

## VINE AND THE VINE GROWING IN THE AREA OF KRAS (SLOVENIA)

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Vine in the Slovene Kras (Karst) region is unique due to the specific geologic, climatic, geomorphologic and soil conditions. Small sized villages with low number of inhabitants are typical for the area as well as fragmented land units. The percentage of the active population in agricultural sector is continuously decreasing. With the land use data for years 1961, 1994 and 2000 we studied the changes in land use by land register units in the area.

Abandonment of arable land and its grass overgrowing, insufficient vineyard renewal, abandonment of cattle breeding and forest overgrowing are the biggest threats to the vine growth in the area. Due to forest overgrowing the local wind called "burja" is weaker and less frequent which leads to higher relative air moisture. The last mentioned fact is of the most important ones, because the local vine is very sensitive to high air moisture conditions which cause different kinds of plant diseases. The renewal of the vineyards in the Karst area is insufficient to maintain the present situation. In the last few years local farmers have been trying to protect the local wine called "Teran" as a regional specialty.

**Key words:** vine, vine growing, land use, Kras, Slovenia

Vinova loza na Krasu uspijeva zbog posebnih geoloških, klimatskih i geomorfoloških te pedoloških prilika. Za to područje karakteristična su sela s malim brojem stanovnika, usitnjenim zemljišnim posjedima i stalnim smanjivanjem udjela zaposlenih u primarnom sektoru. Na osnovi podataka za godine 1991., 1994. i 2000. utvrdili smo stanje i promjene u upotrebi parcela u katastarskim općinama na istraživanom području.

Napuštanje obradivih površina i njihovo ozelenjivanje, nedostatno obnavljanje vinograda, odbacivanje ispaše, zarašćivanje pašnjaka, a s time nezaustavljivo širenje šumskih površina, predstavlja najveću prijetnju vinovoj lozi na Krasu. Upravo širenje šumskih površina smanjuje također čestinu i snagu bure, što se odražava u većoj relativnoj vlazi, pa je tako loza refošk najviše pogođena budući da je osobito osjetljiva na plijesan.

Vinograde na Krasu ne obnavljaju u dovoljnoj mjeri da bi se održalo barem postojeće stanje. Već neko vrijeme pokušavaju kraški vinogradari zaštititi vino teran kao regionalnu posebitost slovenskog Krasa.

**Ključne riječi:** vinova loza, vinogradarstvo, korištenje tla, Kras, Slovenija

## Introduction

Kras is an area between Vipava valley and Trieste bay. In literature this part of Slovenia has different synonyms: Kras, Sežana Kras, Komen Kras or even Trieste Kras. When we think of Kras a stereotypic image is brought up: a barren, waste landscape, with poor red soil being interrupted only by rocky limestone areas. Nowadays Kras is entirely different; it is mostly green landscape overgrown by meadows or even pine forest (*Pinus Nigra*). One of the main characteristics of Kras are vineyards, where farmers produce famous wine – Kraški Teran. Although once a typical vineyard cultural landscape is slowly being reforested. Pastures are transformed into "gmajna," pathless areas of low bushes, surrounding the vineyards. The vineyards are not renewed satisfactorily, as they still were a few years ago. Despite the processes Kras retains its specific image which separates it from the surrounding sub Mediterranean landscapes.

## Research area

The article deals with an area where the so called "Refošk" vine is grown but in Kras this sort of vine produces wine Teran. Part of the area extends also in the neighbouring Italy (Fig. 1), but it has not been included in the research.

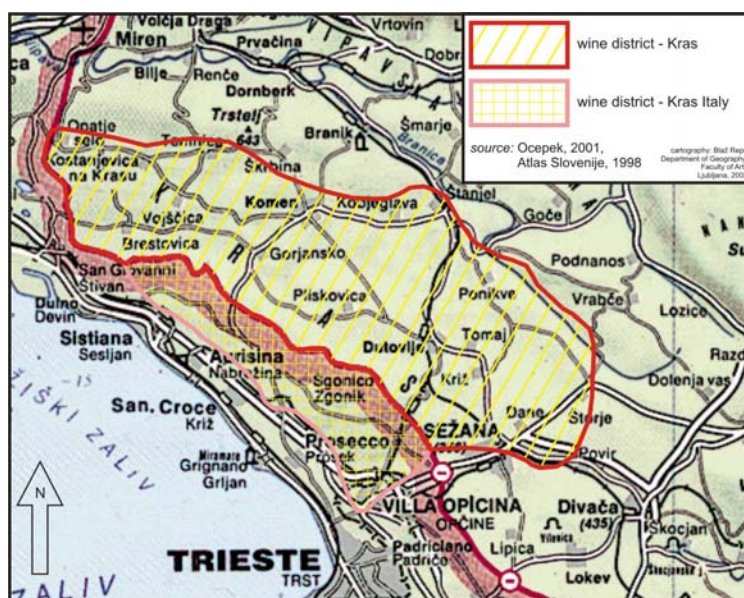


Fig. 1: The research area – wine sub district Kras plateau and its neighbouring area in Italy, where Teran can also be produced.

*Sl.1: Istraživano področje – vinorodno podpodročje zaravnji Krasa sa susjednim področjem u Italiji gdje se isto tako proizvodi vino teran*

The research area coincides with wine sub district Kras plateau (part of the wine district Kras). The sub district is limited with the Slovene-Italian border to the west. The wine sub district border crosses Veliki and Mali Medvedjak, Lenivec and Tabor then drops past Gradišče near Sežana, crosses the road Sežana – Štorje and goes around Vidmaršče where it turns directly north all the way to the railway road Sežana – Divača. The border then follows the railway road till the village of Merče and Plešivica where it turns north again past the settlement of Žirje till the hill Predlovec. The border follows the southern line of land register unit Štorje till the contour line of 500 m, then it turns north till the contour line of 400 m which it follows over Struga and the regional road Senožeče – Sežana all the way to the local road Majcni – Griže (the hill Brdo over Majcni). The sub district border then follows the local road till the river Raša and stream Grižanski Potok. It leaves out the village of Griže and follows the stream Grižanski Potok up to the contour line 450 m. The border follows this contour line under the village of Razguri and Bogo and then the contour line 400 m under the village Dolenje till Ravnje where it drops all the way to the point where the regional road Manče – Kobdilj crosses the river Raša. The border then ascends the road till the contour line 300 m, it encounters the settlements Kobdilj and Štanjel and goes towards the local road Branik – Dutovlje. From there the border drops till the crossroads for the village of Lukovec; it follows this road, encounters Lukovec and, under the hill Tolsti vrh, goes west. Above the settlement Mali Dol it crosses Žlebinje and Komenšček where it hits the contour line 400 m. It follows it above the settlement of Škrbina till Železna Vrata (the pass on the road Lipa – Tabor at Dornberk) where it follows the road to the village of Lipa and there it hits the contour line 400 m again. The border goes above the villages Lipa, Temnica and Novelo, under the hills Tabor and Griža where it joins the field path Novelo-Podnakušnik. Then it crosses Gmajne above the settlements Segeti and Lokvica, it crosses the road Opatje Selo – Miren and joins the Slovene-Italian border again. It follows it till the starting point at Veliki Medvedjak (BRDNIK ET AL., 2000).

