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IMPLEMENTING THE FOREST CADASTRE BY APPLYING THE PROPERTY LAW IN ORDER TO REGISTER A FOREST PLOT

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Abstract: *Forestry cadastre or forestry fund cadastre deals with inventorying and recording lands covered by forest vegetation for a rational exploitation of forests, to consolidate and develop young forests, and to revise existing forestry planning on each administrative territory. The work presented in this paper is based on nowadays legislation and was done in order to record and dismember a forest plot. Measurements and data processing were done with the help of up-to-date technology.*

1. Introduction

Inventorying and recording forestry fund is based upon land survey measurements, soil mapping, and plot descriptions in which all factors on which depend production and optimal valorizing of forest products are shown.

Lands belonging to forestry fund are identified and delimited when forestry planning is designed.

Forestry planning has as an objective the establishment of a judicious ratio between real production capacity of arboretums and the amount of woody mass that is exploited annually or forest growth through melioration, reconstruction, and development of the forestry basin. This planning are revisited and remade every 10 years, thus ensuring a periodical maintenance of forestry fund.

Therefore, elements necessary to forestry cadastre works are supplied together with forestry planning.

Forestry cadastre works concern:

- Identifying and delimiting lands belonging to forestry fund, which is done together with general cadastre works, when they also take into account existing forestry planning;
- Surveying in order to do forestry planning;
- Soil mapping and plot describing, in which all the factors on which rely production and optimal valorising of forestry products.

Cadastre plans from assessing forestry fund (plots, forestry units, etc.) constitute the basis for forestry cadastre records. Forestry cadastre belongs to non-agricultural use category. It deals with monitoring and

systematically inventorying national forestry fund and that of forestry planning, stipulating area, wood species, age, woody mass consistency, etc.
It is done by the Ministry for Waters, Forests, and Environmental Protection in order to ensure a reasonable exploitation of forests and a good management of forestry planning.

2. Material and Method

Cadastral work was done in order to record and dismember a forest plot of 15 ha in Archia (District of Hunedoara).

The documents were made up in order to record the "Archia Composesorat" that is part of the Simeria Forestry District. The land is part of the forestry land category as production unit II planning unit 121. The land is covered by forest vegetation.

The goal of the work was to record it indefinitely in the Land Record of the plot wearing the name mentioned above; plot planning to put into possession 37 owners acknowledged by the District Commission surveying the way the Law for Land Fund is applied in the District of Hunedoara.

The judicial situation of the land in the old Land Record is "mentioned in the L.R. nr. 280, Archia, nr. of top 375/136. Recording in the Land Record shall be done indefinitely according to the Law of Cadastre and Real Estate Publicity nr. 7/1996, and on the ground of Ownership Title, according to the Law nr. 1/2000."

