

## DATA BASE OF VINEYARD CADASTRE INFORMATIONAL SYSTEM

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**Abstract:** *The application aims the achievement and exploitation of a vineyard cadastre informational system database, as a Cadastral Informational System – CIS, by works of general and agricultural cadastre, at the level of a wine-growing unit. For a better practicality, CIS has been developed on a GIS platform of NetSET Map software. This allows to generate topographic and cadastral digital plans, organized on thematic layers, to use and query graphical and textual data, in order to create relational data models topological validated. Also the program helps to optimize decision-making process, by creating by the user of its own informational environment, to rapid provision of thematic reports, based on actual and accurate information collected from the field, regardless of the volume and complexity.*

**Keywords:** *vineyard cadastre, digital cadastral plan, thematic layers, alphanumeric and spatial cadastral data, informational system.*

### 1. Introduction

Vineyard Informational Systems is a subsystem of the Agricultural Informational System, which systematically keeps track, in terms of technical, economic and legal point of view, of the fields from the national vineyard heritage and buildings attached to them, regardless of their destination and owners, organized at the level of each administrative territory by fields, centers and wine vineyards, and centralized nationally [7]. The system purpose is updating or preparing plans by centers and vineyard wines, the correct imposition of the tax on agricultural income, their trading, renting or leasing, statistical processing needed to work out technical and economic documents etc. There are presented the ways of realization of the database of the Vineyard Informational System.

### 2. Method presentation

Vineyard Informational System was developed as a modern and unitary CIS, on a GIS platform of the NetSET Map software that respects the requirements of the European Union and the introduction rules of General and Agricultural Cadastre. The program, through its interactive functions for creating, managing and processing the digital plans, the orthophotomap, the Terrain Digital Model configured 2D or 3D and CIS Data Base, offers better functionality in all phases of use of spatial information, managing to solve a wide range of thematic issues [5, 8]. Only by managing a system based on current data, it can become a viable and useful support in taking decisions for preventing the chaotic development of habitable areas, for rational use of agricultural land by regional planning work, identification

of new land resources etc.

CIS efficiency in a network of Internet, increases as the GIS platform of NetSET Map software allows: defining differential access right and the level of detail of the information of an application, configuring several applications on the same server and displaying of one or other application, depending on the user's identity. Also permits administration and defining of the geographical area and of the graphics or alphanumeric elements through a client's application that can be run also on low performance computers, providing users with geo-informational data, where they need them.

### 3. The data base of a Vineyard Informational System – Case study

The objective of the case study is to achieve Vineyard Informational System, as part of the Agricultural Informational System, based on the application of technical standards of the works of introduction and maintenance of General and Agricultural Cadastre, for the site of 111 hectares of former SAE Copou Iassy (Fig. 1), that became after privatization Vinifrukt Copou Company Iassy and which, since 2007, has been included in the expansion area, denoted by C, of the City of Iassy. For this vineyard unit has been implemented the digital cadastral plan and the agricultural cadastre database, by completion of the real estate summary for the vineyard heritage. Regarding the economic-quality cadastre side, were characterized the soil resources for vine plantations.

