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Ecological Vineyards Governance Activities for Landscape's Strategies

T 1.2.1: Structural analysis of selected areas and vineyard mapping

Responsible Partner

Business Development Centre Kragujevac

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1. TEMPLATE FOR COMPILING T1.2.1

After more than 50 years, the Census of Agriculture, conducted in 2012 by Statistical Office of the Republic of Serbia, collected data on present situation in agriculture and viticulture. At approximately the same time, after more than 40 years, new geographical zoning of viticulture production areas in Serbia was carried out by the Ministry of Agriculture, Forestry and Water Management. On the territory of Serbia, based on data from the Republic Statistical Office, in 1955 there were about 135,000 hectares of vineyards, but now in Serbia, the area of about 25000 ha is under vine, out of which 22150 ha is in Central Serbia and Vojvodina. About 75.7% of total area is used for the production of wine grapes and 24.3 % is used for the production of table grapes. Viticulture zoning divides the territory of Serbia into three wine growing units which comprise 22 regions, 77 wine growing districts and a large number of wine growing oases.

In total fruit production, grape production participates with about 10% in the total amount of fruit produced. The yield of grapes is on the third place in the total fruit production, right after the production of apples and plums, which are the leading fruit species.

The selected pilot areas in Serbia are 2 wine regions of Sumadija and Three Morave. These two wine regions include parts of three geographical areas of Central Serbia, part of the Sumadija district, part of the Pomoravlje district and part of the Rasina district.

Sumadija

The Sumadija region covers an area of 248,282.8 ha, where the largest vineyards are in Kragujevac. In the Šumadija region there are 1,119.79 ha of vineyards (about 1,038.71 ha of native vineyards, or 91.78% of the total area of listed vineyards in this region), of which 585.58 ha are vineyards with table varieties and 534.21 ha with wine varieties. In this region, 5,000 farms (agricultural holding) own vineyards, which is about 12.84% of the total number of agricultural farms in this region. The largest number of winegrowers is located in the municipality of Smederevska Palanka, although the municipality of Topola has the largest area under vineyards. According to the data from the Wine Register, there are 25 wine producers in this wine-growing region. (data from 2015.)

Šumadija region includes the territory in the municipalities of Arandjelovac, Topola, Smederevska Palanka, Velika Plana, Rača, Lapovo, Batočina, Kragujevac and Knić.

Sumadija region consists of 4 vineyards

1. Krnjevačko vineyards / Krnjevo

Spreading - The Krnjevo vineyards are located on hilly slopes and slopes west of Velika Morava, and north of Smederevska Palanka and Velika Plana.

2. Oplenac vineyards / Oplenac

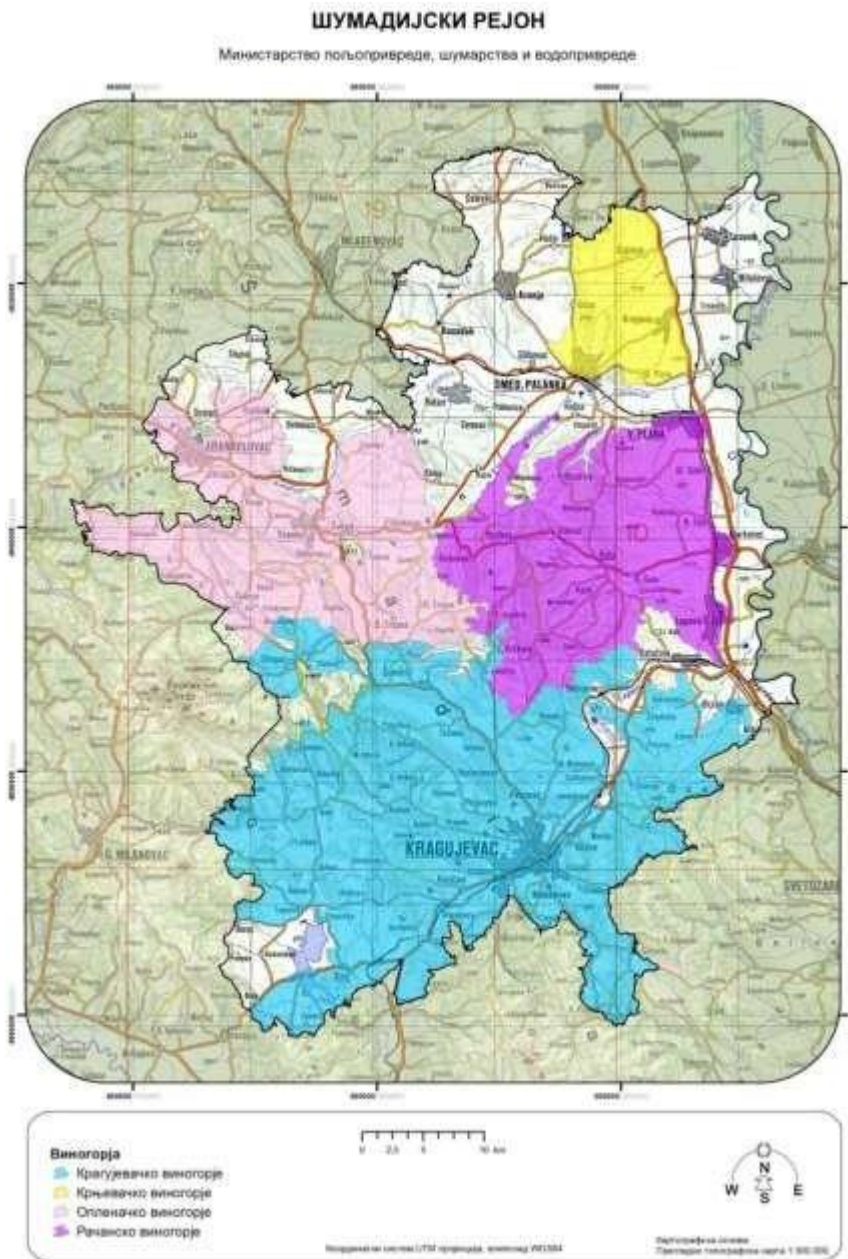
Spreading - Oplenac vineyards are located in the central part of Šumadija, on the hills around Venčac, Oplenac and on the eastern slopes of the mountain Rudnik

3. Rača vineyards / Rača

Spreading - The Rača vineyards are located in the hills on the left side of the Velika Morava, from Miloševo in the south, to Velika Plana in the north.

4. Kragujevac vineyards / Kragujevac

Spreading - The Kragujevac vineyards include the terrain around the city of Kragujevac, the area of Gruža west of Kragujevac, on the southeastern slopes of Rudnik and the northern slopes of the Gledić Mountains.



Source: regionalization of winemaking and viticulture of the Ministry of Agriculture, Forestry and Water Management

Climatic factors

The data are collected from meteorological stations in Čumić, Kragujevac, Rudnikplanina, SmederevskaPalanka, Bukovicka Banja, RC Bešnjaja and RC Bukulja (1961 - 2010).

Land conditions

The predominant soil types in this region are vertisol and eutriccambisol, and luvisol and leaching soils, humofluvisol and semigley, fluvisol and other soils are less represented.

Latitude

The region extends from 44 ° 32 'latitude in the north to 43 ° 52' latitude in south.

The slope of the terrain

This region is mainly characterized by moderately steep to gentle slopes of the terrain where the vineyards are located.

Elevation

Most of the region is located at altitudes of 80 to 400 m, but the areas where the vineyards are located and where the vineyards are located are mostly located at altitudes of 150 to 350 m. The altitude of the region is gradually decreasing from the southwest to the northeast of the region.

Terrain exposure

The region is characterized by different exposures of the terrain, but the vineyards are mostly located on the southern, southeastern and eastern exposures, as well as on the plateau tops.

Relief characteristics

The relief characteristics of this region are the Šumadija mountains, which belong to the group of Dinaric mountains, the so-called Šumadija beam. These include the mountains Kosmaj (626 m), which is located on the northwest side of the region, Gledičke mountains (922 m) on the south side of the region, Kotlenik (749 m), south of Lake Gruž, then the mountain Rudnik (1132 m) and Bukulja m), on the west side of the region.

