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Conditions, Factors and Spatial Organization of Viticulture in Pazardzhik Region

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ABSTRACT

The main spatial characteristics of the geographical environment of the Pazardzhik region provide diverse opportunities for the development of a number of activities in the primary sector of the economy. In its central parts, viticulture plays a leading role in agricultural specialization, which has centuries-old traditions since antiquity.
The main focus of this study is aimed at studying the leading conditions and resources for the development of grape production and its modern spatial organization within the scope of the Pazardzhik region. Special attention is paid to the geographical scope and production specialization, of the formed viticultural micro districts in the studied territory. The study concludes with defining the main challenges in the development of viticulture and the possibilities for overcoming them in the future.

Keywords: viticulture, conditions, resources, factors, spatial organization, specialization, microdistricts.

INTRODUCTION

Viticulture has played an important role in the livelihood of the Bulgarian population since ancient times. Vineyards have been cultivated in Thrace since ancient times. This is due to the extremely favorable terrain and agroclimatic conditions on the southern and western Srednogorsk hills, the heights in the northern and western parts of the Thracian Lowland and the northern slopes of the Rhodope Mountains.

The vine is a plastic plant, which is distinguished by relatively well-expressed biological capabilities for adapting to the diversity of external conditions (Katerov et al., 1978).

The natural environment is not able to permanently change specific grape varieties. Therefore, since the conditions in which the variety is grown cannot change it, it is natural to select varieties that are suited to the geographical conditions of the environment, especially with regard to the exposure

and slope of the terrain, the heat required for the ripening of the grapes, etc. It should be borne in mind, however, that early wine varieties require a cooler climate, while later ones need much greater solar potential.

Fig. 1. Merlot – grape variety. *Source:* www.bordeaux.com

The main criterion that a specific viticultural environment (TERROAR) must meet is its ability to bring the grapes of the planted or upcoming varieties to full maturity. This assessment depends on the varieties' ability to carry out photosynthetic activity, which is determined by the total sunlight, temperature and water storage (Huglin, 1983).

The normal development of the vine depends to a large extent on the impact of the climate, i.e. on its factors and elements, the most important of which are heat, light and moisture. They determine the possibility of its existence. Each climatic element must be evaluated inconnection with the biological characteristics of the vine, taken as a whole, as well as with the characteristics of individual varieties, and also with the production specialization of a given viticultural region (Markov, 2012).

The use of the grape harvest from individual varieties: Merlot, Cabernet, etc. (Fig. 1) is determined to a significant extent by the specific ecological growing conditions.

Therefore, one of the main reserves for increasing the profitability of modern industrial viticulture is the maximum use of natural resources to satisfy the specific biological requirements of individual varieties through their justified macro- and microzonation (Babrikov et al., 1989).

The main objective of the study is the analysis of the conditions and factors of the geographical environment and the spatial organization of viticulture on the territory of Pazardzhik region.

To achieve the set goal, it is necessary to solve the following tasks:

- to carry out a soil-climatic analysis of the Pazardzhik region
- to assess the role of the human factor as the main workforce in viticulture
- to carry out an analysis of the grape and wine market in the Pazardzhik region
- to examine the role of the state in the grape and wine market through relevant policies and subsidies

LITERATURE REVIEW

A number of studies have been devoted to the influence of the natural environment on the vine. From a geographical point of view, Bulgaria has significant advantages for establishing itself as a unique producer of grapes and wine. The country has favorable conditions for growing a large number of varieties, including very valuable local varieties, characteristic only of our lands - Mavrud, Pamid, Cabernet, Merlot, Rkatsiteli, etc. The huge variety of grape varieties also implies a wealth of different types of wines that can be produced from them. Each variety, regardless of whether it originates from Bulgaria or the rest of the world, is characterized by its own specific agronomic and technological indicators. This, in turn, determines whether the grapes have the potential to develop in a specific soil and climatic region and whether there is an appropriate technological supply of a number of groups of substances necessary to produce the desired type of white, rosé or red wines.

It is known that vineyards are perennial crops, providing yields for over 30 years, and their establishment and maintenance also require significant investments. Therefore, proper selection of the most suitable location for their cultivation is necessary.

Many authors have studied the influence of climate and developed climate indices for its assessment (Amerine and Winkler 1944, Huglin 1978). The scientific literature abounds with studies related to viticulture: climatic potential of regions, influence of climate on the quality of grapes and grape products. But the study of climate and its specific influence is complicated by a number of other factors such as environment, varietal composition, and agricultural techniques (Markov, 2012).

The climate in different wine-growing regions is the reason for the great diversity in the quality and typicality of wines. Scientific literature abounds with studies on the influence of climate on the vine: climatic potential of the regions, influence of climate on the quality of grapes and grape products. But the study of climate and its specific influence is complicated by a number of other factors such as environment, varietal composition, and agricultural techniques.

According to Préscott (1965), the northern limit for growing cultivated vines in Europe is related to the average monthly temperature in the warmest month of the year (higher than 19°C) and the average monthly temperature in the coldest month of the year (higher than -1°C). These two requirements must be combined for at least 6 months, when the average monthly temperature must be higher than 10°C.

Branas (1974) points out that commercial cultivation of the vine becomes impossible when climatic conditions do not allow full ripening of the grapes, despite the fact that the vine can grow even under quite unfavorable conditions. Of the natural conditions of a given area, the most important for the growth and development of the vine are the climate and the soil.

It cannot be assumed that the natural environment can permanently change a given variety. Therefore, since the environment in which the variety is grown cannot change it, it is natural to select varieties that are suited to the environment, especially with regard to the heat required for the ripening of the grapes.

