COMPARATIVE PHYSICO-GEOGRAPHICAL CONSIDERATIONS REFERRING TO COTNARI VINEYARD AND CÔTE DE BEAUNE VINEYARD

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Abstract. With a similar geographical position to Cotnari Vineyard, nearby the 47th parallel, Northern latitude, the Côte de Beaune Vineyard from Bourgogne (France) share also litho-pedo-geomorphological and climatic characteristics wuth Cotnari Vineyard in Northeast Romania. Situated at the contact between Langres Plateau and Saône Plain, Côte de Beaune Vineyard has a limestone substrate where rendzinas are developing (among other types of soil). Moreover, the geomorphologic configuration of Côte de Beaune Vineyard is given by the presence of Eastern exposition coasts of Langres Plateau. From a climatic point of view, the French vineyard is characterized by a sheltered microclimate in relation to Atlantic influences and by the existence of an open corridor to the South (Saône corridor), that gives to the climate the sub-Mediterranean shades. The föehn effect is felt here in the form of lower rainfall and the presence of warmer air. However, despite all these similarities, in terms of products, Côte de Beaune Vineyard is known as a dry white wines producing vineyard, while Cotnari Vineyard is individualized internationally by the uniqueness of its sweet wines.

Keywords: *limestone substrate, rendzinas, open corridor, föehn phenomenon, sheltered microclimate*

1.Introduction

Positioned in the proximity of 47° parallel North latitude just like Cotnari Vineyard, Côte de Beaune Vineyard from Burgundy (France) has lito-pedo-geomorphological and climatic characteristics almost similar to those from Cotnari Vineyard (figure 1). These similarities were chosen for a further comparative analysis.

In Côte de Beaune Vineyard we can remark (as subunits) a higher area of plateau - *Hautes Côtes de Beaune*, a coastal area of transition - *Côte de Beaune* and an open corridor - *Saône Plain*.

Being situated at the contact between Langres Plateau and Saône Plain, this vineyard from Côte-d'Or has a calcareous substrate (a sandy-limestone one here and there), covered by a loamy or ferruginous of oolitic type layer (figure 2 and 3).

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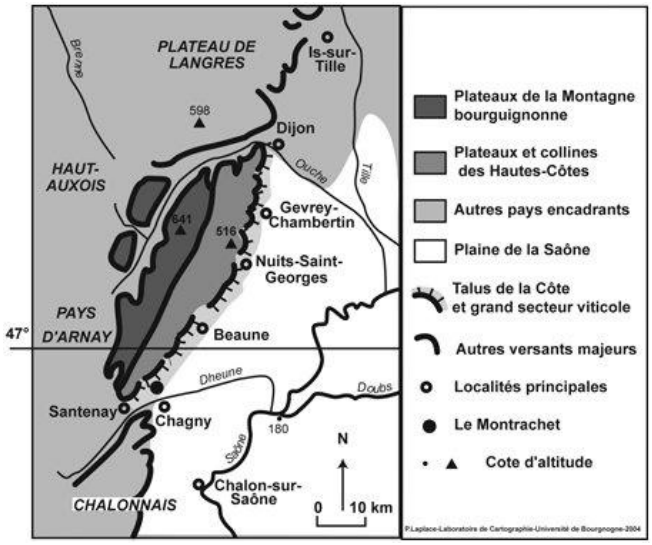


Figure 1: Vine plantations in Côte d'Or (Jean-Pierre Chabin, 2004)