### **The physical geographic conditions for the vine growth in the Kras area**

Kras is a plateau that lowers from southeast towards northwest. In the west and south west it is limited by the range of hills that detach Brestoviški Dol in Slovenia and Nabrežinski dol in Italy. To the north Kras is detached from Vipava valley by the range of hills named Črni Hribi (Trsteljsko hribovje). Both hilly ranges have the so called Dinaric direction and are parallel.

### ***Geologic conditions***

The research area is mostly built of Cretaceous limestones, which in the area of Komen settlement contain larger amounts of quartz in form of lenses and knobs. Along with the limestone weathering the red soil containing lots of quartz is produced. The thickness of soil disables corrosion processes and that is the reason why the surface karst processes are rarer than in the area of pure limestone without quartz. The limestones containing quartz are typical for the area among the settlements of Dutovlje, Tomaj and Avber. The Paleocene strata are developed as dark-grey micritic, partially clay Kozina

limestone. Because of the clay this limestone is less corroded than the Cretaceous strata (BUSER, 1972, 1973).

### ***Geomorphic characteristics***

Kras landscape is mostly influenced by the neighbouring flysh landscapes. They were lowered and changed only in Quaternary era, before that they were higher than the limestone surface. From the Vipava and Trst non-limestone area the surface streams were flowing to the research area, forming the fluvial relief – the fossil fluvial material is still visible in some parts. The corrosion intensified in Pleistocene period (RADINJA, 1972). Today corrosion and humans are the strongest surface changers. The corrosion result is the numerous dolines. In the research area the dolines are not present only on dolomite. They emerge on different kinds of limestone, which depends on chemical and physical properties of rocks. In the study of land register unit Krajna Vas (GAMS ET AL., 1971) the highest number (80) of dolines per 100 hectares was defined on gray Cenomanian limestone.

Minimal altitude in the area is 37 m, maximum 643 m with an average of 340 m. The major part of the research area has an altitude from 250 to 299 m and 300 to 349 m. The highest percentage of the research area (41.4%) is in the surface inclination unit 3°-6° (MRAK, 1997).

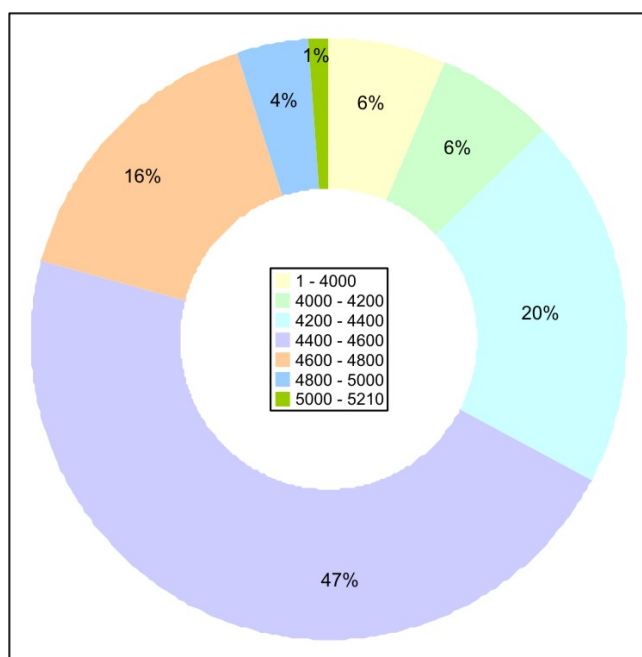
The vine growth highly depends on exposition. The relief features can influence the values of accepted solar energy. Different exposition and surface inclination influence the angle between the sun rays and the Earth surface and together with this they influence the amount of the accepted solar energy. Especially higher relief features are presenting an obstacle for sun rays. The surfaces in shadow are mostly receiving the diffusion part of the insolation. The map of the energy of the quasi global insolation shows that the annual amount of the quasi global insolation is the highest in the sub Mediterranean Slovenia where it exceeds the country's mean value by 10% (GABROVEC, 1997).

The values of annual quasi global insolation show the sub Mediterranean climate (Fig. 2) According to the exposition the sunny south eastern, south western and southern slopes prevail together with the flat areas – this is all favourable for the vine growth (MRAK, 1997).

### ***Climate conditions***

Climatic conditions are mostly the result of geographical position and relief characteristics of the research area. In our case the area is slightly higher than the neighbouring areas. Its edges are hilly and this is the main cause for the climatic isolation and specific climatic conditions of the area. The close to sea position has positive influence on the climate and the mild sea influences are coming to the interior part of the area mostly by Brestoviški Dol dry valley.

Partial isolation is the main reason that Karst climate also has some continental characteristics that are mostly featured in cold winters caused by cold air from the northeast. The consequence is strong wind, called "burja". This wind can sometimes bring snow in the area as soon as October and as late as April. The close to sea position is featured with mild, warm southwest wind, called "mornik". Melik mentions that the temperatures are under 0 °C in average 40 days/year (MELIK, 1960).

Fig. 2: Average annual solar energy (MJ/m<sup>2</sup>)Sl. 2: Prosječne vrijednosti primljene sunčeve energije (u MJ/m<sup>2</sup>)

Source: MRAK, REPE, 2001.

The close to sea position influences the precipitation amount (1,570 mm/year) which differs towards north and northeast. The precipitations are equally disposed throughout the year which is typical for continental climate. The Mediterranean climate characteristics can be noticed in October and December precipitation climax. As a continental climate characteristic there is the precipitation climax in May and June. January and February are the driest months as well as August (MELIK, 1960) which is very favourable for the vine growth - the plant in the phenophase of ripening needs very little rain (Tab. 1).

