The geology in the context of geographical indications of fine wines in Serra Gaúcha region (Brazil)

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ABSTRACT
In Brazil, studies of zoning in wine have contributed to the development of geographical indications. As for the geographical identity, the geology of the criteria has been a subject of research. The region of the Serra Gaúcha, located in northeastern Rio Grande do Sul, Brazil, has a geodiversity that induce the formation of soils and terrain, comprising natural and cultural factors that imply different responses of agronomic vine. These features value the production of wines with unique qualities, which can define different terroirs. The region is at the limit of the geomorphologic units Serra Geral and Planalto dos Campos Gerais, generated from the rocks of the Serra Geral Formation. In the Pinto Bandeira geographical indication for fine wines occurs in the most of area, the Caxias Facies of Serra Geral Formation, which is composed of intermediate to acid rocks (rhyodacite), originated 131 million years ago during a volcanic fissural event of continental extension. The rocks are grayish mesocratic and show fine granular to microphaneritic texture. The area cultivated with vineyards in the Pinto Bandeira geographical indication is located on higher altitudes and lower slopes terrains, on the tops of the plateaus, occupied by rocks of Caxias Facies. Soils formed on parent material of the Caxias Facies are a set of argisoils, cambisoils and nitosoils. To integrate the information was prepared a base map in GIS for zoning studies and also to spatializing different descriptors of natural factors. To construct the geological sketch, photo-interpretation techniques were employed high-resolution aerial photos associated with field work. The digital image processing was used to construct the digital elevation model from high resolution orbital data and its derivatives such as altimetry, slope and exposure, as well as the geological structures and land forms.

Keywords: wine terroir, geology and wine, Pinto Bandeira.

1 INTRODUCTION

In Brazil, the region known as "Serra Gaúcha" in Rio Grande do Sul State (RS), south Brazil, has a tradition in wine production, due to the fact that Italians settlers arrived there, starting in 1875. Geological and geomorphologic studies have been developed to characterize viticultural geographic appellations and geotechnologies have been used by Embrapa and Embrapa Grape and Wine Research Center, located in Bento Gonçalves (RS), at the main Brazilian wine production region. However, studies of zoning in wine have contributed to the development of geographical indications.

As for geographical identity, the geology has been one of the criteria as research subject. The region of the Serra Gaúcha has a geodiversity that induce the formation of soils and terrain, comprising natural and cultural factors that imply different responses of agronomic vine. These features value the production of wines with unique qualities, which can define different terroirs.

In the Serra do Sudeste Region, Rio Grande do Sul, Brazil, studies compared geology and relief units in the region from two sets of orbital data [1]. Other study linked digital elevation models (DEM) and geological surveys to vineyards data [2]. In Bento Gonçalves, Brazil, studies indicated that minerals present in rocks and soils (montmorillonite, mordenite, illite) can be traced in wines, indicating a transmission of soils descriptors to wines [3].

This work presents studies on the Pinto Bandeira geographic indication region (PBGI), Brazil, located in the Serra Gaúcha Wine Region, relating physical data as rock and landscape, which give specificity to wines, and thus define a potential terroir.

2 MATERIALS AND METHODS

In the PBGI, producers have their vineyards above altitudes of 500m and calling their production "Mountain Wines". However, one of the requisites to a geographical denomination is a description of typical features, including the soils where vines grow, and which influence wines get from soil and bedrock, as a way to define a "terroir" [4].

Cartography was based on SH-22-V-D-II-2 map 1:50,000 scale, from the Brazilian Army. Digital elevation model (DEM) were generated from aerial data from 1:5.000 scale, with 2 meter resolution by digital image processing, used to construct its derivatives such as altimetry, slope and exposure, as well as the geological structures and land forms.

The thematic cartography review was based from existing maps [5, 6]. Visual interpretations were made on aerial and orbital data and the digitalized vectors were put into the geographic information system (GIS), related to lithology and morpho-structures. Based on this, field studies were made, recorded with global position system (GPS).

