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# AGRICULTURE THROUGH SUSTAINABILITY PERSPECTIVES



# **AGRICULTURE THROUGH SUSTAINABILITY PERSPECTIVES**

**Edited by:**

**Jana Katunar, Nenad Vretenar & Jelena Jardas Antonić**

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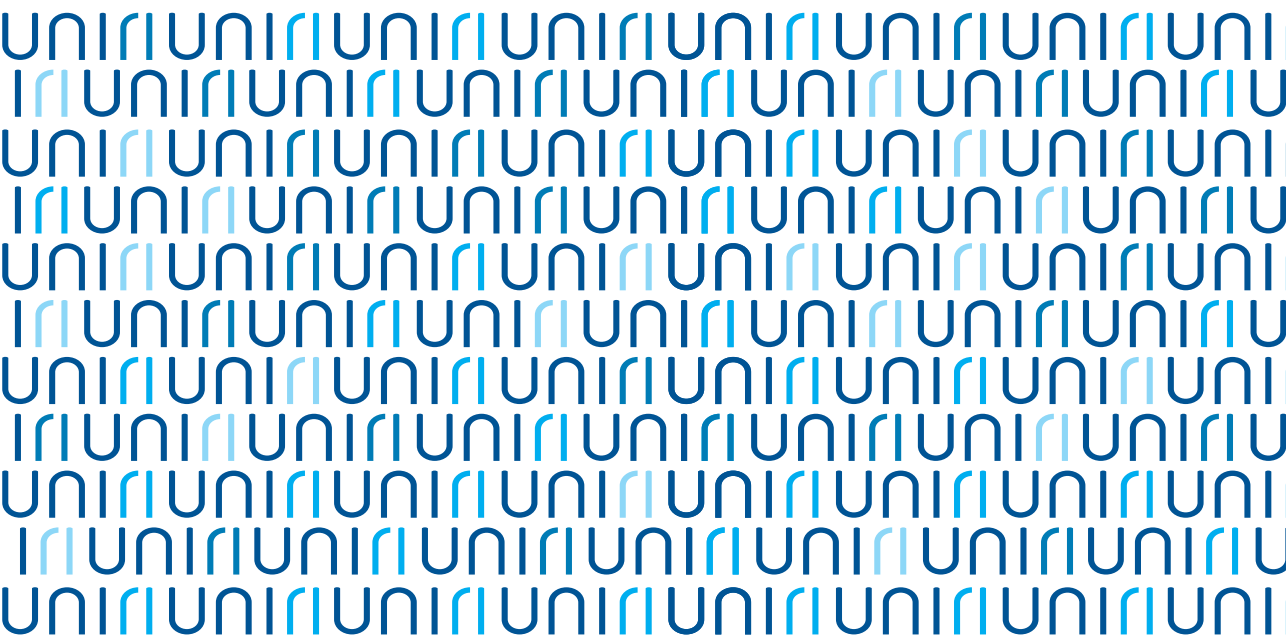
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# Agriculture through sustainability perspectives



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## FOREWORD

Today's agriculture is facing a number of challenges that will have a major impact on its future. Therefore, even though most of these issues are universal and apply to the agricultural sector across Europe and the world, this book is dedicated to analyzing the specific problems and opportunities in Croatian agriculture. Understanding these challenges is crucial for developing sustainable strategies that will enable farmers to successfully adapt their operations to global trends and changes.

One of the biggest challenges for Croatian agriculture is its size, which is small, and fragmentation, both of which pose an obstacle in its competitiveness in comparison to large global producers. While the sector is experiencing rapid progress worldwide, the state of Croatian agriculture is aggravated even more by technological backwardness as many farmers still rely on outdated methods and equipment. Rural communities, already burdened by economic challenges, are facing depopulation and out-migration of young people, resulting in the reduction of the agricultural labour force and threatening the survival of rural areas. This is a problem not only in Croatia, but also in other European countries, which increasingly emphasizes the need for sustainable solutions. Moreover, climate change makes the already difficult conditions in agriculture even more complex as it significantly affects crop yields and quality. The preservation of agricultural varieties is not only a question of agricultural survival, but also of preserving cultural heritage and food diversity. Adapting to the new conditions requires innovative approaches, investment in more resilient varieties and equipping farmers with the knowledge and resources needed to manage change effectively.

Despite these difficulties, Croatian agriculture has considerable potential for development. The synergy with tourism offers opportunities to combine local products with the growing agritourism sector, opportunities to promote local products, support rural development and preserve traditions. With the help of government incentives and European funding, Croatian farmers can modernize their farms, invest in innovation and improve product quality. Particular opportunities lie in the development of organic farming, the circular economy and the shortening of supply chains, which enable greater added value for both producers and consumers.

In this book, particular attention is given to products that combine market potential and cultural identity, such as wine, prosciutto and honey. These products not only have high added value, but are also a symbol of Croatian tradition and excellence on the international stage. Their development can open up and create new business opportunities and, at the same time, strengthen the identity of rural communities.

By comprehensively analyzing the challenges and opportunities, this book aims to give the reader a deeper insight into the complexity of the Croatian agricultural sector. We hope that it will help to understand the problems faced, but also to find solutions for sustainable development. With the right use of resources, innovative

strategies and the combination of science and practice, Croatian agriculture has the potential to become more competitive, to preserve rural areas and to contribute to the overall economic development of the country.