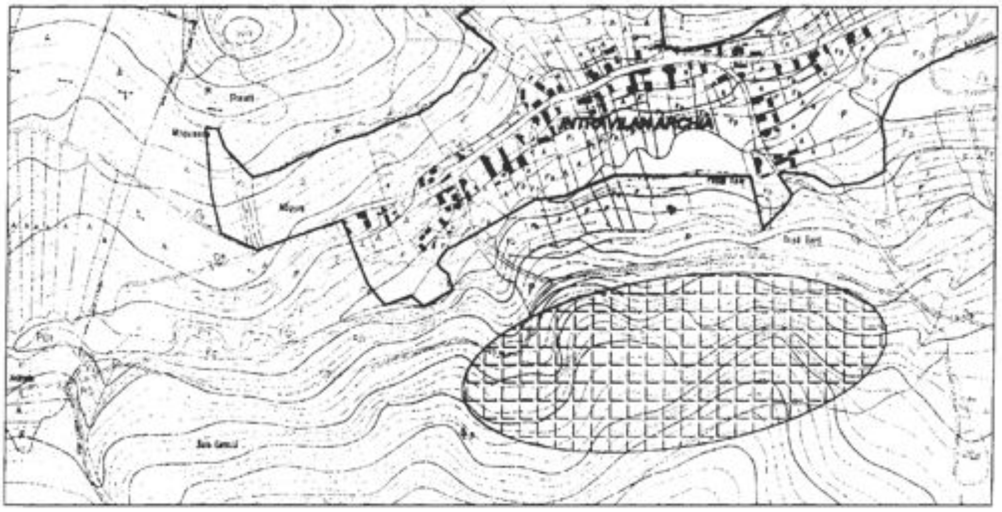

Figure 1. Framing plan of Archia

The forest of 15 ha is situated south from Archia on the western slope of the hill, at the place called "Peste Vale" or "Valea Archiei", neighbouring an exploitation road to the north, a pasture to the east and south, and a forest from the planning unit nr. 122, to the west. The land on which is the forest has a northern-southern extension of 250 m and an eastern-western extension of 690 m. from the point of view of altitude, the extension varies between level curves 280 and 330 (Black Sea as a reference), which asked for a situation plan of level curves with an equidistance of 2 m and a slope of 30^0 necessary to make the proper plotting of the land.

Survey measurements were done with a total station of the Leica TCR 805 type. Works were done in the protection system Stereographic 70.

We stationed in a known coordinate point (the Nucet Relay) – at the limit of the Archia intra-muros – which generated a tachymetric, altimetry traverse close on the starting point formed of 6 points according to the blueprint of the visas and, to crown it all, the practical part of this paper is a technical documentation drew up to record marking sketches from which we irradiated the necessary points to achieve the setting and delimiting plan of the property.

Discharging and primary taking over of data from measurements were done on computer, with the help of programmes such as Leica Survey Office and programmes such as Notepad, Excel, Word, AutoCAD 14, Surfer 7.0, and Mapsys 4.4.