The rock samples were identified macroscopically and sent to the Laboratory of Remote Sensing and Spectroradiometry of Brazilian Geological Survey in Porto Alegre, for mineral identification and obtain spectral signatures of rocks. The analysis of the spectra was obtained by the POSAM device and MISO

software [7]. The digital image processing was made in the software ENVI 4.7 [8].
To construct the geological sketch, photo-interpretation techniques were employed on high-resolution aerial photos, integrated with field work data. A base map in GIS environment was prepared to compile the entire information by gvSIG free software [9] for zoning studies and also to spatializing different descriptors of natural factors.

3 RESULTS

The area of the PBGI is located in the Bento Gonçalves and Farroupilha counties in the state of Rio Grande do Sul (RS), Brazil (Figure 1). Geomorphologically, this area is within the limits of geomorphologic units Serra Geral and Planalto dos Campos Gerais [6]. The rocks belong to the Serra Geral Formation (SGF), with two characteristic Gramado Facies: (FG) and Caxias Facies (FC) [5], originated 131 million years ago during a volcanic fissural event of continental extension.

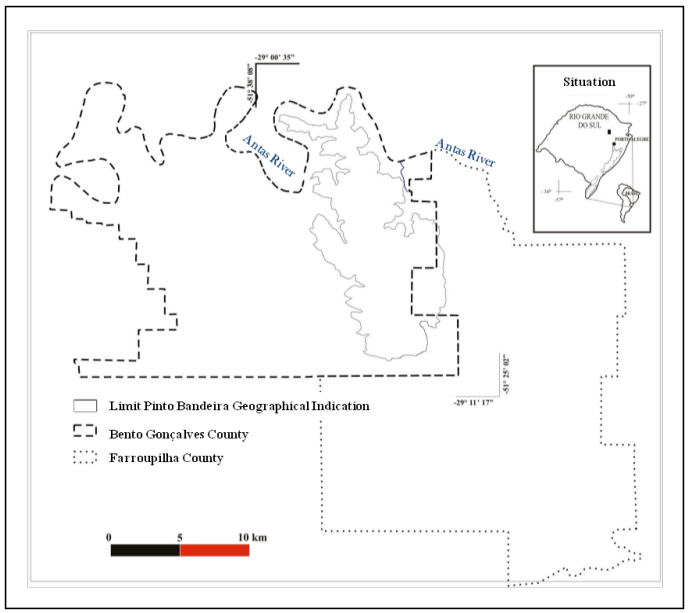

Figure 1. Localization of the study area: Pinto Bandeira, Brazil.

The relief of the PBGI is located mainly between the altitudes 600 and 700 meters, with average elevation 613 meters, the highest point is 770 meters. The slope represents an irregular topography, with extensive terraces and flat tops, existing within the limits of mountainous altitude 500 meters [10].
The area cultivated with vineyards in the PBGI is located in the neighborhood of Antas River Valley, upon higher altitudes and lower slopes terrains, on the tops of the plateaus, occupied by rocks of Caxias Facies. Soils formed on parent material of the Caxias Facies are a set of argisoils, cambisoils and nitosoils. Figure 2 shows these aspects.

The lithologic sequence contains basic rocks such as basalts forming six main lava flows (FG) and the acid volcanic rocks such as rhyodacite, dacite, rhyolite and volcanic glass forming three major spills (FC). The geological map constructed for the geographic indication Pinto Bandeira is presented in Figure 3. Note that the Caxias Facies almost completely covers the region of Pinto Bandeira, and the Gramado Facies occurs along drainages. Previously, spectroradiometric study showed difference in the spectral behavior of the two rock sequences, which influence the origin of soil to viticulture [3].