Tab. 1 Vine phenophases

Tab.1. Fenofaze vinove loze

Weather station	Date of 8 °C sap emission	Date of 10 °C budding	Date of 15°C flourishing	Date of 12 °C end of ripening	Date of 10 °C resting-time
Godnje	1 <sup>st</sup> April	16 <sup>th</sup> April	22 <sup>nd</sup> May	20 <sup>th</sup> September	7 <sup>th</sup> November
Komen	25 <sup>th</sup> March	10 <sup>th</sup> April	14 <sup>th</sup> May	30 <sup>th</sup> September	1 <sup>st</sup> November
Novelo pri Temnici	25 <sup>th</sup> March	10 <sup>th</sup> April	15 <sup>th</sup> May	29 <sup>th</sup> September	31 <sup>st</sup> October

Source: MRAK, REPE, 2001.

Overall Kras has typical sub Mediterranean climate with some continental characteristics. Typical are quite high summer temperatures (mean monthly July temperature is 21 °C) and cold winters (mean monthly January temperature is 2.5 °C) (Fig. 3) that are often characterized by the *bora* cold winds – "burja". The growing season lasts in average 221 days which is favorable for the growth of the so called late sorts of vine. This is confirmed also with the active temperature sum that is over 3300 °C (MRAK, 1997).

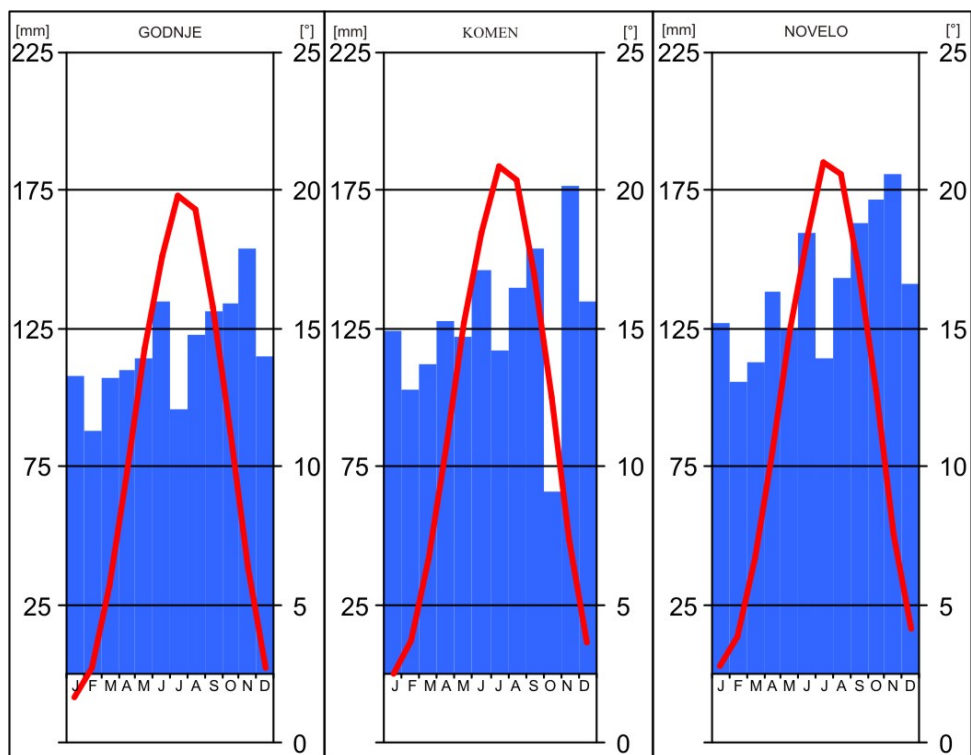


Fig. 3 Climatograph of Godnje, Komen and Novelo (1961-1990)

Sl.3. Klimadijagram Godnja, Komena i Novela (1961.- 1990.)

Source: Klimatografija Slovenije 1961.-1990., Temperature, Padavine (1995.).

For vine growth water balance is of great importance (the difference between the amount of precipitation and potential evapotranspiration). The water balance indicates whether the area gets enough, too much or not enough water (Fig. 4) (ŽIBERNA, 1992).

The highest moisture rate is at the Novelo pri Temnici station that also gets the highest amount of precipitation. This station also gets highest moisture surplus in the grape-ripening period – from August to October, which is not good from the vine growth point of view. The best conditions for vine growth according to potential evapotranspiration and water balance are in the area of the Godnje station. All the three

stations have negative water balance in July when there is less precipitation and the evaporation is the highest.

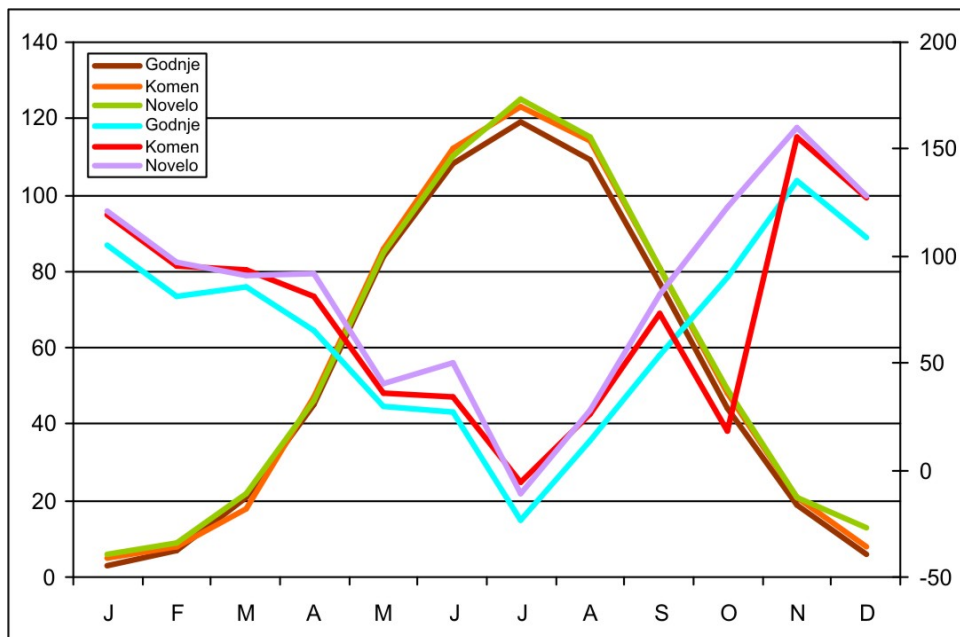


Fig. 4 Potential evapotranspiration (according to Thorntwait) in water balance (in mm)

Sl. 4. Potencialna evapotranspiracija i vodna bilanca na Krasu

Source: MRAK, REPE, 2002.

