POSSIBLE USE OF GEOMATICS FOR THE ANALYSIS OF SPATIAL DISTRIBUTION OF CHESTNUT (*CASTANEA SATIVA* MILL) POPULATIONS IN ROMANIA

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Abstract
 Using applications related to advanced technologies in the field of spatial positioning in different sectors represents certain opportunities for modernizing and improving processes. Geomatic applications can be used successfully today in different sectors for obtaining effective and enlightening solutions for those activities.
 The spatial distribution of the different populations of trees can be analyzed and studied effectively if a series of field inventory data after an appropriate processing ends with reporting in a spatial reference system known which are used today.
 As a result, the use of georeferenced data constitute the premise for effective results, offering the possibility of adopting solutions optimal lines for management and not least to elucidate some issues related to the area of migration and extinction of species habitat.
 The materialization chestnut species areal in the national forest fund with geomatic applications is a clear example of the successful implementation of these technologies in practical activities in the forestry sector.
 Elements necessary to obtain these geomatics applications are the field data, georeferenced raster used for reporting details, specialized software and qualified people.

Key words: geomatic applications, stand, area, chestnut, population of trees, vegetation zones

INTRODUCTION

Currently the spatial positioning can be achieved using modern technologies for the collection and processing data and respectively for obtaining the corresponding final products.

Information geodesy respectively geomatics, due to promoted working principles ensures solving positioning complex problems of the different details and respectively the realization of geographical information systems and afferent databases.

Currently a series of studies and research concerning area and spreading of different species, may use some geomatics applications for explanation and respectively for the correct interpretation of the results and for issuing relevant and integrative conclusions (Serrada et al., 2008).

To obtain accurate and enlightening thematic maps for accurate and true representation of the vegetation areas related to different forest associations is necessary to use georeferenced raster (in the national

reference system), which present if there are possible and some peculiarities of the relief. It is necessary that these graphics products to be found in a suitable format, usually in digital format, and have an appropriate extension for efficient operation.

Usually, there are used rasters with the extension shp., ecw., dxf., dbf., which are obtained from different websites specializing in activities of the spatial positioning, the development of geographical information systems (GIS's) and databases afferent.

At the present, in our country, chestnut is distributed mainly in the northwest, the Baia Mare area - Baia Sprie, Firiza, Tăuţii Măgherăuş Forest Districts, the Western area Gurahonţ and Codrii Cămării - Dobreşti - Gurahonţ, Dobreşti and Codrii Cămării Forest Districts and in the Southern Subcarpathians area respectively in Baia de Arama - Tismana plateu and Călimăneşti in Vâlcea County - Baia de Aramă, Tarniţa, Tismana, Runcu, Călimăneşti Forest Districts (Damian, Crainic, 2012a; Damian, Crainic, 2012b; Pârnuţă, 2011; Pârnuţă et al., 2010; Stănescu et al., 1997).

MATERIAL AND METHOD

Research methods used for the case study are: bibliographic documentation, observation (on itinerary and stationary), statistical and mathematical inventory, comparison, simulation, recording a digital format a satellite data.

Researches and studies field were conducted between 2012 - 2014 in a series of stands where vegetate chestnut species (*Castanea sativa* Mill) in the national forest, located in 12 locations, grouped into zones as follows (***amenajamentele unităţilor de producţie):
- The area northwest - Baia Sprie, Firiza, Tăuţii Măgherăuş Forest Districts;
- The area west - Gurahonţ, Dobreşti and Codrii Cămării Forest Districts;
- The area south - Baia de Aramă, Tarniţa, Tismana, Runcu, Călimăneşti Forest Districts.

Positioning of chestnut trees studied was performed with a receiver G.P.S. Fujitsu-Siemens navigation model that provides accurate positioning plan of approx. 0.5-1.0 m and supposed spatial positioning coordinates related for the sample plots established for research and study of these stands.

The data recorded in the field were processed in real time with specialized program MapSys PDA 2.0 (Marton, 2007), thus obtaining coordinates of sample plots centers in the national reference stereographic-1970 for the plane coordinates (X, Y) and quota system Black Sea -1970 for the elevation (Z).