Geographical studies of agriculture and agribusiness are the focus of research by Patarchanov (2006) and Patarchanova et al. (2019). A number of authors are actively working and conducting research on the development of rural areas: Patarchanov (2009). The profile of the rural economy, some crisis elements and the possibilities for its diversification are the subject of research interest of Patarchanov (2017) and Patarchanova (2007a, 2007b). The organization and management of rural areas is studied by Patarchanov (2017).

MATERIALS & METHODS

A set of analytical tools was used to analyze the development of processes in the viticulture sector. The nature and strength of the studied processes were determined by the following descriptive indicators:

- geomorphological analysis (relief and rocks)
- soil-climatic analysis
- market analysis
- analysis of state policy and subsidies

RESULTS AND DISCUSSION

General Characteristics

Regional geographical research implies considering space and territory as a complex, dynamically functioning and, most importantly, constantly open geographical system (Patarchanov, 2017). It consists of several main subsystems such as: natural, social, economic and others, which in turn represent a cultural geographical complex (cultural landscape) of constantly interacting and changing components (Patarchanov, 2017).

The factors influencing the efficiency, formation of comparative advantages and competitive capabilities of the viticulture sector can be systematized in the following main areas: natural and climatic, production and technological, socio-economic, market and trade, and institutional. These factors are related to the productivity and efficiency (intensity) of using the main factors of production – land, labor, and capital.

In practice, since ancient historical times, it has been established that the relief of the area has a great influence on the growth, development and fruiting of the vine. This circumstance has long been known to our winegrowers and skillfully used when planting vineyards. The distribution of climatic factors (light, heat, precipitation, wind, etc.) depends to a large extent on the relief, but also on the nature of the soil cover (Penkov, 1962). The diversity in the relief and the exposure, which is characteristic of a number of viticultural micro-regions of our country, brings significant changes in the temperature regime, moisture, solar radiation and soil conditions (Babrikov et al., 1989). The hilly relief is more favorable for growing vineyards. It provides protection for the vines. The direction of mountain ranges and hills, for example from north to south or from east to west, has a different impact on the conditions of vine growth, creating diverse complexes of the main factors (heat, humidity, light, etc.) that determine the success of the vine culture, the quantity and quality of yields (Merzhanian, 1953).

In the lowlands and at the base of the slopes, the growing season of the vines is longer, they develop more vigorously, and higher yields are obtained. This is mainly explained by the accumulation of more moisture and nutrients in these places.

The greater amplitude of temperature also has some importance in this regard. During the day, when the temperature increases to certain limits, the intensity of photosynthesis increases, and at night, the more significant decrease in temperature reduces the consumption of assimilates (Kiryakov et al., 1971).

On the ridge and slopes of the hills, the danger of freezing of the vines in winter and from late spring and early autumn frosts is lower, due to the movement of cold air from higher to lower places (Kurtev et al., 1979).

On highlands, the soil freezes deeper than in lowlands, because on highlands the snow is blown away and the snow cover is thinner than in lowlands, where snowdrifts form (Kiryakov et al., 1971). n depressed relief forms (valleys) and flat terrains, due to the small air drainage (prolonged retention of cold air), the danger of frost is always very high, which is why they should not be used for planting vineyards (Penkov, 2009).

In hilly terrain, with increasing elevation gain during the day, the air temperature gradually decreases; at night, and especially in clear and calm weather, the temperature is highest in the upper parts of the slopes, and decreases further down the slopes. The longer duration of the frost-free period on the tops of the hills and in the upper parts of the slopes does not lead to a significant increase in temperature sums, since the beginning and end of the frost-free period here are observed at a reduced temperature background. The decrease in temperature sums in the concave landforms is due to the significant reduction in the duration of the frost-free period.

In mountainous areas, slopes play the role of protective walls depending on their exposure and also on the steepness of the slope. Slopes have different thermal regimes and moistening of different soils, which significantly affects the growth, development and fruiting of the vine.

It is generally accepted that the vine reacts strongly to the conditions of the climatic environment. The meteorological conditions in a given year and in a given area definitely affect the quality of the grape harvest obtained. Of all the climatic factors, the most important for the vital activity of the vine, as for all higher plant organisms, are light, heat, water and air. They determine the possibility of its existence, while the others (secondary) according to Davitaya (1948) only correct the action of the main factors. They acquire independent significance only when they reach high intensity (damage from wind, hail, icing, dry winds, etc.). When assessing each factor, it is necessary to establish the critical periods of the vine during vegetation and dormancy. This can serve as a basis for conducting activities that affect the environment in order to satisfy the requirements of the vine to the highest degree (Davitaya, 1948).

Large bodies of water – lakes and large rivers – influence the temperature and humidity of the air. Winters near them are milder and the risk of frost and frostbite of vines is lower. In addition, they change the amount of thermal energy by reflecting the sun's rays (Rangelov and Nikov 2005).

Proof of the beneficial influence of large water bodies on the development of production is the fact that some of the best vineyards in the world are located in close proximity and on the banks of rivers, lakes and seas. Near large bodies of water, due to evaporation, atmospheric humidity during the summer months is much higher and despite relatively lower rainfall, vines can be grown without irrigation. Higher air humidity has a beneficial effect on the enlargement of the berries, their better coloring and ripening (Babrikov, 1989). The combination of relatively high atmospheric humidity with low diurnal amplitudes near large water bodies slows down to some extent the ripening of grapes and the accumulation of sugars in them and allows the grape harvest to take place later.

Water masses can also have a negative impact on the development of vines. Higher relative humidity creates conditions for the development of certain fungal diseases (oidium and gray rot) on grapes, and in the flowering phase can compromise normal fertilization (Markov, 2012). The evaporated sea drops, falling on the green parts of the vine - shoots, leaves and berries - have a high concentration of salt, causing a burn. The comparative advantages possessed in the production and trade of products of the viticulture sector at the national level are formed on the basis of the comparative advantages at the regional level. The total potential of the Bulgarian viticulture sector is

considered as the sum of the parameters of the production potential of the individual agrarian regions in the country.