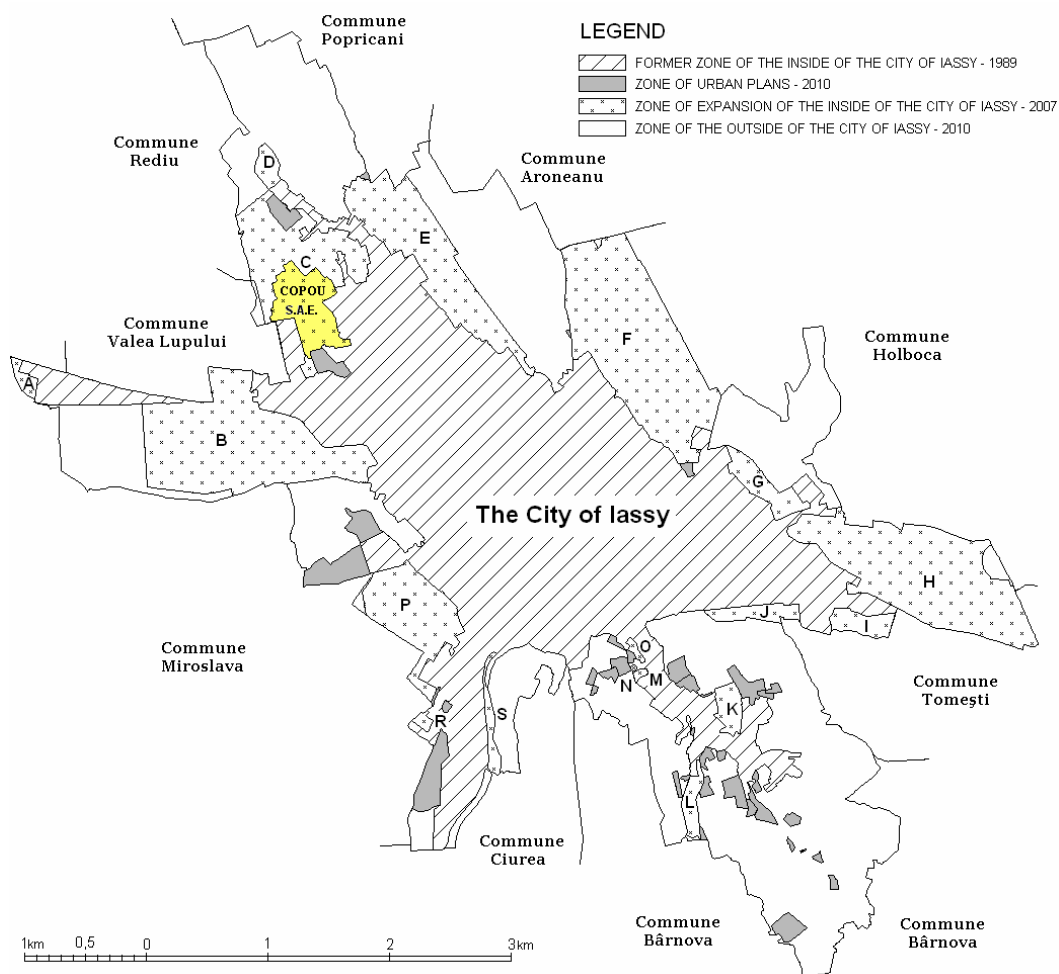


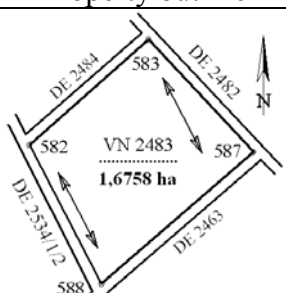
Fig. 1 The map of the areas of the inside and the outside of the City of Iassy

Fig. 2 The overall topographic cadastral digital plan of the study area

After identifying the land and buildings use categories, respective their owners and possessors, was drawn the plots cadastral summary (Table 1), according to *Methodological standards for making and maintenance of the vineyard cadastre* [3, 6].

Table 1. The Summary of the vineyard real estate

County: IASSY	Nomenclature: L-35-32-A-c-3-IV-1-b
Administrative unit: IASSY	No. field: T 63
Code SIRUTA: 95060	Nr. Plot: VN 2483
Code inside / outside city: 2	Nr. Cadastral register: 13263/2004

Property outline	Coordinates and surface inventory	
	No. point	Coordinates in Stereo-70 Projection System
		X (m)      Y (m)
	582	635039.738      692720.834
	583	635122.058      692813.525
	587	635034.041      692895.349
	588	634931.204      692776.806
SURFACE (mp)		<b>16758</b>

#### A.LAND VINE DATA BASE

Use category	Use subcategory	Destination group code	Quality class	The zone inside territory
Vine (V)	Plantations of noble vine (VN)	Agriculture destination fields (TDA)	80 points	Patrici Hill

#### B.LANDOWNER DATA BASE

Landowner's name	➤ Vinifrukt Copou Company Iassy
Landowner's Residence / Headquarter	➤ No. 5 Viticultori Street, Iassy
Landowners group code	➤ DP – private domain
Ownership of the field	➤ Exclusive