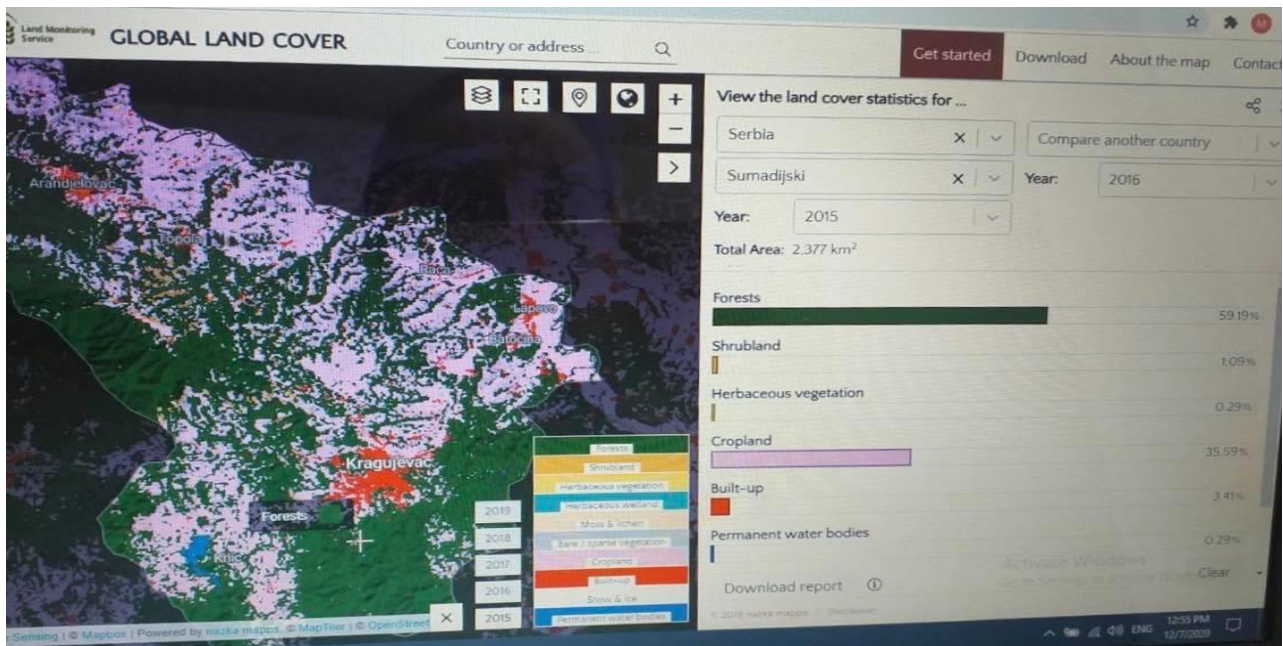
Impact of large water surfaces and impact of forests

The hilly lower sub-belt is mostly overgrown with mountain beech forests, especially in the Rudnik area, which may have an impact on viticultural production.

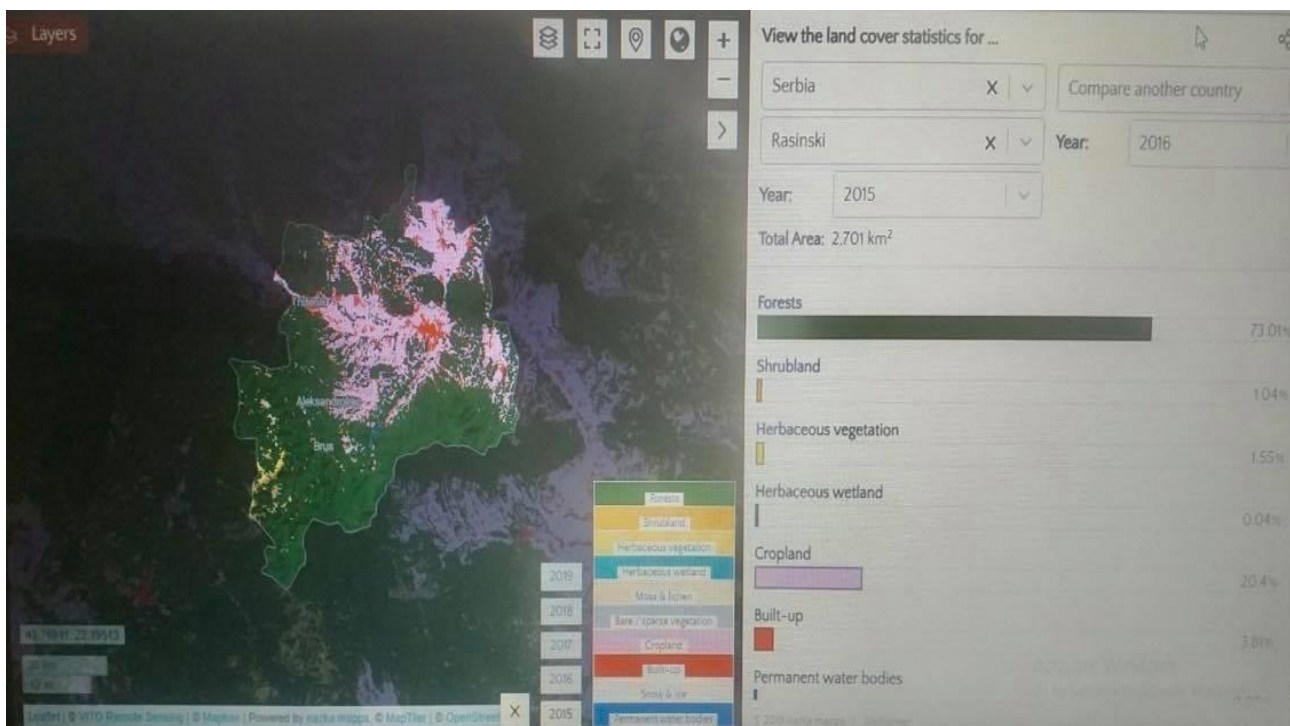
Landscape

The Šumadija region is located in a hilly-hilly belt where the forests of pedunculate oak, ash, willow, poplar, cera and malt oak, as well as beech forests predominate. The main feature of the landscape of this region are hilly and undulating terrains that are often forested, especially on higher terrains (slopes of Mount Rudnik and other mountains), as well as numerous orchards and plots with field crops.

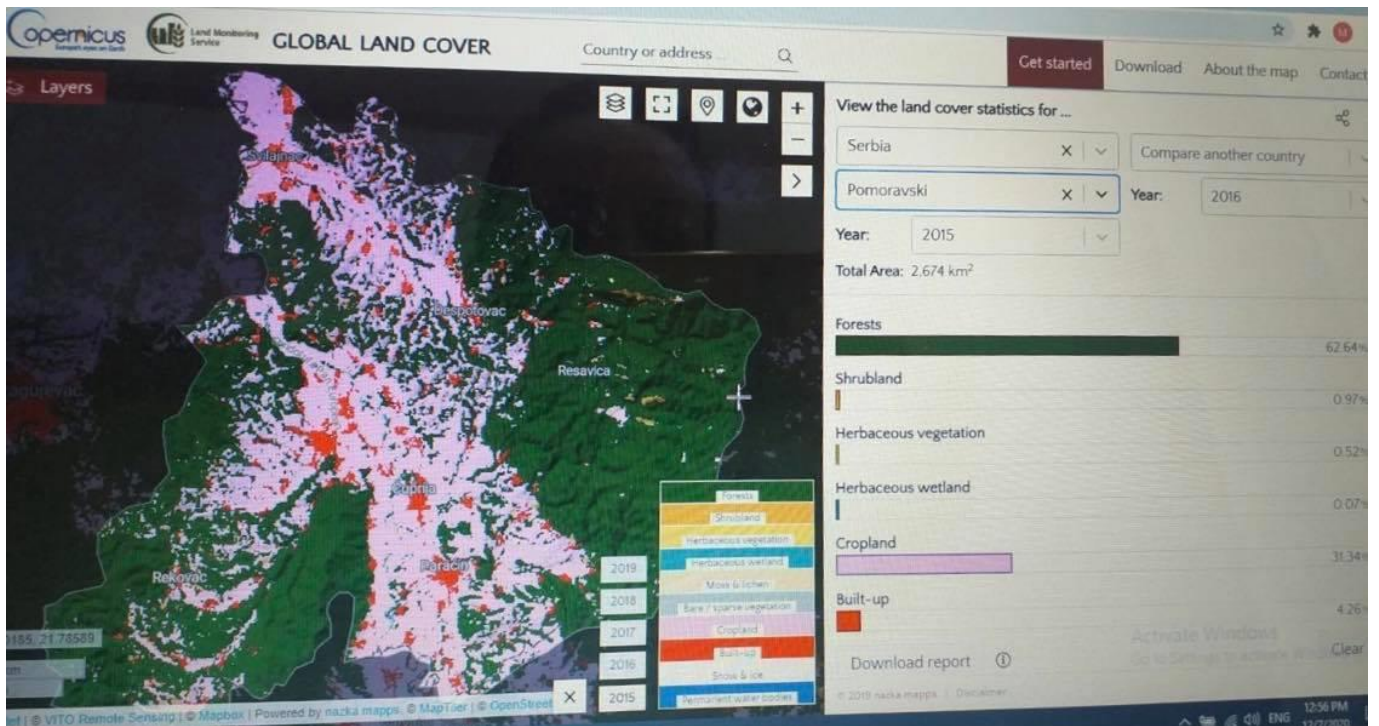
The landscapes of this region are influenced by the river valleys (flat terrains) of Lepenica, Uglješnica, Jasenica, Kubršnica, as well as the river Gruža with Lake Gruž, where mainly field crops are represented. On the east side is a wide valley of the river Velika Morava with lowland characteristics.