We would like to take this opportunity to thank the authors who had recognized the need to participate in writing this book and have contributed to it with their work. We would also like to thank four distinguished university professors who have reviewed the book and have recognized the value of this academic work. In addition, we would like to thank all thirty-four reviewers of the individual chapters, as each chapter underwent a double-blind anonymous review process before the entire book was reviewed. Finally, we would like to thank the management of the Faculty of Economics and Business of the University of Rijeka for their full support in preparing this book. And to conclude, the book in front of you entitled *Agriculture Through Sustainability Perspectives* is published as a scientific monograph of the University of Rijeka in accordance with the decision of the Senate (Class 007-01/25-03/02, Registration number: 2170-137-01-25-38, on 18<sup>th</sup> February 2025).

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Jana Katunar, Nenad Vretenar and Jelena Jardas Antonić

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# SLOVAKIAN EXPERIENCE WITH THE PRESERVATION OF AUTOCHTHONOUS AGRICULTURAL VARIETIES



Petra Medved'ová \*

## ABSTRACT

At the beginning of the 18th century, the area of vineyards in the territory of today's Slovakia was approximately 57,000 ha, at the end of the 20th century approximately 38,000 ha, and in 2023 it was just over 13,000 ha. The aim of the chapter is to map the situation of grapevine cultivation in Slovakia in the period from 2019 to 2023, when the National Support Program was implemented within the joint organization of the wine market. The chapter focuses on must grape varieties grown in wine-growing areas with an emphasis on the registered vineyard areas for traditional varieties and the perspective of new registered varieties. It turns out that in the conditions of the Slovak Republic, the restructuring of vineyards is a priority, as vineyards are not only productive, but also a cultural and landscape-forming element. It is necessary to invest primarily in vineyards by changing the varietal composition of the vineyard in order to plant high-quality varieties and varieties traditional for the given region, by changing the vines of the vineyard in order to plant a new vineyard with a changed vine and moving the vineyards to higher quality areas while maintaining the original area of the production vineyard. The quality of vineyard production, the share of wines with protected designation of origin and protected geographical indication, and also the competitiveness of Slovak wines should be increased.

**Keywords:** *agriculture, varietal composition, vineyards, viticulture, wine, winemaking.*

## INTRODUCTION

Viticulture and winemaking in Slovakia are among the most important traditional industries, and in recent years, their wines often make unexpected breakthroughs in the world of exclusive wines. Although Slovakia is a small wine-growing country, its wines and wine-growing regions deserve the attention of visitors who want to get to know the local wine, gastronomy, nature, culture and history.

Consumer preferences when choosing wines take several factors into account (e.g. pleasant color, taste and aroma, ecological production, guaranteed origin and quality). The price of wine is related to its product and quality (Karabagias et al., 2021). The composition of the wine depends on the grape variety, origin, vintage conditions, production. The vine can be affected by different effects of climate change, but also by the variety and location (Chacón-Vozmediano et al., 2021). We

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assume that the quality of the wine should be comparable within the same variety, but it can be affected by different factors such as their origin production, which is important from the consumer's side. Our wines are increasingly attracting the attention of consumers. Regional products, which can be awarded a Protected Designation of Origin (PDO) or a Protected Geographical Indication (PGI), are products whose quality is linked to their place of origin and local production practices. In Slovakia, the production of quality varietal wines with "designation of origin" or "geographical indication" has recently increased (Fikselová et al., 2021). In general, the designation of origin is one of the most important attributes when choosing a wine. For example, Skuras and Vakrou (2002) estimate that consumers are willing to pay almost twice as much for a certified product compared to a non-certified product. In Spain, Bernabéu et al. (2005) and in Italy Lai et al. (2006) show that the certification of origin is the most important attribute in wine choice orientation. Martinez-Carrasco et al. (2006) and Mtimet and Albisu (2006) also reached the same conclusions and emphasized that regardless of the type of designation (PGI, PDO) it is always in the first place among the criteria of consumer choice. The aim is to produce wine with a more international flavor and increase the potential market. Given the rather strict production specifications, the possibility of differentiating products by introducing new grape varieties could actually prove to be one of the possible strategies to promote the image of the viticulturist and to win over the consumer. Increasing knowledge of consumer preferences regarding typicity and wine is not only relevant for wine producers, but given increasing economic sustainability (Casini et al., 2014) is crucial for rural development. The development of traditional wine production can be seen as an opportunity to revive mature markets and support the sustainability of the production site. Valorizing the link between traditional production and the territory of origin could indeed bring potential benefits in terms of economic opportunities, environmental and social benefits (Thomé da Cruz and Menasche, 2014; Bernetti et al., 2013). The decrease in the area of vineyards, the reduction of the number of business entities in the industry and, consequently, the number of employees leads to an irreversible loss of viticultural and winemaking competences (Sokolić, 2023).

This contribution examines the situation of grape vine cultivation in Slovakia in the period from 2019 to 2023, when the National Support Program was implemented within the joint organization of the wine market. It describes special support measures to help the viticulture and winemaking sector in Slovakia, which are included in the National Support Program. It focuses on cider grape varieties grown in wine-growing areas with an emphasis on the registered area of vineyards for traditional varieties and the perspective of new registered varieties.