Some bio climatic indicators have shown that the research area is highly suitable for vine growing (Tab. 2) (MRAK, 1997).

Tab. 2 Bio-climatic indicators

Tab. 2. Bioklimatski pokazatelji

Station	Hydrothermic coefficient	Heliothermic coefficient	Bio climatic index
Godnje*	2.5	5.2	2.8
Komen*	2.7	5.6	2.4
Novelo pri Temnici	2.8	5.6	2.5

\* insolation data is for the station Novelo pri Temnici

Source: MRAK, 1997

The hydrothermic coefficient shows the research area is not highly suitable for vine growth since the values are higher than optimal. The heliothermic coefficient values are above the optimal and the bio-climatic index values are not optimal. The reason for the results can also be that the three indicators do not consider local climatic conditions (MRAK, REPE, 2001).



**Pedologic conditions**

According to the parent material two types of red or red to brown soils can be found in Kras, known as "jerina" (chromic cambisol). Formerly it was called terra rosa. Mildly leached "ilovka" forms on purer limestones, while heavily leached "kremenica" forms on Komen and Tomaj limestone strata. Kremenica weathers much faster than ilovka. Particle size analysis showed appearance of loam-clay and clay-loam textures which contain high percentages of fine fractions which are in favour for vine growth. Soil reaction (mildly acid to mildly alkaline) is also very suitable (SUŠIN, 1968; LOVRENČAK, 1994; MRAK, 1997).

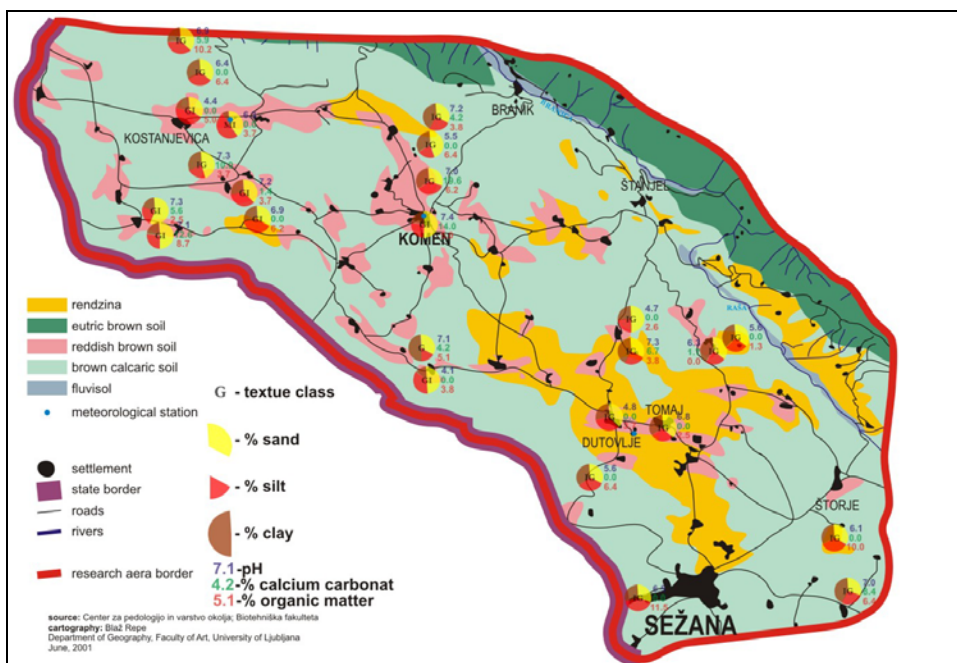


Fig. 5. Soil conditions on Kras  
 Sl. 5. Pedološke značajke Krasa  
 Source: MRAK, REPE, 2002.

**Population and settlement**

Kras was already inhabited in the period of the Würm glaciation when its close to sea position was a great advantage. The inhabitants lived in caves and soon they started to breed cattle, sheep and goats. The number of inhabitants was growing all the time and in the Iron Age Kras was the most inhabited region in the area of what is today Slovenia. They were mostly working in forest, cutting the timber and by the times of the Roman invasion the forests were mainly extracted. The Roman settlements were built by the main



roads. In the Middle Ages the Slavic tribes inhabited the area and they continued to cut the trees and cultivate the land by forest fires. The settlements were small villages with houses built very close together. The fields were also small and with irregular shapes (MELIK, 1960).

In the 15<sup>th</sup> century the forests were so damaged that a special law was launched out to prevent the forest pasturing and all other works in forests were surveyed. Despite that the region turned to barren grounds. The pressures on forests were the biggest in the 19<sup>th</sup> century when Kras was over inhabited (ČEHOVIN, 1986).

The number of inhabitants was decreasing till the World War II and after the war people started to migrate to bigger cities especially in Italy.

Now days the research area has 64 settlements in which there were 12 158 inhabitants in 1961 and 14,208 in 1991. Major centers in the area are Sežana, Komen and Dutovlje. The small size settlements with up to 200 inhabitants prevail (Tab. 3).

Tab. 3 The size of settlements in Kras area in 1991

*Tab. 3. Naselja Krasa 1991. godine*

Number of inhabitants	Number of settlements
< 50	15
51 - 100	16
101 - 200	16
201 - 300	8
301 - 500	6
501 - 1,000	2
> 1,000	1
TOTAL	64

Source: The Census 1991.

### Employment demographics

Besides the number of inhabitants their economic activity was also important, showing the percentage of people dealing with vine growing. We have used the data from the years 1961 and 1991, finding out the changes that occurred in this period of time. As it was expected the percentage of employees in the agriculture sector decreased and the percentage in industrial and quaternary sector increased (Tab. 4). In 1961 26 settlements had the percentage of people in agricultural sector over 50% and in 1991 this was the case for only 5 settlements. The reasons for the decrease were also in the natural conditions for agriculture in the area of Kras that are not allowing the modern way of farming. The fields are small and also the soil depth is only sufficient in small dolines where only traditional way of farming is possible. High percentage of inhabitants commute to work in Sežana daily and they are farming in the afternoon. They mostly cultivate the best arable land (ČEHOVIN, 1986).