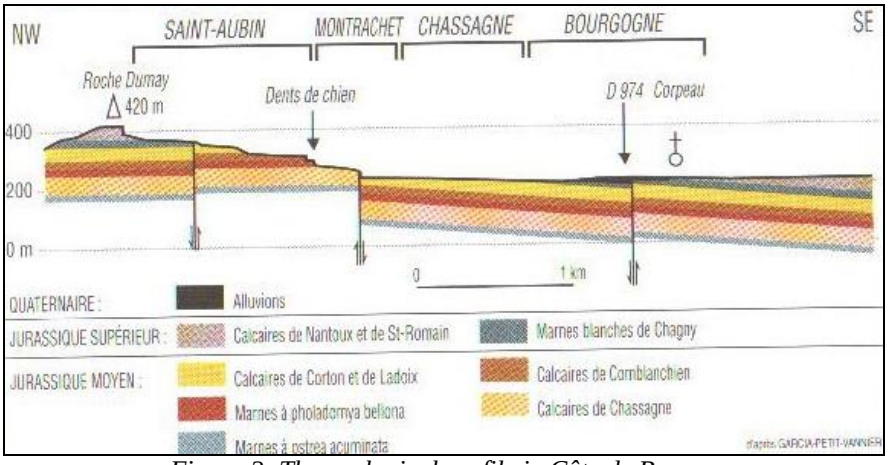


Figure 2: The geological profile in Côte de Beaune (Garcia-Petit-Vannier in S. Pitiot&J.-Ch. Servant, 2010)

a. b.

c. d.

Figure 3: (a-d) Vine plantations (b-c) and calcareous deposits (a-d) in Côte de Beaune: a -Beaune; b – Volnay;c – Meaursault; d –Puligny-Montrachet

Cotnari Vineyard is located between 47° 12' 23" – 47° 35' 17" North latitude, at the contact between Suceava Plateau (in West) and Moldavian Plain (in East) - (figure 4).

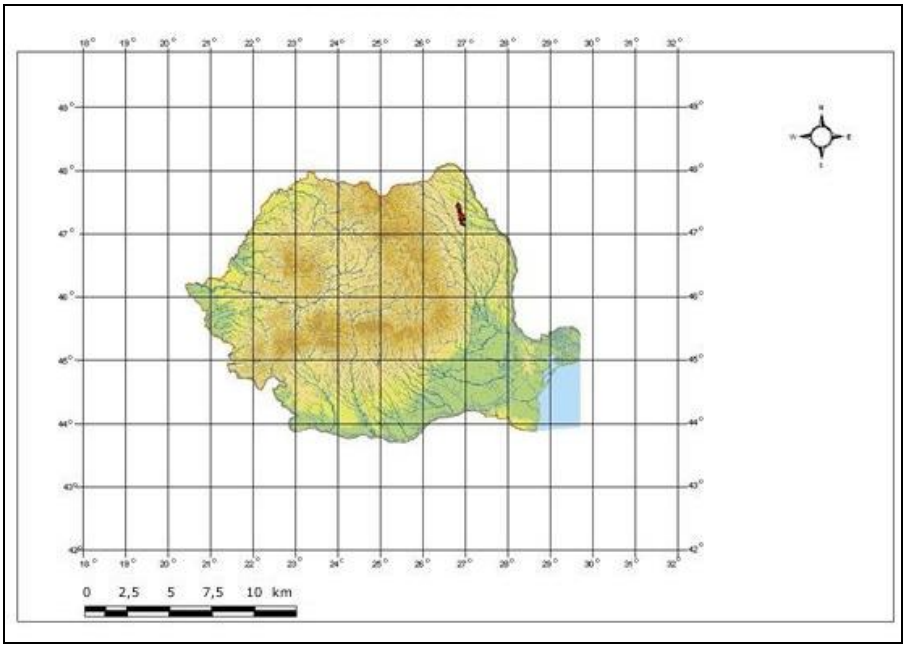


Figure 4: The geographical location of Cotnari Vineyard territory in Romania

In this area, four physico-geographical subunits are distinguished: *The Eastern Marginal Plateau* of Suceava Plateau, with an unfavourable environment for developing of vine plantations, as a result of the presence of higher altitudes and of colder climate (except Băiceni, Cucuteni, Stroeşti and Liteanca); *The Transition Coast*, which it is imposed by an extremely mixed pedological cover due to the intensive natural and anthropogenic processes and by vine plantations concentrated especially in erosion micro-basins; *The Depression Couloir*, which is characterised by the absence of vine plantations as a result of an excess of extended moisture and of the presence of soluble salts; *The Western Marginal Hills* of Jijia Plain, with an approximately similar to that of Transition Coast wine-growing favourability.

2. Comparative approach and results

From a geological point of view, Cotnari Vineyard belongs to the Northern part of Moldavian Platform, consisting of Sarmatian deposits (Volhinian – marly clays, grey marl-clays and Basarabian - grey marls, fine sands, grey clays, oolitic limestones), which appear to date in this area, and of Quaternary deposits (pebbles, sands, clays, loessoid loams) - (figure 5).