#### C.REAL ESTATE CADASTRAL RECORDS SPECIALITY DATA BASE

Type of soil	➤ Cambic chernozem
Suitability class	➤ Land with few restrictions
Favorability class	➤ 61 – 80 points of cadastral creditworthiness
Average slope of the plot	➤ 13.89 % (slightly inclined)
Average altitude of the plot	➤ 110.1 m – Black Sea reference system
Slope exhibition	➤ Semi-shadowed (North – East and East)
Anti-erosion arrangements	➤ Parallel rows with the direction of level curves
Type of vine culture	➤ Pure culture
Soil and surface name	➤ Aligoté = 16836 mp
Stock / variety	➤ Berlandieri x Riparia Kober / Aligoté
Management way of the block	➤ Semi-protected
Planting distances	➤ 2.20 m x 1.20 m
Current occupation degree	➤ 3711 hubs (58.20 %)
Current age of the plantation	➤ 35 years
Current stage of the plantation	➤ Satisfactory

If initially, depending on the conditions of relief was designed and set up a vineyard unit, after the year 1990, the parcels situation, in terms of cadastre, began to change gradually. The causes were various, such as: the previous owners were put in possession according to the Law No. 18/1991, the plots were dismembered, the plots were included in the inside of the city, the plots were subject of selling transactions through notary, for some plots was changed the category of use, the conditions imposed by Law No. 50/1991, regarding the approval of construction works etc., (Fig. 3). Mainly, these were the causes for updating the cadastral data, implicitly the vineyard cadastre.

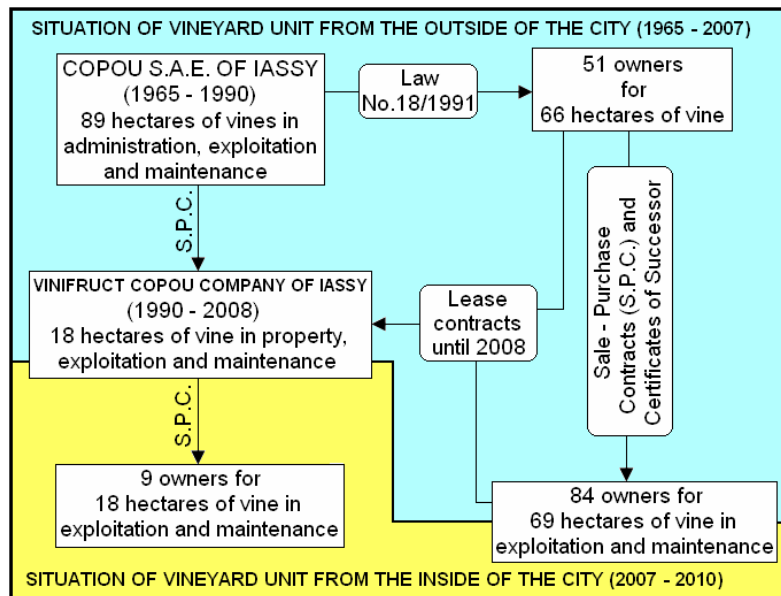


Fig. 3 The changes sketch, occurred between 1990 and 2010, regarding the ownership, exploitation and maintenance of the vineyards of Vinifruct Copou Company of Iassy

As in any field, the efficiency depends on the quality of cooperation and collaboration between the land office and real estate advertising office, in mutual transmission of changed data and documents. Equally important are the legal actions recorded in the land books, which generate changes in the content of cadastral documents, as it must be taken into account to the general cadastre maintenance. A particular attention should be paid to the continuous flow of mutual information between the two institutions to obtain accurate output data for any building or owner.

Regarding the side of economic-quality cadastre, to characterize vineyards soil resources, were established, for each mechanically worked sector, the exhibition to the sun, the average slope and the dominant grape varieties (Fig. 4).

Knowledge of soil resources is useful for a wide range of activities such as:

- inventory and systematization of surfaces (parceling, tracing the roads and others) taking into account soil and terrain conditions;
- establishing the most appropriate land use categories for efficient exploitation of the land while maintaining an optimal level of soil fertility;
- determining the degree of favorability of the soil for different species, varieties and hybrids of cultivated plants;
- adaptation of agricultural technologies for growing plants differently, depending on plant requirements, soil conditions and characteristics and others.