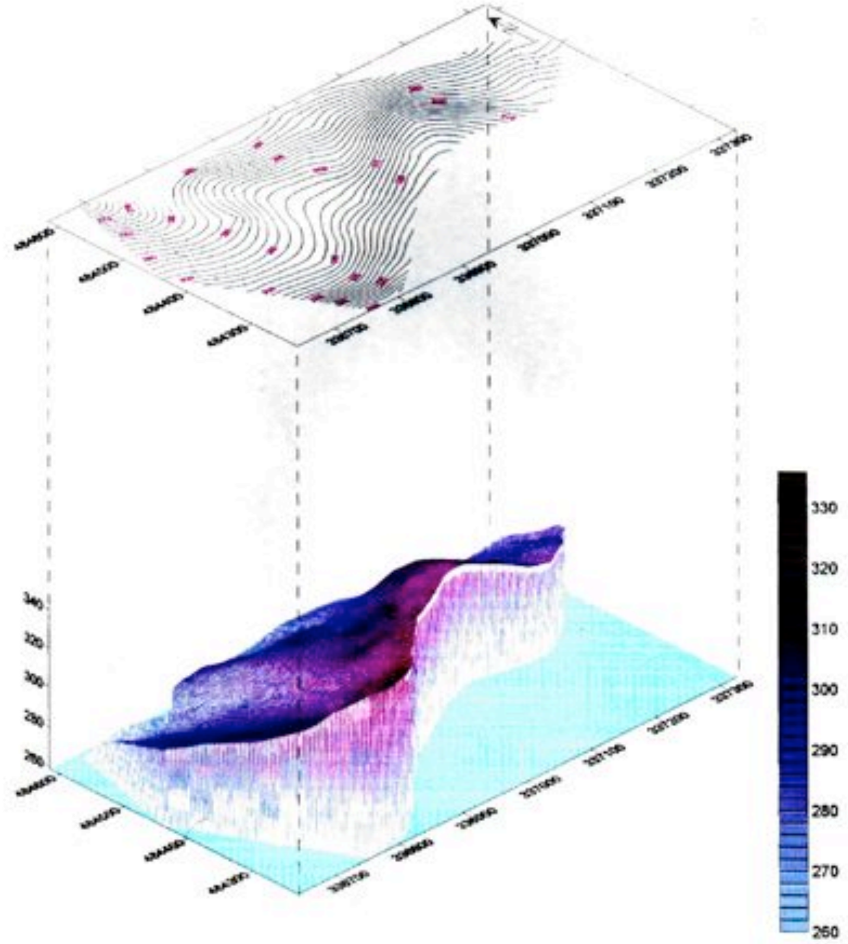

Figure 2. Spatial representation of land

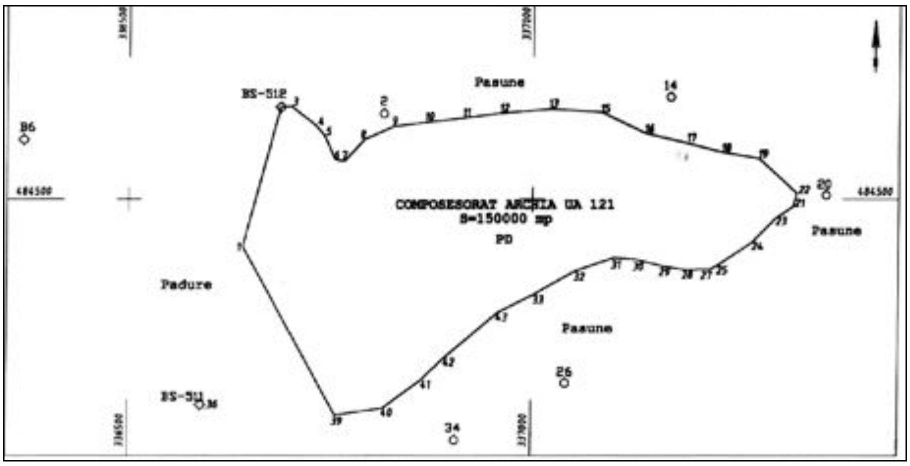

Figure 3. Location plan and mapping of body ownership

3. Results and Discussion

Modern surveying is done with the help of electronic instruments that allow simultaneous and accurate measurements of angles and distances, data memorising and even their processing on the spot.

This is the era of electronic tachometry that ensures surveys with a high degree of automation, safety, and particular yield.

Survey automation process, that included so far calculus and rationing stages, is becoming general, including also in most cases, field measurements.

Survey methods that help assessing points' position in plane and space are, in principle, the same as in classical survey: intersections, traverses, radiations, but the way they are applied is steadily improving. The possibility for precise and rapid measurements of angles and survey distances with no size restriction lead to revisiting and developing methods based on both elements. Increasing the number of V points in the net is done more quickly and cheaper through complete polygonal traverses with radiations, linear and angular intersections, and more elastic methods, adaptable to field conditions.

Independent survey nets, in their turn, can be considered from a different perspective, as electronic tachometers have an applicability field being determined by polygon metrical traverses doubled by the same procedure or under the form of triangulation-triangulation combinations.

Electronic tachometers are also useful in survey netting. Traverse trajectories are easier to choose and they are pursued as successive radiations whose control is in the departure or arrival point. With the help of traverse point coordinates one can also do the survey, i.e. radiations. As a result one can get and record directly radiation point coordinates in the geodesic system that can be automatically pottered together with its order number.

Electronics also penetrated and conquered the field of terrestrial measurements with beneficial effects on yield. Expanding and generalising electronic tachometric procedures is conditioned by equipment and limited by price. This is why for a long period of time there will predominate classical methods of work and equipment already existent.

Global Positioning System (GPS) is a novelty in survey, as it represents an automatic recording of spatial data (x, y, and z). The system was primarily used in the army and it was subsequently adapted to be used in morphological studies.