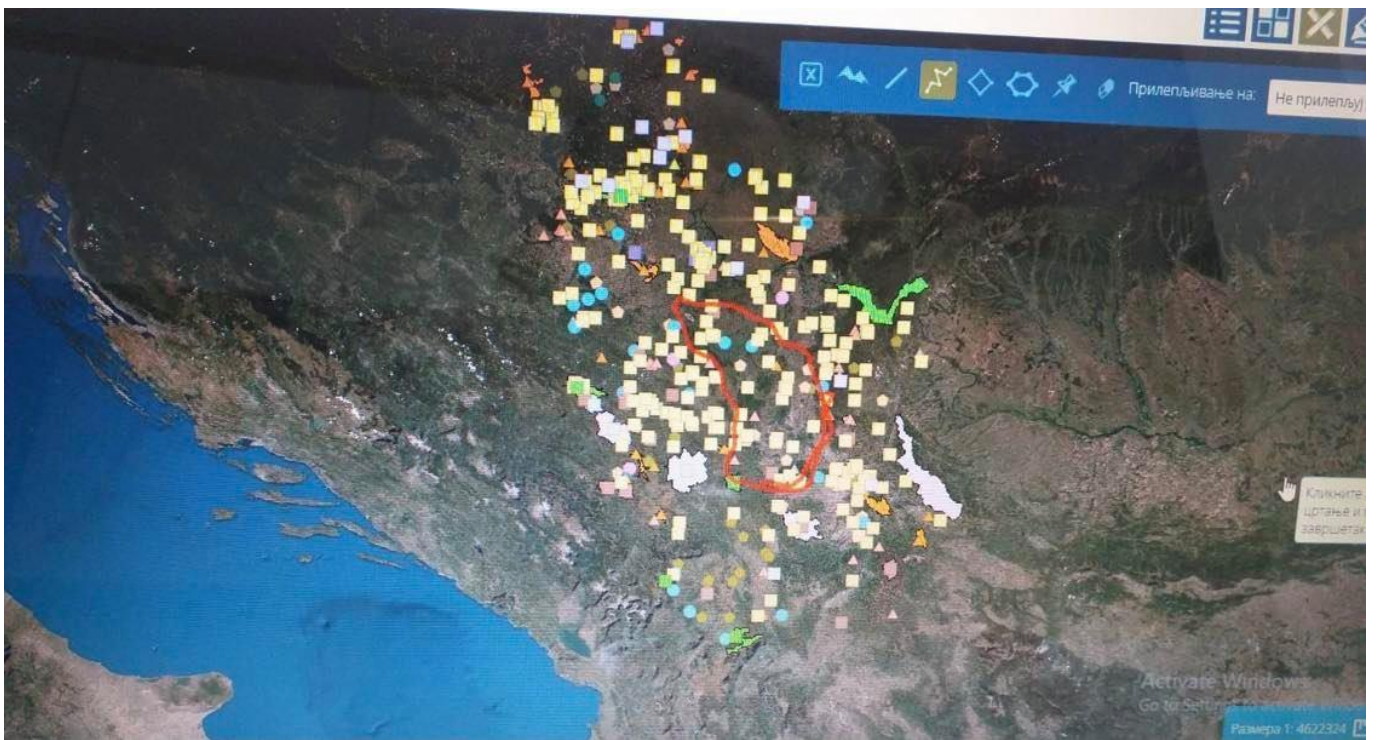
1. Sumadijski region



2. Rasinski region



3. Pomoravski region



Tri Morave region

The region of Tri Morava occupies an area of 286,929.9 ha, where the largest vineyards are Kruševac. According to the 2012 Census of Agriculture, in the region of Tri Morava there are 7,528.76 ha of vineyards (about 7,362.45 ha of native vineyards, or 97.79% of the total area of the listed vineyards of this region), of which 1,367.54 ha with table varieties and 6,161.22 ha with wine varieties. The Tri Morava region is the largest region in terms of area, and one of the most important in Serbia in terms of grape and wine production. Based on the 2012 Census of Agriculture, in the region of Tri Morava 18,129 farms own vineyards, which is about 33.16% of the total number of agricultural farms in this region. Most winegrowers are located in the municipality of Aleksandrovac,

although the municipality of Trstenik has the largest area under vineyards. According to the data from the Wine Register, there are 84 wine producers in this wine-growing region.

The Tri Morava region is located in the central part of Serbia, in the lower basin of the river Zapadna Morava, the lower basin of the South Morava and the upper basin of the Velika Morava and their tributaries. On the west and north side it is bordered by mountains: Gledičke mountains and Bešnjaja, on the south side it is surrounded by mountains: Goč, Željina, Kopaonik and Jastrebac and on the east side of the mountain: Beljanica, Kučajske mountains, Rtanj and Ozren.

The region of Tri Morava includes the territory in the municipalities of Trstenik, Rekovac, Varvarin, Jagodina, Čuprija, Paraćin, Čičevac, Kruševac, Aleksandrovac, Ražanj, as well as small parts of the municipalities of Brus and Aleksinac.

This region contains 9 vineyards:

1. Paracin vineyards / Paracin; covers a relatively large area of hills on the right side of the Velika Morava - from Čičevac in the south, to the border of the municipalities of Čuprija and Despotovac in the north. There are 224.51 ha of vineyards in the Paracin vineyards. Wine varieties participate with 79.5%.

2. Jagodina vineyards / Jagodina; includes vineyards on the left side of Velika Morava near the town of Jagodina. 905 listed farms on a total of 206.68 ha are engaged in viticulture production. Dominated by wine varieties grown at 77.1%

3. Jovačko vineyards / Jovac; is located on the left side of Velika Morava, south of Jagodina. According to the data from the 2012 Census of Agriculture, Jovačkovinogorje has 123.39 ha of vineyards, of which vineyards with table varieties occupy 78%

4. Levačko vineyards / Levač; is located on the northwestern slopes of Juhor and in the upper part of the Lugomir river basin. Within the vineyards there are 407.94 ha of vineyards. Vineyards with wine varieties occupy 92.7% of the total area under vineyards. 926 farms (agricultural holdings) are engaged in viticulture.