## **MARKET REGULATORY AND SUPPORT POLICY**

The system of joint organization of the wine market is governed by European Union legislation (regulations) and national legislation (laws, regulations and decrees). Regulation of the European Parliament and the Council (EU) no. 1308/2013 of December 17, 2013 creates a common organization of markets for agricultural products and also establishes rules governing the allocation of Union funds to member states and their use by member states through five-year National Support

Programs. The Member States are responsible for the National Support Programmes, which serve to finance specific support measures to help the viticulture and winemaking sector. In accordance with Act no. 280/2017 Coll., the institution that implements the support program in Slovakia for the years 2014-2018 and 2019-2023 is the Economic Payment Agency. In 2018, the European Commission approved the National Support Program for the Slovak Republic for the period 2019 – 2023. From 15 April 2017, the Regulation of the Government of the Slovak Republic No. 83/2017 on the conditions for providing support within the framework of the joint organization of the wine market. The aforementioned regulation regulates the conditions for providing support from EU funds for the following measures:

- promotion
  - in a member state of the European Union,
  - in other than a member state of the European Union,
- restructuring of the vineyard,
- crop insurance,
- investments.

The promotion measure in a member state of the European Union is aimed at providing information to consumers with regard to the Union system relating to protected designations of origin and protected geographical indications, especially conditions and effects, in connection with the special quality, reputation or other characteristic features of wine resulting from a specific geographical environment or origin; on the responsible consumption of wine and on the risks associated with the consumption of alcohol through:

- information campaigns,
- participation in events, fairs and exhibitions at national or EU level held on the territory of the Slovak Republic or the territory of another EU member country.

The amount of the investment is at least € 10,000 and at most € 100,000. The rate of support represents 50% of the actual costs incurred.

The promotion measure in a country other than a member state of the European Union is aimed at:

- establishing relations with the public in the form of promotion or advertising and further developing awareness of target groups, promotional sales events, quality information materials;
- participation in events, fairs or exhibitions of international importance, tastings for distributors and journalists, meetings with traders and distributors, press releases and conferences;
- information campaigns aimed at Community systems relating to designation of origin, geographical indication and organic production, aimed at emphasizing originality;
- surveys of new markets necessary for the expansion of outlets.

The investment amount is at least € 3,000 in all four cases, no more than € 30,000 in the second case, no more than € 10,000 in all other cases. The rate of support represents 50% of the costs actually incurred.

The restructuring measure of vineyards is aimed at:

- change of varieties for the purpose of planting high-quality varieties and varieties traditional for the given region, while preserving the original area of the production vineyard; the measure can be combined with the measure of changing the clip, moving the vineyard or uprooting;
- changing the vineyard plot for the purpose of planting a new vineyard with a changed plot while maintaining the original area of the production vineyard; the measure can be combined with the measure of changing varieties, moving the vineyard or uprooting;
- transfer of vineyards to higher quality areas, higher quality regions and to slopes while maintaining the original area of the production vineyard; the measure must be combined with the grubbing-up measure, and at the same time it can be combined with the change of varieties measure and the measure of changing the clip;
- grubbing, which includes the removal of all vine trusses and supporting structures from the vineyard; the measure must be combined with the change of varieties, change of vines or transfer of the vineyard, which must be implemented within two years from the date of termination of grubbing.

The amount of support for the implementation of measures in the Bratislava region was determined to correspond to 50% of the average costs, and the amount of support for the implementation of measures in the other regions was determined to correspond to 75% of the average costs. In the case of measures to change varieties, change the vine or move the vineyard, three levels of support were determined, depending on the average planting density. The minimum planting density is 4,000 newly planted vine plants per hectare. The amount of total support per hectare is fixed. The amount of support for the restructuring of the vineyard is processed in Table 1.

Average number of vines per hectare	Measure: Change of varieties, change of vines or transfer of vineyard		Activity: Planting itself	
	Bratislava region	Other regions of Slovakia	Bratislava region	Other regions of Slovakia
4 000 to 5 000	14 878	22 316	8 403,50	12 604,25
5 001 to 5 682	15 985	23 977	9 510,50	14 265,25
5 683 and over	16 907	25 361	10 432,50	15 649,25

**Table 1** The amount of support in the restructuring of the vineyard (€/ha)

Source: MPRV SR

During the restructuring of the vineyard, financial support is also paid for the activity of pre-planting preparation and for the measure of grubbing when combined with the measure of changing varieties, changing the vine or moving the vineyard without simultaneous planting. Support is set in €/ha. The amount of financial support is processed separately for the Bratislava Region and other regions of the Slovak Republic in Table 2.

Measure: grubbing-up when combined with the measure change of varieties, change of cluster or transfer of vineyard		Activity: Pre-planting preparation	
Bratislava region	Other regions of Slovakia	Bratislava region	Other regions of Slovakia
1 712	2 568	2 050,00	3 075,00

**Table 2** The amount of support in the framework of the restructuring of the vineyard - addition (€/ha)

Source: ÚKSÚP Bratislava

By combining the measure of grubbing with the measure of changing varieties, changing the vine or moving the vineyard, the vintner can claim compensation for the loss of income of 550 €/ha. Compensation for loss of income is paid as a lump sum only once after the planting of the vineyard has been completed.

The crop insurance measure is aimed at providing support for insurance against:

- natural disasters,
- adverse weather events,
- losses caused by animals,
- occurrence of vine diseases,
- pest infestation.

