SPATIAL IDENTIFICATION OF VINEYARDS – A PREREQUISITE FOR MAINTAINING THEM AS A PART OF THE CULTURAL LANDSCAPE HERITAGE

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Abstract
Vineyards are an important part of cultural and historical heritage of Slovakia. They are improving ecological stability in the land and, as a landscape feature, they increase the attractiveness of the landscape view. Precise information about the location and status of vineyards are therefore a prerequisite not only for their conservation and good management (productivity is one of the significant aspects), but also for landscape creation. Viticulture has a long tradition (over 2700 years) in the territory of contemporary Slovakia. Since the Middle Ages the viticulture was supported by royal privilegees. The areas grewed by vine have varied, depending from centuries and economic and political situation in the country. Preparation of Slovakia to join the European Union meant a new approach to registration of vineyards. To get a real data about areas and varieties in vineyards a new vineyard register was build. Because of absence of experience in this area, at first a pilot project was implemented, supported by the European Union EC PHARE Twinning Project SR98/IB/AG02-2001 in a selected wine-growing village of Svätý Jur in the Little Carpathians wine region. The pilot project was aimed to develop a methodology for vineyards measurement for the needs of the vineyard register in line with the EU legislation. Methodology and results of the measurement and important issues for the vineyard register preparation are presented.

Key words: vineyard register, GPS measurement, landscape

INTRODUCTION
Vineyards are an important part of cultural and historical heritage of Slovakia. In addition to the primary production function they perform in the country other important functions such as aesthetic, landscape creating and ecological functions, respectively. They are improving ecological stability in the land (PAUDITŠOVÁ 2011). An important role is played by these landscape features in terms of increasing the attractiveness of landscape look (LÖW & MICHAL 2003, KLVAČ (ed.) 2009).

The landscape look is a reflection of visual perception of the country physiognomy. In addition to basic measurable indicators of landscape features
(e.g. size, shape) other aspects perceived by observation of the landscape comprise division of landscape, arrangement and diversity. The determining factors in assessing the scenery and visual characteristics of the landscape involve topography and elements of the existing landscape structure, especially strong dominant and attractive elements (PAUDITŠOVÁ, ŠALAŠOVÁ & OTÁHEĽ 2010).

Vineyards belong to the landscape elements which increase the variety of landscape mosaic. They are closely linked to the characteristics of topography (slope, orientation), which is an limiting factor in the assessment of landscape look. Vineyards often significantly contribute to the maintenance of ecological stability in the cultural, human-changed land (PAUDITŠOVÁ & REHÁČKOVÁ 2007). Precise information about the location and status of vineyards are therefore a prerequisite not only for their conservation and good management (e.g., productivity is a significant aspect), but also for landscape creation. In terms of originality, uniqueness, harmony and diversity of landscape features vineyards belong to the landscape elements, which together with gardens, orchards and non-forest woody vegetation form attractive landscape mosaic with a high aesthetic significance (KRNÁČOVÁ et al. 2005).