5. Temnić vineyards / Temnić; include vineyards on the hills on the right side of the West Morava, in its lowest part, all the way to the composition with the South Morava, as well as a part of the coast on the left side of the Velika Morava. The vineyards have 347.56 ha of vineyards, and wine varieties are grown at 57.9%

6. Trstenik vineyards / Trstenik; it spreads in the vicinity of Trstenik, on hilly terrains on both sides of the West Morava. This is the largest vineyard in the Tri Morava region. It contains 2,211.72 ha of vineyards, or 29.3% of the area under vines in the entire region. 2,928 farms are engaged in viticulture.;

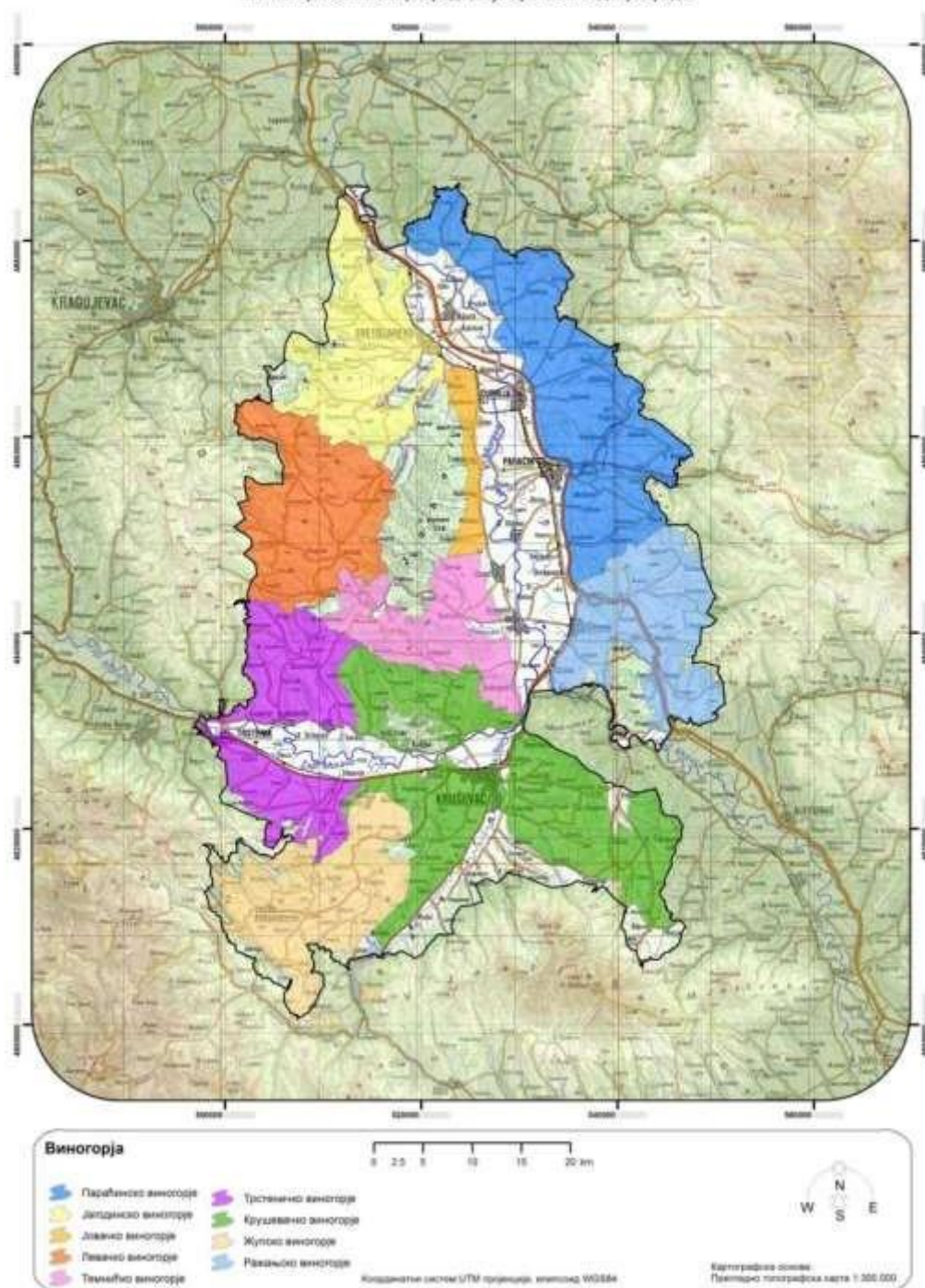
7. Kruševac vineyards / Kruševac; it spreads on undulating and hilly terrains north and south of Kruševac. 2,528 listed farms on a total of 1,900.66 ha are engaged in vineyard production. Dominated by wine varieties, which are grown at 86.2%.

8. Župsko vineyards / Župa; is located on the hills and hilly terrains of Aleksandrovac Župa. Within the region of Tri Morava, most vineyards are located in the Župa vineyards. 3,414 farms are engaged in viticulture, that is 60.8% of vineyard farms. Out of a total of 1,535.45 ha under vineyards, wine varieties are grown on as much as 97.5% of the area. This vineyard has the largest number of wine producers - almost every family produces wine for their own needs, there are a large number of family commercial wineries, and a certain amount of grapes is processed by large wine systems. According to the data from the Wine Register, there are 56 wine producers, today 66.

9. Ražanj vineyards / Ražanj; vineyards stretch on the slopes of the Bukovik mountain in the east, to the rivers Big Velika Morava and Južna Morava in the west. In the vineyards, vines are grown on 148.44 ha, of which wine varieties are represented on 77.1% of the area. 1,226 farms are engaged in viticulture.

РЕЈОН ТРИ МОРАВЕ

Министарство пољопривреде, шумарства и водопривреде



Source: regionalization of winemaking and viticulture of the Ministry of Agriculture, Forestry and Water Management

Climatic factors

bioclimatic indices are monitored on the basis of data from meteorological stations in Aleksandrovac, Aleksinac, Brus, Ćuprija, Jagodina, Rekovac, Kruševac and RC Kruševac (1961 - 2010).

Land conditions

The predominant soil type of this region is vertisol, fluvisol and eutriccambisol, and to a lesser extent **pseudogley, ranker, sirosem, lithosol on shale and gneiss and other soils are present.**

Latitude

The region extends from 43 ° 21 'latitude in the north to 44 ° 07' latitude in south.

Elevation

Most of the region is located at altitudes of 200m to 650m, but the areas where the vineyards are located and where the vineyards are located are mostly at altitudes of 200 to 350m, except in Župa vineyards where the vineyards are at higher altitudes.

The slope of the terrain

This region is mainly characterized by moderately steep to mild slopes of the terrain where the vineyards are located.

Terrain exposure

The region is characterized by different exposures of the terrain, but the vineyards are mostly located on the southern, southeastern and eastern exposures.

Relief features

The relief characteristics of this region are the mountains VelikiJastrebac (1130 m) and Mali Jastrebac (946 m) on the south side of the region. Also, on the west side are Gledičke mountains (922 m), Goč (1040 m) and Željín (1785 m) which belong to the Dinaric mountains. Kučajske mountains (1284 m) which belong to the group of Carpathian-Balkan mountains, lower mountains Baba (656 m), Smoljinac (652 m) and Mojsinjska mountain (496 m), as well as mountain Bukovik (894 m) which belong to the Rhodope mountains are located with the eastern side of this region. In the central part of the region there is the mountain Juhor (773 m) which does not enter the vineyards. Wreaths and slopes of all these mountains, as well as hilly terrains represented more in the western, southwestern and southeastern part of the region, intersected by riverbeds, orographically characterize this region. The northern part of the region is more slightly hilly and with flatter terrain (primarily in the Morava valleys).

Impact of large bodies of water

The region occupies the area around the river Velika Morava and the area near the confluence of the West and South Morava, which affects the air flow, which enables better carbon dioxide recovery and faster photosynthesis, as well as better pollination and fertilization, which certainly has a positive effect on wine. vine.

Landscape

The region includes a hilly-hilly belt, where forests of cera, malt and others predominate. At higher altitudes, and there are mostly mountain beech forests in the lower mountain sub-zone. Around the riverbeds of the Velika, Zapadna and Južna Morava there are mostly moist and flooded forests of pedunculate oak, ash, alder, willow, poplar, etc. There are also smaller rivers Rasina, Osanica, Lugomir, Kaleničkareka, Županjevačkareka, Belica, Pepeljuša, Riljačkareka, Vratarskareka, Grza and Ravanica in this region. The valleys of these rivers, areas with field and vegetable crops, as well as orchards give the landscape characteristics of this region.