Support for crop insurance can be provided in the amount of no more than 80% of the paid annual insurance premium, if the subject of the insurance contract is crop insurance against crop damage caused by an adverse weather event that can be compared to a natural disaster, or 50% of the paid annual insurance premium, if the subject of the insurance contract is crop insurance against damage to the crop caused by another adverse weather event that can be compared to a natural disaster, animals, vine disease, or pest infestation.

The measure of investment in wine enterprises includes:

- purchase of new barrels or containers that are made of wood, intended for storing or maturing wine, leading to the improvement of existing technology,
- investments in the labeling of wine products with new labels with a two-dimensional QR code used to quickly decode information about the origin of the wine (QR code).

The amount of the investment in the first case is at least € 5,000 and at most € 35,000, for the measure in the second case at least € 5,000 and at most € 50,000. Support will be provided in the amount of no more than 40% of eligible costs for investment in a business operated in the Bratislava region and 50% of eligible costs for investment in a business operated in the territory of other regions of the Slovak Republic.

Table 3 shows the provided financial support from EU funds for all measures within the National Support Program for the years 2019-2023.

Measure	2019/2020	2020/2021	2021/2022	2022/2023
Restructuring of vineyards	4 781 228	3 903 742	4 190 477	3 243 378
Vineyard harvest insurance	348 864	408 343	340 499	0
Promotion in a non-EU member state	36 254	51 341	6 787	19 763
Promotion in EU member states	23 467	50 000	100 000	50 000
Investments in wine businesses	406 928	288 039	309 483	385 001
Sum	5 596 742	4 701 466	4 947 248	3 698 143

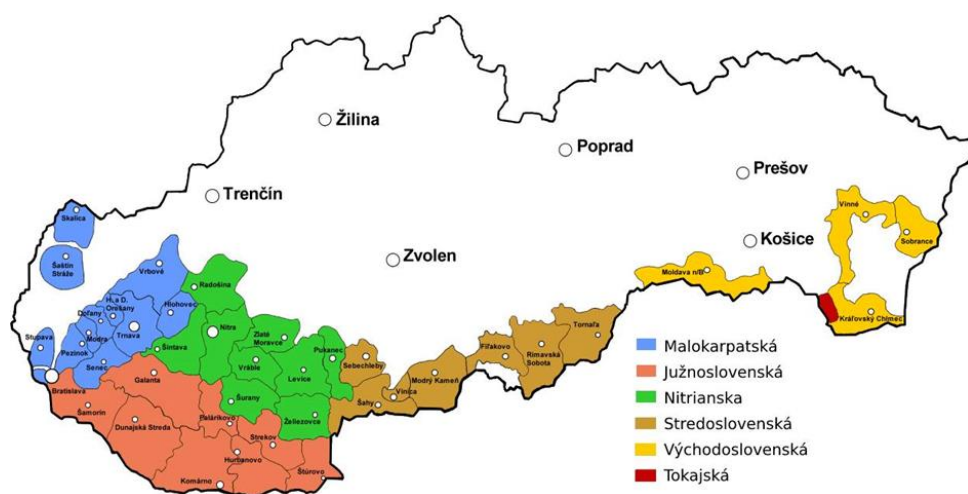
**Table 3** Supports of the common organization of the wine market paid from European sources in wine years (€)

Source: authors' work based on PPA

The data in Table 3 shows that the financial support for all measures has decreased by 34% over the entire observed period, which corresponds to an average annual decrease of 13%. The largest financial resources were allocated to the measure of restructuring vineyards. In the future, Slovakia should endeavour to increase financial support in the area of viticulture, not only from EU sources, but also from its own sources, so that the support measures are more effective.

## VINEYARD REGIONS IN SLOVAKIA

The Slovak wine-growing region is located along the southern border of the country and, according to the legal classification, it is divided into six wine-growing regions: Malokarpatská, Južnoslovenská, Nitrianska, Stredoslovenská, Východoslovenská and Tokaj. These viticultural areas are defined as geographical areas with different climatic conditions for viticulture (ÚKSÚP, 2022). In terms of wine, the largest of them is Malokarpatská, where viticulture today is tied to the south-eastern slopes of the Little Carpathians, around Hlohovec and Skalica. The smallest and most exclusive is Tokajská, which is closely related to the area of the same name in Hungary and is limited to only a few municipalities. The Tokaj vineyard region has precisely defined conditions for growing vines and producing wines.



**Figure 1** Wine-growing regions in Slovakia  
*Source: MPRV SR*

According to the Vineyard Register of the Slovak Republic, the total area of vineyards in wine-growing areas is based on Act no. 313/2009 Coll. on viticulture and winemaking registered on July 31 of the relevant year. The economic wine year lasts from August 1. of the previous year until 31.7. of the respective year. However, the area of Slovak vineyards is decreasing year by year. According to the Vineyard Register of the Slovak Republic, as of 31 July 2023, the total area of vineyards registered was 13,199.43 ha. An overview of the registered total area in hectares (ha) divided into the area of bearing vineyards, non-bearing vineyards within three years and uncultivated vineyards is presented in Table 4.

