703.61 m.

Fig. 3. Racing details with conventional technology (total station), the traverse total station method

Measurement details and determine the coordinates of the plot corners 46 with conventional technology was achieved with total station Trimble 3605 with the surveying by polar coordinates method assigned polygonometrical traverse – fig. 3.

Algorithm for calculating the radiated points does not allow determination of standard deviations their planimetry and altimetric.

Further details of the characteristic points determined by conventional technology can not be compared in terms of accuracy with coordinates determined with GNSS technology.

Plot area 46 was determined by the analytical method with the program Mapsys 7.0. area S = 180,827.71 m^2 and perimeter P = 1702.83 m.

Table 3

Inventory coordinates corresponding characteristic points determined by the conventional technology - the surveying by polar coordinates method assigned with polygonometrical traverse inside the forest massifs

Nr.pct.	X(m)	Y(m)	Z(m)	Observationes
0	*1*	*2*	*3*	*4*
146	644871.846	279203.649	203.390	Point inside the massive forest
246	645261.565	279072.387	213.208	Point inside the massive forest
346	645395.486	279492.995	210.100	Point on the edge of the open gap
446	645016.750	279627.767	206.950	Point inside the massive forest

The difference between the coordinates of characteristic points calculated with the two technologies are presented in table 3.

Analyzing data from the table 3 it is noted that the small differences coordinated occurred if section 346, point which is located on the gap edge of wedge 46.

Table 4

Coordinate differences related characteristic points determined by different technologies

Point	Dx(m)	Dy(m)	Dz(m)
0	*1*	*2*	*3*
146	-0.733	0.139	0.901
246	-0.067	-0.205	-0.028
346	0.036	0.019	-0.002
446	0.379	-0.087	0.024

The difference between the area calculated using the coordinates determined by the two technologies is $\Delta s = 165.3$ m^2 and for perimeter $\Delta p = 0.78$ m.

Analyzing data from tables 3 and 4 that are observed between corresponding coordinates of points defining characteristic form 46 compartment (compartment meanders) determined by the two technologies differ from decimetres order for coordinates of points and points that inch for details.

Ds = 180993,01 - 180827,71 = 165.3 m^2

Dp = 1703,61 - 1702,83 = 0.78 m

The difference between the two technologies determined elements is due to conditions of work in the forestry sector, which do not meet the technical conditions imposed by modern technologies in the field of land measurement in particular the conditions complained of GNSS technology.

CONCLUSIONS

Between coordinates corresponding characteristic points defining the compartment of the plot 46 (elbows plot) caused by the two technologies there are differences of order decimetres if coordinates of points 146, 246 and 446 centimeters and that if the coordinates of point 346.

The difference between surface values determined for the two variants of calculation and amount of management plan, 18 ha.

Differences determined by two elements is due to technology and working methods that the particular conditions in the forestry sector not satisfying the technical conditions imposed by modern technologies in the field of terrestrial measurements.

It is recommended to use differentiated modern technologies, as necessary, to achieve topographical works in the forestry sector considering the season of vegetation, logistics and personnel.

It is recommended to use specialized computer programs post-processing - if using GNSS technology as they realize a complex processing of data and allow editing of their report processing.

Closure detail using radiation method or polygonometric traverse framed the radiation is recommended for situations where GNSS technology is not possible.

Points determined at lifting up details that show a higher accuracy of determination shall be recorded in the database as points of the network or network thicken depending on the precision lifting their determination. Materialization of new points determined to be consider recommendations of technical standards and that the particular activities in the forestry sector.

REFERENCES

1.Boş N., Iacobescu O., 2007, Topografie modernă, Editura C H Bek, Bucureşti;

2.Boş N., 2003, Cadastru general, Editura ALL BECK, Bucureşti;

3.Boş N., 2003, Cartea funciară şi expertiza tehnică topo-cadastrală, Editura ALL BECK, Bucureşti;

4.Boş N., Chiţea Gh., 2005, Ridicarea în plan a pădurilor din România în etapa actuală, Revista pădurilor, nr.1/2005, pag. 28 - 31, Bucureşti;

5.Dragomir P. I., 1992, Topografie generală, Institutul de Construcţii Bucureşti;

6.Hofmann – Wellenhof B., Lichtenegger H., Collins J., 1997, Global Positioning System - Theory and Practice, Springer Verlag Wien New York;

7.Neuner J., 2000, Sisteme de poziţionare globală, Editura Matrix Rom, Bucureşti;

8.Păunescu C., Mocanu V., Dimitriu S. G., 2006, Sistemul Global de Poziţionare G.P.S. – curs, Editura Universităţii din Bucureşti;

9.Tămâioagă Gh., Tămâioagă D., 2007, Automatizarea lucrărilor de cadastru, Editura Matrix Rom, Bucureşti;

10.***Amenajamentul Ocolului Silvic Săcuieni, Direcţia Silvică Oradea, Studiul General;

11.***Amenajamentul Unităţii de Producţie II Sîniob, Ocolului Silvic Săcuieni, Direcţia Silvică Oradea, Studiul General;

12.***Norme tehnice pentru introducerea Cadastrului general aprobate prin Ordinul MAP nr.534/01.10.2001;

Programe utilizate

TRIMBLE TOTAL CONTROL, TRIMBLE DATA TRANSFER, MAPSYS 7.0, TERRAMODEL 10.3,

Adrese utilizate 1.www.trimble.com, 2.www.geotop.ro