

Report on Viticulture and Enology Mission to the Republic of Serbia

Mark L. Chien

Wine Grape Educator

Penn State Cooperative Extension

February, 2008

Introduction

The primary objective of this mission is to assess the current condition of viticulture and enology knowledge and technology in the Serbian vineyard industry. Secondary objectives include the evaluation of support systems, partnerships and infrastructure to the wine industry. The baseline for the evaluation is accepted international standards for best practices and quality that have resulted in the sustainable success of wine growing enterprises in other wine regions, including Pennsylvania.



Figure 1: Mission team: Zlotko, Dragana, Philippe and Peter listening at grower association meeting in the Srem region

Our mission team included Mr. Philippe Chabot, a development research specialist from the Foreign Agricultural Service at the U.S. Department of Agriculture, Mr. Peter Bell, wine maker at Fox Run Vineyards in the Finger Lakes region in New York and adjunct lecturer at Cornell University and Mr. Mark Chien, state viticulturist at Penn State Cooperative Extension. We were accompanied by two staff members of the agricultural attaché at the U.S. in Belgrade, Ms. Dragana Dimitrijevic and Mr. Zlotko Jovanovic (Fig. 1). During our two

week mission we toured almost every wine district in Serbia, visiting vineyards and wineries, and meeting with wine grower associations. With a successful evaluation it can be determined how best to assist the Serbian wine industry to improve, expand and prosper.

Background

The Serbian wine industry has a lengthy history dating back to Roman times, and thus wine growing is well known in the region. However, a turbulent history, especially in recent years with two world wars and the regional conflict in the 1990s that instigated an international economic embargo against Serbia, have dramatically impacted the wine industry. Export markets were lost, domestic spending income was reduced and the chaos of war brought the Serbian wine industry to a halt, while the rest of the world marched ahead with new ideas, technologies and creating global markets for wine at an unprecedented pace. The result of this are abandoned vineyards, lost jobs, insufficient capital and infrastructure necessary for improvements and rebuilding, old and often dilapidated facilities, and poor quality equipment, supplies and materials. As the wine industry attempts to rebuild, there is a conflict between old traditional ideas and methods

and recently developed modern practices that produce high quality grapes, which can make export quality wines¹. One wine grower commented, “we have been through two world wars; we will recover from this recent setback.” I believe this is true, because the greatest asset we discovered on this mission are the people in the industry – a healthy blend of older growers with their traditional knowledge and new, young, energetic and idealistic growers who want to push Serbian wines to international standards for quality.

It is very difficult to recover a vineyard whose best years are behind it. Updating a vineyard often requires replanting with new varieties, clones and rootstocks better suited for the “terroir”² and adopting international standards of best viticulture practices combined with the capital to fund these improvements. Often this requires pushing out the old vineyard and starting with a clean field, but this is not necessarily more expensive than rehabilitating an old vineyard. It usually requires the importation of viticulture experts to fill the “knowledge gap” between old and newer viticultural practices. In the case of Serbian wine growers, most of them are not able to travel to trade shows and meetings to gather information and ideas, so these must be delivered to them.

The wine industry in Serbia must push past the setbacks of the 1990s and move quickly forward in the modern wine world. On this visit, we became aware of both the tremendous challenges that winegrowers face, and the great resources in land and climate, and particularly in the people in the wine community. They will need financial assistance, research and extension education support, and a lot of hard work.

Wine Growing in Serbia

There was a time when Serbia had over 100,000 ha of wine vineyards. Because of the confusion resulting from the conflict in the 1990s, estimates we heard from growers and extension agents varied from 8,000 to 20,000 in current acreage. The Ministry of Agriculture, Forestry and Water Management (AgMin) is currently working on a register of grape acreage (this would include table and raisin grapes) but not home vineyards (non-commercial). This shrinkage was due mainly to economic decline and the inability of people to continue operating their vineyards. This is still significant acreage for a nation the size of Kentucky. By comparison, there are 12,000 ha in Washington State and 5,500 ha in Oregon, at the 2 and 3 position among wine states in the U.S. But it would clearly be a long-term goal for the Serbian wine industry to rebuild to its former size and strength.

While it is difficult to evaluate an entire vineyard industry based on two dozen or so visits, general conclusions can be drawn from what we saw, heard and learned during our visits. It was challenging to acquire specific, fine details of viticulture in the group setting of association meetings or with a group of people standing in a vineyard. In general, the focus of most site visits was enology and a desire of the host to get feedback

¹ Export quality wines are those produced using modern methods and technologies, which meet international standards for quality.

² Terroir is the French term for the influence of soil, climate, plant materials and viticulture on the quality of the wine grown in a specific location.

on wine quality. Two vineyards that produced the best wines we tasted were not visited due to a lack of time. While this assessment represents a sound overview of viticulture in Serbia, it does not capture the finer details of viticulture practices.

During our two-week tour we visited seven wine growing districts in Serbia from the plains of Srem and Vrsac to the steep hills around Negotin and Nis. The topography and local climate conditions varied considerably. Wine growing tradition informed much of the viticulture in the area, especially where autochthonous varieties are grown. As the wine industry increases planting of international varieties, it must learn to adapt these varieties to the unique soil and climate characteristics for the best viticulture performance and quality. Since Serbia is not a large country, the macro-climate does not vary tremendously from north to south or east to west. However, some growers mentioned that red varieties with longer ripening requirements performed better in southern areas. The mapping of climate zones and soils in Serbia's wine districts would be extremely helpful to the location of vineyards to achieve the best quality.