Viticulture has a long tradition in the territory of contemporary Slovakia. Archaeological findings related to viticulture are over 2,700 years old in the Little Carpathians. The real development in the viticulture and wine production began in the era of the Roman Empire (HRONSKÝ 2001). After the collapse of the Roman Empire our ancestors have continued in the cultivation of the vine. This was also due to the advent of Christianity and the use of wine for religious purposes. Written records of winegrowing are from the 9th century from the Nitra region (Benedictine monastery on the Zobor Mountain). The oldest wine cellars are documented from the 13th century, when they were used as shelters to protect population against attacks by Tatars. Renewal of viticulture and the arrival of new residents (Germans, Italians) to the depopulated areas in the Middle Ages led to the development of viticulture. A new varieties were planted. The king and the nobility also supported wine growing farmers. It was exhibited especially in privileges for free royal towns, such as Modra, Pezinok or Svätý Jur near Bratislava (TURCSÁNY et al. 2009). The first vines right of establishment and protection of vineyards in Slovakia and Moravia was appointed by King Charles IV. in the year of 1358. The cadastre registry of Bratislava from 1439 captures a continuous wine region from Devin to Budmerice and Orešany (HRONSKÝ 2001). At the end of the 16th century, the area of vineyards in our area extended over 40 000 ha (HRONSKÝ 2001). The decline of viticulture was observed after the Thirty Years' War (1618–1648), especially in the southern regions of Slovakia, which were under the influence of the Turks. Significant viticulture development occurred again in the 18th century and led to an increase of the vineyards area. In 1720, the vineyards occupied around 57,000 hectares of land. In 1882, the occurrence of aphid mildew (phyloxera) was first detected in Bratislava and the surroundings, which in ten years hit vineyards throughout Slovakia (HRONSKÝ 2001). Vine disease decimated gradually to 80% of areas under vines. A positive result, however, was followed by gradual restoration of vineyards, which accepted new modern approaches. The varieties resistant to the pests were planted. In the first Czechoslovak Republic there was a re-development of viticulture and the overall increase of the vineyard area. In 1936 in Slovakia, therewere 13 745 ha vineyards, in 1937 there were
14,069 ha (MALík et al. 2005). During the World War II vineyard acreage covered approximately 12,000 hectares in Slovakia (HRONSKÝ 2001) while there were 12,913 ha just after the war in the year of 1947 (MALík et al. 2005). Collectivization in the socialist Czechoslovakia resulted in an increase of the area of vineyards in Slovakia up to 30 593 ha (year 1982) and 31,000 ha in 1985 (MALík et al. 2005). However, the statistics for the end of the socialist era in 1989 diverge, MALík et al. (2005) indicate only 20 090 ha of vineyards, while HRONSKÝ (2001) 37,000 ha. Despite the increase in the areas under vineyards we cannot consider this period as ideal, because an individual approach to the treatment of wine was replaced by an anonymous mass production, without relation of the production to the land users and vineyards (HRONSKÝ 2001).

After 1989, the wine industry in Slovakia experienced a significant slowdown not only in terms of acreage, but also in the production of wine. On the one hand, there was a possibility of viticulture renaissance and the possibility of free farming. On the other hand, there was a capital, information and marketing unpreparedness to new conditions, which ultimately led to the decline of wine production. Problems with land reclamation projects, long implementation of the return of the land to the original owners, but mainly the break in continuity of generations in land management caused a significant reduction in the acreage of farmed vineyards.

Preparation of Slovakia to join the European Union (EU) meant a new approach to registration of vineyards. To get the to support under the European legislation, it was necessary to get accurate records of areas and data about vineyards in the individual Member States, it means to build a new vineyard register. After accession to the EU, our wine producers could sell their production only after registration in the vineyard register. The Central Control and Testing Institute of Agriculture and Food in Bratislava (ÚKSÚP) became the authorized body for the vineyard register in Slovakia. Available data showed large differences in the assessment records of vineyards. The Statistical Office of the Slovak Republic on the basis of structural census recorded 16,621 ha vineyards, acreage registered in the cadastre (Ordnance Survey) was more than 27,000 ha. Data from the first phase of the European project CORINE Land Cover – identification of land cover in Slovakia – from satellite images reported 27 375,6 ha (FERÁNEC & OTÁHEĽ 2001). There had been no available contemporary and real map showing the existing vineyard area before the accession to the EU. Also, information about the status of vineyards was missing.

Because of absence of experience in this area, at first a pilot project was implemented, supported by the European Union EC PHARE Twinning Project SR98/IB/AG02-2001 in selected wine-growing villages. The pilot project was aimed to develop a methodology for vineyards measurement for the needs of the vineyard register in line with the EU legislation. The obligation to register vineyard was given according to the Law no. 332/1996 on viticulture and wine. According to this law (§ 25) every subject with at least 300 vines or vineyard of more than 500 m² area is obliged to get registered. The registration request must be done by the vineyard user, not by the owner. Proven methodology was then used for vineyard mapping across all wine growing areas of Slovakia.
METHODS

The first step was to obtain data from the Geodesy, Cartography and Cadastre Authority of the Slovak Republic – then GCCA) about the areas registered as a vineyard in the area of interest. Maps were available in raster format at the scale of 1 : 2 800 (C – type state maps from the cadastre). Cadastral maps were necessary to identify a list of users by agricultural crops – vineyards, because there were recorded parcel numbers and the vineyard acreage. Number of vine roots were not recorded in the cadastre, so it was necessary to find out this information in the field survey. Topographic maps at a scale of 1 : 10 000 were also important and provided by the GCCA. These maps, besides the type of topography and land use contain the altimetry data, which were used for determination of selected morphometric parameters of relief for each vineyard.

