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FACULTY OF GEOGRAPHY-GEOLOGY**

PH. D. THESIS

**OPTIMIZING THE USE OF THE LANDS FOR THE PURPOSE OF A SUSTAINABLE
DEVELOPMENT OF THE IASSY VINEYARD**

- SUMMARY -

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The thesis *Optimizing the Use of the Lands for the Purpose of a Sustainable Development of the Iassy Vineyard* is structured accordingly:

- the first chapter: **Preliminary Remarks** (pp. 4 - 9) with the subchapters: *The Purpose, The Objectives, The Methodology of the Research, The Geographical Position*.
- the second chapter is entitled **The History of the Research** (pp. 9 - 25) and refers to a series of studies made along the years for the geographical area where the Iassy vineyard is situated. This chapter contains the subchapters: *The History of the Geological Research* (pp. 9 - 12), *The History of the Geomorphological Research* (pp. 12 - 18), *The History of the Climatological Research* (pp. 18 -19), *The History of the Hydrogeological and Hydrological Research* (pp. 19 - 20), *The History of the Biogeographical and Pedological Research* (pp. 20 -21). The last subchapter has its own subchapters: *A Short History of the Viticulture in Romania, A Short Historical Presentation of the Iassy Vineyard and The Importance of the Vine Cultivation in the Economy of Romania and Iassy County*.
- the third chapter has the title **The Favorability of the Natural Environment for Vine Cultivation** (pp. 26 - 83). This chapter is divided in eight more subchapters, as follows: *Geology* (pp. 26 - 29), *The Paleogeographic and Tectonic Evolution* (pp. 29 - 31), *Useful Resources for a Sustainable Development* (pp. 31 - 32), *The Relief* (pp. 32 - 45), *Climate Characteristics* (pp. 46 - 53), *Hydrological Characteristics* (pp. 55 - 63), *Vegetation and Fauna* (pp. 63 - 66), *Soil Typology in the Iassy Vineyard* (pp. 67 - 83).

The stress fell on the subchapters relating to the relief and the soils because such elements directly influence the cultivation and spreading of the grapevine. The relief, through its characteristics of altitude, orientation and exposure, influences all the other elements of the geosystem, including vine cultivation. From the hypsometric analysis or that of the altitudinal levels resulted the fact that the zones with altitudes less than 100 m are characteristics of the plains of Bahlui, Nicolina, Jijia and their areas of confluence. The absolute minimal altitude of the Iassy vineyard is 35.5, registered in the meadow of Bahlui, in the SE of Iassy.

In the Iassy vineyard the ratio of the meadows with altitudes up to 50 m is of 16.55%. The predominant altitudinal classes are the ones with values from 50 to 150 m, occupying 66.16 % (33.11% is occupied by the areas with altitudes from 50 to 100 m, while 33. 06% is occupied by areas with altitudes from 100 to 150 m) of the vineyard surface territory. These are followed by those with altitudinal values from 150 to 200 m, registering 13.24% of the total surface. We rarely find areas with over 400 m in altitude (0.02%), in Dealul Păun which has the highest altitude of the vineyard area - 407.2 m. The analysis of the relief geodeclivity resulted in the following situation: the semihorizontal and monoclinal terrains with slopes less than 5% occupy approximately 49.15% of the Iassy vineyard area. Theses terrains correspond with the meadow areas and, in a small measure, with the interfluves and terrace tops. In such areas, the predominant geomorphological processes are those of transport and accumulation of the eroded materials from the areas with steep slopes and sheet erosion. The moderately sloping lands (between 5 to 15°) represent 49.19% of the territory.

The strongly sloping terrains (15 - 25°) represent 1.66% of the surface. These are often met in the case of the slopes of the cuesta escarpment type, positioned both in the north as well as in the west. The processes of geomorphological degradation are present in all these areas, being one of their characteristics. The surface sloping more than 25° represent only 0.03% of the total researched territory, being often met on the cuesta escarpment and landslide cornices. Such slope values can also be found at the border between fields and plateaus, but in the northern part of the vineyard, on the slopes of the asymmetric valleys of the second degrees, with a N-S