Serbian vineyards vary tremendously in size from very large (>1000 ha) owned by former state-owned "factory" wineries to the family-owned and operated vineyards (1-5 ha). Among those we saw, the quality of viticulture was good where sufficient capital was available to perform the necessary tasks and maintenance in the vineyard. We were told by grower that a family can be supported by 20,000 liters of wine production or 2-5 ha of grape and wine production. If a vineyard is larger than 10 ha, additional personnel are needed to maintain it.

In some vineyards we visited, the quality of viticulture was at the level of international standards that would be accepted in France, Italy, Australia and the U.S. While it is difficult to do an exacting evaluation of viticulture practices in the winter, a lot can be discerned by talking to growers and observing winter canopy patterns. The research vineyard at the Agriculture Faculty in Novi Sad is one such vineyard. The methods of vineyard development, training, and maintenance are very high quality. While there are always smaller questions that any viticulturist may have about their practices, such as the use of side-by-side planting of vines, these represent local and experimental practices that do not detract from the overall quality of viticulture. The competence of the vineyard is almost always reflected in the quality of the wine and those we tasted at the research station were generally very high. This demonstrates the value of viticulture research and extension staff, because they can be the teachers and leaders who bring new ideas and technologies to the grape growers. The growers in the Bermetage association in the Srem region placed a high value and trust on the information and resources at the Faculty of Agriculture.

In any wine district it is critical to look for the leaders in technology and ideas. They form the nucleus for progress and pushing the quality envelope. Most growers, no matter how wedded to tradition they may be, will eventually follow the leaders. These innovative first-adopters of new practices are essential for the improvement of the industry and must be encouraged and supported. One grower in the Negotin region, Sasha Dejjic at the Jelenkovic Cellar, is making very fine wines in his small winery and has planted new

international varieties and clones of Riesling, Sauvignon Blanc, Pinot Noir, Gamay and Cabernet Sauvignon. His wines sell for up to 25 euro in a fancy Belgrade wine shop. This is unprecedented among the wineries we visited and very near to international standards.

The wine industry needs to decide if it wants to produce and market wines in the international wine marketplace. If it wants to do this, it must modernize, while retaining the charming traditions that will benefit agri-tourism. It must decide that it is, in fact, a community of wineries and vineyards and not just a collection of autonomous businesses, and they must work together to improve and promote the grapes and wines. A strong industry association with visionary and creative leadership is necessary, along with key partnerships with local, state and national government agencies, universities, industry vendors, private consultants and any stake holder who may benefit from the success of the wine industry. A unified voice can be a powerful advocacy tool when working with key partners.

The following assessment will be divided according the four components of terroir: plant materials, soil, climate and viticulture. Each of these plays an essential role in wine quality and is part of the Scope of Work. Some non-agricultural observations of the wine industry in Serbia will also be offered.



Figure 2: Tamjanika with traditional Zupski training

Plant Materials

Grape varieties: As in many emerging wine regions, the search for the grape varieties that perform the best, both viticulturally and in the marketplace, is very important. Most districts try to establish a varietal identity, such as Cabernet Sauvignon in the Medoc or Riesling on the Mosel. Grape growers and researchers are well into the process in Serbia.

The autochthonous (indigenous) varieties are important to the history and identity of the wine industry in Serbia. Varieties such as Prokupac, Tamjanika (Fig 2), Vrnacs, and Smederevka were once widely planted but amounts have fallen off significantly. While these wines will be of little practical value in the export market, there may be significant demand in the domestic market for these familiar and traditional names.

International varieties such as Cabernet Sauvignon, Gamay, Riesling, Chardonnay, Sauvignon Blanc, and other pure *Vitis Vinifera* varieties are important for the future of the industry, especially in the perception of quality among consumers, critics and peers. They are the common denominator for wine character and quality, by which any wine region is judged in the international wine marketplace. Therefore, progressive wineries such as Aleksandrovic and Radovanovic are focusing much of their attention on these popular varieties and having great success with wine quality.

The Gamay grape is a particular example of a variety that is adaptable to the climate of Serbia. The variety has produced wines of deep color, great concentration of flavors and complexity, soft and generous tannins and is a wine that can compete in the international wine market.

Rootstocks: We encountered a few growers with basic knowledge of the effect of rootstocks in viticulture. Rootstocks are essential for the successful culture of *V. vinifera* in soils with the root louse phylloxera, which arrived in Serbia in the early 1900s. While phylloxera resistance is always the primary rationale for rootstock use, rootstocks impart other viticultural characteristics that can dramatically affect wine quality, such as influence of vine vigor, drought resistance, lime tolerance, etc. We were told that SO4 and 5BB, are the main rootstocks being used in Serbian vineyards, not for their viticultural virtues but because the nurseries have selected them for their easy bench-grafting qualities. The growers need to change this situation and demand rootstocks that are suited to the nature of their soils. In the case of most of the vineyards we visited, lower vigor rootstocks such as 101-14, 420A, Riparia Gloire and Rupestris du Lot would be more appropriate choices. These important selections are often made as a result of ongoing rootstock trials conducted at agriculture research stations by university faculty and resulting in local recommendations. However, the general performance characteristics of rootstocks are well publicized within the international grapevine nursery industry and other academic publications such as Pongracz.³ There were a few examples of incorrect planting of the vine with the graft union too low to the ground, allowing for the possibility of scion-rooting which could compromise the quality of the rootstock and lead to vine mortality. Graft unions should be 8-10 cm above the ground level.