Tab. 4 Active population employed in industrial sectors

Tab. 4. *Struktura aktivnog stanovništva prema sektorima djelatnosti*

Year	Active population (%)	Industrial sector			
		I.	II.	III.	IV.
1961	44.9	16.1	8.6	11.0	5.8
1991	42.6	3.7	9.7	11.3	9.7

Source: The Census 1961 and 1991.

### Land use and areas under vineyards in years 1961-2000

Data for years 1961, 1994 and 2000 were used to examine land use in land register units (Figs. 6 and 7). The period is marked with the following processes: decreasing of field and pasture areas, increasing of forest areas, meadow areas remain nearly unchanged, while vineyard areas decreased slightly.

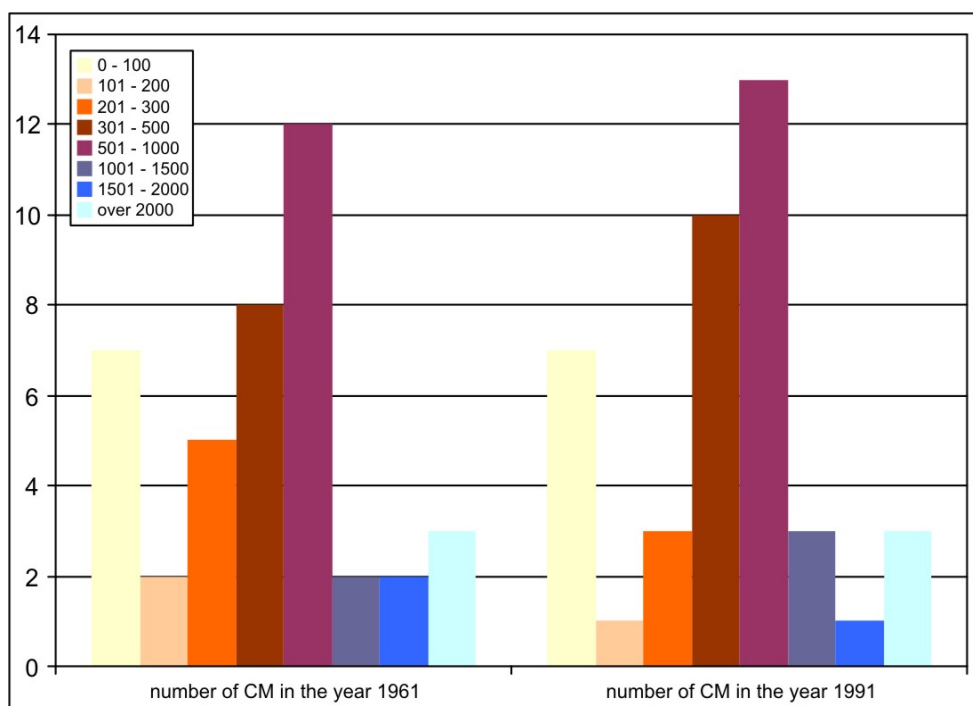


Fig. 6 Vineyard areas in land register units (classes according to the number of hectares)

Sl. 6. *Površine s vinogradima prema katastarskim općinama (razredi prema broju hektara)*

Source: MRAK, 1997

In 1961 vineyards covered 3,174 hectares or 1.4% of the entire research area. Land register units with the largest areas of vineyards were Dutovlje, Tomaj, Križ, Avber,

Komen, Kobjilj and Utovlje. In 1994 vineyards covered 3,059 hectares or 1% of the entire research area. The largest areas remained in aforementioned land register units except Sežana which joined the group. Overall the land use categories show the decrease of percentage of fields from 8.5% in 1961 to 6.9% in 1994. The percentage of meadows increased by 1% in thirty years, while percentage of pastures decreased by 7%. Forest areas in the research area increased by 8%.

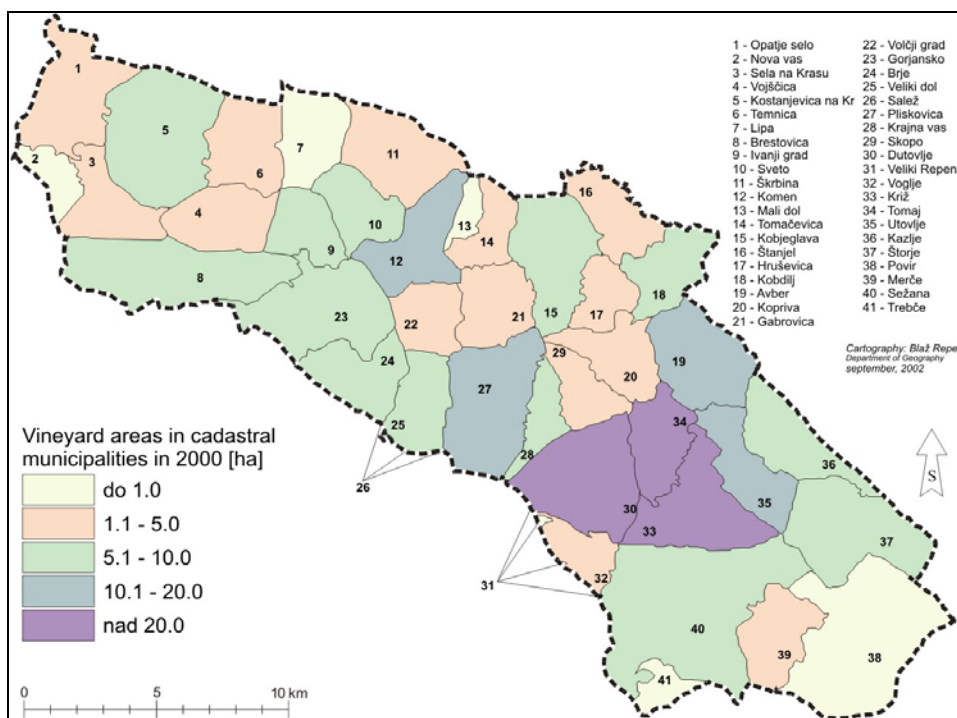


Fig. 7 Vineyard area in land register units in the year 2000 (in ha)

Sl. 7. Površine s vinogradima prema katastarskim općinama godine 2000. (u ha)

Decrease of field and pasture areas corresponds with general trends in decreasing of employed in primary sector, which is also reflected in land use. Vineyards in Kras are very small and therefore appropriate for spare time cultivation and vineyards owners can afford employment in secondary and tertiary sectors. That is the reason why vineyards are still being cultivated and the areas remain the same. Pasture areas are decreasing on the account of forests which are already suitable for economic use. The process is reversed in comparison to the process in previous centuries. The reason is similar to the previous one. Decrease in percentage of farmers stimulates less livestock and therefore less needs for pastures (MRAK, REPE, 2001).