general orientation, with irregular, smooth, elongated slopes, hardly affected by the geomorphological processes. Such slopes represent cuesta reverses with eastern exposure. The left slopes of these valleys are cuesta escarpments with western exposure, with slopes of over 25% inclination in some areas, such as those of the valleys of: Cârlig, Ciric, Rediu, Lupului. Slope orientation directly influences the quality and intensity of the solar radiation captured by the foliage vines and it can also determine the risk of some climatic accidents. The highest values in the intensity and quality of the captured solar radiations can be found on the slopes with southern exposure, followed by the ones facing south-east and south-west. Slope orientation is also a very useful indicator for a detailed analysis on the features of the slope processes (distribution and intensity), the analysis being conditioned by the monoclinical geological structure with a 7-8m/km inclination NNV-SSV (as a passive element), as well as the evolution of the hydrographic network. In the Iassy vineyard, the largest expansion belongs to the slopes with eastern exposure (17.21%), to the second degree cuesta reverses, slightly degraded, and last, to the slopes with North-Eastern exposure (17.08%). A special place is occupied by the slopes with South-Eastern exposure (15.45%) and those with Western exposure (13.08%), respectively, cuesta escarpment slopes of second degree. Northern orientation is characteristic for 9.03% of the slopes, which are cuesta escarpments of first degree, strongly affected by delluvial processes. The North-West oriented slopes occupy 6.18% and are characteristic of the confluence of some valleys with different degrees of asymmetry, though their aspect is similar to that of a cuesta escarpment.

As for the types and main forms of relief, we can identify in this area a structural relief, a sculptural relief and the one of fluvial accumulation. The structural relief is well represented by structural plateaus and types of structurally conditioned valleys, where we can identify: the reconsequent valleys that are oriented according to the general inclination of the strata (Valea Lupului, Rediului, Podgoria Copou, Cârlig, Ciric); the subsequent valleys, characterized by an almost crossing disposition facing the direction of the strata inclination cut an angle more or less than 90° (Valea Adâncă, Valea Ursului, Valea Cornești, Valea Bârca, Valea Bahluiului); the obsequent valleys, which present a general evolution that face the resistance of the geological strata they cross (Valea Nicolinei). The sculptural relief is represented in this area by interfluvial ridges and delluvial slopes (cuesta escarpments with western exposure and structural asymmetry of second degree; delluvial slopes - the typical cuesta reverses). The relief of fluvial accumulation is represented by alluvial plains and terraces (the representatives being here the seven terraces of the Bahlui and the seven terraces of the Nicolina).

The physical features of the soil (texture, structure) and the agropedological and physico-chemical ones (the supply of nutrients, the content of humus, soil reaction, the content of harmful salts and the content of clay) indicate propitious conditions for vine cultivation.

Out of the total surface of the Iassy vineyard of 33756.65 ha, 19575.12 ha were mapped, the difference of 14267.75 ha being represented by urban area, lakes and forests. On the vineyard territory, 13 types of soils were identified, according to SRTS, 2003, soils belonging to the following classes: Protisoils (13.58%), Chernisoils (64.94%), Antrisoils (15.93%), Luvisoils (3.28%), Hidrisoils (1.91%) and Salsodisoils representing 0.36% of the mapped surface, occupying 12711.52 ha, which is 64.94% of the mapped surface. Its predominated elements are the Chernozems soils with 95.53% and the Phaeozems with 4.47%. A special place is occupied by Antrosoils which cover over an area of 1543.20 ha, which is 49.49% of the Antrisoils class and almost 7.88% of the mapped surface. There are soils that are taking over new territories due the anthropogenic intervention in order to be used as vineyards or orchards. In the Iassy vineyard

area they can be found mainly in the southern part, south of Bahlui, more exactly in the area of the former wine farms and orchards of Agroindustrială Bucium S.A. All soils are swampy while others are compacted. The soil complexes that occupy an area of 3825.86 ha that is 19.54% of the mapped territory also influence the way the lands are used.

The fourth chapter *The Land Use in the Iassy Vineyard* (pp. 86 - 102) contains four subchapters - *Elements of Human Geography, The Land Use in the Iassy Vineyard, The Structure and Evolution of the Bearing Vineyard, Recent Modifications in the Land Use*. As far as the land use is concerned and taking into consideration the whole area of the Iassy vineyard, the built on surfaces occupy 7897.26 ha, which is 23.19% of its area. In this category we include the discontinued industrial zones, representing 59.13% of this category and 13.83% of the total mapped area. In this subcategory we include built-on territories with dwellings that engulf the human settlements, namely the 36 villages belonging to the communal areas and the city of Iassy. Next, there are the continual industrial areas that cover 1087.84 ha, representing 13.77% of this category and 3.22% of the total area of the Iassy vineyard. Out of the entire agricultural land of 21436.55 ha the farming land represents 36.70% (7866.08 ha), the vineyards 12% of the territory (2570.49 ha), the orchards 3.77% (809.52 ha), the pastures 17.55% of the total (3762.7 ha) and the areas with a complex agriculture 29.98% of the farming area of the vineyard, that is 6427.76 ha.