The modernization of the structure of the industry is related to the processes of zoning and micro-zoning. They represent an important prerequisite for the development of modern viticulture and increasing the efficiency of production and market realization of the product.

The economic assessment of the significant regional changes that have occurred in Bulgarian viticulture during the period of Bulgaria's membership in the EU leads to the conclusion that they have had an overall negative impact on its production potential. This is manifested both in the overall decline in the area of fruit-bearing vineyards and in the observed changes in the production structure of the sector.

The regional structure of Bulgarian viticulture will continue to change in the future, mainly influenced by market factors. In order to increase the competitiveness of producers, the efforts of those involved in the sector should be directed towards adapting production to market demand and the overall internal and external market conditions.

Competitiveness and efficiency have a particular importance and manifestation in the agricultural sector due to the specifics of the agricultural production process. The same finding is valid with regard to the manifestation of these categories in the viticulture sector, which is distinguished by a number of features of the production activity. Viticulture is a major raw material base for the development of winemaking, which is why the two sub-sectors are inextricably linked in technological, technical and organizational terms.

The influence of markets as a factor has been felt strongly in recent years, after Bulgaria joined the EU and competed in the markets of the community. This largely determines and falls into the sub-sector. The high achievements in the past can in turn be explained by Bulgaria's membership in the CMEA (Council for Mutual Economic Assistance) where its markets were secured. The assortment, diversity and quality of the produce are increasingly influencing marketing.

The influence of demographic resources is reflected not only on the consumption of production, but also in the need for qualified labor in viticulture. For many of the activities, a mechanized way of working has not been found, which requires a larger amount of labor with qualifications and production experience, not only in a short period of time.

The influence of mechanization on the development of the sector is clearly expressed - the country still does not have enough small-sized and specialized equipment that can significantly shorten labor-intensive processes and reduce the cost of production. The strong influence of the transport factor is related to the fact that grapes, especially dessert grapes, are not transportable. They require specialized transportation (containers, refrigerators, etc.) for long-distance transportation, which increases the cost of the final product.

Over the past few years, an increasingly influential factor on the development of the sub-sector has been the environmental one, which is closely related to both foreign and domestic markets.

Geomorphological Analysis

Geographical position - Pazardzhik region is located in Southern Bulgaria and includes parts of several natural geographical areas. (Fig.2) From north to south are located respectively: the southern slopes of Sashtinska Sredna Gora, which are very suitable for viticulture; the western part of the Upper Thracian Lowland with several hills with significant potential for the production of various grape varieties; the northern foothills of the Western Rhodopes, having relatively smaller opportunities for the studied agricultural activities; the southernmost parts of the district include medium and high mountain territories of the westernmost part of the Rhodope massif, where the vine is found extremely rarely only in some valleys (e.g. the Chepina Valley, which is also the largest in the Inner Rhodopes). Administratively, the region borders the Sofia, Blagoevgrad, Smolyan and Plovdiv Region. It covers 4457.0 km2, representing 4% of the total territory of the country. More than half of this territory (57.1%) is forest land, 35.9% is agricultural land, 3.3% is urbanized territory, 2.6% is rivers and water areas, 0.6% is road infrastructure and 0.4% is quarries and mines. The

geographical location determines the overall philosophy for the development of the vineyard, the quality and quantity of the produced produce. As a plant of economic importance, the grapevine successfully develops between 25-50° N. lat. and 30-50° S. lat. The northern limit for growing grapes is related to the average monthly temperature of the warmest month of the year, with the average temperature value being above + 20 °C, and the values of the coldest month, with average values being above 1 °C.

The geological base of the Pazardzhik region reveals formations from the last era - the Neozoic, from its two periods, the Tertiary and Quaternary. Above the crystalline base lie thick Tertiary and Quaternary deposits, and the studied area is made of Proterozoic rocks, overlain by Neogene and Quaternary materials. These geological conditions are a good basis for soil-forming processes, thanks to which sandy and drained soil structures are formed, very suitable for the development of viticulture in the studied territory.

Quaternary deposits (Q) are widespread, overlying Neogene materials from the Akhmatovsk Formation or directly over Proterozoic marbles. Their thickness varies from a few to 60 m. They are mainly represented by sands and gravels. The sands are heterogeneous, loose or weakly bonded, grayish-yellow to yellowish. The alluvial deposits of the middle-mountain tributaries of the Maritsa River - the Topolnitsa River and the Luda Yana River - are mainly represented by variously grained sands with small gravel inclusions and fine to medium-grained gravels with sandy filler.

Fig. 2. Geographic map of Pazardzhik district *Source: Wikimedia Commons*

The relief, as a condition since ancient times, has been established to have a great influence on the quantity and quality of agricultural production. To a large extent, the action of climatic factors depends on it: light, heat, soil moisture, precipitation and the movement of air masses. Vineyards can be created in places that are not suitable for other types of crops on terrain that is more difficult to cultivate: narrow slopes, hilly terrain, places with greater altitude, low plains and valley fields. The hilly relief is favorable for the cultivation of vines.

The location of the vines depending on the mountain ranges and hills: north-south, east-west have different positive influences on the vine, creating a microclimate of a complex of climatic factors. The relief of the region is diverse: lowland (the western part of the Pazardzhik-Plovdiv Plain, representing the western part of the Upper Thracian Lowland) and medium and low mountain in the

separate parts of Ihtiman and Saschin Sredna Gora, and high mountain in the Western Rhodopes and Rila. The most fertile alluvial soils of the Pazardzhik Plain are here. The diverse relief of the area contributes to the development of agriculture and, in particular, viticulture.

