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Scientific field: HORTICULTURE

HABILITATION THESIS

**VITICULTURAL POTENTIAL OF WINE
GROWING REGIONS AND ITS EVOLUTION IN
THE CONTEXT OF CLIMATE CHANGE, IN AN
INTERDISCIPLINARY APPROACH**

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ABSTRACT

The introduction of geomatic tools into scientific research in the technical fields, over the past two decades, has led to remarkable achievements, which allow us today to better understand the functioning of systems and to find solutions for their improvement. It is also the case of viticulture, the wine grape production being carried out under an *environment-plant* system, dependent on many ecological factors, difficult to assess by using the classic tools that scientific research had in the past. Knowledge of the spatial distribution of these factors, the result of their joint action, the way they change and influence wine production is possible today, due to the use of *GIS (Geographic Information System)*, *GPS*, *remote sensing and satellite imagery*. These tools provide solutions for optimizing viticulture management and its sustainable development in the context of climate change.

This is the argument underlying the research that I have carried out and which are presented together with results of my professional, scientific and academic career evolution in the habilitation thesis entitled ***"Viticultural Potential of Wine Growing Regions and its Evolution in the Context of Climate Change, in an Interdisciplinary Approach"***.

The thesis is structured in three sections, in accordance with the legislation in force and the USAMV Iasi specific rules regarding the process of obtaining the certificate of entitlement to acquire the quality of doctoral supervisor, namely: **A - Abstract; B. I.- Scientific, professional and academic achievements, academic career development plans; B. II - Bibliographic references.**

The results I have selected in order to highlight the evolution of my own scientific career after obtaining the title of PhD in Agricultural Sciences -Horticulture in 2006 are presented in the **B.I. section** in a chronological sequence differentiated on lines of research and documented by reference to the articles that I have published between 2001 and 2019. The results are presented in the context of current state of scientific research in the field of viticulture, highlighting the original contributions and their relevance for the field. The four lines of research within the research that I have carried out are:

- *viticultural potential of wine growing regions;*
- *impact of climate change on winegrowing regions;*

- the spatial distribution of frosts in winegrowing areas;

- grapevine training systems.

For each line of research, I have presented the following structure: *introduction; methodology; results and discussions; conclusions*. The habilitation thesis includes 46 figures and 40 tables, of which 11 figures and 3 tables are published here for the first time. The other 35 figures and 37 tables come from the 47 scientific articles *in extenso*, which I have published in ISI Web of Science indexed journals with impact factor (9 articles; 8 as first author) and BDI (39 articles; 24 as first author). The results of the research I have carried out are presented briefly on the research lines according to this order in **Chapter 1 - Scientific Achievements**, as follows:

1. Viticultural potential of wine growing areas

The research on this topic has used a methodology that we developed during 2009-2014 and which reveals the spatial distribution of viticultural potential of an area, in the form of wine types that can be obtained. Not only traditional viticultural areas such as Husi, Iasi, Dealul Mare vineyards were evaluated, but also areas that could acquire viticultural potential in the context of climate change, such as the Baci area, Cluj County. The methodology we developed was used in a doctoral thesis at Rennes 2 University (France) to assess the viticultural potential of the Brda region (Slovenia). It was also used as documentary support for similar assessments in Mexico and the USA. The results of the research on viticultural potential have revealed its spatial distribution in wine growing areas, the existence of homogeneous viticultural zones and they were published in ISI indexed journals with impact factor such as *J Int Sci Vigne Vin* (Bordeaux, France) and *Appl Ecol Env Res* (Budapest, Hungary).

2. Influence of climate change on wine-growing areas

Our research on the impact of climate change on viticultural potential in Romania, on a regional and local scale, revealed major shifts, caused by the increase of temperatures and sunshine duration, amid precipitation stability. The results of our research are not only consistent with the findings at the continental and global level, but they also bring new data which represent our original contributions to knowledge the impact of climate change on viticulture.

a. *Research on the impact of climate change on the wine-growing area at national level* has provided the data support needed to develop a strategy for adapting Romania's viticulture to climate change. **b.** *Research on the influence of climate change at regional level* provided information on

the changes in the eight large viticultural regions and 141 wine-growing areas in Romania. **c.** *Our research on the impact of climate change on viticulture at local scale* is the first to be conducted in the viticulture research, and it revealed the spatial shifts of climate suitability for viticulture as a consequence of climate change (published in *Theor Appl Climatol*). It has been demonstrated that the initial climate profile of wine growing regions is getting altered, representative wine production patterns are changing and major shifts are occurring in the spatial distribution of homogeneous viticultural zones. **d.** *Our research on the impact of climate change on Western European wine growing regions* (developed within the LIFE ADVICLIM project) targeted Bordeaux, the Loire Valley, the Rhine Valley, La Rioja and South Sussex wine regions. The results that we obtained show that climate change affects viticulture at the continental level, and the pattern of developments is similar, with peculiarities induced by regional climate. **e.** *Prospects of climate suitability for viticulture in the Cotnari wine growing region for the 2020-2100* (published in *Present Environment and Sustainable Development*), were based on the RCP-4.5 scenario and has revealed that after 2070 the climate of the Cotnari area and the Wine-growing Zone of North-Eastern Moldova will become suitable only for the production of red wines.

3. Research on the distribution of frosts into wine growing areas is a new approach to scientific research in viticulture, made possible by the use of GIS and temperature sensors installed in vineyards (published in *Ed. Lavoisier Tec & Doc*, France). Research in the Cotnari and Averesti wine regions has provided a tool for assessing frost exposure of vineyards, which serves to optimize vineyard establishment and exploitation strategies.

4. Research on grapevine training systems has demonstrated the possibility of using the vine foliage as a tool of controlling the chemical composition of grapes. Which has become important in the context of climate change, when excessive heliothermic resources have become a limiting factor for grapes quality.

In Chapter 2 - Professional Achievements, the main results that I obtained on the professional and academic level are presented, namely: the publication of two specialized books in national publishing houses as a single author; director of two research projects which I have gained within UEFISCDI national competitions; responsible partner for the USAMV Iași in the European LIFE ADVICLIM project, coordinated by Rennes 2 University (France) alongside international well-known institutions from France,

England, Germany and Spain; obtaining four PRECISI prizes for the scientific articles published in ISI journals classified in the yellow zone; obtaining the OIV Prize Mention in 2015 for the book *Climate Change and Terroir Viticoles* (Ed. Lavoisier Tec & Doc, 460 p.), in which I participated as a co-author with a chapter; the setting up a research laboratory for students, master students and PhD students using the funds of the projects I have won; implementation of temperature sensors networks in Cotnari, Huși and Dealul Mare wine growing regions; collaborating with researchers, teachers and world-renowned viticulture professionals.

In Section B. II. of the habilitation thesis I presented the proposed objectives in the future development of my didactic and research activity (appropriate to the strategic research objectives of the faculty and the University), as well as possible ways to implement them.