Aerial photographs were an important basis for orientation in the field and in searching for the vineyards were also. The orthophotos were provided by the EUROSENSE Ltd. in the of scale 1 : 1 000 in the JPEG format and 1 metre spatial resolution. The maps and aerial photos were cartographically transformed to Slovak national coordinate system S-JTSK and then loaded in the GIS program Topol.

Before the measurement in field was conducted, the vineyards were identified on aerial photographs overlaid with a cadastral map. The principle of filed measurement was in precise location of of points on the perimeter of each vineyard area with a GPS reciever. Points were measured from vineyard column to column. Joining the measured points created a line, forming perimeter of a planted vineyard. In the case of division of a vineyard block (there were more users of a single vineyard block) the border line was created in the middle between two rows of vines. The two columns on the border area were measured on both sides of rows in the block of vineyard. Measurement was conducted by walking, data for registration of the vineyard were loaded in the receiver Trimble Navigation Pathfinder. Positioning was based on a differential GPS correction signal from the OMNISTAR satellite with a sub-meter accuracy. There were recorded not only the spatial coordinates of each vine variety, but also the information on the system of vine alignment too. All marked border points were transferred into a GIS at the end of each day of measurement. Terraces were measured as a whole area. Measurements were transformed from the coordination system WGS-84 to S-JTSK in the DATTRA software. Data were imported into GIS Topol for final processing. After creating a vector map a database was generated for each vineyard. The database structure was based on a questionnaire of vineyard register. The maps with the related database were printed and then consulted with each vineyard user. The new vineyard registration was also implemented by workers of the ÚKSUP office (if it was necessary).

At the time of the project, the area of interest – the cadastral area of Svätý Jur, a land reclamation project was performed and many users had committed vineyards to use in replacement what meant that rows of vines were assigned to each user throughout the vineyard block in areas that were used by agricultural cooperative PD Svätý Jur and PD Vajnory. In the first phase of measurements we have contacted the cooperatives. The staff was informed about the procedure of the vineyards measurement. The staff cooperated in the
localizing individual vineyard blocks, varieties and their users. The same approach was followed in the second stage also with private users.

The requirement of registration was to capture all the vineyards, overlooking their reconstruction and not to lose unnecessarily large area of vineyards after the accession to the EU.

**Area of interest**

The Ministry of Agriculture selected the cadastral area of the village of Svätý Jur for this project. The area belongs to the Little Carpathians wine region and to the wine district of Pezinok. An important factor for choosing this model area was in the existing complicated structure of vineyards users (agricultural cooperatives, vineyards alternate use, private plots, private wine growers) and the relief dissection.

The case study area, in which the measurement process was tested, was represented by two areas used by agricultural cooperatives in the village of Svätý Jur: the PD Svätý Jur and the PD Vajnory. There were the majority of vineyards users, and they had a database of information about each vineyard block. PD Vajnory had got vineyards in the Svätý Jur village by returning the land from the PD Svätý Jur.

Cadastral area of village Svätý Jur is linked to viticulture for centuries. Information about the village are listed by TURCSÁNY (2009). Planting of vines in this village dates back to the 9th century. The document from the year of 1209, when the Hungarian King Andrew II. donated to the administrator of the royal cellars the city Svätý Jur, is a proof of prosperous viticulture. The wines from Svätý Jur had, since the early Middle Ages, an excellent reputation and they were a profitable business article. Price of wine from this vineyard was higher than that of other wines from the Little Carpathian region. The area of vineyards in the early 13th century was about 100 ha. Their subsequent development was also related to the arrival of German colonists in 1209, who brought not only new methods, but maybe the new vine varieties. The area of vineyards increased to about 200 ha. In 1548 there were 362 ha of vineyards registered and taxed. In 1647 Svätý Jur became a free royal town by privileges under Emperor Ferdinand II. The decline in wine production and vineyard acreage was due, inter alia, as in the whole of Slovakia, the Tatar invasion and subsequent wars and uprisings in Hungary. Renaissance came about in the middle of 19th century. In Svätý Jur there were 357 ha vineyards at that time. After the phylloxera epidemic in 1882, only about 10% of the vineyard territory in Svätý Jur was affected. The area under vines was maintained at about 300 ha in the first half of the 20th century.