However, by describing the pedogenetic conditions of four representative soil units were established evaluation notes for vineyards used in wine and grapes for table production (Table

2), [2].

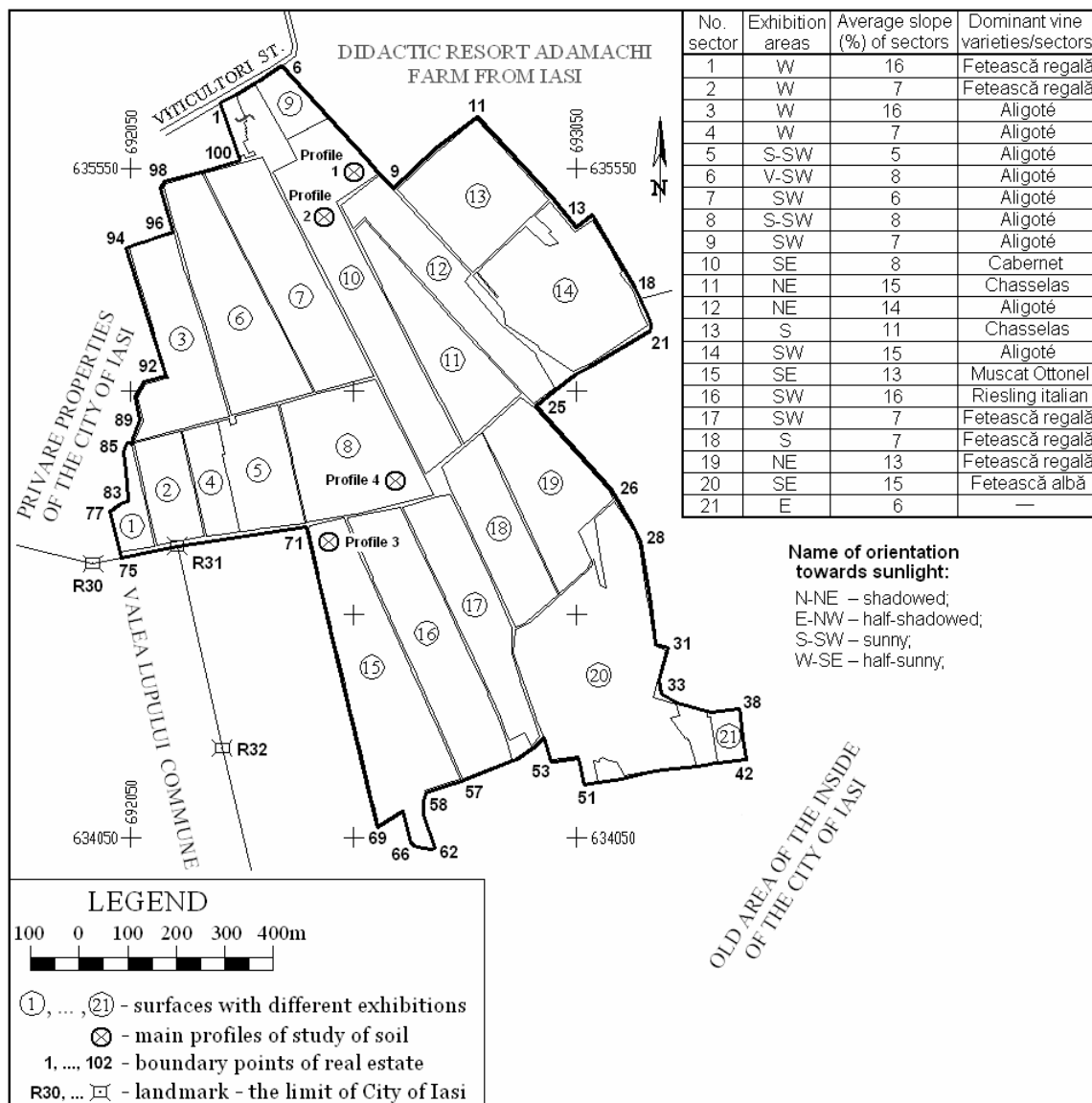


Fig. 4 Relatively uniform slopes with various exhibitions and dominant vine varieties on mechanically worked sectors at Vinifrukt Copou Company of Iassy