Soil-Climatic Analysis

The climate in the Pazardzhik region is characterized as favorable temperate-continental, characterized by summer droughts. This climate is transitional between the temperate continental climate of the Danube Plain and the transitional - Mediterranean climate of Southeast Bulgaria. Negative temperatures in the Thracian Lowland are characteristic of the most typical winter month - January. Due to the protective role of the Stara Planina and the influence of the Mediterranean Sea, the average January temperature of the Pazardzhik region is positive. The summer temperatures of the region are not higher than those of the Danube Plain. The average July temperature is 23.3°C. The long summer, often from April to October, is characterized by sufficiently high temperatures. As a result, the formed agroclimatic conditions become a very important factor in the vegetation process of the vine plantations and especially in the ripening of the grape harvest.

In the lowlands, the natural geographical conditions are more pronounced on the temperature regime and in particular on the duration of frosts and heat. In the Pazardzhik Plain in winter, due to the temperature inversion, it is colder and there are longer frosts than on the Middle Mountains and Rhodope slopes and branches. Early spring allows for early planting of summer crops, and late autumn is very favorable for good ripening and harvesting of grapes. Compared to Northern Bulgaria, in the lowland territories of Pazardzhik region, frost stops falling earlier in spring, and in autumn - later.

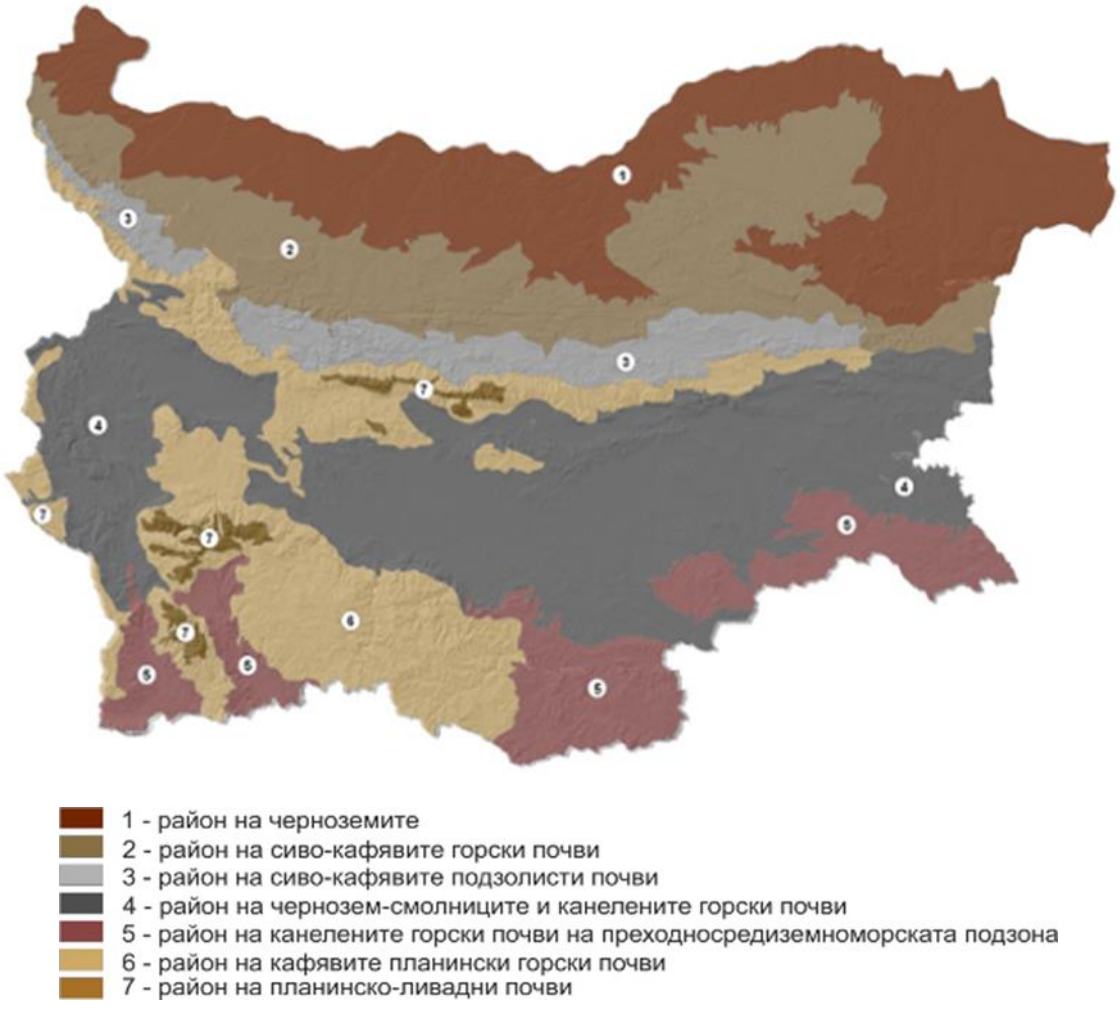

Fig. 3. Soil map of Bulgaria. *Source: nationalsoils.com*

The precipitation in the area depends on the cyclonic conditions that form and the prevailing winds - northwest, southwest and south, northeast and east. The Stara Planina and Sredna Gora Mountains prevent the free penetration of precipitation from the cyclonic winds from the north and northwest, and the Rhodope Mountains from the southern - Mediterranean precipitation. Thus, the Thracian Lowland benefits from less precipitation than the average precipitation amount for Bulgaria. Thus, Pazardzhik region is under the rain shadow of its surrounding mountains, so the annual precipitation amount is only 515 mm. The municipality receives the most precipitation in the summer - 142 mm (27.6%), and in the spring - 27%. Summer rainfall, even the highest, is often torrential and insufficient for agricultural crops, especially for secondary crops. The Pazardzhik Plain is also characterized by frequent droughts, occurring mostly in the second half of July and the first half of August. On the other hand, the water resources from the riverbeds provide sufficient quantities of freshwater, sufficient to meet the needs of the population, agriculture and industry.