After 1945, a questionnaire identified 400 ha of vineyards in the village. After the onset of socialism after 1948, there were 308 ha of vineyards registered in 1949 as a basis for contingent from private wine growers. After the establishment of an agricultural cooperative (JRD) and forced collectivization in 1958 the JRD Jur had 260 ha of farmed vineyards. Destruction of private property led, on the other side, to planting of new vineyards in the form of wide rows, with possibility of machining viticulture. Planting of new vineyards reached in 1969 about 148 ha. After the changes in 1989 there was a return of some vineyards to 340 original owners. The fundamental problem, however, was the
identification of vineyards. JRD during its existence not only consolidated land to bigger blocks, but also had built terraces and paths, so the real situation in the country did not correspond to the original cadastral maps. At the time of the pilot project a land reclamation project took place in the village as a tool for real restoration of land ownership in the landscape.

**Project implementation**

There were three categories of vineyards distinguished in the field:

- **cultivated** – these vineyards are "proper" cultivated by a certain technology (PD Svätý Jur maintained half-greening in vineyards and black herbicidal fallow)
- **abandoned** – in these types of vineyards, the remains of the original structure supporting systems in wine rows were located, but they were overgrown with weeds and remnants of the original culture of the vine
- **grubbed** – land which was overgrown with weeds, without supporting structures.

There were three types of users identified on land used by for agricultural cooperatives:

- PD Svätý Jur and PD Vajnory
- small “private plot” way of farming
- temporarily released vineyards for replacement use for the period of land reclamation project

**Vineyards in the use of PD (cooperatives)**

The surveying of undivided areas of vineyards was relatively without any problems. The surveying on the terraces took much longer time as the vineyards areas were much smaller located on a steep slope. Measuring of the terraces revealed a methodological problem. Cadastre maps, as well the basic topographic map, portrayed the areas of vineyards with terraces as a whole vine area. In reality only a part of the terrace is a vineyard (Fig. 1, Fig. 2).

![Figure 1: Example of measured terraces overlaid on top of a cadastral map (Map source: Geodesy, Cartography and Cadastre Authority, GPS measurement – author)](image-url)
As shown on Figure 1, the real boundaries of areas under vines, especially area of terraces, did not correspond with the situation on the cadastral map. So direct measurement in the field proved to be the only method to obtain a true indication of areas under vines. The procedure for registration of vineyards was unique even in a foreign context.

The procedure of identifying the terraces revealed an important methodological problem – what is the vineyard area? For example, for the cadastral purpose the whole area of a cadastral parcel was recorded, without quantifying the netto area of a terrace. In basic topographic maps, the terraces are only indicated as terrain edges. In our opinion, the slopes of terraces, not used as vineyards, should be categorised as a so called, other land in the cadastral map. This opinion was confirmed in the process of subsequent implementation of the land reclamation project in Svätý Jur. For register of vine growing it is important to measure only areas really cultivated, planted with vines. Defining the area of terraces had consequent importance in the implementation of GAEC rules (Good Agricultural and Environmental Conditions), which came into force after accession to the EU. As part of the measures taken since 2008 (Government Ordinance no. 50/2008) destroying of vineyards terraces has been prohibited in Slovakia.

![Fig. 2: Map of measured terraces on top of the basic topographic map in scale 1 : 10 000 (Map source: Geodesy, Cartography and Cadastre Authority, GPS measurement – author)](image)

Terraces are extremely important in terms of erosion control, as well as a criterion for additional support under the agri-environment measures in rural development programs (MATEČNÝ et al. 2010).

The individual plots measured in the field were linked with a database in the following structure as the basis for creating the vineyard register:
- user
- name of the vineyard
- parcel number (from cadastral map)
- planted varieties
- system of wine alignment
- vineyard registration number.
In the next step data about relief were processed on the basis of contour lines from basic topographic maps in scale 1 : 10 000. The slope of terrain was classified in 5 categories (Tab. 1). The most common slope aspect of vineyards comprised: south, southeast, southwest, but rarely there were also vineyards with eastern, western, northeastern, northwestern and northern orientation reported.