Table 2. Evaluation notes of ground unit  $US_1$  of vine plantations of Vinifrukt Copou Company of Iassy

Culture	Coefficients of evaluation for:									Evaluation notes
	Tc (°C)	Pc (mm)	Ground-water	Texture Ap	Slope (%)	PT (%)	CaCO <sub>3</sub> (%)	pH Ap	Humus reserve	
VV*	1	1	0.8	1	1	1	1	1	1	80
VM**	0.8	1	0.8	1	0.9	1	1	1	1	58
VN***	0.9	1	0.8	1	0.95	1	1	1	1	68

\*VV – wine vineyard, \*\*VM – consumption grapes vineyard, \*\*\*VN – vineyard (two varieties: VV and VM)

The unit of soil  $US_1$  has a lower favorability for plantation of vines for consumption



grapes production, the limiting factors being represented by groundwater located at great depth and corrected annual temperature average values.

Forasmuch some of the pedogenetic conditions which led to the formation of soil units  $US_2$ ,  $US_3$  and  $US_4$ , are similar to those presented at the unit  $US_1$ , the average evaluation notes that resulted for each culture fall into the same class of favorability.

In conclusion, the studied soil units belong to the second class of favorability for vines for wine production and to the third class of favorability for vines for production of consumption grapes.

The update of the emplacement and cadastral determination plan and cadastral situation for the vineyard unit in the year 1989, was achieved based on the topographic measurements from 2004, to observe the changes due to Law No. 18/1991, was based on dismemberments approved by Cadastre and Land Registration Office of Iassy, to observe the effect of including the vineyard unit in the area of the City of Iassy and based on the General technical cadastre, to observe the changes due to Law No. 50/1991 [1].

In order to have an overview of the development in time of the cadastral plots number due to dismemberment (Table 3), has been drawn up a diagram of the categories of use (Fig. 5), respectively their total (Fig. 6), where may be observed an ascending trend, after the inclusion of the studied area in the inside of the City of Iassy.

Table 3. The changes occurred on plots number of the vineyard unit, by categories of use of the land (1989 – 2010)

Years	A	P	F	VN	L	PD	PDT	HB	HC	DS	CC	CP	N	TOTAL
1989	20	5	7	67	1	4	0	1	2	77	8	0	0	192
2004	21	5	7	97	1	4	0	1	2	126	8	0	0	272
2008	21	5	7	209	1	4	0	1	2	131	8	0	0	389
2010	43	5	14	323	4	3	1	1	2	219	33	8	4	660

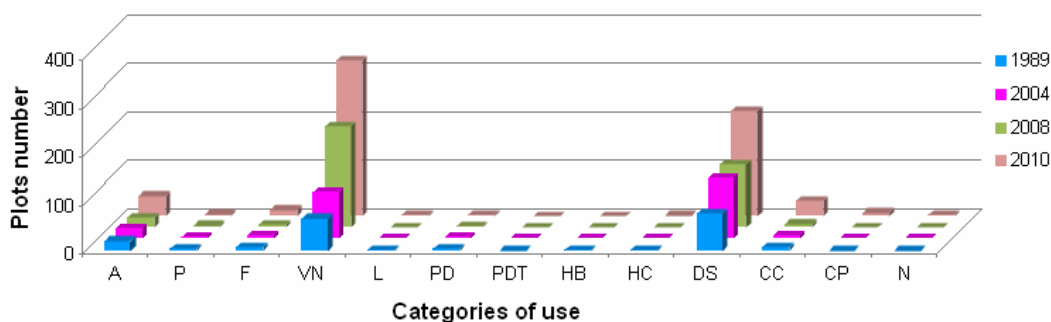


Fig. 5 The evolution of the number of plots by categories of use (1989 – 2010)