Vineyard areas in land register units were divided in classes according to the number of hectares. Most of the units fall into 0.31-0.50 and 0.51-1.00 hectares class. The average of more than 2.0 hectares through all examined years can be found only in three land register units – Dutovlje, Križ and Tomaj.

Land register units with above average vineyard hectares, apart from the aforementioned are Avber, Komen and Utovlje. Between years 1961 and 1994 the increase in vineyard areas can be noticed in land register units of Sežana, Kobdilj, Kopriva and Kostanjevica na Krasu. The decrease was noticed in Komen, Tomačevica, Hruševica and Sela na Krasu.

When we add data from year 2000, changes follow the same trends, except for the vineyards which show slight tendency of increase. Noticeable positive changes can be found in land register units with the best conditions for vine growth (Dutovlje, Križ, Tomaj and Pliskovica), while negative trends were spotted in Gorjansko, Kobdilj and Komen. The percentage of forests still increases on the account of pastures.

Tab. 5 Land register units in the research area.

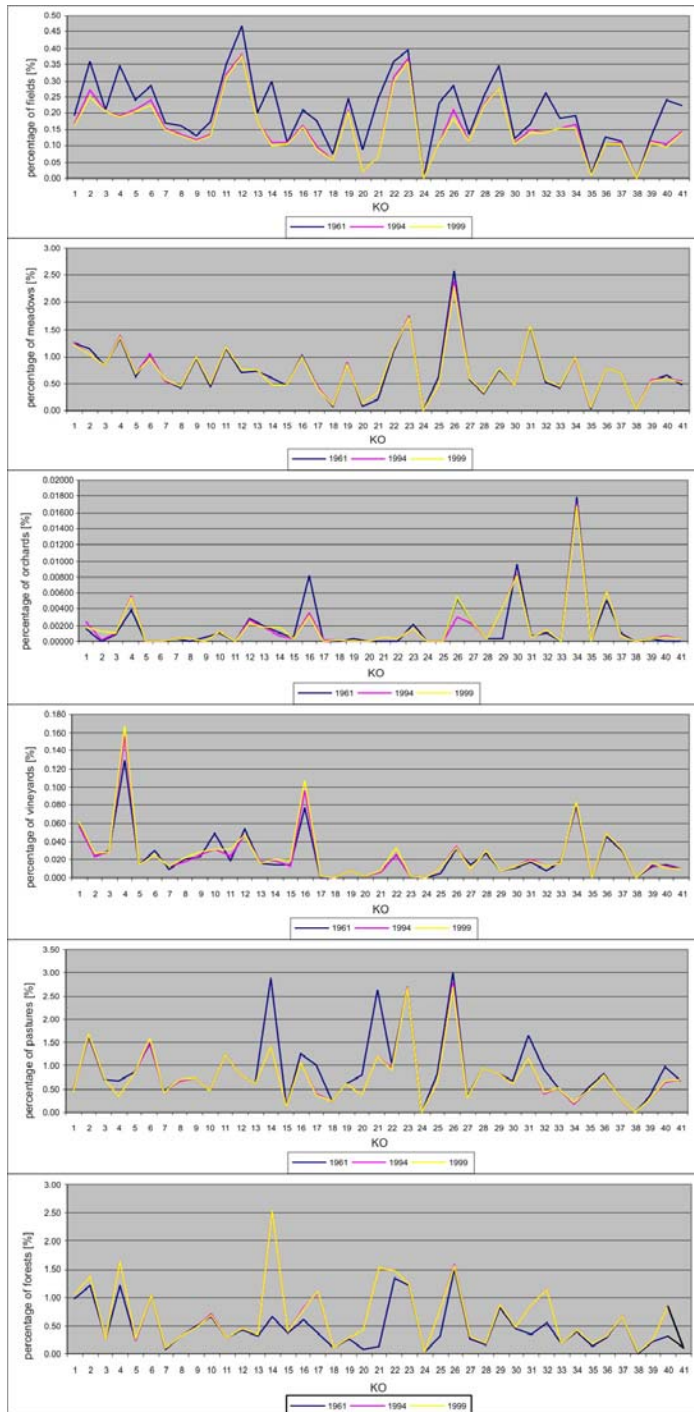
Tab. 5. *Katastarske općine na istraživanom području*

No.	Land register unit	No.	Land register unit	No.	Land register unit
1	Avber	15	Krajna Vas	29	Škrbina
2	Brestovica	16	Križ	30	Štanjel
3	Brje	17	Lipa	31	Štorje
4	Dutovlje	18	Mali Dol	32	Temnica
5	Gabrovica	19	Merče	33	Tomačevica
6	Gorjansko	20	Nova Vas	34	Tomaj
7	Hruševica	21	Opatje Selo	35	Trebče
8	Ivanji Grad	22	Pliskovica	36	Utovlje
9	Kazlje	23	Povir	37	Veliki Dol
10	Kobdilj	24	Salež	38	Veliki Repen
11	Kobjeglava	25	Sela na Krasu	39	Voglje
12	Komen	26	Sežana	40	Vojščica
13	Kopriva	27	Skopo	41	Volčji Grad
14	Kostanjevica na Krasu	28	Sveto		

(Next page)

Fig. 8 Land use changes in land register units in the research areas

Sl. 8. *Promjene kategorija korištenja tla u istraživanom području*



Source: MRAK, 1997, GURS, 2001

Field and pasture abandoning, insufficient vineyard renewing and reforestation are one of the greatest threats to Kras vine, and Refošk sort is one of the most sensitive and therefore affected (Fig. 9).



Fig. 9 The over growing of former pasture  
*Sl. 9. Zaraščivanje nekadašnjeg pašnjaka*  
Source: MRAK, 1997.

Forest vegetation is claiming areas that were once carefully cultivated and protected by men and so contributed to typical cultural Karst landscape. At present this landscape fortunately still remains a unique blend of natural processes and human activities.