Characteristics of vineyards in these two regions

Cultivated varieties .According to the data of the 2012 Census of Agriculture, out of a total of 22,150 ha of vineyards listed at that time, those with wine varieties make up 75.7% of the total area under vineyards. Stone varieties are grown on 24.3% of the total area under vineyards in Serbia, and a similar ratio is in our pilot area, but varies up to 10% difference depending on the vineyards.

Regarding the ratio of vineyard areas with white and black wine varieties within the VR (wine register) (5,763.43 ha of analyzed areas), white wine varieties account for 58.46% of the total area under red wine varieties.

Based on data from VR, the five most represented autochthonous and regional varieties by area of vineyard plots are Prokupac, Smederevka, Vranac, Tamjanika (group Tamjanika) and Slankamenka (Plovdina).

Based on data from VR, the five most represented international varieties by area are Graševina (although this variety is listed as a regional variety, it will be presented here within the international grape varieties), Merlot, Cabernet Sauvignon, Chardonnay and Riesling.

Based on data from the VR, the vineyards managed within this register are mostly on the Berlandieri x RipariaKober 5BB substrate, as much as 75.97% (4,934.93 ha), as well as the Berlandieri x Riparia SO4 substrate 16.33%. (1,061.02 ha). Of the other substrates present in VR vineyards, the only substrate exceeding 1% is Berlandieri x Riparia 420 A which shows moderate resistance to drought or chlorosis, but is suitable for poor soils in hilly terrain.

Vine rootstocks Based on data from the VR, the vineyards managed within this register are mostly on the substrate Berlandieri x RipariaKober 5BB, as much as 75.97%, as well as the substrate Berlandieri x Riparia SO4 16.33%. Of the other substrates present in VR vineyards, the only substrate exceeding 1% is Berlandieri x Riparia 420 A which shows moderate resistance to drought or chlorosis, but is suitable for poor soils in hilly terrain.

A number of vineyard plots are with the rootstock Rupestris du Lot, which is located mainly in older vineyards with indigenous varieties. In general, such data reflect an insufficiently good structure of substrates, which should have a greater dispersion of different substrates in accordance with different types of land in the wine-growing areas of Serbia.

Age structure of vineyards

The age structure of vineyards in Serbia is such that the largest areas under vineyards are in the group that includes those aged between 10 and 19 years (30.00% of the total area of vineyards kept in VR). In second place in terms of area are vineyards belonging to the age group between four and nine years (22.10%). 30 and 39 years 14.23% and over 40 years of age 11.75% of the total area of vineyards in VR), while the smallest areas are in the group of vineyards up to three years of age 5.09% of the total area of vineyard plots..

Age of the vineyard	% of total area
Up to 3 years	5.09%
4-9years	22.10%
10-19 years	30.00%
30-39 years	14.23%
Over 40 years	11.75%

Breeding forms, canopy management

The most common cultivation form is single-edged Guyot, which is present on areas and represents 39.71% of the total area of vineyards. The double-edged Guyot is represented on twice less area on 19.94% of the vineyard area in VR). Far behind these two forms of cultivation in terms of area is Kazanavljevakordunica, which is represented by 3.71% of the total area of vineyards managed in VR. Traditional cultivation forms are represented on 3.22% of the total area of vineyards (vineyard plots) that are kept in VR. The breeding forms Roajatskakordunica, Karlovačkiuzgojnioblik, Kazarsa and Mozerovakordunica are also less represented. Young vineyards that have not yet formed a cultivation form are located on an area of 486.55 ha of vineyard plots.

Structure of wine and grape producers in Serbia

Out of a total of 4,298 grape producers for which data are kept in the VR (wine register), about 55% (2,369) have areas of vineyard plots from 0.1 to less than 0.5 ha, with a total area of these plots of 592 ha. The share of grape producers who have a smaller total area, ie from 0.5 ha to 2 ha is significant and they make up about 31% of the total number of growers for whom data are kept in the VR. The group of grape producers that have from 2 to 10 ha, important for the development of family viticulture and winemaking, make up only 6.8% (292 winegrowers) of the total number of producers for which data are kept. This group of grape producers has a significant area of vineyard plots with a total of 1,130 ha of vineyards. The situation is similar with grape producers who have from 10 to 100 ha, who have a total area of vineyard plots of 1,265 ha, but their number is even smaller, is only 54 grape producers. As for grape producers who have registered vineyard plots with 100 and more ha, they, although there are only three of them, participate with 2,225 ha under vineyards, which represents almost a third of the total area of vineyard plots managed in VR. The number of producers who have from 2 to 100 ha of vineyards managed in VR is 346, which represents 8.05% of the total number of grape producers registered in VR.

This group producers need help through various measures, in order to become competitive in grape production and grow into more active factors in domestic viticulture and wine production.

Vineyards plots in ha	% of total area
From 0.1ha to 0.5 ha	55%
from 0.5 ha to 2 ha	31%
from 2ha to 10 ha	6.8%
From 2ha to 100ha	8.05%
From 10ha to 100ha	54grapeproducers
More than 100ha	3wine producers

Based on data from the VR in the last twenty years (1999–2018), most vineyards have been raised in the Tri Morava region (1,077.55 ha). a larger number of vineyard plots (5,313 vineyard plots erected with vineyards in the last 20 years), which leads to the conclusion that vineyards are raised on smaller plots in this region.

Based on data from the Wine Register, out of 312 wineries in Serbia, more than half, 136 wineries have limited maximum possible capacities for annual wine production below 20,000 l. A significant number of wineries (93) have slightly higher maximum possible capacities for annual wine production (from 20,000 l to 40,000 l), but still insufficiently large capacities for competitive wine production. The largest volume of wine capacities is located within the 48 largest Serbian wineries, which have the possibility of maximum annual wine production of 100,000 l and more, and where 13 wineries have maximum capacities for annual wine production of more than 1,000,000 l.

Based on the analysis of available data on the maximum possible annual wine production capacities, 163 wineries registered in VR have annual capacities from 20,000 to 1,000,000 l, and this is a group of wine producers who need help in order to achieve competition with foreign producers.

in the Tri Morava region the largest number of producers is located, 86 wine producers, 23.24% of all producers entered in the Wine Register in all Serbia. According to the data from the Wine Register kept by the Ministry of Agriculture, Forestry and Water Management from 2012, 370 production wineries were registered, today it is estimated that there are about 440.

Problems and challenges

Planting material

Of all the inputs in viticulture and wine production, certainly one of the most significant inputs is planting material. For that reason, special attention is paid to the quality and categories of grapevine seedlings when raising modern vineyards. The appearance of certain problems in viticultural production and exploitation of vineyards is often a consequence of inadequate planting material in terms of its quality and health, which has a negative impact on the success of viticultural and wine production. Some of the consequences of using inappropriate planting material are visible through poor reception of seedlings in the soil and a large number of empty places, through a mixture of varieties and vine rootstocks, uneven growth of plants, rapid decay of planted vine plants, etc. However, the greatest danger in this production is the health condition of the planting material, which is why it is necessary to work on establishing and maintaining the system of production of healthy and varietal-correct planting material of the vine.

In our country, there used to be 1,200 producers of planting material of the standard category, mostly natural persons, but the legal regulations in 2005 enabled the production of planting material exclusively to economic entities and entrepreneurs who can provide better control in the production of planting material of higher phytosanitary categories. According to the data of the Plant Protection Administration during the 2017/2018 season, grape seedlings were produced by 44 producers of planting material registered in the Register of Producers of Fruit, Grapevine and Hops.

Backrest, Pillars

Based on VR data, 92% of vineyards have a backrest, and the remaining percentage of vineyards are traditional vineyards without a backrest or young vineyards where no backrest has been set up yet. The back of the vine, which is very important for the quality of grapes and wine, is generally in a satisfactory condition in young and modern orchards, while in older orchards in some large wineries (former social systems) it is mostly in unsatisfactory condition.

The structure of pillars in the existing commercial vineyards (analyzed area of 6,457.90 ha) is such that wooden ones predominate with 35.73% (2,307.68 ha), followed by concrete pillars with 31.52% (2,035.49 ha). Metal poles that have a long lifespan, are easy to install and are suitable for machine and manual grape harvesting make up only 9.78% (631.44 ha).