Clonal Selection: As with rootstocks, grape variety clones are a way of improving wine quality through proper plant selection. In recent years, wine makers have become extremely fussy about clones. It is no longer enough to offer just, for example, Pinot noir, but a grower must have Dijon clones such as 115, 667, 777 or Pommard. The numbered clones are often produced and licensed by the French national nursery ENTAV (<http://www.entav.fr/ANG/index.htm>) or its Italian counterpart Rauscedo (<http://www.vivairauscedo.com/>). We met some growers who understood the value of proper clonal selection and were tracking differences in the wines they produced but this was exceptional. Again, this is where research and extension education by viticulture and enology faculty is needed to test traditional and new clonal materials for suitability to the growing conditions in Serbia and the preferences of wine makers. While this is not as urgent as correct variety selection, it is a viticulture practice that can dramatically improve wine quality.

Grapevine nurseries and certified plants: The goal of any grape grower is to plant a vineyard with healthy vine stock. Since grapevines are propagated from cuttings, nursery materials may be infected with pathogens acquired in the field. There are many chronic vine ailments such as virus, phytoplasma, bacterium and other pathogens that can affect

³ D.P. Pongracz. Rootstocks for Grape-vines. 1983

grapevines, and this is a major problem in all viticultural areas around the world. The ailments tend to be most pronounced in areas with a long tradition of grape culture such as Serbia because populations of harmful organisms accumulate in the vines, nursery materials and in the soil. These maladies, over time, can have a devastating effect on the quality and productivity of vineyards. A system for testing and producing certified vine materials is a tremendous asset to any wine industry, and Serbian wine growers appear to be very aware of the benefits of planting vineyards with certified vines, either from imported sources like ENTAV or Rauscedo. There are also commercial nurseries in Serbia producing certified vines, and they should be required to produce vines that meet international standards. Some growers complained about a lack of selection of varieties, clones and rootstocks, and about insufficient quantity. As Serbia expands its vineyards towards 60,000 ha, the production capacity of its nurseries must also increase without sacrificing vine material quality.

Soil management

Understanding the soil is the foundation for any viticultural region since it is so vital to plant health, growth and productivity. Soil testing is an important part of site evaluation and vineyard maintenance. In most cases, low to moderate size vines are preferred for good wine quality. Serbian grape growers are aware of this but have limited access to soil testing services. The nature of Serbian soils for vineyards was not explained in depth during the visit. We saw a wide variety of soils, from deep, fertile valley soils, sandy soils, to more coarse soils on hillsides. This is typical of most wine growing regions. It will be important for the Serbian wine industry to analyze, understand and map their vineyard soils to determine which are the best for both quality and production viticulture. No soil maps, like the extensive USGS soil survey, are available in Serbia.

Every vineyard visited was clean cultivated (Fig 3) in the winter. A bare vineyard floor leads to erosion and soil compaction. Cover crops offer numerous benefits such as controlling erosion, reducing compaction, increasing water infiltration, building soil structure and organic matter. The use of low-growing, permanent grasses for cover crops would be beneficial in almost all vineyards.



Figure 3: clean tilled vineyard in Fruska Gora region

Adequate water drainage appears to be a problem in some low-lying vineyards. Poorly drained soils can result in excess vine vigor, lower fruit quality and the possibility of increased winter injury to vines. In some cases artificial drain tiles have been installed. Soils should be evaluated for drainage capacity and tile installed if necessary. The

solution to this problem is good vineyard site evaluation and selection to avoid poorly drained soils.

The agriculture faculty recommends that soils be tested every three years, and this meets normal expectations. It is important that soil test interpretation be made by a viticulture specialist with knowledge of vineyard soils and not an agronomist, since the production goals are different.

Climate

We were not able to examine any climate data during our visit and only general descriptions of climate were offered. In the key area of precipitation, Serbia is a relatively dry region with less than 1000mm of annual rain. This offers an advantage to wine culture, since warm and dry areas have fewer problems with disease and often ripen fruit more quickly. Warm summers and cold winters appear to be the pattern in Serbia, and in the case of the latter, winter injury is a threat.

While experienced growers often have the best sense of regional climate patterns, a systematic study of climate patterns at the macro and meso levels as they affect viticulture would be very useful. At Navid in Fruska Gora the vineyard manager explained that harvest temperatures often dip to 10C at night and rise to 25-28C during the day, ideal conditions for developing flavors and retaining acidity in aromatic white varieties and high quality reds.

Extension agents should encourage growers to use weather data loggers to collect local climate data on their farms. This information can be very useful for variety and rootstock selection and can help to assess the risk of frost and cold injury. Precipitation distribution and temperature data can help to predict disease and ripening patterns. Winter injury is a threat in Serbian vineyards. We were told that the winter temperature can drop below -25C, cold enough to result in permanent trunk injury or death (Fig. 4).



Figure 4: Old vineyard in Vrsac with winter injury to vines and open trellis space

Viticulture

The quality of viticulture as practiced across a wide spectrum in vineyards around the world ranges from rudimentary to highly sophisticated precision viticulture using advanced technologies such as GPS mapping and remote sensing devices. There are a basic set of universally accepted viticultural best practices that are common to all vineyards that produce high quality grapes. These practices impact all of the viticulture

issues outlined in the Scope of Work for this mission. It is important to offer an assessment for each one of these.