Refošk vineyards are also very sensitive to even slight changes in microclimatic conditions. Those being calm, low depressions, where higher values of air moisture cause diseases, especially moulds. What is best for Refošk vine are well aired, opened spaces, where burja plays an important role, especially its strength and power. But reforestation of Kras significantly contributes to much more humid local climate conditions. Native people can say that "burja" is considerably weaker, and moulds as often as never before. And everything due to "moist" air. Unfortunately this is not apparent in meteorological data, which proves the exactly reverse process. Available data are for three stations in Kras (Fig. 10). Till the year 2000 only Godnje station was still active, while Novelo and Komen ceased to work, in 1991 and 1998, respectively. But in all three cases, the decrease in average year moist is obvious.

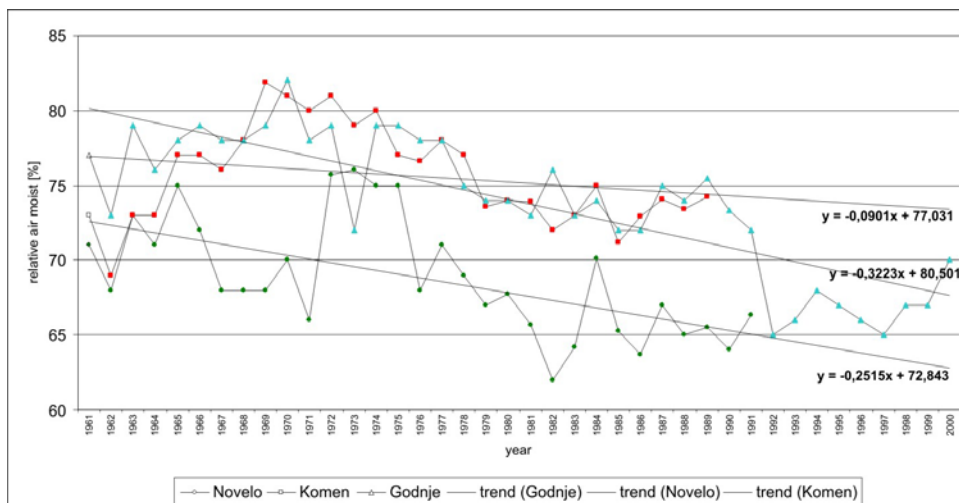


Fig. 10 Average year moist for Godnje, Komen and Novelo

Sl. 10. Prosječne godišnje vrijednosti relativne vlage za Godnje, Komen i Novelo

Source: Klimatografija Slovenije: Relativna zračna vlaga 1961-2000, HMZRS, Ljubljana

## Kras Viticulture

Growing Refošk and making Teran is already mentioned in ancient Greek and Roman times. The Greeks called it the Pretorian wine, the Romans "Pucinium", but both were attributing medicinal characteristics to Teran, which therefore called the "elixir of life". The vine was thriving through entire middle ages on the edges of fields and behind many stone walls. Much of the Refošk vine was destroyed in the 19<sup>th</sup> century because of the wine louse and phyloxera. But disaster was beneficial. Renewing was necessary and first larger plantations were introduced.

During Italian occupation the law was prohibiting selling wine containing less than 10% of alcohol (typical Teran has 9.0-10.5% of alcohol). New sorts were introduced and the sale of Teran dropped significantly. After the World War II it took quite some time for Teran to regain its reputation and price which it still has this day (VODOPIVEC, 1992).

Besides Refošk wine district Kras recommends also Rebula, Laški Riesling, Malvazija, White Pinot, Sauvignon and Chardonnay, allowed are also Grey Pinot, Prosecco, Merlot, Cabernet Sauvignon and Blue Pinot. But Refošk is the most common being planted on 80% of vine growing areas, and other sorts supplement to broadening the assortment (VODOPIVEC, 1992).

Due to the specific and unique pedological and climatic conditions Teran can be made from Refošk only here on Kras. "Kraški teran" is a qualitative red wine of carmine red colour and higher quantities of lactic and carbonic acids which contribute its pleasant sour taste. Wine is rich in iron, tannin, colouring matters, vitamins B and C and up to 15% or more of acids (VODOPIVEC, 1992). One of the most important is the process of



biological disacidification, where malic transforms into lactic and carbonic acid (CERKVENIK, 1994).

Based on the oral sources, the data on vineyards in the wine subdistrict Kras plateau are out-of-date, but above all they are not uniformed. According to agro-map in 1985 there were 558 hectares of vineyards. Cadastral register shows 400 hectares, while farm counseling service Sežana estimates 595 hectares. Most up-to-date estimations indicate 708 hectares of vineyards where Refošk is (*Vitis vinifera L.cv.*) grown on 465 hectares. According to suitable pedological conditions Refošk vine could be extended up to 800 hectares. There is also 40 hectares in the neighbouring Italy where Teran can also be produced.

Administrative unit Sežana is setting up a register of winegrowers. By december 2001, there were 780 winegrowers in Kras wine district and 40 more that were registered in Gorica. Registered winegrowers must own at least 500 m<sup>2</sup> of vineyards, or less if the wine is sold at the market. All registered winegrowers must give notice about the entire crop, enlargement of vineyards and stocks. According to the register farmers receive subsidies. There are 1,600 farms on Kras and this includes 12 ecological farms, 41 ecological vineyards and 38 farms where fruit production is integrated. 42 individuals bottle their wine and for half of them wine growing is their primary source of income.

Farmers and winegrowers are satisfactorily educated as the courses (organized by Farming acceleration service Sežana) are well attended. Nevertheless farmers have but a few problems. Subsidy applications have to be filled in every year describing activities yet to be carried out next year. Dead lines and form applications change from year to year, many farmers entitled to state subsidy do not get the needed money to expand or renew their vineyards. Only to preserve the present condition on Kras every year 25-30 hectares of vineyard should be renewed. For the last three years this number has not been reached. Only 15-20 hectares of vineyards is renewed. In spite of this fact the sale of Teran is not decreasing, it has stayed around average for the past 10 years. The reason is an increased stress on environment, especially the usage of fertilizers and pesticides which enables high yields despite poor soil, old vines and the rigors of the weather.

Kras winegrowers wish to put Teran forward as a regionally protected wine, origin and name and it would still be recognizable after joining the European Union. Teran should be a sort of wine, made out of Refošk vine which grows in Kras wine district, on a specific parent material and soil and unique climate. The reason lies in growing Refošk vine in Italy, where vine itself is incorrectly called Teran. This many times results in "Teran" wines that in none of the properties resemble the original one. Another consequence leads to the fact that you can produce Teran wherever you plant Refošk.