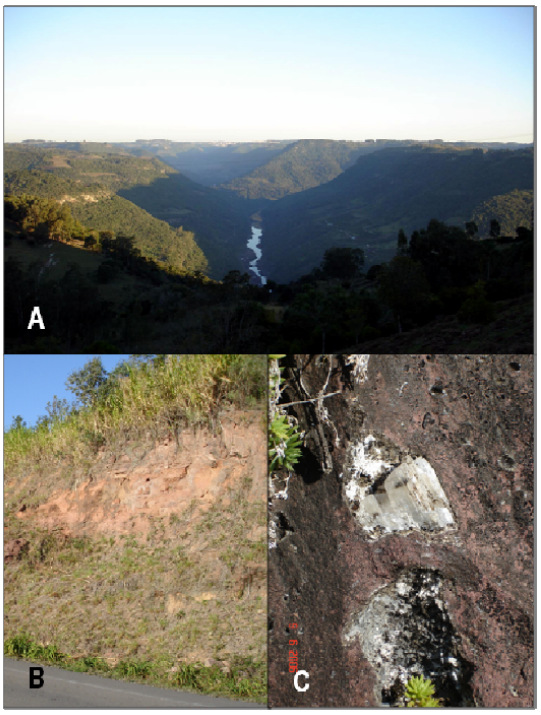

Figure 2. Geologic and geomorphologic aspects of Pinto Bandeira, Brazil: A: relief mountainous, showing Antas River Valley; B: rock wall of Serra Geral Formation (Caxias Facies) and C: calcite into volcanic rock (rhyodacite).

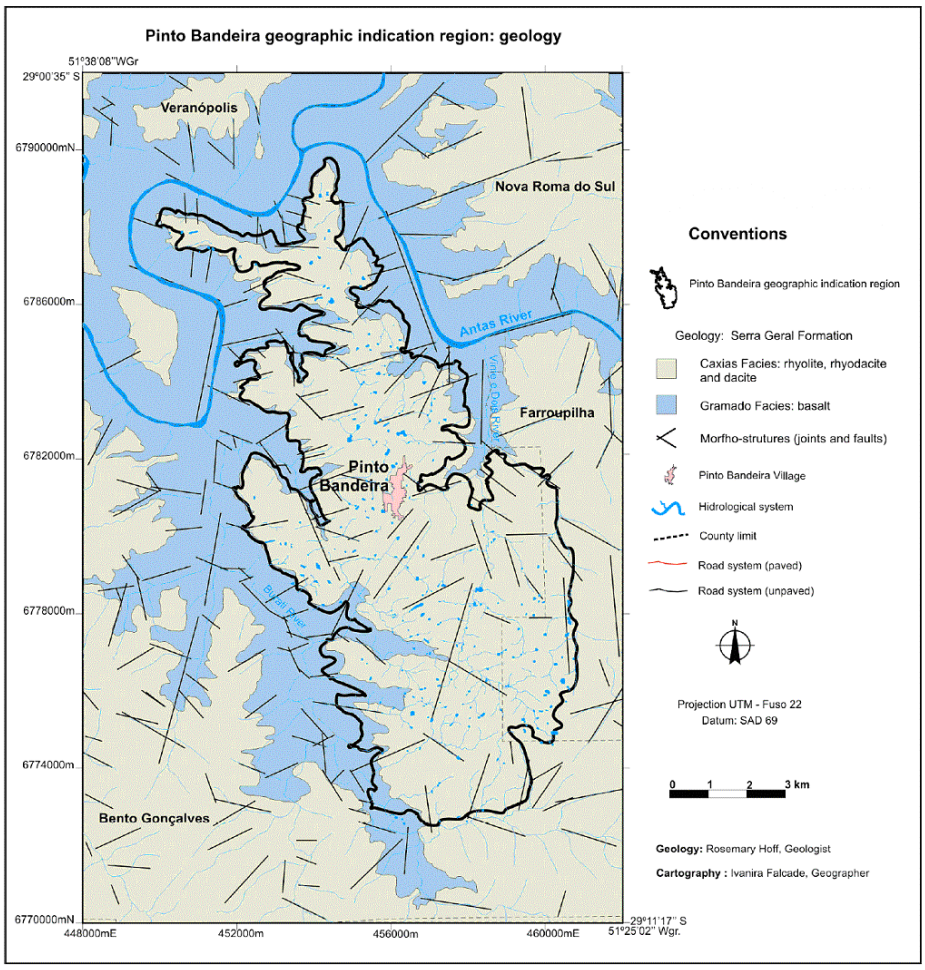

Figure 3. Geologic map of the Pinto Bandeira geographic Indication, Brazil.