Year	Total area	Bearing vineyards	Non-bearing vineyards	Uncultivated vineyards
2020	15 080	11 090	1 131	2 859
2021	14 641	10 452	858	3 331
2022	14 364	10 570	1 442	2 352
2023	13 199	11 952	664	583

**Table 4** Registered total area of vineyards as of 31.7. of the respective year (ha)  
*Source: ŠÚ SR*

The trend of the decrease in vineyard areas, which has been ongoing since 2013, continues even in the period of implementation of support measures in the years 2019 to 2023. During the observed period, the total area of vineyards decreases, the areas of uncultivated vineyards and barren vineyards up to 3 years of age also decrease, but there is an overall increase in productive vineyards. The overall reduction in uncultivated and unproductive vineyard areas can also be influenced by the financial resources from the support programme, with most of the financial

resources being allocated specifically to the measure of restructuring vineyards. The impact of the decrease in areas for the cultivation of cider grape varieties in the monitored period did not have a downward trend for wine producers. Despite the fact that Slovakia is not self-sufficient in wine production, the overall number of wine producers has increased. It is likely that domestic wine consumption has increased due to the corona crisis. Due to the fact that the gastro segment was closed and also the winemakers' own stores, wine stocks remained in the cellars. The largest number of registered wine producers in the observed period is in the Small Carpathian wine-growing region. Only the Východoslovenská wine-growing region registered a slight decrease in wine producers.

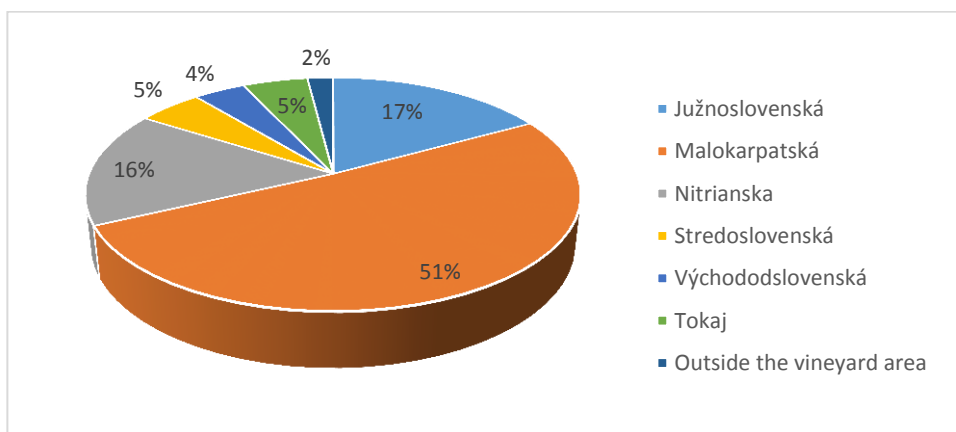
As of 31/07/2023, 802 active winemakers were registered in the register, which was the most since 2020. The number of producers of wine products in the monitored years by winegrowing region is processed in Table 5.

Wine-growing region	2020	2021	2022	2023
Južnoslovenská	125	125	127	133
Malokarpatská	319	321	383	407
Nitrianska	119	118	125	131
Stredoslovenská	39	39	40	42
Východoslovenská	35	35	32	33
Tokaj	38	38	36	39
Outside the vineyard area	14	16	26	17
Sum	689	692	769	802

**Table 5** Number of producers of wine products by viticultural regions in Slovakia as of 31.7. of the respective year

*Source:* authors' work based on ÚKSÚP

The highest representation of 51% is for wine producers in the second largest wine-growing region, which is the Malokarpatská wine-growing region. In the Južnoslovenská wine-growing region, which is the largest wine-growing region in Slovakia by area, 17% of producers produce wine. The Tokaj winegrowing region is the smallest in terms of area, but due to its exclusive wine production, it has a representation of up to 5% of the total number of wine producers. The smallest 4% share is held by the Východoslovenská wine-growing region, where there is a slight downward trend in wine producers.