Graphics distribution points positioned by that materialize stands of chestnut was made in two versions.

In the first version to used a georeferenced raster related to our country which was implemented on the website: http://www.geo-spatial.org/download/datele-srtm90-reproiectate-in-stereo70, with ArcGIS 9.2 and MapSys 8.0 software.

In the second version were used for vector data respectively coordinates characteristic points materializing frontiers of our country, using MapSys 8.0 software (Marton, 2007).

RESULTS AND DISSCUSION

Researches and studies have highlighted a number of populations of chestnut (*Castanea sativa* Mill) which grow in the national forest, being represented by stands of pure or mixed chestnut, of different ages, which have some particularities related to vegetation conditions and structural elements of horizontal, vertical and qualitative.

Table 1

Coordinates of reference of the sample plots in stands of chestnut
(*Castanea sativa* Mill) in the national forest fund, researched and studied

No.	Location (stand)	Geographical coordinates		STEREO-1970 coordinates	
		Latitude	Longitude	X(m)	Y(m)
1	Baia de Aramă	45.0490	22.6270	314310	397743
2	Baia Sprie	47.6640	23.6650	399885	685885
3	Călimăneşti	45.2780	24.3730	450900	420000
4	Codrii Cămării 1	46.8880	22.3090	295065	602209
5	Codrii Cămării 2	46.8880	22.3150	295541	602152
6	Dobreşti 1	46.9060	22.3140	295517	604133
7	Dobreşti 2	46.9010	22.3080	295063	603675
8	Firiza	47.6830	23.5060	387929	688183
9	Gurahonţ 1	46.1860	22.3890	298578	523775
10	Gurahonţ 2	46.2340	22.350	295762	529441
11	Gurahonţ 5	46.2410	22.4170	300975	530104
12	Runcu	45.1610	23.0970	350544	408552
13	Tarniţa	44.9860	22.6680	316270	390038
14	Tăuţii Măgherăuş	47.680	23.4670	384998	687880
15	Tismana 1	45.0780	22.9460	338421	399656
16	Tismana 2	45.0730	22.9200	336385	399193

The coordinates of the reference of sample plots in the stands of chestnut that have been investigated and studied (Table 1) were obtained by processing the real-time satellite data recorded by the receiver Fujitsu Siemens, it is used for this purpose differential corrections provided by satellites geostationary.

To report points that define stands of chestnut studied were used ArcGIS 9.2 and MapSys 8.0 software and georeferenced raster corresponding our country (Fig. 1).
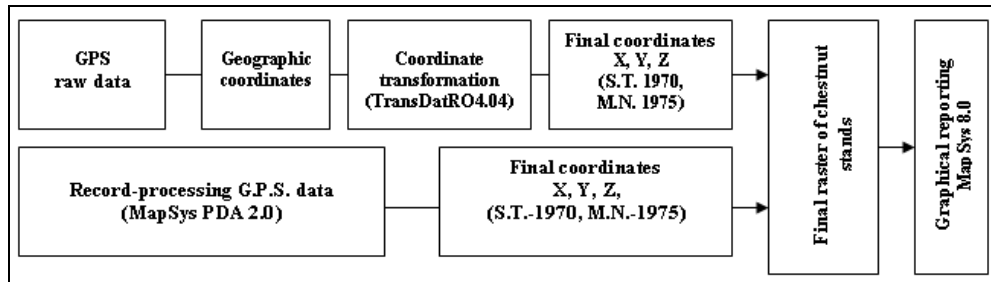