Wire

The wire structure in commercial vineyards (6,263.89 ha of analyzed vineyards) is predominantly favorable for the growing forms that currently dominate in the analyzed vineyards, where 78.86% (4,939.91 ha) of vineyard plots have five or more wires within the backrest. Vineyards with a smaller number of wires (from one to four wires) comprise 7.08% (443.65 ha) of surveyed commercial vineyards.

Soil nutrition

In addition to the fact that in some areas our lands are very fertile, due to the previous policy of producing as high a yield of grapes as possible and mass production of low-quality wines, the applied amounts of fertilizers were often wrong. This situation is present in most vineyards with small producers, as well as with large ones where grapes and wine of lower quality are produced. In domestic viticulture, in most cases, for basic (winter) fertilization, fertilizer with a nutrient ratio of 1: 1: 1, ie NPK 15:15:15 is used, and a smaller percentage of producers use appropriate fertilizers with a higher amount of potassium (K) and phosphorus (P) relative to nitrogen (N), or 8:16:24. These fertilizers for winter fertilization are applied in quantities of about 500 kg / ha, and for fertilization during the growing season, producers in Serbia mainly use nitrogen fertilizers (KAN and UREA) in quantities of about 300 kg / ha. In addition to the incorrect application of different formulations and different amounts of fertilizers, domestic producers often make mistakes at the time of application of fertilizers. Nitrogen fertilization is mainly applied in the later stages of vegetation, which results in later maturation of shoots or incomplete maturation of the vine and its freezing.

One of the main problems with grape fertilization is the fact that grape growers most often use plant nutrition products without prior soil analysis, as well as that soil analysis is absent even before the vineyards are raised, although there is an obligation prescribed by law. For that reason, soil preparation (primarily deep cultivation) with reclamation fertilization is an indispensable activity in raising vineyards.

One of the economic factors that affect viticulture and winemaking and which occurs as a problem, is the lack of labor, then their productivity which depends on the knowledge and qualifications of the worker and the organization of labor. The problem with labor is common, especially in agriculture and The average age of workers in the vineyard is 53 years. There is no interest of young people in the profession of winegrowers, although it is a well-paid job if you work well.

The unresolved social status of agricultural employees makes the occupation of farmers insufficiently attractive and competitive compared to other jobs in the rural labor market. Seasonal workers, as well as those employed in the status of auxiliary workers on the farm, usually do not have social insurance, which further emphasizes the informal status of their employment. One of the most delicate issues of future development of the agricultural sector is extremely unfavorable age and educational structure of agricultural labor. This problem is significant both from the aspect of the social structure of rural areas, and in terms of the capacity of human resources to adopt new technologies or change the production structure.

As for the relationship between winemakers and winegrowers, their cooperation with each other is excellent, but the relationship with other community members and farmers or beekeepers is based only on personal relationship, there are no regulations that would determine the use of pesticides or water and regulation wastewater in accordance with other farmers e.g. imer to beekeepers, to protect their production.

There are subsidies for raising vineyards and for wine production through various funds, but small producers are insufficiently informed and are afraid to use these incentives, because they do not have enough funds and are afraid to invest in large investments, because they do not have much confidence in new funds. In the last few years, work has been done through the Regional Development Agencies to present and clarify funds and subsidies to all producers and in remote areas.

The share of agriculture in total employment in the Republic of Serbia is still very high, among the highest in Europe, and amounts to over 20%. This can be explained by the high share of employees in seasonal jobs in agriculture.

Agricultural and food products play a significant role in the foreign trade of the Republic of Serbia, especially in exports. Their share in total exports has stabilized in recent years, at about 23%.

Having in mind natural resources, favorable soil and climatic conditions, biodiversity and relatively healthy agroecosystems, in Serbia there are favorable conditions for the development of **integrated and organic production**. The Republic of Serbia does not have a developed legal framework that defines integrated agricultural production, but its great importance and potential has been recognized. Since 2006, after the entry into force of the Law on Organic Production and Organic Products ("Official Gazette of RS", No. 62/06) 4i the introduction of incentives for the development of organic production, there is a constant increase in the number of producers and areas where organic production methods are applied.

Inputs in agricultural production in Serbia are 60% and more from imports, we mean mechanization, then mineral fertilizers and chemicals for protection, then reproductive and seed material. In this way, production is more expensive because everything is imported, and until 30 years ago everything was produced in Serbia and met the needs of agriculture in Serbia.

History and heritage Before the Roman conquest of Sumadija and Zupa, Illyrian and Celtic tribes lived in the area of today's Šumadija. During Roman rule, this area belonged to the province of Moesia, and after the collapse of the Roman Empire, this area was ruled by Huns, Byzantines and Gepids. Slavs inhabited these areas in the 6th and 7th centuries. In the area of Šumadija lived a Slavic tribe called Moravljani. Since the 10th century, Sumadija and Zupa have always been an important part of the Serbian state and on its territory were built numerous medieval castles of rulers, and Orthodox churches as royal endowments, which today represent significant historical and tourist sources.

Socio economic analysis

The selected pilot area of Sumadija and Tri Morava includes 20 municipalities in its area. The total area of Serbia without Kosovo and Metohija is 7 747 400 ha where our pilot area consists from Sumadija area with 248282.8 ha plus Tri Morava area with 286 929.9 ha, in total 535213.7 ha of the area where 8648.55 ha are under vineyards. This means that the surface area of our 7.16% of the land territory of Serbia.

Area in ha Sumadija and Tri Morava	Numer of municipalities	Vineyards area	Number of inhabitants in pilot area
535 213ha	20	8 648.55ha	803 437

Our area includes 20 municipalities with about 803 437 inhabitants and the largest municipality is Kragujevac with 179,417 inhabitants according to the 2011. census, and the smallest municipality in the region of Sumadija is the municipality of Lapovo with 7 837 inhabitants and in the region of Tri Morava the largest municipality is Krusevac with 128,752 inhabitants and the smallest is the municipality of Razanj with 9 150 inhabitants.

According the last census from 2011. the population of Serbia is 7,186,862 out of a total of 3,499,176 men, which makes up 48.69% of the total population, and 3,687,686 women, that is 51.31%. The economically active population is 2,971,220 that is 41.34% with 2,304,628 employed and 666,592 unemployed, and the inactive population is 1,025,278. under 15 that is 14.27% and pensioners 1,628,428 it is 22.66% of all population.

The adult population is 5,923,734, of which over the age of 55 years is 2,375,009 it is 33.05% , with the average age of the population being 42 years.

Population in Serbia	Men population	Women population	Economically active population	Population under 15 years , economically	Pensioners , economically inactive

				inactive	
7,186,862	48,69%	51,31%	41,34%	14,27%	22,66%

Education of the population> Of 6,161,584 -85,73%of population older than 15 years without educational attainment and with incomplete primary education and primary education makes 2 121 499 inhabitants which is more than 30% of the population and highly educated is 1 000 569 -13,92% inhabitants and with secondary education 3 015 092 inhabitants.

Number of the population older than 15	Education level primary	Education level secondary	Education level high
6,161,584	37.15%	48.93%	13.92%

Comparative overview of the number of households in Serbia from 1948 and 1971 and 2011 is 1 485 591in 1948.and 2 248 172in 1971.and -2 487 886households in 2011.. Here we see a slight increase in the number of households in the period from 1971 to 2011, because Serbia experienced a difficult period of wars and economic decline since 1991.

Out of 20 municipalities located in this area, only one municipality, Kragujevac, has a level of development above the national average, and 7 municipalities are below the national average in the range of 80% -100% of the national average and the remaining 12 municipalities have a level of development of 60%. -80% of the national average. The republican average in Serbia is a net salary of 500 euros for 2020.year,

The employment rate of the population aged 15 and over was 49.9%, of the male population 57.5% and the female population 42.7%. The region of Šumadija and Western Serbia has the highest rate employment (51.2%), followed by the Belgrade region and the Region of Vojvodina (50.9% and 49.9% respectively), while the Region of Southern and Eastern Serbia recorded the lowest value (46.7%).