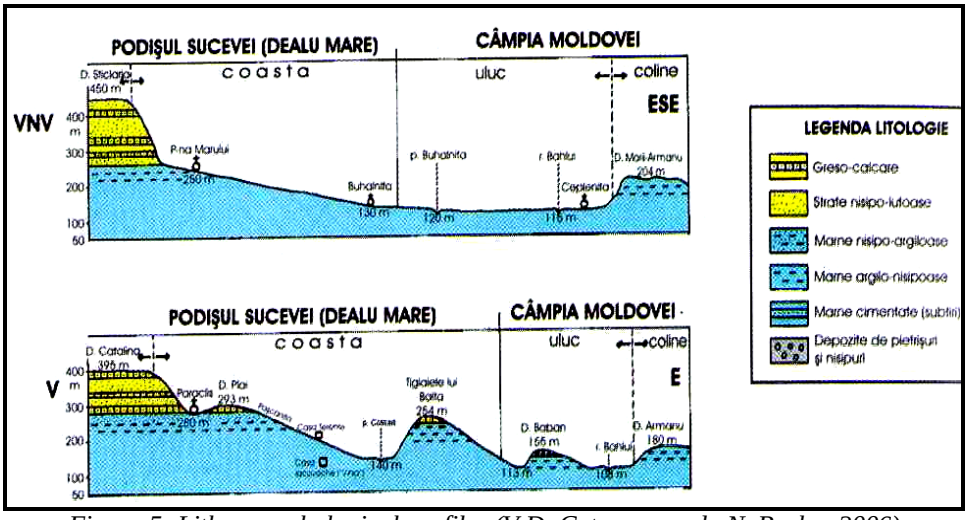
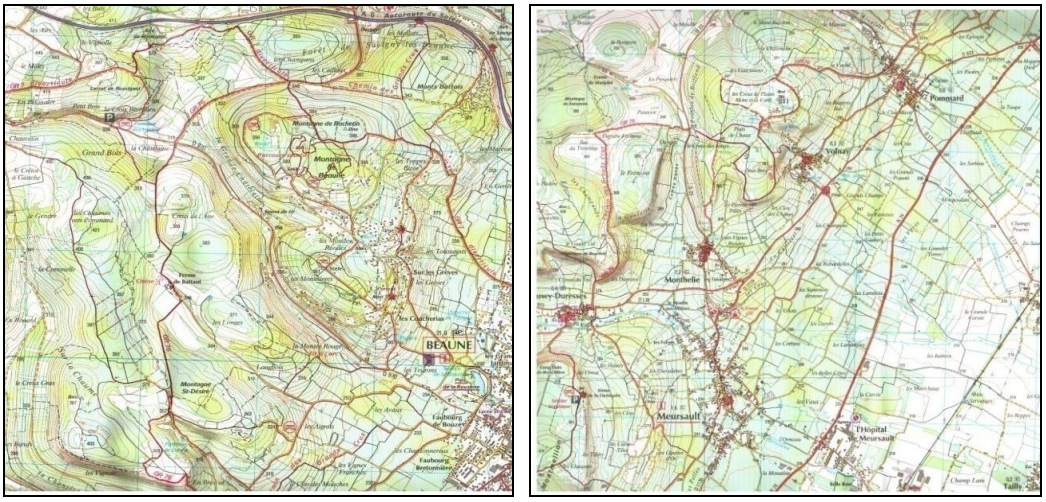


Figure 5: Litho-morphological profiles (V.D. Cotea - coord., N. Barbu, 2006)

Geomorphologic configuration of this vineyard, with altitudes between 200-380 m, is given by the presence of Eastern exposition coasts of Langres Plateau, planted with vines in the South-East sector (figure 6a and figure 6b).



a. *b.*

Figure 6: (a-b) Coasts system in Côte de Beaune - Côte d'Or, Bourgogne (excerpt by Carte topographique 1: 25 000, Beaune-Chagny, Institut Geographique National, 2005)

Côte de Beaune is strongly fragmented by the valleys (le Rhoin in Savigny-lès-Beaune, L'Avant Dheune in Pommard, Ruisseau des Cloux in Meursault etc.), like the Transition Coast from Vineyard Cotnari. From climatic point of view, this vineyard is situated at an intersection of favourable influences: the predominant latitudinal effect is doubled, in Eastern Burgundy, by the longitudinal effect, emphasized by the relief. In addition, another two favouring elements can be recorded in this area: the sheltered microclimate in relation to Atlantic influences and the existence of a Southern opening corridor (Saône Corridor) that confers to the climate Sub-Mediterranean shades. The föehn effect is also felt by a reduction of the precipitations (from 1000 mm towards the top of Montaigne bourguignonne to 700-750 mm at the base of Côte-d'Or Talus) and by an additional air heating (the annual average temperature in Côte de Beaune being of 11.8° C in Corpeau → 230 m, 12.0° C in Le Montrachet → 275 m, 10.4° C in La Rochepot → 450 m; figure 7).