Soils influence the overall growth, quantity and quality of grapevines. The life cycle of the underground parts of the vine takes place in it, providing water, all the mineral composition and nutrients for normal functioning. Characteristic properties of the soil are: mechanical, chemical composition, physical properties determining the growth, fruiting, quality and sustainability of the vineyard (Markov 2012).

The region is mainly covered with black earth-tar soils, cinnamon-forest and diluvial-alluvial soils (suitable for growing vineyards, fruit, grain and oil crops, tobacco and essential oil crops). (Fig. 3) Brown forest soils prevail in the mountainous areas, and cinnamon soils prevail in the valley areas (suitable for potato production).

The basins of the Maritsa and Topolnitsa rivers, in turn, abound with another fertile type of soil – dark meadow-marsh. In the northern part of the region, richly saline soils are found. he diversity of fertile soils is a significant prerequisite for the development of crop and livestock farming, combined with sufficient water resources. In order to obtain a certain type of grape production from a given variety with fixed quality indicators, an appropriate soil is also necessary (Markov 2012). It has been proven that in the same microdistrict with the same climate, different soils leave a certain imprint on the quality of the grapes. From many years of experience, the notion has long been established that there are no universal absolute soils that can be suitable for all grape varieties and directions of viticulture (Markov 2012).

Each soil is more or less suitable for a particular direction in viticulture. For example, leached and podzolized chernozems, cinnamon soils, and grey forest soils are considered the most suitable for growing red grape varieties (Markov 2012). It should be noted, however, that, although to a lesser extent, they are suitable for growing other grape varieties. Therefore, when choosing soils for a particular direction in viticulture, the most suitable ones for this purpose should be used first and foremost.

Soils that are suitable for growing wine grape varieties for the production of dessert wines. These soils should be light in mechanical composition, loose, with good heat and air regime and with moderate moisture retention capacity. For obtaining dessert wines, the content of stones and gravel in the soil also has a positive influence. The humus content should be about 1.5-2.5%. In addition, the soil should have enough carbonates, phosphorus and potassium. The following soils, which are found in the northern hilly part of the region, meet these requirements (Table 1).

Table 1. Soils found in the northern hilly part of Pazardzhik region

Soil type	**Characteristics**
Carbonate black soils	weakly powerful, moderately powerful and powerful, weakly humus, loess, eroded and non-eroded
Carbonate black soils	weakly powerful and powerful, on limestone, uneroded and weakly or moderately eroded

Typical black soils	high-micellar, powerful, low humus, loess, medium and highly eroded
Typical black soils	high-micellar, weak and medium-power, weak humus, on loess
Typical black soils	deep micellar, weakly and moderately thick, weakly humus, loess, weakly and moderately eroded
Typical black soils	deep micellar, powerful, weakly humic provided they are heavily eroded
Cinnamon forest soils	typical, slightly humus, slightly, moderately and strongly eroded
Cinnamon forest soils	leached, low humus content, highly eroded

Soils that are suitable for growing wine grape varieties for the production of red table wines.

The most suitable soils for this purpose are moderately moist, well aerated, with a sufficiently good thermal regime. The humus content should be higher compared to soils intended for the production of dessert wines. Soils for red table wines should contain sufficient phosphorus, potassium and iron. These types of soils are found in the hilly and semi-mountainous part of the Pazardzhik region (see Table 2).

Table 2. Soils found in the hilly and semi-mountainous parts of Pazardzhik district

Soil type	**Characteristics**
Weakly leached black soils	leached and heavily leached, weakly powerful, moderately powerful and powerful, weakly and moderately humus, on loess-like sandy clays and on clays, non-eroded and eroded
Typical black soils	deep micellar, weakly and moderately strong, moderately humus, on loess-like sandy clays, non-eroded and eroded
Black soils	deep micellar, weakly and moderately strong, moderately humus, on loess-like sandy clays, non-eroded and eroded
Cinnamon forest soils	typical, leached and podzolized, weakly powerful, moderately powerful and powerful, weakly, moderately and highly humus, eroded and non-eroded
Dark gray forest soils	high carbonate, weakly powerful, moderately powerful and powerful, weakly and moderately humus, eroded and non-eroded
Dark gray forest soils	high carbonate, weakly powerful, moderately powerful and powerful, weakly and moderately humus, eroded and non-eroded
Dark gray forest soils	deep carbonate, weakly powerful, moderately powerful and powerful, moderately humus, on loess-like sandy clays, loess-like clays, weakly and moderately eroded.
Brown forest soils	weakly powerful, moderately powerful and powerful, weakly and moderately humus, on sandy loams and clays, non-eroded and eroded.

Gray forest soils	weakly powerful, moderately powerful and powerful, weakly and moderately humus, on loess-like sandy clays, on carbonate clays, eroded (weakly, moderately and strongly).

Soils that are suitable for growing wine grape varieties for the production of white table wines.

For the production of low-extract white table wines, the most suitable are soils with a light mechanical composition, highly skeletal (containing a large amount of stones of various sizes - gravel, etc.), sandy, with a low content of humus and a high content of phosphorus and potassium. Such soils are found in the region of Pazardzhik region (see Table 3).

Table 3. Soils suitable for growing wine grape varieties for the production of white table wines in Pazardzhik region.

Soil type	**Characteristics**
Alluvial-dilluvial soils	Slightly humusy
Deluvial soils	Високо скелетни, слабо хумусни
Cinnamon typical soils	Leached and podzolized, on clayey-sandy materials

Soils that are suitable for the production of high-quality dessert grapes with the following varietal set: Bolgar, Chaush, Perle de Xaba, Chasla dore, Chasla misketova, Tsaritsa na lozyata are: soils that contain a light mechanical composition; loose, with sufficient water-holding capacity (Markov 2012). The humus content should not be more than 3-3.5%. In addition, it is necessary for the soils to be provided with $CaCO_3$ and with sufficient phosphorus and nitrogen.