4 CONCLUSIONS

This study showed how the integrated use of geotechnologies supported by field data can contribute effectively to viticulture studies aiming to terroir characterization. Aerial images with high resolutions are effective to produce information on geological and geomorphologic data, important to establish criteria to identify potential terroir units, to agricultural zoning, and to strategies in vineyard and wine production.

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REFERENCES

1. R. HOFF, J.R. DUCATI, M. BERGMANN, 2010. In: VIII International Terroir Congress, Soave. Proceedings of the VIII International Terroir Congress. Conigliano: Centro di Ricerca per la Viticoltura, 2010. v. 1. p. 4-44-4-49.

2. M. BERGMANN, R. HOFF, J.R. DUCATI, M.G. BOMBASSARO, G.L. COSTA, 2009. In: XII Congreso Latinoamericano de Viticultura y Enología, Montevidéu. Anales XII CLAVE (CD). Montevideo: PROMOVER.

3. A.L.S. COUTINHO, R. HOFF, J., R. DUCATI, 2008. In: VIIth International Terroir Congress, 2008, Nyon. Proceedings of the VIIth International Terroir Congress. Nyon : Agroscope Changins-Wadenswil, v. 1. p. 481-485.

4. C. VAN LEEUWEN, G. SEGUIN. 2006. The Concept of Terroir in Viticulture. Journal of Wine Research 17 (1), 1.

5. CPRM – Companhia de Pesquisa de Recursos Minerais, 2008. Mapa Geológico do Rio Grande do Sul. Escala 1:750.000. CPRM/MME. Available online in http://www.cprm.gov.br/

6. IBGE – Instituto Brasileiro de Geografia e Estatística, 2003. Levantamento de recursos naturais, 1: 1.000.000. Folha Porto Alegre, SH.22. Brasília, DF, CDROM. Available in: http://www.ibge.gov.br/

7. DOWA Engineering Co., Ltd., 2003. POSAM POrtable SpectrorAdiometer for Mineral identification and MISO Ver.1.0 Mineral Identification Software User's Manual, 22 p. Tokyo.

8. ITT VIS - ITT Visual Information Solutions, 2011. Available: http://www.ittvis.com/

9. GVA - Generalitad Valenciana, 2010. gvSIG – Sistema de Información Geográfica. Conselleria d'Infraestructuras y Transportes (CIT), Valencia. Available in: http://www.gvsig.gva.es/

10. I. FALCADE, 2011. A paisagem como representação espacial: a paisagem vitícola como símbolo das indicações de procedência de vinhos das regiões Vale dos Vinhedos, Pinto bandeira e Monte Belo (Brasil). Tese de Doutoramento, Porto Alegre:IGEO/UFRGS, 309 p. il.
Available in: http://hdl.handle.net/10183/36052.

New zoning of the viticulture areas in Serbia

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ABSTRACT

The zoning of the viticulture areas in the Republic of Serbia, based on a detailed study of climate, soil and other conditions, which was adopted on the basis of an expert study made in seventies of the XX century, has presented for a long time the basis for the production of wine with GIs and development of the Serbian viticulture and wine production. However, in the last ten years big and important changes occurred in the wine sector in Serbia: these changes, first of all, refer to the surfaces under the vineyards, variety assortments and technology of grape production, the structure of producers, but also to changes in climatic factors, such as certain global warming.

All above mentioned, has imposed the need for reform of the Serbian system of geographical indications and updating of viticulture zoning. Accordingly, the Ministry of Agriculture and Italian partners, through the IPA Twinning Project SR 08/IB/AG/02, Capacity Building and Technical Support for the Renewal of Viticulture Zoning and for the System of Designation for Wine with Geographical Indications" together with Serbian and Italian scientific institutions and all relevant stakeholders, started with the creation of new viticulture zoning through two phases of its development (first phase – in order to meet the requirements of the EU in terms of GIs and the second – in order to specify viticulture zoning and develop micro-zoning).