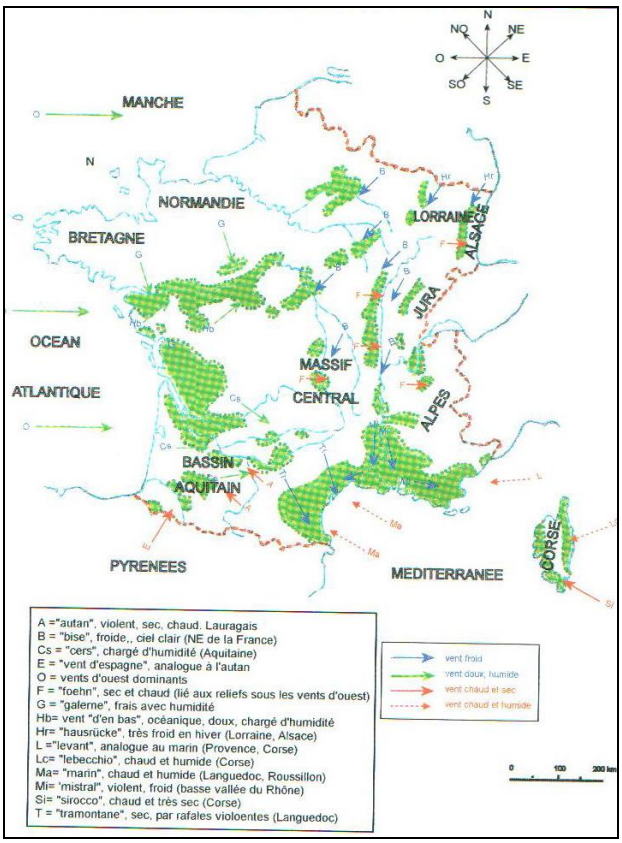


Figure 7: The main dominant local winds that blowing over the vineyards of France (source: De Martonne and Météo France in R.-P. Dubrion, 2010)

In Côte de Beaune Vineyard, there are two disadvantages: higher quantity of precipitations than in Cotnari, who are responsible for diluting the wine and the appearance of grey rot and hail, which makes great havoc. Chardonnay is the main white grape variety specific to this area, wherefrom the most important white flavourless dry wine in the world results *(P. Caspar, 1949; J.-P. Chabin, 2004; R.S. Jackson, 2000; J.-F. Bazin, 2002; A guide to Burgundy' appellations, 2010; S. Pitiot et al., 2010; T. Stevenson, 2005; J. Fanet, 2008).*

On the calcareous-loamy deposits the rendzinas develop, among other types of soils, like in Cotnari Vineyard.

With all these similarities, Côte de Beaune Vineyard is known as a vineyard producing white dry wines (*Bâtard-Montrachet AOC, Beaune Premier Cru AOC, Chevalier-Montrachet AOC, Meursault AOC, Montrachet AOC* ş.a.*)*, while Cotnari Vineyard individualizes internationally by the uniqueness of its sweet or semi-sweet wine-making products such as *Tămâioasa Românească* and *Grasa de Cotnari*.

The highest values (450-426.3) correspond to the hilltops of the *The Eastern Marginal Plateau* of Suceava Plateau, and the smallest values (118.6-95 m) in *The Depressional Couloir* and in *The Western Marginal Hills* of Jijia Plain.

Wine-growing plantations of Cotnari Vineyard territory are generally located in areas with Southern and Eastern expositions in order to benefit from solar radiation, especially when considering its position at the Northern limit of vine cultivation, area somewhat with insufficient heat (figure 8).