The soil conditions in the Pazardzhik region for growing early dessert varieties are the same as for medium-early or late dessert grape production. However, as a rule, early varieties should be planted on slopes with a southern and southwestern exposure (Stoev et al., 1960). Such soils are found in the Pazardzhik region (see Table 4).

Table 4. Soils suitable for the production of high-quality table grapes in the Pazardzhik region

Soil type	**Characteristics**
Carbonate chernozems	weakly powerful, medium powerful and powerful, weakly humus, on loess, eroded and non-eroded.
Carbonate chernozems	weakly powerful, moderately powerful and powerful, weakly and moderately humus, n. limestones, eroded and non-eroded.
Typical black soils	high-micellar, weakly powerful, moderately powerful and powerful, weakly and moderately humic, eroded and non-eroded.
Typical black soils	deep micellar, weakly powerful, medium-powerful and powerful, weakly and medium humic, on loess and loess-like materials, eroded and non-eroded.

Black soils	weakly leached and leached, weakly powerful, medium powerful and powerful, weakly and medium humic, on loess and loess-like materials, eroded and non-eroded.
Podzolized chernozems	weakly powerful, medium powerful and powerful, weakly and moderately humus, on loess and loess-like materials, eroded.
Cinnamon forest soils	typical, leached, weakly and moderately humus, eroded and non-eroded.

The water resources in the region are rich in rivers and lakes. The influence of water bodies on the temperature and humidity of the air is of great importance for the development of viticulture in the region.

The main drainage artery in the region is the Maritsa River and, together with its catchment area, provides a significant part of its water potential, with its larger left tributaries - the Topolnitsa and Luda Yana rivers and right tributaries - Chepinska and others. A major challenge in the river runoff of the Maritsa River is that its high water level is delayed in the spring due to the later melting of snow in the Rila and Western Rhodope Mountains.

The waters of the large left tributary of the Maritsa River - the Topolnitsa River, receiving waters from the Medetska, Bereiska, Mativir, Pavel, Bunuvska and Zlatishka rivers, as well as the Topolnitsa dam of the same name, built along its banks, cannot actually be used for irrigation, but they have energy potential. The other left tributary of the Maritsa River – the Luda Yana River, which collects the waters of the Moley, Magareshka Reka, Svinarsko Dere rivers, and further downstream the Banska and Strelchenska rivers, is sometimes heavily polluted due to the fact that the river receives untreated wastewater from the town of Panagyurishte, the town of Strelcha and other smaller settlements located along its course, which also makes them risky for irrigation of the agricultural vineyards of the region.

Demographic Analysis

The assessment of the role of the human factor as the main workforce in viticulture is related to the labor intensity of this agricultural production. A major factor in the formation of employment levels, as well as the qualitative characteristics of the individuals involved, is the demographic crisis in the country and its progressive development over time. Insufficient employment levels in the sector have been reported, as well as a lack of opportunities to acquire adequate professional education and qualifications for employment in viticulture. Limitations in the quantity and quality of labor resources lead to a decrease in the quality of the final product produced, a reduction in the efficiency and competitiveness of production, and a deepening of the crisis in the sector.

The ongoing negative demographic processes at the national and regional level are most affected by dessert grape production, which is more labor-intensive (with a lower degree of mechanization of agrotechnical activities) and highly dependent on the human factor.

Another negative demographic problem is emigration waves, especially of young people of working age, which proves to be negative for the local viticulture sector, especially in rural areas where it is concentrated. The factors that stimulate migration processes are mainly economic and social (Table 5). n this regard, the influence of the political factor in internal migration needs to be studied, because the problems it causes, of a demographic, social and economic nature, affect an increasingly large part of the population and territory of our country, and often determine the general demographic situation (Patarchanova, Nikolova 2019).

The lack of good remuneration and prospects in the sector forces young and able-bodied people from the region to seek suitable employment in larger cities or abroad. This is one of the main problems to be solved and for the future development of the viticulture sector in the Pazardzhik region.

In addition to aging, the deterioration of the age structure and age ratios of the workforce in viticulture, its qualification is also a problem. There is an increasing shortage of qualified personnel to work with complex mechanized equipment and to apply new technologies in viticulture.

Table 5. Mechanical movement of the population in Pazardzhik district (2024). *Source: National Statistical Institute of Bulgaria (nsi.com)*

MECHANICAL POPULATION MOVEMENT IN 2024 BY REGIONS, MUNICIPALITIES AND SEX* (NUMBER)									
Regions, Municipalities	Settled			Evicted			Mechanical growth		
	All	Men	Women	All	Men	Women	All	Men	Women
Pazardzhik	**3420**	**1746**	**1674**	**3284**	**1478**	**1806**	**136**	**268**	**-132**
Batak	74	31	43	53	22	31	21	9	12
Belovo	78	43	35	122	57	65	-44	-14	-30
Bratsigovo	126	72	54	141	70	71	-15	2	-17
Velingrad	404	187	217	422	170	252	-18	17	-35
Lesichovo	108	51	57	113	56	57	-5	-5	0
Pazardzhik	1342	614	728	1332	619	713	10	-5	15
Panagyurishte	197	86	111	300	144	156	-103	-58	-45
Peshtera	209	105	104	166	63	103	43	42	1
Rakitovo	518	398	120	182	86	96	336	312	24
September	254	111	143	291	128	163	-37	-17	-20
Strelcha	60	29	31	61	27	34	-1	2	-3
Surnitsa	50	19	31	101	36	65	-51	-17	-34

The negative demographic processes in the district are a consequence of the accumulated, over a number of years, unresolved problems in the fields of healthcare, education, employment policy, demographic and migration policy. They have a direct impact on the two main reasons for the deteriorating demographic characteristics in the district. The negative natural growth rate of the villages of the rural areas in the district, which exceeds that of the cities, is the main reason for the continuing decrease in the total number of the rural population, and hence in its share of working age.