The purpose of the morphometric parameters was in describing the terroir for individual vineyards more properly together with other information such as soil characteristics, substrate, climate, etc. (TOMAS et al. 2013, PAVLOUŠEK 2011).

**Tab. 1:** Categories of inclination (slope) in the model area

<table>
<thead>
<tr>
<th>Category no.</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 – 5 %</td>
</tr>
<tr>
<td>2</td>
<td>5,1 – 15 %</td>
</tr>
<tr>
<td>3</td>
<td>15,1 – 30 %</td>
</tr>
<tr>
<td>4</td>
<td>&gt; 30,1 %</td>
</tr>
<tr>
<td>5</td>
<td>terraces</td>
</tr>
</tbody>
</table>

In the vineyards with several varieties was entered into the database grape variety, which constitutes about 85% of the total roots. If in the vineyard block were two varieties, in relation about 50/50% then the area was measured for every planted varieties (Fig. 3).

**Fig. 3:** Cadastral map with measured areas by GPS, showing the grape variety (MT – Müller-Thurgau, FM – Lemberger, RV – Welschriesling, SAU – Sauvignon Blanc) Map source: Geodesy, Cartography and Cadastre Authority, GPS measurement – author)
Figure 4 shows a sample output from the project with alignment of vines.

Fig. 4: Map with surveyed areas by GPS and type of vine alignment (v – high alignment, s – middle alignment) (Map source: Geodesy, Cartography and Cadastre Authority, GPS measurement – author)

Small “private plot” way of farming
It was a vineyard area, which was partly farmed by the PD and partly by private users. In this case it was necessary to set out a coherent single vineyard area of vineyards according to specific users. The problem was with measurement of the exact split, as the signs on the columns were confusing and sometimes a representative from PD did not know the status of users. Since it was a specific vineyard management approach and the vineyard was registered to the official user, it means, to the PD, it was not necessary to assign every plot a registration number.

Temporarily released vineyards for replacement use for the period of land reclamation project
These vineyards are issued to the use of temporarily replacement use until the implementation of land reclamation project. They were located in the vineyard area in the use of PD. If these users of vineyard are qualified for registration, then such vineyards were measured and also registered as independent. After
completion of land reclamation project users with registration of vineyard reported the change of the user relationship to ÚKSÚP and he was given a new registration number.

**Vineyards used by private users**

In the second phase were measured vineyards in the use of private users. These vineyards formed in village Svätý Jur about 40 ha. Database of users and landowners of the village of Svätý Jur was given from the local authorities. The database was more than 10 years old, there were not updated user names (dead, moved), addresses, area of vineyards, there was no change of culture mentioned in it. Updating of the database was implemented in the software Information System of Land Registry (ISKN). After that, the workers from ÚKSÚP then created a list of vineyards users. In total, 625 users vineyards were identified. Because according to the Law No. 332/1996 only vineyards with the area greater than 500 m² were obliged for registration, smaller vineyards were withdrawn from the registration process. The revised list included 277 of vineyards that were sorted by parcel numbers assuming the parcel with these arrangements will lie side by side in one location. Consequently, the invitation of users to vineyards measurement was started.

ÚKSÚP started to popularize the vineyard register between local citizens with a signboard notice on which they were informed about ongoing field activities related to preparation of vineyard register. Local radio broadcast (several times) as well as announcements in a local TV were another way to address the citizens for vineyards registration. The workers from ÚKSÚP tried to cooperate and be helpfull in creating a new vineyard register in this way. None of these methods, however, had a great response. During the campaign in the entire month only two applications for registration of vineyards were received. This experience had shown, how the private vineyard users have reflected on the registration. In terms of the relationship to the pilot area there were two groups of private vineyard users: users residing in the village of Svätý Jur and users residing outside the village.