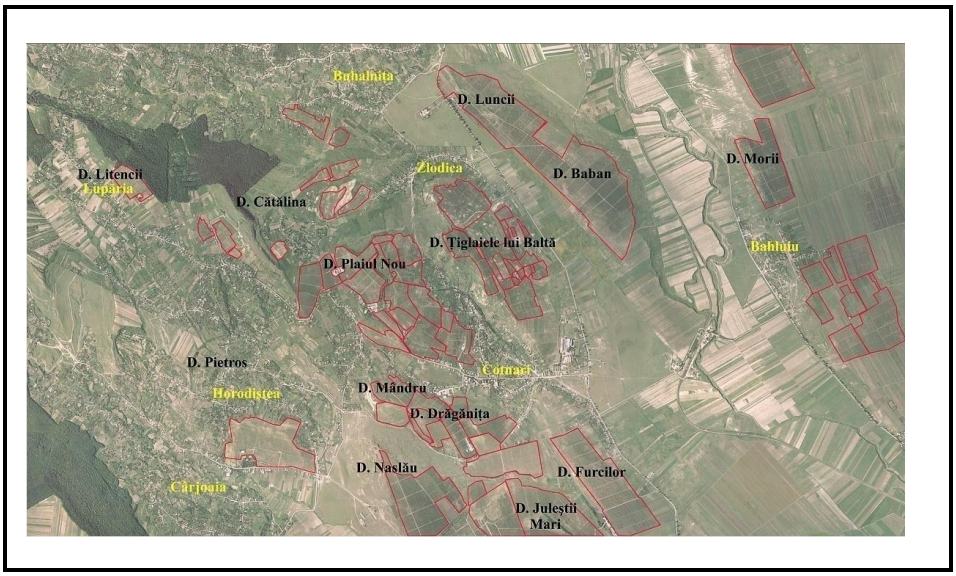


Figure 8: (a-b) Vine plantations identified on an orthophotoplan (1:5 000, 2005) realized in Cotnari Vineyard territory (Buhalnița-Cârjoaia area)

Between the genetic types of relief we can mention:

- *structural relief*, represented by structural-lithological plateaus and by valleys developed in monoclinal general structure: consistent/reconsistent, subsequent, obsequent;

- *sculptural relief* in the monoclinal general structure, predominant in the area, with the characteristic shapes like interfluvial peaks (which sometimes can present sculptural saddles) and slopes, modelled by the current geomorphologic processes (figure 9);

- *fluvial accumulation relief*, which includes as specific forms *terraces*, very favourable from the wine-growing point of view; *alluvial plains*, which may not be used for viticulture because of hydro-climatic inconveniences; *glacises*, with great wine-growing favourability under pedo-geomorphological aspect, provided that their valley microclimate is not restrictive);

- *anthropic relief* (*terraces* arranged on slopes with high inclination from the coastal subarea with their wine-growing capitalization).

From climatic point of view, Cotnari Vineyard territory is included in a transitional temperate climate area, going from enhanced continental influences in the East-European of Moldavian Plain to moderated continental climate of the Central-European of Suceava Plateau.

Regarding the annual thermic averages we cannot remark significant differences when analysing data from different meteorological stations in the area. The annual regime of monthly average temperature in Cotnari is characterized by a maximum value in July (20.3° C) and a minimum value in January (-2.5°C).

Behind the analysis of annual average quantities of atmospheric precipitations during 1956-2006 we can observe that they were more reduced in Cotnari (515.2 mm) comparative to those of Botoşani (569.9 mm) or Iaşi (570.2 mm), as a result of the influence of foehn phenomenon in this area. Monthly maximum produced in Cotnari in July (76.3 mm), while monthly minimum was recorded in February (21.6 mm).

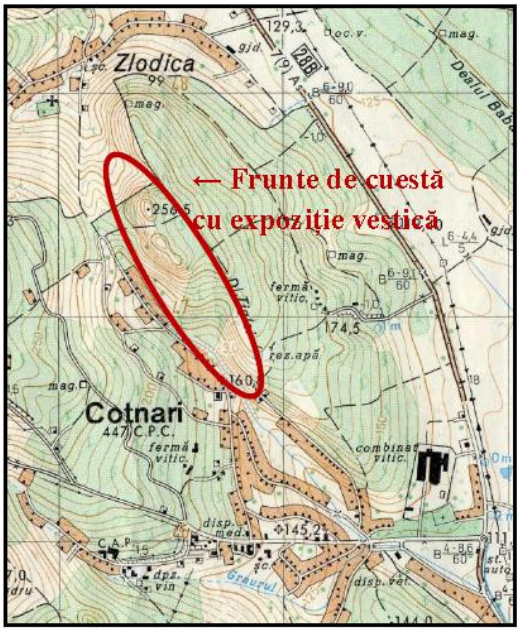


Figure 9: Cuesta on Ungurilor Valley in Cotnari Vineyard (extract after Topographic Map 1: 25 000, Topographic Military Direction, 1985)