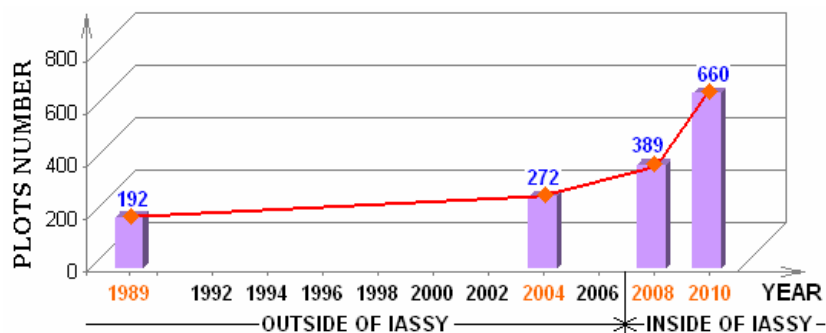


Fig. 6 The evolution of the number of cadastral plots (1989 – 2010)

Vineyard Informational System has been developed on the GIS platform of the NetSET Map software because the program allows creating, managing and processing of: the digital plans, the orthophotomap, the Terrain Digital Model, the CIS Data Base. Once are made the association links between the data table lines, the plots summary and plots polygons from the active layer, by the identification number, can access various functions of the software to query the data of the plots summary (Fig. 7).