**Figure 2** Representation of wine producers within the regions as of 7/31/2023

Source: authors' work based on ÚKSÚP

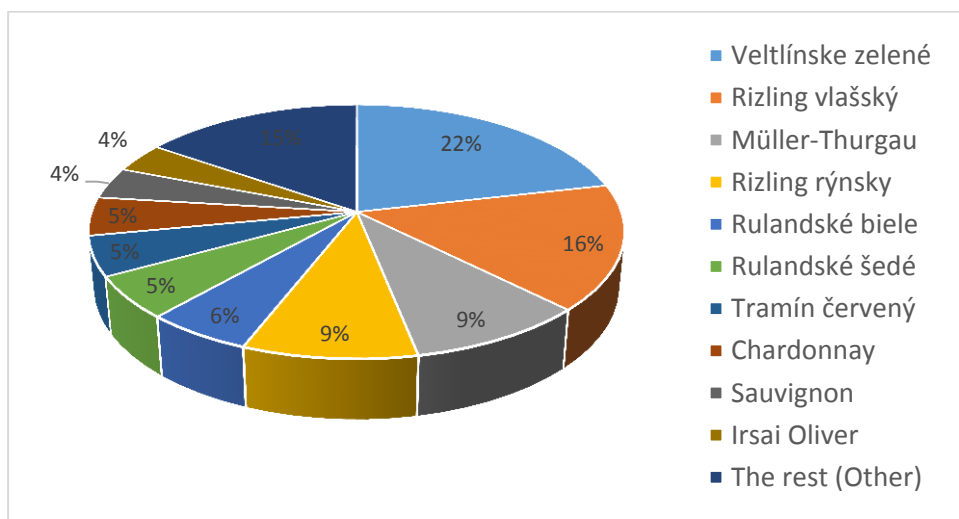
## VARIETAL COMPOSITION OF SLOVAK VINEYARDS

The Ministry of Agriculture and Rural Development of the Slovak Republic annually publishes the List of Registered Varieties, which lists the varieties subject to mandatory registration. Vine is included among other types of agricultural crops. Varieties that can be used for wine production according to the Act on Viticulture and Winery are registered in the deed, and their names can appear on bottle labels. The list of registered varieties for the year 2023 was compiled by the Central Control and Testing Institute of Agriculture in Bratislava as of June 30, 2023. All registered varieties of grape vine (*Vitis*) are suitable for the production of standard propagating material. There are 50 must grape varieties registered in this list for 2023 (of which 30 white musts, 3 Tokaj musts and 17 blue musts), 21 table varieties and 10 rootstock varieties for vines. The oldest varieties were registered in 1941, the others in 2011, 2016 and 2018. The oldest varieties were registered in 1941: Cider white (Müller-Thurgau, Neuburg, Riesling Rýnsky, Riesling Vlašský, Pinot Blanc, Pinot Gris, Silvan Green, Tramin red, Veltliner green), Cider Tokaj (Muscat yellow), Cider blue (Frankovka blue, Portugal blue, Pinot noir, St. Lawrence), table grape varieties (Chrupka white, Chrupka red). In 2011, the white cider varieties Breslava, Hetera, the blue cider varieties Hron, Nitria, Rimava, Rosa, Rudava, Torysa, Váh and the table varieties Bezsemenka, Heliotrop, Luna, Premier, Rhea were registered. The most recently registered varieties were only cider white, in 2016 Rothgipfler, Silvaner Roth, Zierfahndler Roth and in 2018 Hossa and Rizling Ritual (Ministry of Agriculture and Rural Development of the Slovak Republic, 2023).

Of the currently recognized 50 varieties of *Vitis vinifera*, it is permitted to produce high-quality wine. In Slovakia, the white varieties Veltlínské zelené and Riesling Vlašský dominate, while Frankovka blue and Svätovavrinecké dominate the blue varieties. Here we can meet the varieties that are planted all over the world Chardonnay, Pinots - blanc, noir, gris known in our country as Pinot Blanc, Blue and

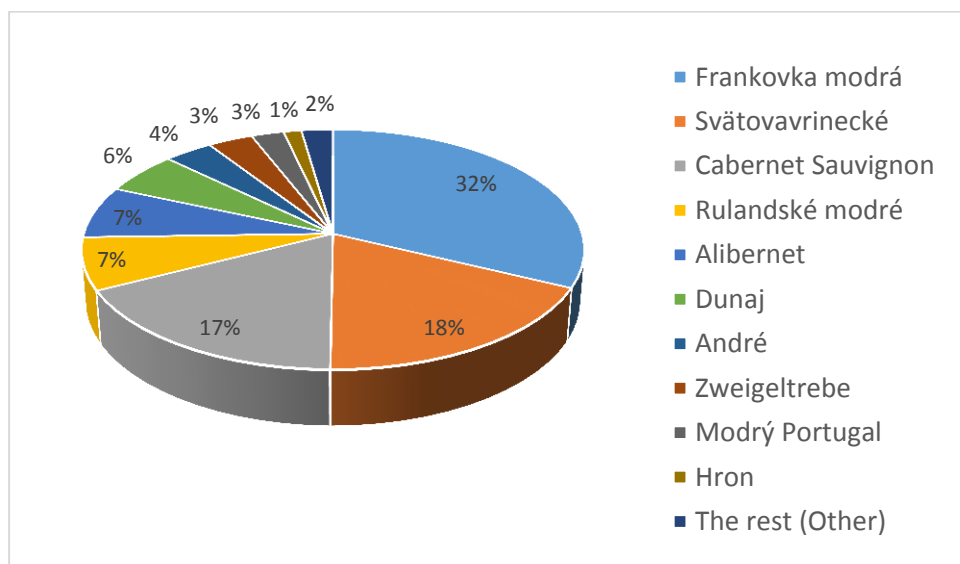
Grey, Sauvignon, Tramín Red, Cabernet Sauvignon, Alibernet, Svätovavrinecké, Zweigeltrebe. In Slovakia, we can find varieties typical for Central Europe - Wallachian and Rhenish Rieslings, Pálava, Moravian Muscat, Müller-Thurgau, Irsai, Aurelius, Bouvier's grapes, Dievčie grapes, Feteasca regala, Neuburg, Veltlin red early, Veltlin green. From the blue varieties, they are André, Frankovka blue - a so far suppressed gem among blue varieties, but also Neronet. We can compare them with the wines of neighboring countries - Austria, the Czech Republic, Hungary - and discover the character of this Central European region - freshness, sparkle, harmony, zest for life. The real pearls are the varieties bred exclusively for us. In their taste, we present a piece of the country and at the same time a piece of our skill and heart - Devín, Milia, Noria, Dunaj, Silvanské zelené, Hron, Váh, Nitra. These are varieties that you will not meet anywhere else in the world. Tokaj varieties can also be added to them - Furmint, Lipovina, Yellow Muscat, whose unique cultivation and processing gives exceptional wines.