As far the recent modifications in land use, we followed their evolution mainly after 1990, especially after the passing of the Land Law (the law no. 18 from 1991). Thus, during 1986-2006, looking at the categories with agricultural use, we notice a regressive evolution of the farm lands, with a drop of 846.55 ha, respectively from 8322.82 ha (in 1986) to 7866.08 (in 2006). The areas occupied by pastures and grasslands lost 100 ha (from 3862.7 ha in 1986 to 3762.7 ha in 2006). The areas covered by orchards follow the same trend of negative dynamics specific to lands for agricultural use. Their area was reduced from 1543.98 ha in 1987 to 809.22 ha in 2005 by deforestation of an area of 737.76 ha.

The areas occupied by vine cultivation in the Iassy vineyard suffered an obvious regress after the 1990's. Thus, if in 1989, the areas cultivated with vine were of 4237.25 ha, in 1995, the same areas occupied only 3842 ha and in 2010, only 2476 ha. In this chapter I came up with two case studies about the Șorogari Terroir, where from an area of 237 ha in 1986 we found only 180 ha occupied by cultivation in 2010. A highly important percentage - 10% of this area (about 18 ha) - is now derelict and the only areas covered by bearing vines in Șorogari are of 162 ha. In 1990, the Bucium wine centre had 1100 ha of bearing vines, all noble. After 1990 the vineyard was taken over by the State Domain Agency and part of the land began to be given back to the previous owners according to Law 18 from 1991. Until 2003 460 ha had been retroceded and from the remaining 640 ha, other 600 ha were retroceded in 2003. Today, the Bucium vineyard has only 40 ha left belonging to the State Domain Agency.

The fifth chapter *Optimizing the Land Use for the Purpose of a Sustainable Development of the Iassy Vineyard* (pp. 107 - 148) is divided in four subchapters: *Viticulture and the Concept of Sustainable Development, Evaluation and Classification According to Favorability for the Purpose of Optimizing the Vineyard Use, Problems of the Romanian Viticulture in General and of the Iassy Viticulture in Particular, Optimizing the Land Use*. The subchapter about evaluation starts with the analysis of the limiting factors for the vine plantations from the Iassy vineyard area. The analysis was done according to environmental conditions offered by the relief, climate, hydrology and soil, with values varying from 0 to 1. For 1, the conditions ensured by the environmental factors are excellent for vines or other types of crops.

When the values are lower than 1, the environmental factors limit certain crops or become totally improper (when the value is close to 0). The terrains with 10.1 - 15% slopping impose minor restrictions on VV and VM with 09 and 08 evaluation coefficient on a 969.28 ha, representing 4.95% of the mapped area. The greatest restrictions appear on the terrains with more than 20% slopping, with differences between the two types of vine, VV and VM. The moderate erosion affects 30.50% of the area, which is 3159.52 ha, while the strong erosion affects 10.50% of the territory. The strongly eroded slopes occupy 2640.98 ha, that is 25.50% of the total while the excessively eroded areas occupy 11.09%, that is 1150 ha. According to field surveys and pedological maps, 508.86 ha are affected by active landslides, 2382.85 ha by semi-active ones while 1581.66 ha of the total area of the vineyard are stable. In the surveyed area salinity affects 1282.83 ha, that is 6.55% of the mapped area. Under the given circumstances, on 38.28% of the terrains (7484.09 ha), the depth of the phreatic water can reach up to 5 m, in which situation, for all vine species, the coefficient of evaluation is 0.8 point. Values lower than 0.6 points appear on the areas with a 0.5 m - 1 m depth of the phreatic water, the areas occupying a surface of 439.35 ha, that is 2.24% of the mapped area of the vineyard.

The purpose of writing this chapter about area evaluation was to identify the production capacity of the area for different crop plants, orchards, vineyards and for pastures and grasslands and to establish the causes that limit the production capacity. The soil favorability of the Iassy vineyard area for the main crops was the result of the ratio of the evaluation marks. According to their values, there are ten classes of favorability: first class - 100-91 points; second class - 90-81 points; third class - 71-80 points; fourth class - 61-70 points; fifth class - 60-51 points; sixth class - 50-41 points; seventh class - 40-31 points; eighth class - 30-21 points; ninth class - 20-11 points; tenth class - 10-0,1 points. We add for use: class A – 81-100 points, class B – 61-80 points, class C – 41-60 points, class D – 21-40 points, class E – 0-20 points.