Pruning, training and trellising: Many vineyards wait until St Trifun's Day to begin pruning their vines (14.2). We saw some pruned vineyards and the quality of the work was very good. Large vineyards rely on experienced workers to make the best cuts. Native varieties are often grown on the zupski system (goblet) and traditional spur pruning is performed. Modern vineyards are trained mostly to single or double guyot on vertical shoot positioned trellis. We found very little evidence of cordon/spur training. The best vineyards displayed excellent pruning and training technique (Fig. 5).



Figure 5: Dr. Ivan Kuljanjic at Agriculture Faculty in Novi Sad demonstrating training to Peter Bell.

Vine nutrition and fertilizer: It is difficult to judge vine nutrition in the winter without the benefit of foliage and tissue test results. When asked, growers said they are not performing tissue analysis, which along with soil testing is a very important part of any nutrition maintenance program in a vineyard. This service should be provided by a university-based analytical lab or by private agricultural labs.

Grape diseases and pests: Grapes that are free of disease are essential to making good wines. With its generally dry weather during the growing season, fungal diseases do not appear to be a big problem in Serbian vineyards. Most growers spray 5-6 times per year, less than half of the average in the Eastern U.S. The extension service provides crop protection support to grape growers. A number of growers expressed interest in sustainable methods of viticulture, something that can be adopted in Serbia's relatively dry climate. But it requires excellent skills in integrated pest management (IPM), and a lot of training will be involved to elevate the identification and control strategies for diseases and pests. This could be a very beneficial collaborative project between viticulture research assets and the Ministry of Agriculture. There are very practical examples of these kinds of programs in the U.S. including the NY Sustainable Viticulture Program.⁴



Figure 6: not fall foliage but dying vines from phytoplasma

In Serbia, the most commonly mentioned problem by growers is the phytoplasma Flavesence Doree (Fig. 6). It is a disease that blocks the phloem of the vine and, over time, causes the vine to die. It

⁴ New York Sustainable Viticulture - <http://www.vinebalance.com/>

is transmitted by insect vectors such as leaf hoppers (called cicadas) and through the propagation process at nurseries and must be controlled at these two sources. There is great concern about the debilitating effects of the phytoplasma and significant measures, including removal of affected vines and control of the cicada vector, are in effect. Growers expressed a concern that funding for vine removal and crop protection is inconsistent from one year to the next.

It appears that no disease modeling/forecasting systems are in use in Serbia. This is an area that can be further developed in cooperation with Penn State, Cornell and private firms in California who have made significant investments in this technology. However, without extensive extension resources, the implementation of this technology may be premature. It also assumes the availability of computer and internet access by the grower.

The only mention of any non-fungal or insect problem was birds. There are many standard practices to control bird predation in vineyards, with netting being the most effective but also the most expensive.

Frost and winter injury: There was a significant winter freeze event in 2005 in much of Serbia; when temperatures dipped to -25C for multiple days and caused vine injury and death. Some growers are using preventative measures such as hilling up soil over graft unions to protect the vines. But overall there is a lack of concern for the dangers of spring and fall frost and winter injury. We saw no active avoidance measures, such as wind fans or heaters, in place at any vineyards. Long term macro and meso climate data will be important to determine viticulture zones that minimize the threat of winter and frost injury.

Canopy management: The goal of every grape grower is to achieve a balanced vine. The best time to assess canopy management practices is during the summer but from the cane position in the winter it is possible to estimate the quality and size of the canopy. In the best vineyards, standard practices of shoot thinning, shoot positioning, leaf removal, and hedging are all practiced. But in many vineyards, canopy quality was lowered by excessive vine vigor (related to soil and rootstock choice) and poor management practices. Knowledge of canopy management practices, timing of procedures, availability of skilled labor and creating a balanced vine, all contribute to the quality of the canopy and can be easily taught and demonstrated. Vertical shoot positioning (VSP) and goblet (zupski) were the primary vine training systems, with the latter used mostly on autochthonic varieties. These are standard international systems. The use of divided systems may help to achieve balanced vines in fertile soils.



Figure 7: Two vines in one place in Vrsac

One notable training method is the use of two vines at one planting position. This method is used to increase vine density yet maintain a wider distance between vines in a row

to allow for machinery use. This technique was used in the research vineyard at Novi Sad yet no comparison study was done with conventional planting configuration. We were simply told that it has “no negative effect” (Fig. 7).

Crop management: Wine quality is impacted by yields. The presence of too many grapes on a vine results in unripe fruit that yield diluted wines. Many growers are aware of the relationship between yield and quality yet are unable or unwilling to trade quantity for quality due to low grape prices.

Site selection: This was not included in the SOW but may be the single most significant factor in growing high quality wine grapes. Most grapes are planted wherever a farmer has land, but some of the more sophisticated growers are looking for the best places to grow wine. This is a natural process in the evolution of a wine region. In the Zupa and Nis areas, particularly in the hills and above the steep gorge, we saw sites with exceptional wine growing potential. The soils and climate of these areas should be examined carefully so the best varieties can be planted, such Syrah (along with traditional Prokupac) in the gorge area near Nis or Cabernet Sauvignon in the hills above Aleksandrovac. We were shown many areas where vast tracts of vineyards had been removed or were abandoned for economic reasons. These vineyards have historic reasons for being planted and should be examined closely for potential renewal as the wine industry rebuilds.