The unemployment rate of the population aged 15 and over was 9.0%, 8.8% for men and 9.4% for women. Viewed at the regional level, this rate had the lowest value in the Region Vojvodina (7.2%), followed by the Belgrade region (7.8%) and the Region of Šumadija and Western Serbia (9.7%). The worst situation on the labor market is still recorded in the Region of Southern and Eastern Serbia, which shows the highest unemployment rate, of 12.0%.

The employment rate of the population aged 15 and over	Total 49.9%	Male population 57.7%	Female population 42.7%	Sumadija and Western Serbia 51.2%
The unemployment rate of the population aged 15 and over	Total 9.0%	Male population 8.8%	Female population 9.4%	Sumadija and Western Serbia 9.7%

In 2017. Agriculture, forestry and fishing participated in Serbian GDP with 6%, and it takes 3rd place, just behind Manufacturing and Wholesale and retail trade. Agriculture belongs to low profitability sectors in Serbia. However, production of food and drinks is recognized among 5 priority sectors within smart specialization strategy in Serbia. Vineyards and wineries are seen as agriculture sectors with strong potential for high-tech agriculture and implementation of innovations. In recent years it is reported increased interest of business people and entrepreneurs to invest their money in wine production.

Participated in Serbian GDP in 2018	manufacturing sector	wholesale and retail trade and repair of motor vehicles	real estate sector	agriculture, forestry and fisheries sector	information and communication sector
	14,5%	11,5%	7%	6,3%	4,8%

Employment in the agriculture, forestry and fisheries sector in Serbia is in serious decline - in 2016, more than half a million people worked in this sector(500,000), two years later (2018.)that number dropped to 372,800,which made 15,9% of total employed persons in 2018. The age structure of the heads of family farms is very unfavorable. 42.5% of farmers are over 65 years of age, 27.9% of them are from 55 to 64 years of age, 17.8% of farmers are 45-54 years old, and 8.7% of them are from 35 to 44 years of age. Only 3.1% of the total number of farmers are under 35 years of age. The highest number of agricultural holders under the age of 40 is in the region of Šumadija and western Serbia - 8,730,where our pilot area is.

The age structure of farmers	over 65 years of age	from 55 to 64 years of age	from 45to 54 years of age	from 35 to 44 years of age	Under 35 years of age
	42.5%	27.9%	17.8%	8.7%	3.1%

Viticulture has become increasingly popular in recent years, new wineries are opened every year and the share of viticulture and winemaking in agriculture is gradually growing, which is the goal of the new strategy in agriculture planned for the development of viticulture from 2020 to 2030.

Regarding tourism and catering. The total number of tourists in 2019 was 3,690 thousand. From the

there were 1,843 thousand domestic tourists, while the number of foreign tourists who visited our country was 1,847 thousand. Achieved number of nights of all tourists who used accommodation capacity amounted to 10 073 thousand. Domestic tourists realized 6 063 thousand nights and foreign tourists 4 010 thousand overnight stays.

In Serbia, industry and agriculture have the leading place in the economy. Last year, they gave a little more than half of the national income (industry 35% and agriculture 20%)

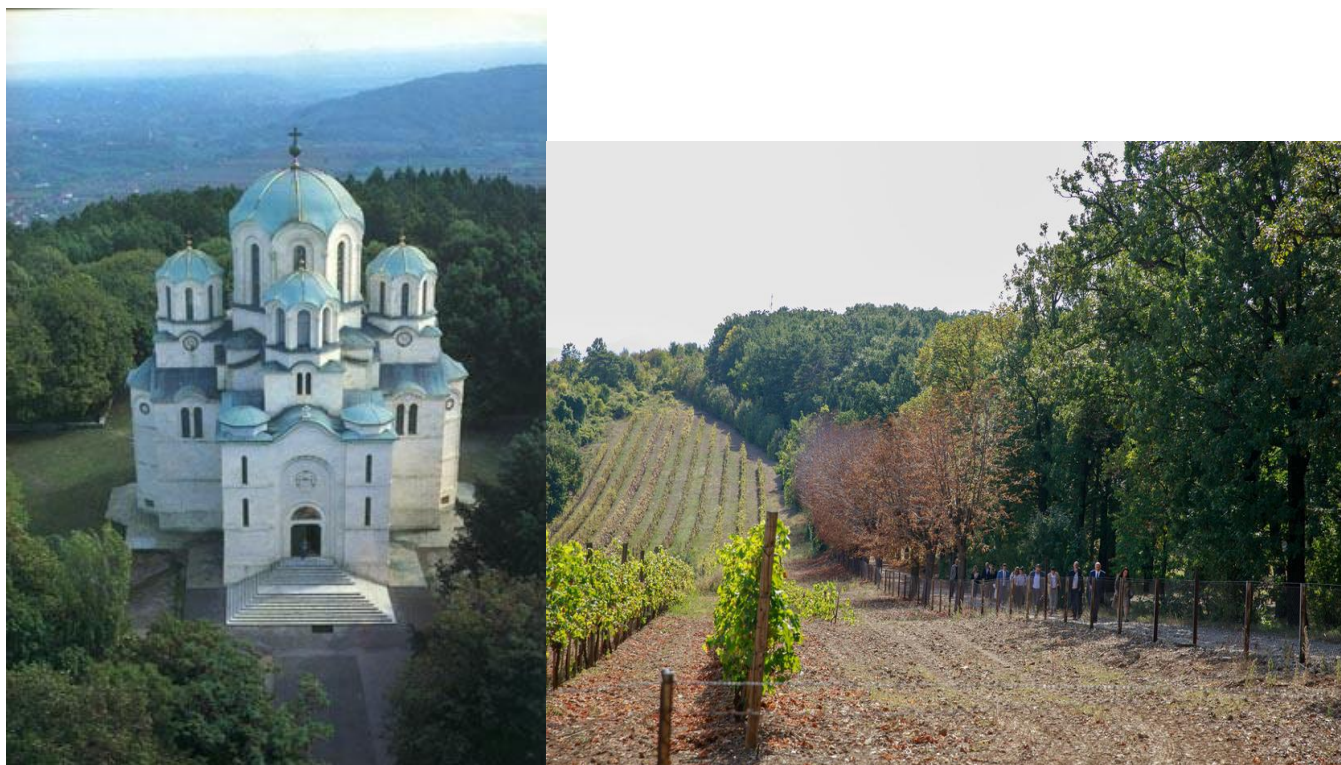
Based on the structure of employees in different economic sectors, the economic development of the country is determined. In Serbia, in the tertiary and quaternary sector, there were slightly less than half of the total number of employees, and thus Serbia belongs to the group of medium-developed industrial-agricultural countries.

With respect to the availability of significant human and natural resources, as well as the achieved level of production and processing, agriculture is the key economic activity of the Republic of Serbia. However, as a result of the transition process, the agriculture of the Republic of Serbia operates in extremely unstable, unpredictable and unfavorable conditions. It is therefore characterized by an unchanged production structure, primarily in capital-intensive production. Animal Husbandry in Serbia, together with farming, represents an essential branch of the agriculture. Serbian livestock occupies an important place in the national economy because it creates a greatvalue-added by engaging natural and human resources. Although this activity has a chance to grow into a significant agricultural industry, the volume of livestock during the last two decades has been constantly decreasing in the amount of 2-3% per annum.

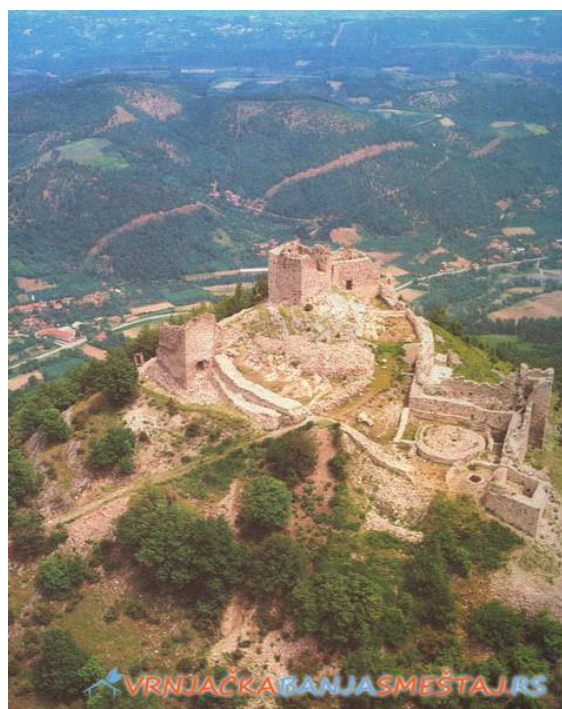
In the total industrial production of Serbia, the processing industry is in the first place and makes 76% of this industry, followed by electricity supply with 16.7% share in the total industry and mining with 7.3% share in industrial production.