Market Analysis

The market as a factor for the development of viticulture is of extremely important importance for the realization of production at the local, regional and even national level.

A significant role in this direction is played by improving the competitiveness and sustainability of vineyard holdings by improving the age and varietal structure of plantations, with a view to meeting market demand and requirements, and improving management techniques to optimize production costs.

Of great importance for the sale of production in the region are the wine exchanges in the villages of Vinogradets and Ognyanovo, etc., where, during the active harvest season, various grape varieties with good overall quality, ripeness and high sugar content are offered.

The existing wineries, as well as the newly established wineries located in the region, play a key role in purchasing the production. They are crucial for the production and sale of high-quality wine and brandy on the domestic and international markets.

In this regard, a good example is the winery "Vintechprom" AD, which is among the most authoritative producers of wine and high-alcohol beverages in the region. The high quality of the winery's products is due to the spirit of ancient winemaking traditions preserved over time, which is skillfully combined with modern winemaking technologies.

The company has established partnership relationships for the processing of grape must of typical grape varieties ("Pamid", "Rkatsiteli", "Dimyat", "Merlot") with wineries in Northern Bulgaria - the Pleven region, and Southern Bulgaria - the Sandanski-Petrich region. The winery's products are distinguished by high quality and are well received on the domestic market, as well as on the markets in Russia and Belarus. The company has well-established traditions and authority in the wine business. It is the winner of many prestigious awards at the national and international level. The products have been awarded numerous medals from our and international competitions. The role of the non-governmental sector is extremely important for viticulture in all wine-growing regions of the country.

The National Chamber of Viticulture and Winemaking is the only organization in Bulgaria that unites on a professional basis everyone involved in viticulture and winemaking. It was established in February 2000. The mission of the chamber is to protect the professional interests of its members, the quality, authenticity and origin of grapes and wine.

Table 6. Annual reports of Pazardzhik district 2015-2024 Source: *Pazardzhik District Directorate of Agriculture*

Annually	Vineyards in general	Wine vineyards	Dessert vineyards	Wine vineyards	Dessert vineyards
2024 г.	21 991 dka	18 656 dka	3 335 dka	yield 485 kg/dka per year	yield 493 kg/ dka per year
2023 г.	21 991 dka	18 656 dka	3 335 dka	yield 262 кg/dka per year	yield 281 kg/dka per year
2022 г.	21 364 dka	18 076 dka	3 288 dka	yield 482кg/dka per year	yield 529 kg/dka per year
2021 г.	32 354 dka	31 928 dka	3 256 dka	yield 470кg/dka per year	yield 450 kg/dka per year
2020 г.	35 224 dka	31928 dka	3 256 dka	yield 411 кg/dka per year	yield 414 kg/dkaper year
2019 г.	39 440 dka	36 570 dka	2 870 dka	yield 554 кg/dkaper year	yield 975kg/dka per year
2018 г.	39 440 dka	36 570 dka	2 870 dka	yield 539 кg/dka per year	yield 988kg/dka per year
2017 г.	39 440 dka	36 570 dka	2 870 dka	yield 830 кg/dkaper year	yield 494kg/dka per year
2016 г.	39 720 dka	36 850 dka	2 870 dka	yield 597кg/dka per year	yield 928kg/dka per year
2015 г.	40 755 dka	37 850 dka	2 905 dka	yield 649кg/dkaper year	yield 1 211kg/dka per year

In the studied area, the Regional Chamber of Viticulture and Winemaking (RLVK) "Trakia", which is headquartered in Plovdiv, plays the greatest role. With its legal status, it is called upon to work for the development and competitiveness of viticulture and winemaking in the region. For the first time, the state is granting part of its powers to the non-governmental sector. The RLVK "Trakia" maintains a register of grape and wine producers in the Pazardzhik region. The Viticulture and Winemaking Chamber issues certificates of origin for quality wine and authenticity of grape brandy and brandy and forms tasting committees to carry out mandatory organoleptic analysis.

The Regional Chamber of Viticulture and Winemaking prepares a strategy for the development of viticulture and winemaking and implements the policy of this sector. The data from the study on the status and trends in the varietal composition of viticulture in the area clearly highlight the need to renew the production potential, especially in terms of the spread of local wine vineyards. A negative trend is the reduction of the area of cultivated vineyards by half in the last ten years in the Pazardzhik region, which is an extremely unfavorable trend (see Table 6).

Analysis of State Policy Regarding Viticulture

The role of state policy for the development of viticulture is very important. The influence of this significant factor on the development of viticulture is expressed both in the adoption of laws serving the general policy in the agricultural sector and those related to this traditional production in the region and the country. Another essential tool for influencing economic activities is the specific financial policy related to supporting the various stages of the production process and the purchase of produce and other economic levers (e.g. tax breaks to stimulate viticulture).

In 2002, following changes in the Wine and Spirits Act (Wine and Spirits Act), relating to the creation of real conditions for effective control and management of the viticultural potential, texts

were developed and adopted regulating the rights to new planting of wine grape varieties, replanting, grafting and uprooting of existing grape plantations. In 2005, a National Strategy for the Development of Viticulture and Winemaking in the Republic of Bulgaria 2005-2025 was adopted, and in 2006 a National Program for the Promotion of the Production of Table Grapes in the Republic of Bulgaria was created.