Mechanization and equipment: growers constantly mentioned the desire to further mechanize their vineyards and the need for additional capital to purchase new equipment. Much of the equipment we saw – tractors, sprayers, plows and hoes was antiquated and did not perform effectively. Vineyards still rely heavily on hand labor, which is expensive. Grape quality relies on knowledge and the tools to implement that knowledge. Until small and larger vineyards alike in Serbia can upgrade their technology and equipment, they will face additional challenges to consistently meeting international wine quality standards.

Vineyard design and trellis systems: Vine density is tightening, a sure sign of modern viticulture influence towards a French style of wine growing. Between vines, growers stated that close spacing is not possible because of equipment limitations. Equipment limitations do not constitute the best rationale for determining spacing. In the best vineyards we saw good trellis construction and materials but not the most modern in current use. Research with different combinations of rootstocks, vine density, trellis and training systems would provide very useful information to growers.

Irrigation: We saw no use of drip irrigation in vineyards despite relative dry growing season conditions. While dry farming appears possible in the deeper, more fertile low-lying vineyards, it may be necessary to provide supplemental water to vineyards in hillside locations. Again, research on irrigation use and scheduling would be very helpful to growers who install irrigation systems. This is a significant expense and likely will not be adopted for some time.

Growing the Wine Industry in Serbia

Capital requirements: Wine represents one of the most lucrative value-added agricultural products in the world. Farm-gate grape values are often pushed 5-20 times in bottled wine, but both grape and wine production are capital-intensive operations, especially up front. At almost every visit we heard about the trials of the 90s and the need for additional capital to make improvements to vineyard and winery infrastructure, including equipment, supplies and personnel. Vineyards and wineries are capital-intensive businesses and there is often a direct correlation between the amount of funds available and the success. Without the right equipment – tractors, specialized implements such as cultivators, mowers, sprayers, trucks, tools, etc. - the grower is severely hampered in his efforts to produce high quality grapes. Many small growers do most of the work by hand, but larger commercial vineyards need significant investment in equipment.

While operating costs for vineyards will vary considerably, a grower with 25 years of experience at a single vineyard quoted 184,000 dinar (about \$1500 US/ac) per hectare of annual operating expense at the 110 ha vineyard. When asked what her greatest concerns were she mentioned the financial stability of the winery and her ability to maintain the vineyard.

It is uncertain where this capital will come from. Many of the wineries are struggling and cannot help growers with establishment costs. At current grape prices, quoted by many growers from 0.3-0.5 euro per kilogram, the growers will not have much extra capital to invest in the vineyard after operating costs and family income needs are deducted.

The economics of wine production begins with the price a winery is able to charge a customer for a bottle of wine and descends from this point. At the end is the grape grower, who needs to cover the cost of production and make a profit. When both partners in wine growing can do as much as possible to enhance the quality and value of the wine, each will benefit.

We encountered a variety of opinions expressing varying levels of confidence, trust and caution in the future of the Serbian economy, and also political and social stability. There were enough signs of significant personal investment to justify optimism for the future of the industry. If the Serbian economy improves and people, especially younger consumers, have more discretionary income to spend on wine, it will benefit the wine industry tremendously.

We saw a few examples of outside investment, and this should be encouraged, but it is always better to grow an industry through domestic investment.

Tradition vs. Modernization: This can be an asset or a liability to a wine region. Traditional varieties and viticulture production methods may not produce the international style of wine. But the old vineyards and cellars have great appeal to the wine tourist and should, to some extent, be preserved. It may be practical for smaller producers to focus on the autochthonous varieties, while larger producers that focus on

export markets, rely on the international varieties to establish their reputation and sales. Ultimately, modernization must occur on a large scale in Serbia if the industry hopes to succeed in the international marketplace.

The knowledge gap: New viticulture knowledge and technology is created at a rapid pace in the international wine world. While grapes have been cultivated for almost 9000 years, modern viticulture as a discipline has only existed in the past 15-20 years. Up to 80% of international viticulture standards are common to all wine growing districts, but it is the last 20% that will allow Serbian viticulture to succeed and produce wines characteristic of the terroir in Serbia. We found that the best wines were often associated with growers and wine makers who aggressively seek out modern viticulture and enology technology and best practices. In one example, a consultant from a large, international fermentation products company helped a new wine maker to produce much better wines. This young wine grower also planted international varieties and clones and had a very attractive wine package. There is a strong need and demand for viticulture and enology information resources in Serbia. This knowledge gap can be filled by university curriculum, extension services, consultants and self-learning.

Research and Extension Education:

Agriculture faculty in viticulture can help to fill the knowledge gap. Visits to the viticulture and enology faculty at Zemun and Novi Sad were very enlightening. At both stations, a fine faculty works under challenging facility and financial conditions. During our brief visit and discussions we were not able to learn about their research in depth, but the wines we tasted demonstrated very competent work in the vineyard and cellar. Significant work in grape breeding and ampelography is being done at both locations for cold hardiness and disease resistance. It may be most effective for viticulture researchers to focus on applied research problems that can have an immediate impact on wine quality in Serbia. There appears to be a communication gap between industry and university – neither seems to know or particularly care about what the other is doing. The industry, once it solidifies its financial base, should support and offer input into the direction and type of viticulture research.