A constellation of 24 NAVSTAR satellites allow users owning specialised receivers to calculate the position of a point anywhere on Earth with an error of about 1 m (depending on use technique and on receiver quality). The system allows direct linking of GPS receivers to calculus systems and the use of data directly in Geographical Information Systems (GIS). The system supposes the existence of 4 satellites visible the moment of the readings, which hinders the system use in narrow valleys or on fields covered with forest vegetation.

As a result of the development of NAVSTAR satellites and of availability of positioning signals for commercial users, it is possible nowadays to assess point position on Earth, with maximum precision and in real time, thus reducing much of land costs. The system does not rely on weather conditions and ensures direct visibility for at least 4 satellites for any point on Earth, at any time of the day and night (though sometimes in the presence of 9-10 satellites in the visibility fields, and in most observation periods of the day about 6-7 satellites).

Academic foundation of position assessment procedures is very clear. Thus, by knowing the position of 3 satellites and the distance of a point on Earth to the 3 satellites, it is possible to assess tri-dimension position of the station point on Earth (assessed as intersection point of 3 spheres whose centre – satellite position – and rays – distance from the satellites to the unknown station point – are known). Due to the fact that position to satellites is measured by using the time at which the signal transmitted by them reaches the receiver, to assess station point coordinates in practice it is necessary to ensure visibility to a fourth satellite that has the role of ensuring clock synchronising on board the satellites (atomic clocks) with the clock of the receiver (low precision). Assessing time with maximum accuracy and synchronising clocks directly influences assessment accuracy as with time measuring one can also measure distance between satellites and the unknown station point. Receivers of the ZEISS type have clocks whose accuracy can be compared to atomic ones, but they are more expensive than less accurate ones. Signal received from the field station also contains information concerning the exact position of satellites in the whole constellation and an almanac that allows the receiver to anticipate angle positions of visible satellites from the point in question at any time, thus reducing detection time of satellite position by the receiver (satellites have orbital periods of 12 h). Correction details by GPS receivers are extremely complex.

As a conclusion, GPS systems allow field positioning with an accuracy varying between a few tens metre and some centimetre depending mainly on:

- technique;
- position and visibility of satellites in relation to receiver;
- registering time for each position measurement;
- correlations input through further data processing.

The advantages of global positioning system to the classical methods are:

- no visibility between two successive recording points is required;
- there is no need for an ante-calculated supporting net;
- it functions no matter the weather conditions;
- it integrates correlation data directly into geographical informational systems (GIS).

The disadvantages of the positioning system compared to the advantages are relatively few:

- they are based on a military system;
- there are reception problems in narrow valleys and under thick canopy (the problem was solved in new receivers by increasing antenna sensitivity and signal/noise ratio);
- two receivers are needed to get an acceptable error;
- the cost of GPS receivers and relatively high electricity consumption.

As for future perspectives, they concern mainly the diminution of receiver costs together with increasing performance.

4. Conclusions

We should mention that because of difficulties caused by land shape, by its covering, and by the features of this fund, survey work is done by simplified techniques that do not require too high plan metric or altimetry accuracy.

These last year's photogrammetric methods practically replaced all survey methods, as they have the advantage of qualitatively inventorying forests (species, ages, density, moisture, diseases, etc.) besides high yielding plan metric survey – using photo-interpretation and teledetection.

In the future, global positioning systems already performing will evolve towards superior accuracy, in a shorter time and with lower costs. Geographical information systems will take advantage of all this (due to ease in getting field data, the main problem with present systems), accurate location of permanent test areas within already inventoried planning works.

Data recorded with GPS devices lead to coordinates in a universally accepted system (i.e. UTM), while in Romania they still use the stereographical projection system 1970. In these conditions, when directly implementing data recorded with GPS devices, there are problems of trans-calculation.

Coordinates of the stereographical projection system 1970 are trans-calculated into geographical coordinates that allow direct change into Universal Geodetic Datum relying on the WGS 84 spheroid used by GPS systems, atmosphere effect <10.0 m.

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