We are interested in the distribution of vineyard area for cider grape varieties. The distribution of the area of the varietal composition for selected white must varieties as of 31.7.2023 is in Figure 2. The Figure shows the dominant varieties Veltlínske Grüner and Riesling Vlašský, which are among the original varieties in Slovakia.



**Figure 3** Areas of vineyards cider white variety as of 7/31/2023  
*Source: authors' work based on ÚKSÚP*

The variety composition for blue cider varieties is dominated by Frankovka blue, Svätovavrinecké and Cabernet Sauvignon, which are among the original varieties in Slovakia. The distribution of the area of the varietal composition for selected blue cider varieties as of 31.7.2023 is in Figure 3. The Figure also shows new varieties in Slovakia such as Dunaj and Hron, which were bred only for Slovakia.



**Figure 4** Areas of vineyards cider blue variety as of 7/31/2023

Source: authors' work based on ÚKSÚP

For the overview of the varietal composition and area of the vineyards, we selected three white cider varieties - Rhenish Riesling, Wallachian Riesling, Grüner Veltliner, three Tokajské - Furmint, Lipovina, Yellow Muscat and three blue cider varieties - Dunaj, Frankovka blue, Svätovavrinecké. These varieties are the most represented in wine certification in the monitored period of 2020 to 2023. The total area in hectares (ha) is divided into the area of fruiting vineyards, non-fruiting vineyards up to three years and uncultivated vineyards. The varietal composition and surface area for musty white varieties in the monitored period of 2020 to 2023 is processed in Table 6. In the overview for white varieties, we see that the area under vines with a harvest for all selected varieties increased overall during the observed period, although the total area under vines for all observed varieties shows a downward trend. In the overview for musty white varieties, we can see that the trend of the decline in vineyard areas continues only for the Grüner Veltliner variety.

Year	Cider white variety	Total area	Bearing vineyards	Non-bearing vineyards up to 3 years	Uncultivated vineyards
2020	Rizling rýnsky	784,9	550,0	76,8	158,2
	Rizling vlašský	1685,4	1196,0	55,0	434,4
	Vetlínske zelené	2194,3	1609,7	61,1	523,5
2021	Rizling rýnsky	761,5	545,9	36,5	179,1
	Rizling vlašský	1620,5	1126,0	34,2	460,3
	Vetlínske zelené	2036,5	1042,4	23,7	970,4
2022	Rizling rýnsky	721,3	595,2	59,4	66,7
	Rizling vlašský	1462,0	1096,4	76,8	288,8

	Veltlínske zelené	1926,6	892,2	64,5	970,0
2023	Rizling rýnsky	762,9	699,0	27,0	36,9
	Rizling vlašský	1332,1	1257,2	42,1	32,8
	Veltlínske zelené	1793,6	1677,1	30,7	85,9

**Table 6** Varietal composition and surface area of registered vineyards (white cider) in the Slovak Republic as of 31.7. of the respective year (ha)

Source: authors' work based on ÚKSÚP

The exclusive and at the same time the most developing area is the Tokaj wine-growing area. It has the status of a special wine-growing area with a precisely declared territory of seven wine-growing municipalities, with a prescribed varietal composition and a special wine-making technology with stony and gravelly soils. The varietal composition and surface area for Tokaj cider varieties in the monitored period of 2020 to 2023 is processed in Table 7. In the overview for Furmint, Lipovina and Yellow Muscat, we can see that the trend of the decrease in vineyard areas for Furmint and Lipovina continues.

Year	Tokaj cider variety	Total area	Bearing vineyards	Non-bearing vineyards up to 3 years	Uncultivated vineyards
2020	Furmint	369,2	322,3	41,7	5,2
	Lipovina	212,5	188,0	20,5	3,9
	Muškrát žltý	163,3	113,6	45,7	3,9
2021	Furmint	359,4	338,6	5,3	15,4
	Lipovina	208,5	189,0	7,7	11,8
	Muškrát žltý	173,0	152,5	19,6	0,8
2022	Furmint	310,2	303,2	2,6	4,4
	Lipovina	196,3	177,6	16,6	2,1
	Muškrát žltý	185,2	148,5	36,6	0,2
2023	Furmint	291,4	274,6	10,6	6,2
	Lipovina	166,9	157,5	7,3	2,2
	Muškrát žltý	189,0	168,2	20,8	0,0

**Table 7** Varietal composition of registered vineyards (Tokaj cider) in Slovakia as of 31.7. of the respective year (ha)

Source: authors' work based on ÚKSÚP

The varietal composition and acreage for the three selected blue varieties, which are the most represented in the wine certification of the seventeen blue must varieties, is processed in Table 8. Two varieties Frankovka blue, Svätovavrinské belong to the original varieties in Slovakia. The third Dunaj variety is a newly bred variety for Slovakia. In the overview for cider blue varieties, we can see the growth trend of fruiting vineyards for the Dunaj variety.