And in the manufacturing industry it has the biggest impact Manufacture of food products, which accounts for 15.1%, followed by other activities with significantly lower share in the processing industry, such as: Manufacture and refined petroleum products by 6.6%, Manufacture of rubber and plastic products by 6.4%, metal products, except machinery with 5.6%, Beverage production with 4%.

Serbia is one of the most underdeveloped European countries in terms of infrastructure, so it needs increased investments in the construction of sewers, water supply networks, wastewater treatment plants, sanitary landfills, railway and road infrastructure, so the state adopted the Serbia 2025 plan, which plans investments in these areas which would advance the development of the economy.



church of the royal family Karadjordjevic, in Oplenac, Toploa.



the medieval town Koznik in the Zupa



wine fountain in Aleksandrovac, center of the Zupa

LIST of PILOT FARMS

The name of the winery	Place, Region	Kontakt	Note
1 Winery Aleksandrovic	Sumadija, Topola, Vinca	063/604175 Bozidar Al. 062/221832 snezana	
2 Royal winery	Sumadija, Topola, Oplenac	063/656229 Reljic Dragan	
3 Winery Trilogija	Sumadija, Arandjelovac, Banja	069/1727910 Dragan Mijailovic	
4 Rural household Jovanovic	Sumadija Topola, Lipovac	064/8700115 Predrag Jovanovic	
5 Rural household Pavlovic	Sumadija, Topola, Bozurnja	064/9864327 Mira Pavlovic	
6 Rural household Ferluga	Sumadija, Topola, selo Topola	0631555128 Nevenka Ferluga	
7 Rural household Jevtic	Sumadija, Topola, selo Topla	063/7325015 Miroslav Jevtic	
8 Agriculture farm Milana Milosevic	Sumadija, Sipic, Raca	064/6531107 Milan	
9 Agriculture farm Andjelic Rekovac	Tri Morave, Rekovac,	064/3093760 Branislav Andjelic	
10 Agriculture farm	Tri Morave, Jovac, Jagodina	060/6286909	

Jovac, Jagodina			
11 Winery Despotika	Sumadija, Smederevska Palanka, Vlaski do	069/8214174 Aleksandar	
12 Winery Stari Hrast	Sumadija, Kragujevac, Zirovnica	063/638867 Slavica Stevanovic	
13 Winery Wine Art	Sumadija, Kragujevac, Grosnica,	063/329429 Sasa	
14 Winery Trival/Rujevica	Sumadija, Kragujevac, Draca	065/2602995 Maja I Ivan Dimitrijevic	
15 Winery Cilic	Tri Morave, Jagodina, Lozovik	069/1410114 Cilic Milorad	
16 Winery Lastar	Tri Morave, Rekovac	066/8135016 Nenad Milisavljevic	
17 Winery Miletic	Tri Morave, Oparic	064/2535631 Marija Miletic	
18 Winery Ivanovic	Tri Morave, Zupa, Aleksandrovac	063/528246 Gaga Ivanovic	
19 Winery Spasic	Tri Morave, Zupa, Trzac	064/2437422 Milan Spasic	
20 Winery Minic	Tri Morave, Zupa, Trzac	064/1897306 Moma Minic	
21 Winery Cokot	Tri Morave, Zupa, Starci	063/8312512 Radovan Djordjevic	
22 Agriculture farm Zoran Markovic	Tri Morave, Varvarin		
23 Vineyard owned by Secondary Agriculture school Aleksandrovac	Tri Morave, Aleksandrovac	060/5578727 prof Dejan Mihajlovic	
24 Rural household Jovanovic Svetlana	Sumadija, Topola, Trnava	061/1121579 Svetlana Jovanovic	
25 Rural household Lukic	Sumadija, Topola, Ovsiste	063/7060161 Miljojka I Verko Lukic	
26 Winery Milosavljevic	Tri Morave, Trstenik, Bucje	064/1766103 Milomir	
27 Winery Pevac	Tri Morave, Rekovac	060/3152577 Ivana I Dejan	
28 Winery Katanic	Sumadija, Kragujevac, Kamenica	0653302000 Tanasije	
29 Winery Ambelos	Sumadija, Koporin, Velika Plana	0642939532	
30 Vineyard Jovanovac	Sumadija, Kragujevac, Jovanovac	0631053716 Vladimir Alempijevic	

Questionnaire comment.

1. In our pilot area, 30 pilot farms have been selected, of which 20 are wineries, 9 are rural households and 1 is a vocational high school.

There are 16 pilot farms in the Sumadija region and 14 pilot farms in the Tri Morava region.

2. Farming management > Conventional -14 farms, Integrated-5 farms and Organic-3 farm

3. Product destination > C, R, W, E, P- 8 farms, C, R-8 farms and C-13 farms

4. Educational level of farmers > university-16, high school -3

5. Comment about size of their farms, is it enough for their needs > YES It is enough-18 farms, No it is not we need more land-3 farms

6. Animal husbandry > without animals-20 farms, with animals-2 farms

7. Irrigation > all farms without irrigation management

8. Source of water > 20 farms with municipal water and 2 farms with well

9. Grape and wine production > 20 winery produce only vine grape and 10 farms produce vine and table grape

10. Soil type < clay loam -10 farms, sandy clay loam-5 farms,

11. Organic matter (level) > very low- 1 farm, low-3 farms, medium- 6 farms, high- 2 farms and doesn't know that information – 6 farms

12. Land satings, slope > 0-11% - 9 farms, 11-30% - 12 farms and 31-50% - 2 farms

13. Number of treatments > from 3 to 8 times for one year

14. The most common agroecological practices they apply from the list like >

1. Vineyard Canopy Management, 2. Cover crop, 3. Hand picking the grapes, 4. Mechanical Inter-row weed control in vineyard, 5. Mulching, 6. DSS to reduce of pesticides in viticulture, 7. Resistant grape varieties, 8. Social learning and knowledge generation in agriculture, 9. Wine routes as promotional tools for viticulture, 10. Wood Poles, although they do not know that they are agroecological, they accept them because they give results as traditional.

Farmers are interested in adopting new practices such as >

1. Bio stimulants in viticulture,, 2. Green Manure in vineyard, 3. Mating disruption, 4. Mulching, 5. Land Use Maintenance, 6. Bird nests and shelter for bees and pollinating insects, 7. Pyro-weeding" in vineyards,

8. DSS to reduce of pesticides in viticulture, 8. Soil Fertility Monitoring, 10. Erosion prevention

Problems >

We collected 22 questionnaires of which 10 questionnaires were completed in the meeting with the stakeholder and the conclusion is that this way of communication is the best for understanding the questions and questionnaires. The most common problems arise in understanding landscape units and farmers do not know how to recognize and make a difference and not understand the composition of the land.

When filling in online, farmers filled in the answers they know without thinking, and any additional initiation to fill in the remaining empty fields did not give any results. Based on the completed questionnaires and through discussions with producers, the main problems are > lack of knowledge of the land, first lack of knowledge of geographical features and exposure and the inability to obtain this data easily, and the lack of desire of farmers to collect this data. Organic matter in the soil is determined on the basis of general knowledge by transmitting information from the other farmers, only 50% of the answers are based on the analysis of the soil.

They all described the vineyards as one part, eventually determining the slope, but no one presented them as separate landscape units even though there are vineyards in several locations,

If most of the questionnaires were filled in by highly educated members, the fact is that there were a lot of ambiguities and unfilled fields because they do not have data and they have not needed them in their work so far.

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