Fig. 1. The block diagram for obtaining raster for the locations where vegetate the chestnut (*Castanea sativa* Mill) stands
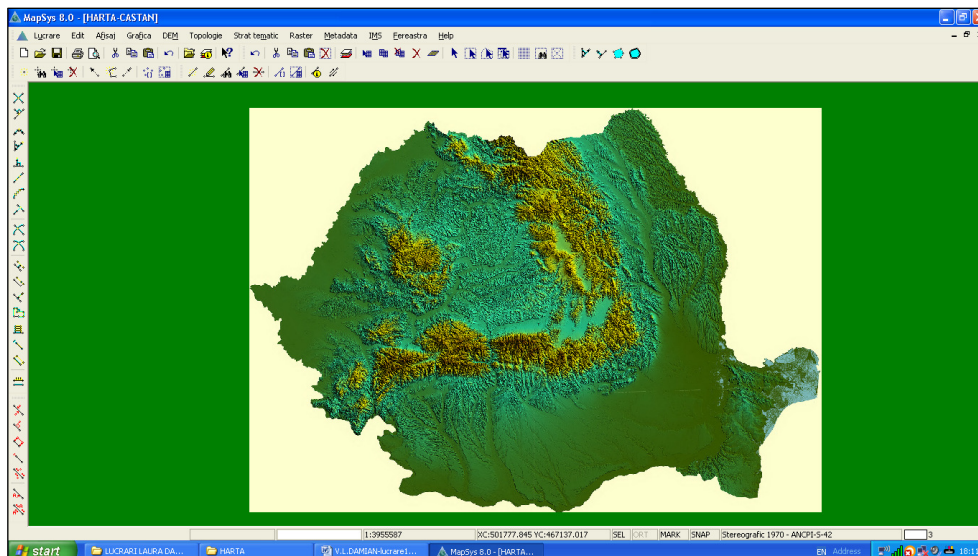

Fig. 2. The program interface MapSys8.0 with georeferenced raster implemented

Following the implementation of positioned points and their overlapping over georeferenced raster with MapSys 8.0 program (Fig. 2), was