Year	Cider blue variety	Total area	Bearing vineyards	Non-bearing vineyards up to 3 years	Uncultivated vineyards
2020	Dunaj	155,6	122,7	29,3	3,6
	Frankovka modrá	1260,4	1045,0	54,4	161,1
	Svätovavrinecké	815,7	701,2	5,1	109,4
2021	Dunaj	175,8	133,1	39,1	3,6
	Frankovka modrá	1181,5	909,4	56,3	215,8
	Svätovavrinecké	772,8	643,4	3,9	125,5
2022	Dunaj	220,8	136,3	80,9	3,6
	Frankovka modrá	1257,5	1101,5	91,5	64,5
	Svätovavrinecké	805,5	735,8	10,0	59,7
2023	Dunaj	198,1	150,7	47,4	0,0
	Frankovka modrá	1131,0	1070,2	38,5	22,4
	Svätovavrinecké	632,6	620,1	7,5	5,0

**Table 8** Varietal composition of registered vineyards (mustové blue) in Slovakia as of 31.7. of the respective year (ha)

Source: authors' work based on ÚKSÚP

In the monitored period of the wine years 2019 to 2023, we processed the area of vineyards for all cider varieties from the registered area of vineyards according to the Vineyard Register of the Slovak Republic. From the overview, we can see a decrease in fruiting areas for cider whites between 2020 and 2022, but an increase in vineyard areas in 2023. There was an overall decline in the area under vines of Tokaj varieties between 2020 and 2023. There was a slight overall increase in the area under vines for red wine varieties. The largest overall decline was recorded for uncultivated vineyards, especially for white wine varieties. The total area of registered vineyards for cider varieties is in Table 9.

Year	Variety	Total area	Bearing vineyards	Non-bearing vineyards up to 3 years	Uncultivated vineyards
2020	Cider white	9 593,0	6921,0	737,2	1934,8
	Tokaj cider	745,0	624,0	108,0	13,0
	Cider blue	3825,6	3225,9	264,9	334,7
2021	Cider white	9310,1	6348,5	570,9	2390,6
	Tokaj cider	740,8	680,1	32,7	28,0
	Cider blue	3722,2	3051,8	250,4	420,0
2022	Cider white	8950,3	6169,3	954,4	1826,6

	Tokaj cider	691,7	629,2	55,9	6,6
	Cider blue	3960,4	3377,9	411,2	171,4
2023	Cider white	8355,9	7692,2	421,9	241,7
	Tokaj cider	647,4	600,3	38,7	8,4
	Cider blue	3517,1	3291,7	195,8	29,5

**Table 9** Area of registered vineyards for cider varieties in Slovakia as of 31.7. of the respective year (ha)

Source: authors' work based on ÚKSÚP

## CONCLUSION

The aim of the work was to map the situation of grape vine cultivation in Slovakia in the period from 2019 to 2023, when the National Support Program was implemented within the joint organization of the wine market. We paid attention to the measures of the National Support Program, namely promotion in member states and non-member states of the European Union, vineyard restructuring, crop insurance and investments in wine enterprises. The total financial support from European Union funds for all measures has decreased by 34% over the period observed, which corresponds to an average annual decrease of 13%. The largest financial resources were allocated to the measure for the restructuring of vineyards. In the future, Slovakia should endeavour to increase financial support in the area of viticulture, not only from European Union funds, but also from its own resources, so that the support measures are more effective.

The total wine-growing area had a decreasing trend, it decreased by 12% in the observed period, the areas of non-cultivated vineyards and non-productive vineyards also decreased within 3 years, but the total area of vineyards in harvest increased by 8% in the observed period. The area of uncultivated vineyards recorded an overall decline of up to 80%. The overall decline in uncultivated and unproductive vineyards can also be influenced by the financial resources from the support programme, whereby most of the financial resources are provided specifically for the measure of restructuring vineyards. Slovak winegrowers should continue to focus on the restructuring of vineyards, as the funding provided has helped to reduce uncultivated vineyards and increase productive vineyards in the future.

The total area of vineyards had a downward trend, during the monitored period they decreased by 12%, but the total area of fruiting vineyards increased by 8% during the monitored period. The number of producers of wine products had an increasing trend, it increased by 16% during the monitored period. The highest increase in the number of producers of wine products was recorded in the Malokarpatska wine-growing region, where there is also the highest representation of wine producers, up to 51%.

The work was focused on cider grape varieties grown in wine-growing areas with an emphasis on the registered area of vineyards for traditional varieties and the perspective of new registered varieties. The varietal composition for white cider varieties is dominated by Grüner Veltliner, Riesling Vlašský, for blue cider varieties Frankovka blue, Svätovavrinecké and Cabernet Sauvignon, which are among the original varieties in Slovakia. For white cider varieties, there was a decrease in the total area of vineyards, but there was an increase in the fruiting areas of vineyards for all the monitored varieties. For Tokaj ciders, only Yellow Muscat has an increasing trend in both the total area and the area of fruiting vineyards. For the musty blue varieties, we can see the growth trend of fruiting vineyards for the Dunaj variety.

It turns out that the restructuring of vineyards is a priority in the conditions of the Slovak Republic. It is necessary to invest primarily in vineyards by changing the varietal composition of the vineyard in order to plant high-quality varieties and varieties traditional for the given region, by changing the vines of the vineyard in order to plant a new vineyard with a changed vine and moving the vineyards to higher quality areas while maintaining the original area of the production vineyard. This should increase the quality of vineyard production, the share of wines with protected designation of origin and protected geographical indication, as well as the competitiveness of Slovak wines.

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