**Private users from village Svätý Jur**

According to list of private users, the ÚKSÚP staff invited users to be present during the vineyards measurement. The meeting was on the local PD in the defined time. This approach was not efficient, therefore, to reach out and bring the people to cooperate, we searched for another way. A local confidant was chosen in the village, who had a good knowledge about local citizens as well as about the vineyards in the pilot area. He was tasked to arrange a meeting with the users according to ÚKSÚP list in the defined time. He also had to supply the users with the registration forms for vineyard register with instructions, how to fill in the applications. For every date, he arrange meeting with 5–8 users from the list. Most of users, however, were not willing to cooperate in the measurement in the vineyard. It was often found, that some vineyards did not comply with the conditions for registration of vineyards. This method of users identification was time consuming. It was necessary to search and track new addresses and user relationships. Most of them were skeptical to vineyards registration. But it was the only way how to bring the people to register.
Private users living outside from the village of Svätý Jur

Many users of vineyards (total 112) were residing outside the village of Svätý Jur. Database of such users was provided by the Geodesy, Cartography and Cadastre Authority. However, it was not updated, there were invalid addresses, many users were dead or the real users were different from those in official records. For these reasons, it was necessary to update the addresses according to the following sources: list of the new zip code in Bratislava, lists of renamed streets, phonebook and partial data from the City Council of Svätý Jur.

ÚKSUP have sent to users an invitation to vineyard measurement together with the application for registration of vineyards, instructions for filling out the application and also the return label. Users received invitations from 10 to 14 days before the date of measurement and there were two days from which they had to choose when they can arrive in its vineyard. Altogether, there were 107 people invited (according to the stated address), 55 users turned up. In the field, the ÚKSUP official verified personal information of the present users, variety and alignment of vine.

RESULTS

Vineyards used by agricicultural cooperatives

Within PD Svätý Jur we have measured 348 areas of 127,4686 hectares. From these 118,5396 hectares were planted, 5,8614 hectares abandoned and 3,0676 grubbed. Within the PD Vajnory 54,5886 hectares were measured on 31 areas of which 46,884 hectares were planted and 8,4002 hectares abandoned. The institute of temporary replacement was assigned to 34,0353 hectares on 254 areas, of which 32,5636 ha were planted and 1,4717 ha abandoned (Tab. 2).

Tab. 2: Measured areas of vineyards in the village of Svätý Jur in 2001 within the pilot project of vineyard register (Source: ÚKSUP and author)

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Jur</td>
<td>127,4686</td>
<td>348</td>
<td>118,5396</td>
<td>5,8614</td>
<td>3,0676</td>
</tr>
<tr>
<td>PD Vajnory</td>
<td>54,5886</td>
<td>31</td>
<td>46,1884</td>
<td>8,4002</td>
<td>0</td>
</tr>
<tr>
<td>temporary released for replacement use</td>
<td>34,0353</td>
<td>254</td>
<td>32,5636</td>
<td>1,4717</td>
<td>0</td>
</tr>
<tr>
<td>Private farmer</td>
<td>13,8382</td>
<td>159</td>
<td>11,0715</td>
<td>2,7667</td>
<td>0</td>
</tr>
<tr>
<td>other</td>
<td>1,0351</td>
<td>3</td>
<td>1,0351</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>230,9658</td>
<td>795</td>
<td>209,3982</td>
<td>18,5000</td>
<td>3,0676</td>
</tr>
</tbody>
</table>

Vineyards used by private users

According to the list from the ISKN database there were 377 of vineyards users, who used together 639 vineyards. One user could have been using a larger number of vineyards. The obligation to register vineyards under the Law No. 322/1996 takes action for the vineyard area over 500 m\(^2\), so smaller areas of vineyards were not considered. This decreased the number of users to 235 and the number of vineyards to 277. Among these users residing in Svätý Jur, there were 123 users considered who used 123 vineyards. There were 112 users residing outside the village of Svätý Jur and they used 124 vineyards. The number of 123 users from Sväty Jur were invited to the vineyard measurement.
After repeating the call for presence during the measurement, 54 users turned up. The remaining 69 users reported that the vineyard had not been used as a vineyard or it did not satisfy the requirement for registration.

From the users living outside the village of Svätý Jur, 107 people were invited, and 55 people announced their intention to come. Only 19 of them were finally present in the vineyard, 36 reported that they did not qualify for registration for the following reasons: low shrubs, small acreage, or not farmed vineyard, or that they will not come in that term. About 52 users did not specify any reason why they were not going to be present.

Even though the vineyard was physically measured and checked, the users often did not provide completed application for registration of vineyards. Altogether 159 private vineyards were measured. Result records of private users, processed by ÚKSUP and author is shown in Table 2. The total measured area of vineyards identified by private users was 13,8382 hectares, from which 11,0715 hectares were planted and 2,7667 ha abandoned. In total, 795 areas were measured, with the aggregated area of 230,9658 hectares.