Viticulture extension: While agricultural extension in the U.S. is based at land-grant universities, in Serbia the extension service is within MinAg. While this arrangement should not hamper the work of extension, it removes it from the research resources at the university, whose results should be extended to the end users (growers and wine makers). Numerous growers commented that while they appreciated the efforts of extension agents, they are often unavailable to help because of understaffing issues. Since information is the key to learning and to the adoption of best practices that will push the modernization of viticulture in Serbia, it is critical to have a robust and competent extension service. The extension service should be better connected to the university-based research to carry new and practical knowledge into the vineyards. Extension should work closely with older, traditional growers to help them to modernize and with new growers to make sure they adopt best viticultural practices in their vineyards. Information dissemination and education are the key duties of all extension services and

methods of delivery to growers should be assessed and improved. More practical workshops should be delivered on a seasonal basis according to activities and the situation in the field. Extension educators should form partnerships with any assets that may enhance and increase extension's reach into the vineyards, such as collaborations with private viticulture consultants and knowledgeable product vendors. Extension agents should be a conduit for information transfer between growers and research institutions, making sure that researchers know the problems in the field and growers gain the benefit of research results. The best extension example we encountered was in Vrsac and Negotin, where extension personnel were actively engaged in the work and welfare of local growers. Snezana Kremic (Fig 8) is a viticulturist who works with pathology, entomology and ag machinery colleagues in the Srem region to help grape growers. Her main focus is to assist small vineyards and new start ups. She can be found most often in the fields, believing that seeing a problem is the only way to understand it. This kind of personal support is invaluable to growers but puts a lot of demand on extension agents.



Figure 8: Snezana Kremic, viticulture Extension agent in the Srem Region

Computer and internet technology: The technology improvement that may have the greatest impact on the quality of viticulture is access to the internet, which would deliver the world of viticulture best practices to the home of every grower/user. Younger and non-traditional growers are most likely to adopt this technology. It can be used as a portal to distance learning curriculum, local information resources such as weather, disease forecasting and extension information, to announce and promote government programs, and to scan the vast array of viticultural assets world-wide. Since much of this information will arrive in non-Serbian language, translation of materials will be necessary for some growers.

The Ministry of Agriculture, Forestry and Water Management: The ministry is playing a significant role in the redevelopment of the wine industry in Serbia. Under the leadership of deputy minister Ljubisa Dimitrijevic and his assistant, Darko Jaksic, the ministry has led the way in developing and improving vineyards. A subsidy program for planting new vineyards and replanting vineyards infested with phytoplasma compensates growers for plants (standard and certified) and trellis materials. Priorities created by the ministry could represent the foundation of a strategic plan to guide the growth of the wine industry:

1. Education to industry, especially of new, small growers
2. Study of mycoplasma problems
3. Registry of grape varieties and size of vineyard industry
4. Expanded production because of lack of fruit availability
5. Increased productivity and quality in existing vineyards
6. Focus on indigenous varieties
7. Geographical denomination, AOC-like program

8. Competition with EU for quality and market
9. Enhanced research and extension education assets

The wine industry should work with the ministry to formalize a strategic plan to guide and encourage its development. A strong and well-crafted strategic plan can be an important document for introducing and marketing the industry to outside partners.

Geographic denomination: This is a very important part of the viticulture and enology program at MinAg. Mr. Darko Jaksic services this quality assurance system, which was created to define, encourage and maintain quality practices in the vineyard and winery. I question whether it may be too advanced for the current condition of the industry, which is struggling to maintain minimal quality standards. As these regulations are imposed, they should be periodically checked for validity by a panel of growers, university and ministry members.

The Wineries

Wine production is a continuum from the vineyard into the cellar and then the marketplace. Because wine and grapes are inseparable partners, it is necessary to mention the role of the winery in the success of the grape grower. Good grapes can be made into bad wine, bad grapes cannot be made into good wine. The production facilities at the wineries (from smallest to largest) are often antiquated and can have a detrimental effect on high quality grapes that arrive on the crush pad. Grapes need a minimum level of technology and expertise to be turned into good wines, even more to realize export quality, and these production conditions were not always available or evident in the bottled wines. In discussions with growers, there is a palpable sense of discontent between growers and wineries, especially the larger wineries. This tension is not unusual but efforts should be made to understand their cause and to mitigate their effects. Issues like grape prices, quality standards, rejection, etc. should be discussed. Open communication between vineyards and wineries is a key to better wine quality.

Marketing Serbian Grapes and Wines

Growing wine grapes is predicated on selling wine. Since the economics of wine flows backward from the bottle price down the production stream, everything in the vineyard hinges on the successful sale of a bottle of wine. There is no point in growing grapes if you cannot sell the wine, so marketing both grapes and wine is in the interest of the grower.

As in all wine districts, there is some tension between small growers and large wine producers. Due to the economic difficulties of the 1990s, payments to growers were either delayed or non-existent. As a result, grower-winery relations have suffered. A large winery like Vina Zupa with no estate vineyards depends greatly on independent growers for its raw materials. A grower relations position would be very helpful in this situation, primarily for quality control but also to secure a steady supply of grapes.

It was clear that certain areas enjoyed non-viticultural benefits such as potential to agri-tourism. The Timok region, while beautiful and picturesque, is quite isolated and would be difficult to reach for tourists. The Zupa region has a landscape much like Piedmont, the famous wine region in Italy, with skiing and spas in the area, and is not too far from Belgrade. Wineries need markets and the best strategy is always to bring the customer to your door for a full retail sale.