During the year, the month with the highest value of the length of sun brightness in Cotnari was July (291.4 hours) and the month with the minimum value was December (76.5 hours in Cotnari). Annual average of this climatic parameter, between 1975 and 2006, was higher in Cotnari (2129.8 hours), compared to that in Iaşi (2015.0 hours) and to that in Botoşani (1999.7 hours), which can be attributed to the influence of foehn phenomenon in the area.

Relating to the winds, we can say that the highest annual average velocity and the highest annual average frequency, between 1970 and 2006, have been recorded on NW direction at all meteorological stations taken into account. In Cotnari Vineyard area, foehn is formed when the warm air masses from the Western slopes of Dealul Mare are cooling, in ascending moving, and go down heated on the Eastern slopes of Cotnari Coast (figure 10). As

a matter of fact, the winds which come from NW direction bring a great contribution to the formation of foehn phenomenon from coastal subarea; this phenomenon favours the cultivation of vines in this area by warming, foehning the air, which is directed to the base of Cotnari Coast, maintaining a favourable microclimate for ripening and even for super-ripening of the grapes.

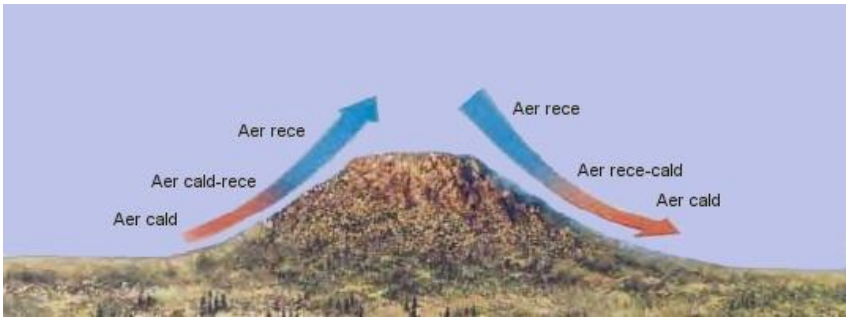


Figure 10: Forming process of föehn phenomenon
(modified by C. Donald Ahrens, 2008)

The hydrographical network from Cotnari Vineyard belongs to Bahlui River and to Miletin River. The main supplying source of hydrographical network is represented by rainfall which they have a weight for more than 50%, while the supplying from melting of the snows contribute to 36-37% in forming of discharge.

Conclusions

Côte de Beaune Vineyard from Burgundy (France) and Cotnari Vineyard from Romania have some approximately similar characteristics:

- positioning of two wine-growing regions nearby the parallel of 47° North latitude;
- the existence of three almost similar subunits: a higher area of plateau - *Hautes Côtes de Beaune* ↔ *The Eastern Marginal Plateau* of Suceava Plateau; a coastal area of transition - *Côte de Beaune* ↔ *The Transition Coast of Cotnari*; an open corridor - *Saône Plain* ↔ *The Depression Couloir*;
- both regions are situated at the contact between a plateau (Langres↔ Suceava) and a plain (Saône↔Moldavian);
- in both cases, the deposits are calcareous ones, among others;
- the presence of Eastern exposition coasts, planted with vines in the South-Eastern sector;
- *Côte de Beaune* and *The Transition Coast of Cotnari* are strongly fragmented by the valleys;
- the existence of a sheltered microclimate within the coast;
- the effect of föehn is felt by reducing of the precipitations and by an additional air heating;
- on calcareous-loamy deposits, the rendzinas develop, among other types of soils.

However, Côte de Beaune Vineyard is known as a vineyard producing white dry wines, while Cotnari Vineyard individualizes internationally by the uniqueness of its sweet or semi-sweet wine-making products.

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