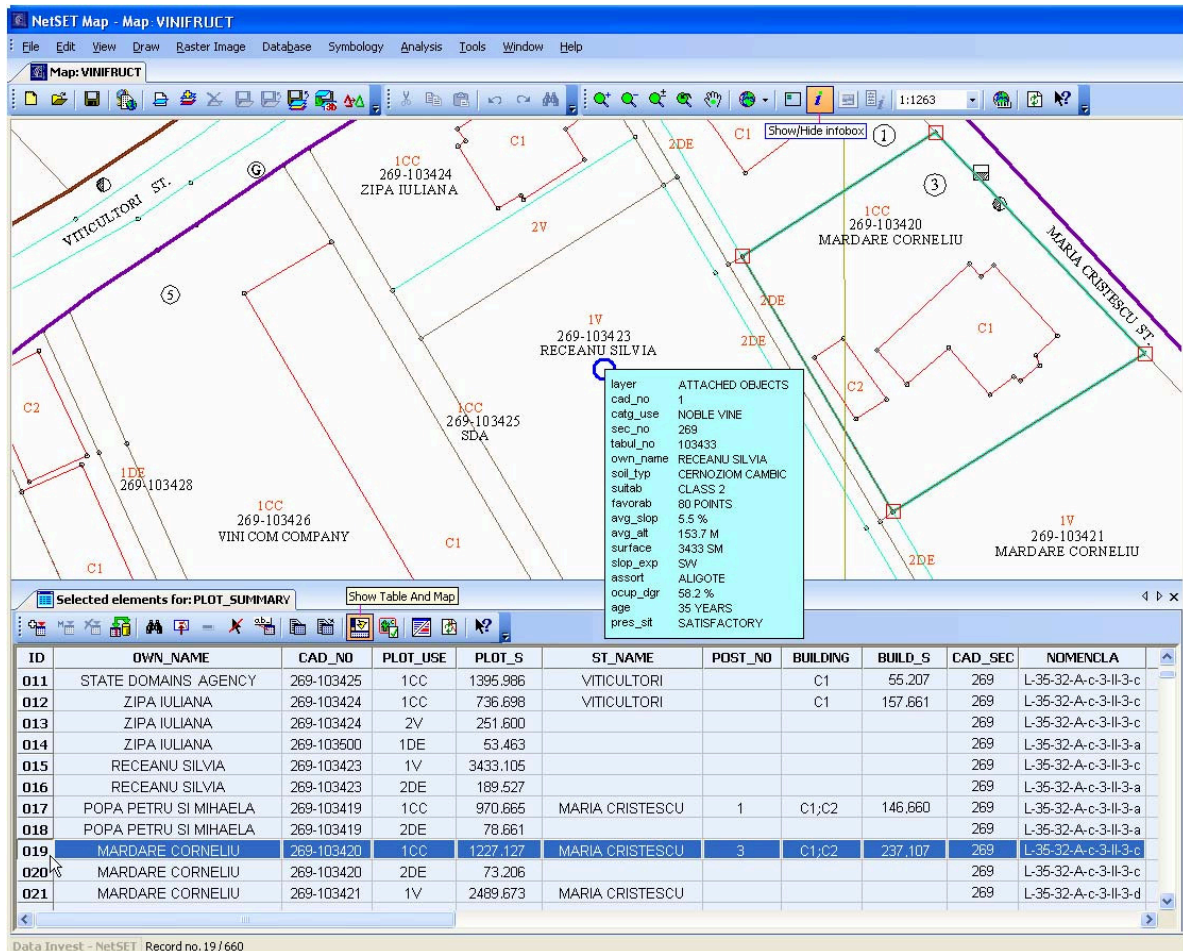


Fig. 7 Simultaneous viewing of digital plan, plot summary and attached information

The window attached to one object from the digital plan, may contain either, basic and specialized data of a cadastral plot, according to *Methodological standards for making and maintenance of the vineyard cadastre*, or a raster image of the vineyard (Fig. 7).

Interrogation of plots by the size of the area is made through the function *Simple Query*. After setting the search parameters (for example:  $\geq 1000$  mp), in table will only be shown the data lines for plots which have the area that meets the search conditions (Fig. 8).

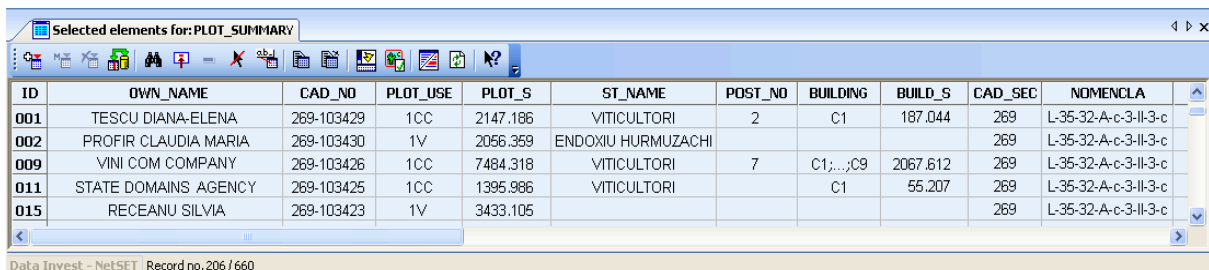


Fig. 8 The result of the search and the selection of the data lines table



The display of the selected lines is made in the order they were recorded in the table, maintaining the identification number of the line, to keep in touch with graphic elements of the digital plan. Under the plots summary, will appear the number of recorded lines (206), which meet the condition set, from the total of 660 lines of the table.

However, for the representation of some volumetric territorial objects, was integrated the 3D information with 2D traditional cadastre, through the interactive function *Shape Fade* of NetSET Map software. Moreover, the current trend in cadastre records is towards the concept of 4D cadastre, defending the need as at different queries, one of the parameters is the time, being important the feature of the plot at some point.

For example, for the representation of the 3D digital model of the terrain by color, depending on the relief height, are established in the *Shape Fade* window, as support, the layer LEVEL\_CURVES and the color ranges towards the linear elements (Fig. 9). Also, using these interactive features, can choose to display color codes of the different areas depending on the selected layer, to deal with various topics such as: roads, depending on their width, cadastral parcels, according to their average slope (*Slopes cartogram*), cadastral parcels and buildings, according to the size range of surfaces, thematic query of the occupation degree of cadastral plantation/plot, to result the empty zones of the vineyard etc.