CONCLUSION

Experience from the pilot project highlighted a number of issues that were needed to be taken into account when building a nationwide vineyard register in 2002–2003. Slovakia asked for recognition of 22,217 ha of vineyards area in the accession talks on joining the EU. Consequently, it was necessary to measure this acreage, which is located in 603 wine-growing villages in 6 vineyard regions in Slovakia.

Several conclusions can be drawn from the pilot project presented in this paper which subsequently helped to the successful implementation of vineyards measurement throughout Slovakia. They can be summarized as follows:

– detailed aerial photographs of all areas with vineyards are necessary,
– cadastral maps need to be most up to date, in cases a a renewed land registration (ROEP) exists and land reclamation project was undertaken, it is appropriate to use the cadastral maps in a vector format,
– basic topographic maps with contour lines in scale 1 : 10 000 are also necessary as the maps provide additional data on terrain parameters;
– the key issue is the organizational support: communication with public, close cooperation between farmers and local authorities in wine-growing villages and sufficient expertise and surveying capacity with a realistic work timetable.

The constructing of the vineyard register resulted in a successful incorporation of the EU legislation in the Slovak Republic in this field in the coming years. It was important also for the fulfillment of the conditions of good agricultural and environmental conditions (GAEC). According to the Government Regulation no. 50/2008 on conditions for agriculture support in the form of direct payments from February 6, 2008, for the area erosion following standards are listed (Tab. 3):

The condition refers to the terraces (both natural and built), where, according to the vineyard register of ÚKSUP, there are vineyards. The data from the vineyard register were also used within the support measures of the Rural Development Programs in 2004–2006 and 2007–2013, for cross-compliance
checking. The following environmental measures (except for organic production) were applied in vineyards in the programming periods 2004–2006 and 2007–2013:

**Basic support** – the aim is to support the exclusion of selected plant protection products and limit of the amount of nitrogenous organic substances to max 135 kg M/ha, and avoiding the use of sludge from sewage treatment plants and bottom sediments.

**Integrated production** is focused on the controlled cultivation of grapes to ensure ecologically safer methods that reduce the number of appplications of crop protection products and fertilizers. This reduces unwanted side effects and it is increasing the safety for the environment and human health. An applicant for an integrated production must be registered throughout the duration of liabilities in the relevant register maintained by the controlling institute. Only registered pesticides can be applied for the whole area for integrated production. There are also specific conditions for vineyards including a continuous herbaceous vegetation at least between every other row and the number of fruiting roots over 2000 pcs per 1 ha. Only fruiting vines are supported.

**Protection against erosion in vineyards** – the support involves a condition to of protecting the ground by grassing, bark mulch, straw or hay in every second row of vineyard in the period from 1 November to 30 April or vine-growing on the terraces. When removing vines, planting vines and soil improving works in the vineyards this must be reported to the controlling institute. Support varies according to three categories of slope vineyard: 3°–9°, 10°-17°, above 18° (Note: the original categorization of vineyards in 2004–2006: 20%, 21–40%, over 41% was converted to degrees for the years 2007–2013).

**Tab. 3:** GAEC standards for vineyard terraces since 2008

<table>
<thead>
<tr>
<th>Area</th>
<th>Soil erosion: soil protection by appropriate measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>Maintenance of terraces</td>
</tr>
<tr>
<td>Conditions</td>
<td>Destroying of existing vineyard terraces is prohibited</td>
</tr>
</tbody>
</table>

**Tab. 4:** Overview of selected agri-environmental payment commitments for vineyards in the RDP 2004–2006 (source: www.apa.sk)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic support – vineyards</td>
<td>670,27</td>
<td>473,96</td>
</tr>
<tr>
<td>Protection against erosion in vineyards</td>
<td>646,15</td>
<td>319,30</td>
</tr>
</tbody>
</table>

**Tab. 5:** Overview of selected agri-environmental payments commitments for vineyards in the RDP 2008 and 2009 from RDP 2007–2013 (source: www.apa.sk)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated production – vineyards</td>
<td>4030,71</td>
<td>4518,04</td>
</tr>
<tr>
<td>Protection against erosion in vineyards</td>
<td>60,39</td>
<td>60,39</td>
</tr>
</tbody>
</table>
Vineyards play an important role also in land reclamation projects and to land use plans. Their ecological stability (REHÁČKOVÁ & PAUDITŠOVÁ 2007, LÓW & MICHAL 2003) is higher than that of arable land, in the case of integrated production with grassing between vine rows provides effective protection against erosion, as well as terraces.