Wine trails are used very effectively by small wine regions in the Eastern U.S. bringing together a collection of wineries in an specific district to market their wines. In addition, wine makers and grape growers meet to share information, ideas and technology to improve wine quality in the group. Seed money for wine trails often come from local or state government but later they become self-sustaining associations.

Personal Observations and Conclusions

We tasted a lot of wines during our nine days of touring Serbia's wine regions. Some of the best were found at these vineyards and wineries:

- Sasha Dejjic near Negotin
- Vrsackigrade vineyards near Vrsac
- Ratka Bosancic at Navid in Srem
- Boris Aleksandrovic (Sumadijsko/Velikomoravski)
- Gavrilovic Mica at King Peter Vineyard (Tepola)
- Mija Radovanovic
- Agriculture Faculty at University of Novi Sad (Srem)
- Milutin Markovic at Rubin

These growers and wineries should be examined and used as case studies for wine industry improvement. It would be helpful to have an agriculture economist analyze these businesses, which vary in size from a garage winery to medium production facilities, so others may achieve similar success. Common attributes we saw on display at each vineyard are innovation, capital (equipment, facilities, personnel), viticulture and technical knowledge, passion, good business and marketing skills, high quality wines, often young and enthusiastic owners.

When I visit new wine regions I always look for indicator wines. These wines are proof that fine wines can be made in the district. They follow the adage "in vino veritas," because the truth of any wine is in the glass. We tasted many such wines during our visit from many varieties, both autochthonic and international. These wines offer encouragement and evidence that fine wine is possible on a larger scale. The goal of any region should be to identify the varieties that grow well and to produce them consistently at the highest quality level. The best growers in Serbia are capable of doing this.

Another positive sign for any emerging wine industry is the confidence of private investors to commit substantial funds towards a vineyard and/or winery project. We saw enough examples of this to justify cautious, if not enthusiastic, optimism about the future

of wine in Serbia. These individuals have almost always been very successful in another business and they know what to do to succeed. They have made a very calculated decision to invest their personal fortune in the wine industry. It is a statement of confidence in viticulture and much more.

The Ministry of Agriculture is devoted to the success of the wine industry. Deputy Minister Dimitrijevic and Mr. Jaksic are both enthusiastically committed to helping this sector of agriculture and see the benefits to the ministry, agriculture and the economy in Serbia if the wine industry can be rebuilt. Their efforts should be acknowledged and further supported.

Recommendations for Viticulture

Key goals: Develop information and technology resources and delivery systems to grape growers. Enhance research and extension assets. Improve funding and available of capital for vineyard improvements. Enhance all forms of communication and develop key partnerships with industry stakeholders.

Short term:

- Enhance available resources and funding to the existing viticulture extension system.
- Continue government support of grape planting. Expand to include capital improvements (equipment, structures, etc) either through direct grants or low-interest loans, etc.
- Improve information sharing between grower associations by creating a national association with grape grower representatives from each region
- Develop access to the internet for growers by providing equipment and training. Regional centers can be “libraries” for viticulture information
- Viticulture researchers and extension agents should conduct regular workshops to present latest research (in-house and outside) information to growers
- Identify product vendors who can help provide technical and practical information to grape growers via meetings and site visits
- Continue aggressive monitoring and control of Flavescence Doree
- Test and develop new rootstock and clonal varieties for use in Serbian vineyards
- Continue to test and improve autotochtonic varieties for best viticulture methods and market suitability

Medium term:

- Enhance and enlarge viticulture extension services. Implement regional viticulture offices with specialists in viticulture and integrated pest management
- Aggressively develop and promote a site selection process for vineyards in Serbia that can be promoted by extension agents
- Stakeholders in the industry should get together to develop a strategic plan for the growth and development of the wine industry

- Connect the viticulture research programs to the grape growers by creating an advisory group composed of representatives from each community. Develop a priority list of viticulture issues that need to be addressed
- Bring in outside “experts” to compliment and supplement existing viticulture resources and bring a world viticulture view to the grape growers
- Create working groups between wineries (especially large ones) and local growers and grower associations to address past and present issues such as prices, grape quality, varieties, etc.
- Develop soil and tissue laboratory analysis facilities (government, university or private)
- Develop best practices and /or sustainable viticulture programs for Serbia grape growers
- Evaluate and improve grapevine nursery services in Serbia

Long term:

- Map soils and climate in Serbia for viticulture potential
- Using GIS soil and climate data, create a digital, on-line site evaluation system
- Develop a Master Grower program utilizing the best viticulturists to teach new growers viticulture best practices
- Develop durable funding sources for viticulture and enology research and extension. Vineyards, wineries, universities should work together as a team to present their case for increased government funding
- A US-style commodity marketing order should be established for grapes and/or wine to develop a funding source for research, extension marketing and used to leverage government matching funds
- Develop a Balkan region viticulture and enology conference and trade show bringing in latest equipment and ideas

Acknowledgements and Appreciation:

I would like to thank Philippe Charbot at USDA-FAS for the invitation to participate in this mission and his very competent, energetic and enjoyable leadership style while on the ground in Serbia. I also thank Peter Bell for offering my name to Philippe as a qualified viticulturist for the mission. Missions like this do not happen without on the ground support and we had plenty, including Kara Stanley (USDA), Sue Donlan, Penny Reese, Stacey Bucha, and Karen Woomer (PSU). I would like to thank Dr. Bruce McPheron, the dean for Research and Graduate Education at Penn State Cooperative Extension Service for his support and Professor Tom Bruening for his sage advice about international extension work. I cannot give enough praise for our colleagues at the US Embassy, Dragana Dimitrijevic and Zlatko Jovanovic, our companions, guides, and translators on the road. And, speaking of on the road, I thank Zoran, our fearless, tireless, and skillful driver for getting us to every destination alive and well and sitting through endless, interminably boring tasting sessions with great patience and cheer. I also would like to thank Mr. Hassan Ahmed, agriculture attaché at the US Embassy for his support of this mission. Many thanks, both personal and professional, are extended to

minister Ljubisa Dimitrijevic and Darko Javic for their strong interest and support of this mission and a wonderful tour of Belgrade. Finally, many thanks to all the growers, wine makers, winery owners, association leaders, researchers and extension agents that we met during our two weeks on the ground in Serbia. They were all the epitome of graciousness, hospitality and professionalism even if we arrived hours late to our appointment. They gave us a clear view of viticulture and enology in Serbia and made our mission a success, along with memories of smiles, food and wine, beautiful landscapes, that I will never forget. Given the quality of the people in and around the wine industry in Serbia, it is hard to imagine the world will not soon recognize it as one of the best fine wine regions. Finally, my most heartfelt gratitude to my wife Judi for her constant support, and for editing and proof reading this report.

Mark L. Chien
Wine Grape Educator
Penn State Cooperative Extension
February, 2008



**St Trifun, Patron Saint
of Vineyards**

Appendix I:

Some take home thoughts from my note book:

- focus is more on wine making, not the vineyards. Most are interested in wine making. They mainly want equipment and to expand and improve winery facilities. Also, more land for vineyard
- all questions about viticulture inevitably gravitate towards varieties, marketing and economics. This is the big concern for all producers. They may believe that the biggest impact on quality is made in the winery and not in the vineyard. In new regions, this is often the case. It is easier to use cellar technology (buy it and learn it) to fix problems than to understand their origin and causes in the vineyard. Or, maybe they just do not know much about viticulture or stick with the traditional viticulture and do not see any need or way to change.
- lots of small regional wine associations all over the country. How can they be empowered to help them gain funds and viticulture assets (information, technology, ideas, etc.) for their wineries and vineyards and also greater marketing power
- growers are too busy surviving to really think about how research and extension might help them. They don't have time to worry about anything more than their farm. Issues are not vit/enol but money and finance
- there is a communication gap between the growers – especially small growers, and large wineries and research community. Grower associations can help to bridge this gap
- how do you farm well or make wine on a shoe-string? Short term is to offer a prioritized, hierarchy of recommendations for growing and winemaking so they have options. Long term is to get capital (loans, grants, investors, etc) develop funding sources that will allow for capital improvements.
- fill the knowledge gap between pre-1990s practices and current modern best practices, equipment and materials using extension and private consultants
- most growers do not yet have access to internet so information delivery is via phone, newspaper, radio and personal contact.
- develop partnerships: individual growers – associations – university – extension – Ministry of Agriculture – wineries – consumers
- look at those who are succeeding in the vineyard and/or winery and understand why and then promote their practices and ideas

Appendix II

Strength, Weaknesses, Opportunities and Threats (SWOT) for Serbian Wine Industry

Strength:

- Grower associations in most viticulture districts, most with very capable leadership
- High level of knowledge and experience among best grape growers
- A youth movement interested in pursuing growing wine as a career
- Strong tradition of wine growing in the country
- Autochthonic grape varieties that are unique to Serbian wine
- Good to excellent terroir with favorable climate and soils for fine wine culture
- Existing need for greater grape supply among domestic wineries
- Strong support for growers and vineyards within the Ministry of Agriculture
- Vocational viticulture education programs at agriculture high schools
- Capable viticulture research personnel and facilities
- Established viticulture extension services
- Greater levels of private investment in vineyards and wineries
- Certified vine materials available from commercial nurseries
- Geographic denomination is helping to define and assure quality in vineyards

Weaknesses:

- Lack of capital to invest in vineyard modernization and growth
 - Outdated equipment
 - Too much reliance on old practices and ideas
- Weak grape prices and sometimes unreliable payment by wineries to growers
- Competition from international bulk wine imports
- Overextended viticulture extension services
- Underfunded viticulture research programs
- No strategic planning process underway for the Serbian wine industry
- Lack of continuity in government programs directed at grape growers
- Viticultural challenges: phytoplasma, overall grape quality, rootstock selection, etc.
- Access to new knowledge and technologies
- Insufficient communication between industry/research/government/other stakeholders creates barriers to understanding and cooperation
- Need for a strong leadership and a national association to represent the interests of grape growers and wine makers
- Old, unproductive and unprofitable vineyards

Opportunities:

- To rebuild the Serbian wine industry to something greater than its former peak condition
- Gain international respect and recognition as a fine wine producing region

- Play a leadership role in agriculture in Serbia
- Agri-tourism, wine trails and vineyards contributing to the growth of the industry
- Serbia represents a good investment value in vineyards with growth potential

Threats:

- Political, social, ethnic, religious and economic instability threaten to undermine investor and industry confidence in a secure future for the wine industry
- Too much reliance on imported bulk wine
- Lack of a Serbian regional identity for wine
- Competition from EU and other nations for wine markets
- High cost of capital improvements and further development of high quality vineyards
- Challenges to long term sustainability and profitability of vineyards, natural and man-made