revealed the presence of seven areas where vegetate chestnut (*Castanea sativa* Mill) species in the national forest fund, which is materialized by red circles (Fig. 3).
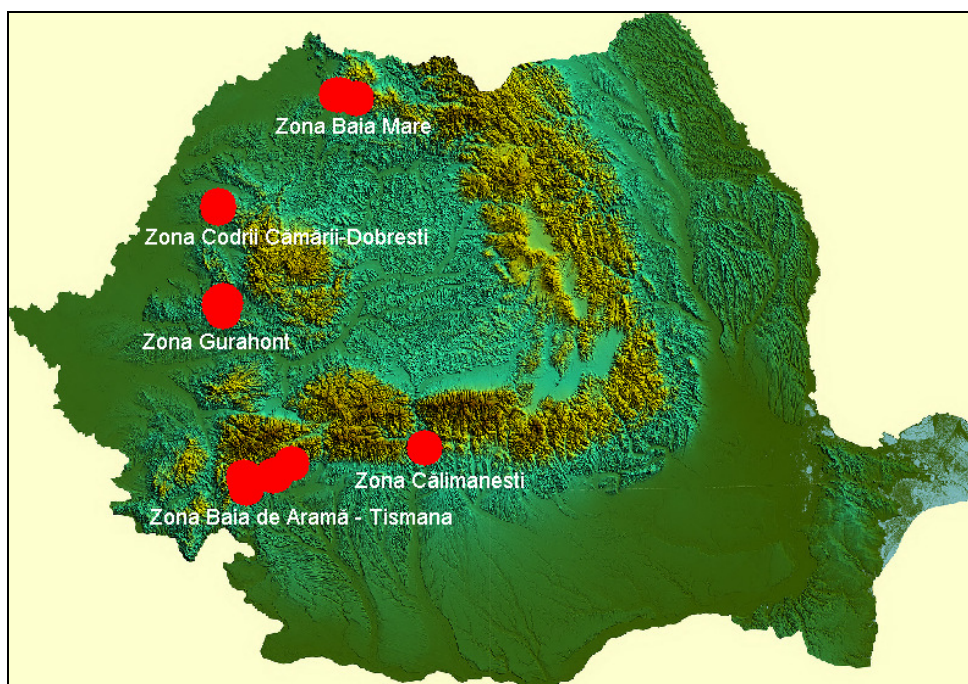
Fig. 3. The spatial distribution of the studied areas with chestnut in national forest fund, performed with the MapSys 8.0 software
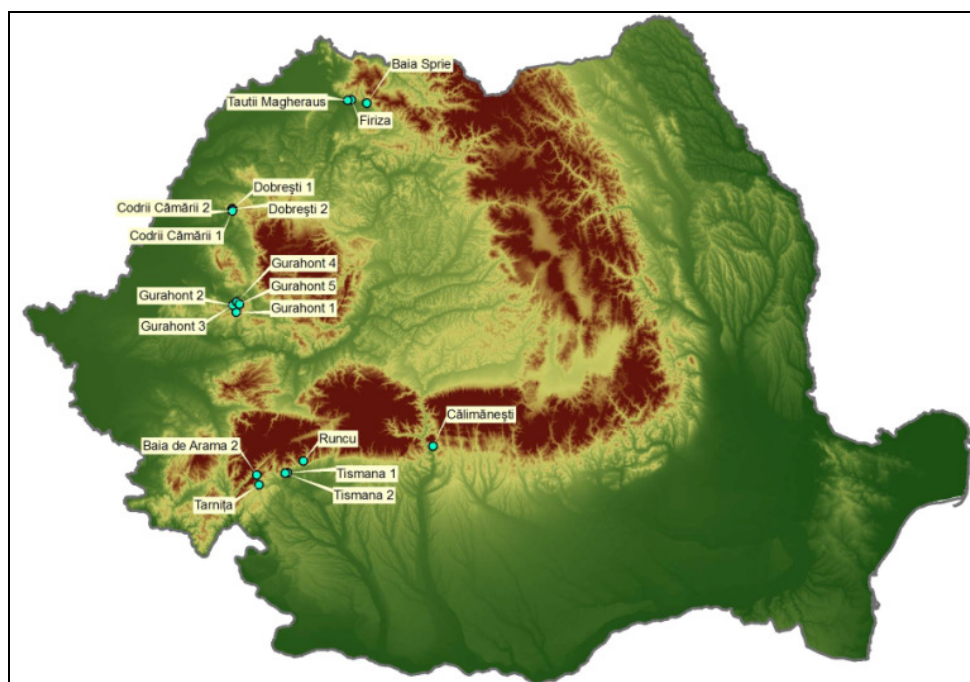