Vineyards are important elements to preserve the landscape look. There are negative phenomena, particularly in the Little Carpathian region, as the pressure by developers to convert vineyards to building sites. Negative results can be seen not only in Bratislava, but also in the adjacent belt of Little Carpathian municipalities. For example, the Svätý Jur municipality, there were 471 vineyards with the area of 378,4 hectares registered in the ÚKSÚP database. Although the official data reported 356,9 hectares of cultivated vineyards, in reality there were only about 80 ha. From the point of view of the managed area, the PD Jur the acreage dropped from the project period (2001) to about 52,5 ha in 2008 (TURCSÁNY 2009, according to data from ÚKSÚP).

The situation is extremely unsatisfactory which is not only concerning the wine production. The increasing public pressure led, for example in 2012, to the adoption commitments from the Regional Board of the Bratislava Self-Governing Region and 9 municipalities to protect the character of the vineyards. The memorandum aims to maintain the vines in these municipalities as a part of the historical and cultural heritage of previous generations.

ACKNOWLEDGEMENTS

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www.vinestory.sk
www.uksup.sk
www.apa.sk


VYHLÁŠKA MINISTERSTVA POĽNOHOSPADÁRSTVÁ SLOVENSKEJ REPUBLIKY z 19. augusta 2009, ktorou sa vykonávajú niektoré ustanovenia Zákona č. 313/2009 Z. z. o vinohradníctve a vinárstve

ZÁKON č. 332/1996 Z. z. o vinohradníctve a vinárstve.

ZÁKON č. 313/2009 Z. z. o vinohradníctve a vinárstve.

40
SÚHRN

Priestorová identifikácia vinohradov – predpoklad ich zachovania ako súčasti kultúrneho dedičstva krajiny

Vinohrady tvoria dôležitú súčasť kultúrneho a historického dedičstva Slovenska. Okrem primárnej produkčnej funkcie plnia v krajinie aj ďalšie významné funkcie, ako estetickú, krajinotvornú, ekologickú, resp. ekostabilizačnú. Významnú úlohu plnia tieto krajinné prvky aj pri zvyšovaní atraktivity krajinného obrazu. Presná informácia o ich lokalizácii a stave je nevyhnutným predpokladom nielen pre ich ochranu a správne obhospodarovanie (najmä z produkčného hľadiska), ale aj z hľadiska krajinotvorby.

Pestovanie viniča má na území dnešného Slovenska dlhú tradíciu, dlhšiu ako 2700 rokov. Od stredoveku boli pestovanie viniča podporované zo strany panovníkov ako aj šľachty.

Výmery vinohradov sa na území Slovenska menili počas jednotlivých storočí v závislosti od ekonomickej a politickej situácie v krajinie.

Príprava Slovenska na vstup do Európskej únie znamenala nový prístup k evidencii vinohradov. Aby bolo možné získať reálne údaje o výmerách a o elodách vinohradov, bolo potrebné vybudovať nový vinohradnícky register. S ohľadom na nedostatok skúseností v tejto oblasti bol najs ďubor realizovaný pilotný projekt, podporený zo strany Európskej únie projektom EC PHARE Twinning Project SR98/IB/AG02-2001 vo vybranke vinohradníckej obci – Svatom Jure v Malokarpatskom vinohradníckom regióne. Pilotný projekt si kládol za cieľ vyvinúť a otestovať metodiku mapovania vinohradov s ohľadom na požiadavky budovania vinohradníckeho registra v súlade s legislatívou Európskej únie.

V článku sú prezentované výsledky merania vinohradov vo vybranke vinohradníckej obci ako aj identifikované problémy, ktoré bolo potrebné vziať do úvahy pri následnom budovaní celoslovenského registra vinohradov.

Kľúčové slová: vino hrad, vinohradnícky register, GPS, krajina