Unfortunately, after our full membership in the EU, the way in which part of the subsidies under the CAP (Common Agricultural Policy) per unit are received has a negative impact on the development of viticulture area, because it mainly stimulates the production of extensive agricultural crops, which is at the expense of a number of traditional agricultural activities, the main of which is viticulture. Serious financial support should be provided for the sector, which would create favorable conditions for increasing production and establishing it as a secure livelihood in the viticultural regions.

Of great importance for the development of viticulture is that the National Chamber of Vine and Winemaking has created the "Bulgarian Wine" fund, the purpose of which is to support the organization of advertising campaigns, participation in fairs, exhibitions, organization of promotions and other activities aimed at popularizing Bulgarian wine. The fund can also finance individual advertising campaigns under the motto “Bulgarian Wine”. This fund is the first example of a partnership between the state through the State Fund “Agriculture” and the private sector, which unites efforts to raise the prestige of Bulgarian wine. The funds under the fund are raised by voluntary annual contributions from wine producers and an annual target subsidy granted by the State Fund "Agriculture" in an amount equal to the amount raised from the voluntary contributions.

In connection with the great dynamics of changes in agroclimatic conditions, there is a growing need to improve the adaptability of grape producers to income losses and support risk management by promoting crop insurance.

It is increasingly urgent to provide additional tools to influence the market in the viticulture sector, in case of indications of crisis situations related to both natural processes and other extraordinary challenges, such as the 2020 crisis with the COVID 19 pandemic.

CONCLUSION

The complex of natural geographical conditions and resources in the research area has significant potential for sustainable development of viticulture. The favorable agro-climatic conditions and suitable soil types are the basis of centuries-old traditions in the production of various grape varieties that allow the completion of the entire cycle of viticulture and wine agribusiness in the Pazardzhik region. Modern demographic processes are one of the main limiting factors for the development of viticulture in the studied area. The aging population limits the possibilities of the workforce in the main agricultural production activities. The increasing lack of interest in continuity between generations has a detrimental effect on the production experience and qualifications of those employed in viticulture. This, together with the decreasing potential of the workforce, indirectly reflects on the volumes of production, as well as on its quality.

In recent years, there has been a reduction in the number of wine farms, a deterioration in the economic indicators of production, and an increase in the age of those employed in viticulture. he reasons for this are complex and there is no single answer to what is happening in the sector. First of all, one of the main reasons is the decrease in grape and wine exports from our country in recent years. The reasons for this are complex and there is no single answer to what is happening in the sector. First of all, one of the main reasons is the decrease in grape and wine exports from our country in recent years. The loss of market positions gained, both within the EU and in third countries, inevitably leads to an increase in the level of uncertainty regarding the final financial result of the activity for grape growers. There are no or limited at least the previously concluded contracts for the purchase of grape production.

The analysis of the geomorphological, soil-climatic and demographic conditions in the Pazardzhik region shows that there are very good conditions for the cultivation and development of viticulture. The hilly terrain, black earth-tar soils, cinnamon-forest and diluvial-alluvial soils, high annual temperatures and the dry climate in general are a prerequisite for almost exclusively red varieties - mainly Merlot, Cabernet Sauvignon, Pamid. With the development of viticulture and winemaking, traditions in agriculture, and in particular vineyard estates, would be preserved, and funds would be provided for development and investment in rural areas.

Among the main problems of the viticulture sector in the region is the low purchase price of grapes. It is mainly due to the lack of real and lasting interaction between grape growers and wine producers, as well as the relatively small capacity of wineries. There is a tendency for wineries to have their own vineyards, and the grapes produced on their farms have a high cost, so if their owners need additional quantities of grapes, they strive to buy them at the lowest possible price. This In turn, it adversely affects the economic efficiency of vineyard owners, especially the smaller ones, and in most cases they are forced to sell their production even below its cost price.

The lack or insufficient degree of association (cooperatives, producer organizations), as well as preliminary contracts with wine producers, especially for small farms, leads to low prices, non-purchase and disposal of the harvest and lack of funds for the next grape production cycle. This demotivates wine grape producers and reduces their desire to grow wine vineyards, which in turn leads to losses for all participants. First of all, grape producers suffer the greatest losses, and secondly, wine processors and producers. Ultimately, the state and the tax authorities are also harmed, because tax and excise contributions are reduced because the sector is not developing stably and its opportunities and resilience to survive are reduced.

Another serious problem in the studied area turned out to be the high degree of fragmentation of the vineyard massifs. There is a lack of desire for association between the owners of vineyard farms, a total lack of trust and, last but not least, difficulties of a purely administrative nature. There are quite a few producers who do not meet the minimum requirements for applying for any of the measures, but there is also a significant number who meet the conditions but do not apply for support due to the lack of timely and up-to-date information. In this sense, it can be said that the role of state institutions in raising awareness among agricultural producers is not at the necessary level, in view of the absorbability of the financial resources provided to support the sector.

The stabilization of the viticulture sector in the Pazardzhik region requires land consolidation, the planting of new and high-quality grape varieties, as well as regulated binding of grape producers. The poor condition of the vineyards is due, on the one hand, to their deteriorated age structure and, on the other hand, to the inconsistent and untimely implementation of the necessary agrotechnical measures for them. Grape varieties are a determining factor in the development of viticulture. The key to improving competitiveness and developing viticulture in the area is the production of more quality and bottled wines and diversification of production, and the state's agricultural policy must be focus on promoting productions other than traditional winemaking, such as the production of grape juice, raisins and table (dessert) grapes. An important condition for the stabilization of the viticulture sector in the Pazardzhik region is the development and implementation of a technological scheme for planting new vineyards on old uprooted ones. Ensuring healthy, pure varietal vine planting material, ensuring the production of grapes, which in the future will bring high yields of quality harvests in the region. Important future processes in the structure of viticulture in the area are improving the quality of the resulting production, providing employment and gradually increasing the competitiveness of the viticulture sector in the context of the current economic environment in the studied territory.

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