Fig. 4. The spatial distribution of the studied areas with chestnut in national forest fund, performed with the ArcGIS 9.2 software

The implementation of positioned points and their overlapping over georeferenced raster with ArcGIS 9.2 software, revealed the presence of 18 locations (or stands) which were carried out research and studies relating to the cultural specificities of *Castanea sativa* Mill species in the national forest fund. These locations were materialized on georeferenced raster with tags that have been mentioned the place names (Fig. 4).

In addition to these areas, the chestnut can be found in a series of locations that were more or less studied in the counties of Bistrita-Nasaud, Salaj, Arad, etc., which were not the subject of this study from objective considerations (incomplete information).

An alternative for presentation graphics (in a digital and/or analog format) of the areas where chestnut species vegetate in the national forest fund, using MapSys 8.0 software is based on using absolute coordinates the corresponding borders of our country (national the land fund contours) and that samples plots coordinates (located in stands of chestnut) obtained following the case study (Fig. 5).
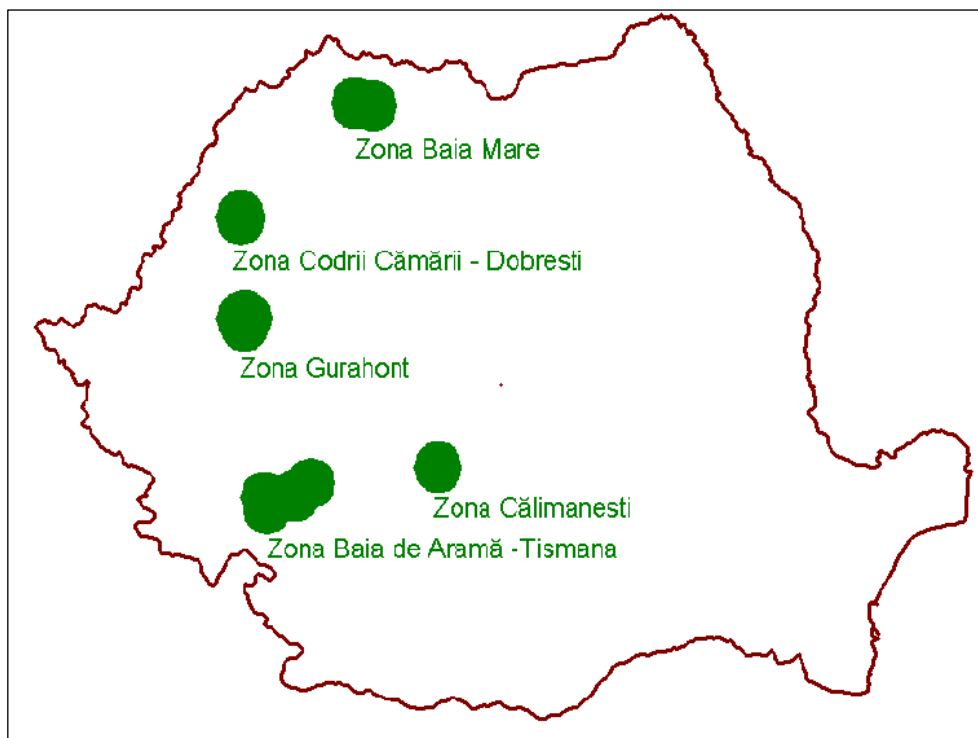

Fig. 5. Distribution of chestnut stands studied, performed with the MapSys 8.0 program using Romanian borders coordinates

For the graphical reporting of points and obtaining distribution studied areas in which grown chestnut species, using MapSys 8.0 software were comprised the following stages:

- the opening MapSys 8.0 program and the implementation of border points coordinates (Fig. 6);
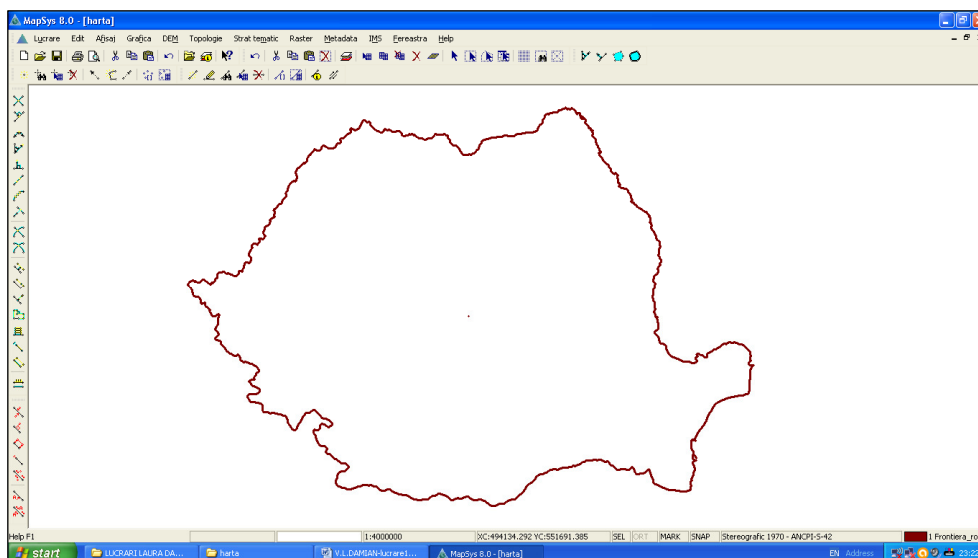

Fig. 6. The opening MapSys 8.0 program and the implementation of border points coordinates