The evaluation marks for vine cultivation were obtained by the arithmetic mean of the evaluation marks given to vine cultivation for wine and for table grapes. By consulting this evaluation we notice that 41.43% of the mapped area of the Iassy vineyard are situated in the first two classes of evaluations, with good and very good terrains for vine cultivation while 21.74%, that is 4256 ha are found in areas unfavorable to vine cultivation. Soils that are listed in class A for favorability (81-100 points in evaluation) occupy 2522.88 ha, that is 12.88% of the total mapped area of the vineyard for farm land. As a result of the evaluation of the orchard land, the case for the Iassy vineyard was as follows: the terrains listed in class A for favorability for orchards with evaluation marks from 81-100 points, occupy 2549.97 ha, that is 13.20% of the mapped area. The terrains listed in class B (61-80 evaluation points) occupy 7281.14 ha (37.20%). Class C (41-60 points) occupies 2577.59 ha (13.16% of the mapped area). Class D occupies 3121.67 ha and 15.94% of the mapped area and last, class E (0.1-20 points) occupies 3947 ha, that is 20.50% of the total. After the evaluation of the terrains for pastures and grasslands, the conclusion was that the predominant terrains were those listed in class C for favorability, followed by class D terrains. Next, we have class B, with relatively large areas and last, classes A and E terrains. In order to better highlight soil favorability for vine cultivation we have come up with a 10 class evaluation for the wine grape crops and table grape crops.

As a result of the evaluation of the terrains for wine grape cultivation we can notice a predomination of the third class terrains occupying an area of 5506.99 ha, that is 28.13% of the mapped area, followed by the terrains belonging to second and fourth class with an area of 2423.21 ha (12.37%), respectively 2195.17 ha (11.21%). As a result of the evaluation of the terrains favorable to table grape cultivation, we notice that there are no first class terrains and very few

second class ones and only 169.76 ha, which is 0.86% of the mapped area. The third and fourth classes occupy each about 14% of the mapped area. The sixth class occupies only 486.26 ha.

In this area there are soils which obtained, as a result of the terrain estimation, 100 points for certain crops and uses. Such terrains can be met on the interfluves between the left sided tributary streams of the Bahlui, occupying 553.96 ha.

In the subchapter Problems of the Romanian Viticulture in General and of the Iassy viticulture in particular, we discussed the main issues that viticulture faces: firstly, the greatest problem, the excessive fragmentation of the lands is followed by the expansion of the urban area, the soil infestation, lack of financial resources for investments, the illegal market of the wine, the lack of promotion of the Romanian wine, the ageing of the vineyards and the high costs for their maintenance.

The optimization of the land use can be achieved by mainly adapting the vine species to favorable conditions. In this respect, the stress falls on the limitation of the areas with vines prone to drought or extreme temperatures, the promotion of the tolerant varieties, the enrichment of the soils to classify for higher classes that evaluate favorability, the adaptation of the crops to the morpho-climatic conditions, the capitalization on the local traditions and the current wine and vine infrastructure, the development of tourism (enotourism).

The most important conclusion of this study is that a sustainable development of the local viticulture can only be achieved with favorable natural conditions and by increasing the agricultural productivity. The current tendency of territorial expansion of the built on areas and the economic underdevelopment of the region have become an obstacle in optimizing the vine use of the lands known in ampelography as *the Iassy vineyard*. A viable development can be achieved only on small areas, in specialized farms who would be willing to invest in this domain. The Metropolitan Church of Moldavia and Bukovina, through a program of agricultural conversion, started a vineyard of 8.2 ha of noble vine at Schit Bucium-Podrom, and SC Vinia S.A., SC Weinut T&D SRL invested in this domain. All this aspects come to strengthen the idea that the name given to this area is no longer justified, especially from the perspective of the continual transformation of the land use for a sustainable development. If the territorial expansion plans are drawn correctly (in the sense of a controlled medium and long term expansion, adapted to the physical-geographical realities of the region), a new vineyard might be brought to life here. Viticulture and wine are elements of the economic and cultural heritage of this region. From this point of view, the Iassy viticulture must be supported, on one hand, for the keeping and continuation of old traditions and results, and on the other hand, for the profitability of this occupation and its possible contribution to the local and regional development.

- **Conclusions** (pp. 166 - 168)

- **Bibliography** (pp. 169 - 177)

- **Annexes** (pp. 177 -185) include *Definitions and basic concepts, The list of figures and tables from the text*

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