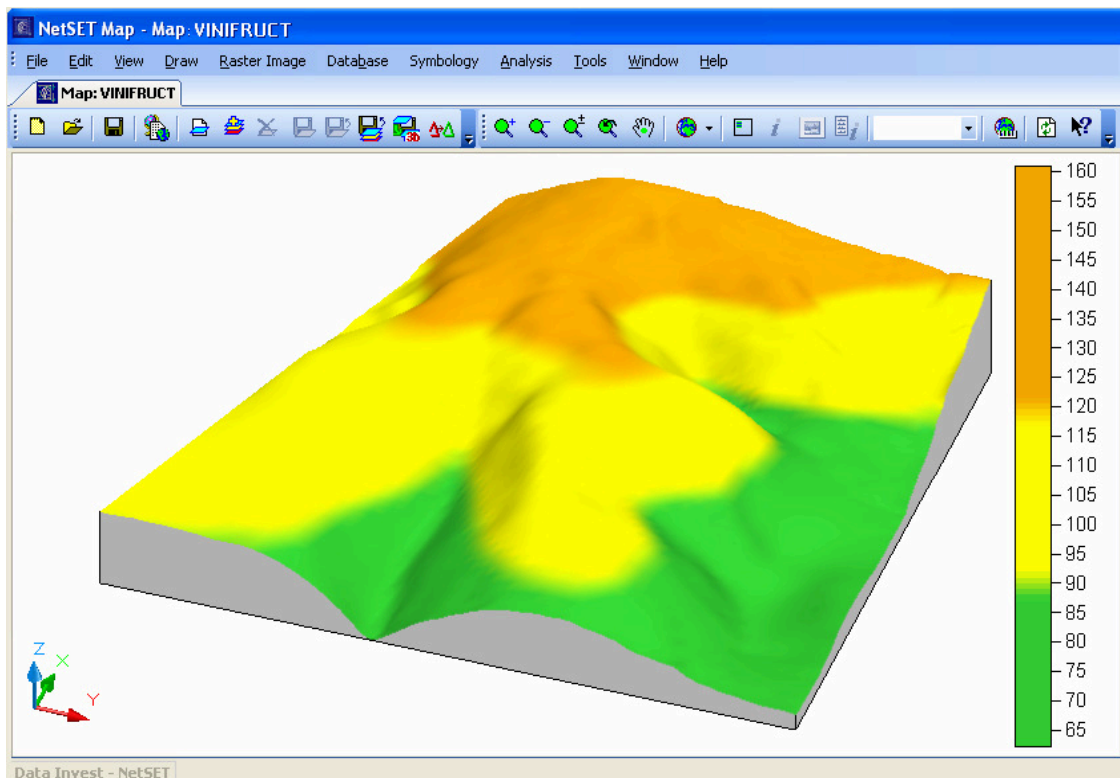


Fig. 9 The 3D colored model depending on the height of the relief

The advantages of this IT application are: the possibility of transferring graphical and alphanumeric data in the most popular GIS formats, to create your own informational environment and rapidly generate more thematic reports, the possibility of accessing large Internet applications from low performance computers. Also, to query and to edit the alphanumeric and graphic data, with the specific of agricultural cadastre, generally speaking, and vineyard cadastre, particularly speaking, to create, to search, to select and to modify graphic and text elements, to generate and to capitalize the digital plan, to print the plan sheets or standardized data summaries, with which, are covered all the demands of creating and updating CIS Data Base, in a single GIS application.

Therewith, the CIS is intended to be compatible with other systems, for a quick update of the changes produced by documentations approved by Cadastre and Land Registration Office of Iassy, and to become a viable and useful support in decision-making process to prevent the chaotic expansion of habitable zones, to rational use of agricultural land through the works of regional planning, of identification of new land resources etc. If the property sheet of cadastral plots should be completed with documents in scanned form, to determine the legal status of land, then the CIS could be successfully used by the Payment and Intervention Agency for Agriculture (PIAA).

#### 4. Conclusions

The Vineyard Informational System implementation, as a CIS, on the GIS platform of the NetSET Map software, creates advantages in the management, operation and updating of the CIS Data Base because it offers opportunities for:

- modification of the data structure in correlation with the changes of the laws, in order to reevaluate to date the terrains for agricultural and/or urban purposes;
- Internet access to the application's data, in order to capitalize by using them in other platforms and systems applications;
- achievement of informational systems that are specifics also to other fields of activity;
- development of 2D+T applications, respectively 3D+T applications, which contains general cadastre data, to allow the study the evolution in time of the way of changing the land use, the plots size and specification of the owners;
- improving the quality of services offered to different beneficiaries, by making available a more complex database, permanently updated, at a minimum cost.

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