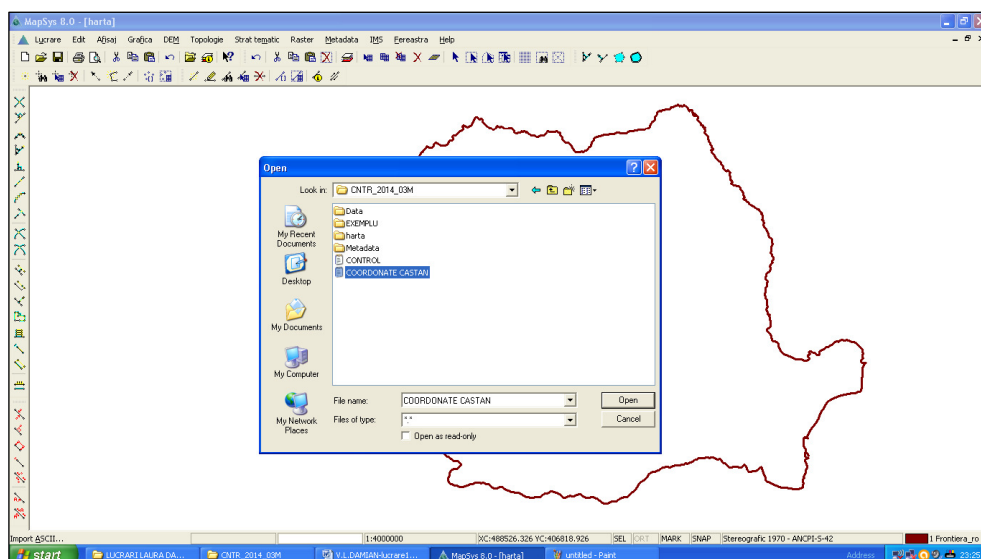- the implementation of sample plots coordinates (Fig. 7);

Fig. 7. The implementation of sample plots coordinates

- graphics materializing of the areas where are carried out the case study (in stands of chestnut studied) was made with green circles (Fig. 8);
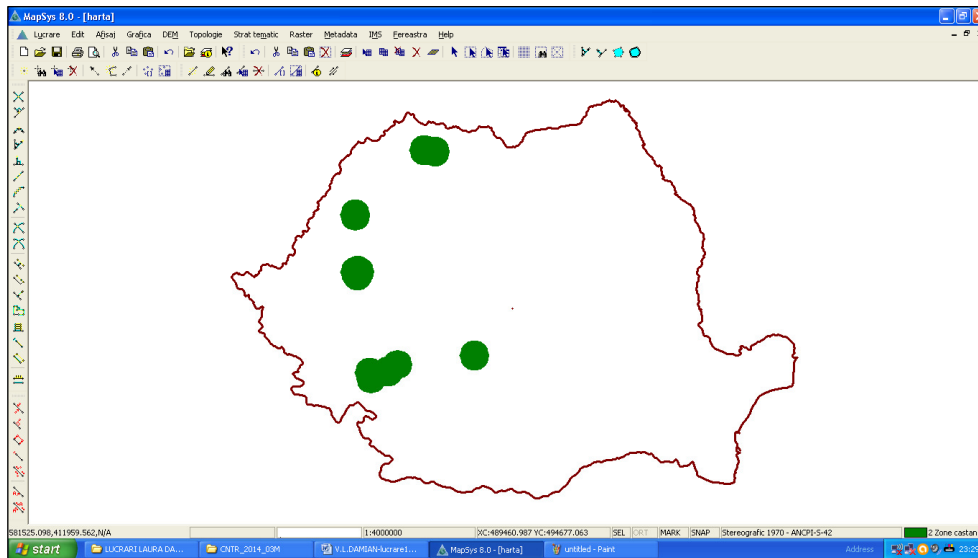

Fig. 8. The implementation of samples plots coordinates

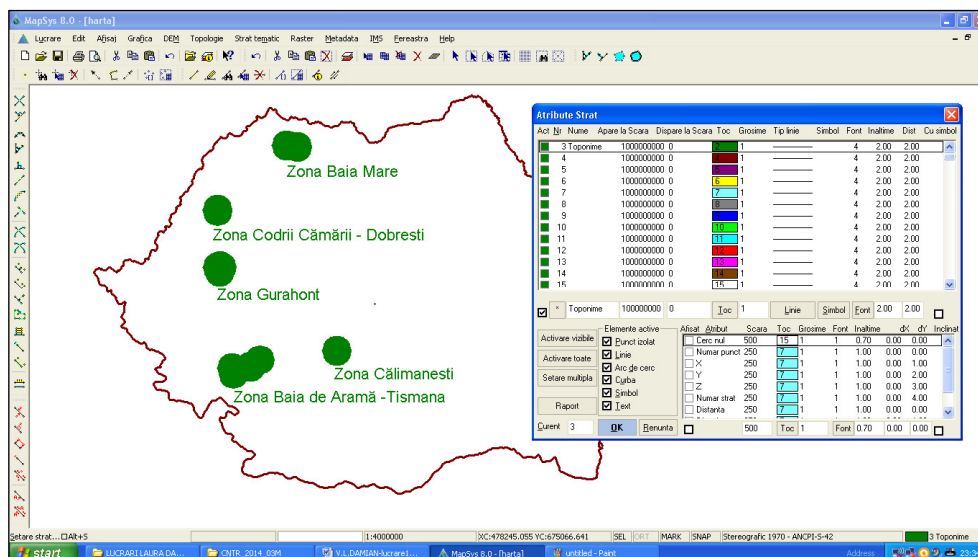- the attributes implementation relating to of place names (Fig. 9);

Fig. 9. The implementation of place names related to the areas where chestnut vegetate

- obtaining in a digital format of graphics product related to the areas where chestnut vegetate in national forest fund (Fig. 10).
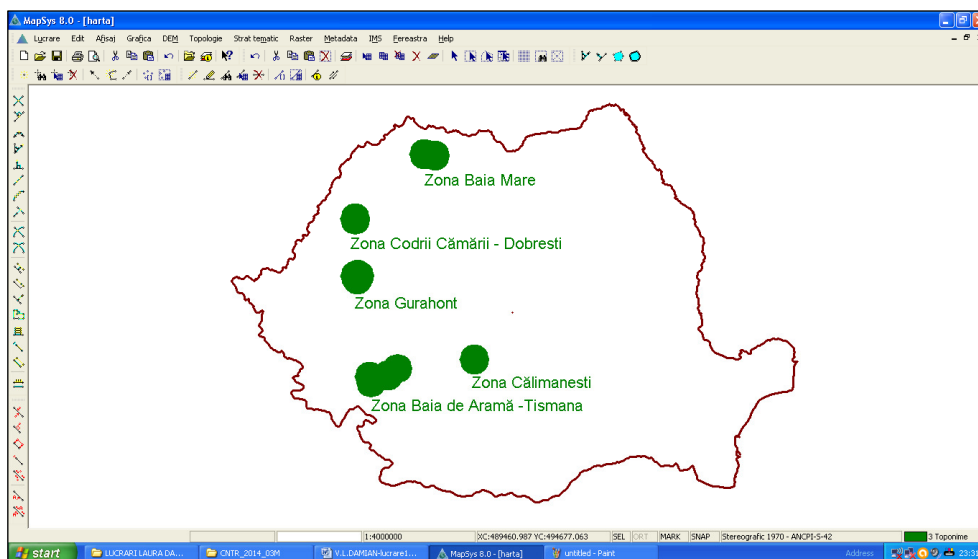
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Fig. 10. The areas where *Castanea sativa* Mill vegetate

CONCLUSIONS

Using some applications related to geomatic technologies for the positioning of details easier to obtain final products in a digital and / or analogical format with a high accuracy and precision.

For the spatial positioning of the various details of the forest fund with precision and efficiency high it is now necessary an adequate logistics, represented by G.N.S.S. technology-G.P.S. system and a series of data processing programs recorded and an appropriate infrastructure.

Reporting the results obtained in the process of spatial positioning (final coordinates in the reference national system) involves using a raster oriented, with a corresponding extension (eg *ecw*) to facilitate its operation in optimal working conditions.

The raster can be equipped as needed with various attributes related to activities taking place in the across the areas studied and analyzed, which were marked by color or by tags.

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