Wine that would deserve naming Teran ATN - Acknowledged Traditional Naming should have the following properties (summarized and reduced from BRDNIK ET AL., 2000):

1. Maximum yield of grapes in vineyard is 9,000 kg/ha.
2. Minimum sugar level for Teran PTP is 70°Oe and at grape-harvesting grapes should be examined for highest quality (Ur.l. RS, No 70/79).
3. Natural alcohol: at least 9.2 vol%.
4. Actual alcohol: 10.0-12.5 vol%.
5. Total acids: 7.0-10.0 g/l.

6. SO<sub>2</sub>: total up to 100 mg/l and free up to 28 mg/l; extract without sugar: at least 25 g/l; ash: at least 2g/l; etc.
7. Taste: vinic, pleasantly sour, reminding of raspberry or red currant, full.
8. Colour: intensive, ruby red, possible violet shades.
9. Hue: at least 45°.
10. Scent: vinic, frutier (forest fruits).

Teran ATN should be entirely produced in Kras wine district and in case of bottling packaging should be original:

1. Only bottled Teran ATN can be sold. Non bottled wine can be sold only inside Kras district wine on farms directly to the customer.
2. Before going to the market, wine must be examined and graded by authorised organisation for wine quality determination.
3. Bottled wine can be on the market for maximum two and a half years.
4. Original name and geographical origin is: Teran ATN, Kras.
5. Any other use of name Teran is prohibited.

Inside the Kras wine district there are three inner areas of producing Teran:

1. Area of maximum quality Teran: Tomaj, Avber, Dobravlje, Gradnje, Ponikve, Šepulje, Dutovlje, Godnje, Kreplje, Kopriva, Skopo and Križ.
2. Area of very good quality Teran: Pliskovica, Krajna Vas, Mali in Veliki Dol, Tublje, Hruševica, Kobjeglava, Komen, Dol, Vrhovlje and Kazlje.
3. Area of good quality but untypical Teran: Gorjansko, Ovčji Grad and Ivanji Grad.

Differences in quality depend on acidity, colour, taste and alcohol content (VODOPIVEC, 1992).

### **Sežana agricultural cooperative**

Majority of Teran wine is produced in agricultural cooperative Sežana. Its primary goal is producing, keeping, storing and selling Teran and that's why it was built in 1971.

Agricultural cooperative Sežana owes 40 hectares of vineyards in vicinity of Komen and Sveto settlements, where majority of vines represent Refošk. Land is partly rented by local farmers. Agricultural cooperative Sežana pools approximately 200 members, 175 of them being active. For 2 of them vine growing is their only source of income, others also work in local enterprises. Some of them can produce up to 1,000 kg of grapes, but the average ranges around some 100 kg of grapes per year. Part of the yearly crop remains at home for domestic use. Average production of wine is 5000 hectolitres/year, but is variable according to the harvest. Due to the heavier burdening of vine and soils (addition of pesticides and artificial fertilizers), production used to be larger. Crop has been endangered in years with higher amounts of rainfall which results in intensive sprinkling. Summer storms and hail can seriously reduce crops. In 2002 almost entire production of grapes was destroyed in the western part Kras wine subdistrict by only one summer hail storm (Fig. 11).

Grape redemption amounts depend on the level of sugar. Agricultural cooperative Sežana sells its wine mostly in Slovenia, but some amounts are exported to

the Unites States of America, Bosnia and Herzegovina and Italy. At the moment demand for Teran is large and exceeds the supplies.



Fig. 11 Before and after the hail storm in 2002  
*Sl. 11. Prije i poslije oluje s tučom godine 2002*  
Source: REPE, 2002

Agricultural cooperative's plan is to increase the vineyard areas and raise the production (Fig. 12). The process is very slow since the farmers are not willing to give land for hire. Slovenian farmers are emotionally attached to their land and from that point of view the hire period is very long (25-30 years).



Fig. 12 Vineyard renewal  
*Sl. 12. Obnova vinograda*  
Source: MRAK, 1997

## Conclusion

The natural geographic characteristics of Kras enable good conditions for vine growth. The plant which is known as "a plant of the Sun" has in the research area so specific natural environment that the vine sort Refošk gives a special type of wine called Teran. The main factor that influences this is the parental material and soil conditions. The vine Refošk on flysh gives different wine – called Refošk. The sufficiently received solar energy depending on relief characteristics enables longer growing season and also the growth of so called late vine sorts. But on the other hand Kras landscape is not allowing larger vineyards. Due to specific surface conditions where dolines are prevailing only small vineyards can be planted requiring traditional way of cultivation with human labor involved. The vineyard enlargement is also limited due to dispersed land ownership which is the result of the specific inheritance in the area. In the inheritance all children are involved and later on they all have the right to decide about the future of the land. This is especially problematic in case of renting the new land to plant new vineyards. The rent in this case has to be for a long period and that is the main reason why the owners hesitate to rent their land. But the demand for the quality wine Teran is growing.

If Kras used to have problems with barren stony grounds and different professionals were trying to find appropriate tree species to reforest the area, nowadays the problem is opposite. The over growing has already reached the critical level of endangering the cultural landscape. The advancing forest has negative impact on the vine Refošk - due to higher moisture rates the vine is endangered by different diseases. The Teran production in comparison with other wines in other wine districts is smaller and from this point of view non-competitive. Entering the EU the Kras wine district will be even less recognized among all other well established and known European wine regions. The future of Teran will only be in preserving its specialties and marketing its uniqueness. The last will highly depend on respecting the regulations on Teran growing and production, which is just a start in the long way of protecting this kras wine trade mark.

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## SAŽETAK

### Irena Mrak, Blaž Repe: Vinova loza i vinogradarstvo Krasa (Slovenija)

Sudjelovanje prirodno-geografskih faktora omogućuje dobre uvjete za rast vinove loze na Krasu. Ta kultivirana biljka koju označujemo kao "biljku Sunca", tu je našla specifične prirodne uvjete u kojima sorta loze refošk daje vino teran. Pri tome je od najvećeg značenja upravo matična podloga te pedološki odnosi. Loza refošk daje, naime, na fliškoj podlozi drukčije vino, istoimeno refošk. Zadovoljavajuće količine Sunčeve energije, koja je povezana osobito s reljefnom oblikovanošću zemljišta, pogoduje duže vegetacijsko doba, a s tim mogućnost i kasnih sorata vinove loze. Reljef Krasa ne omogućuje prostrane vinogradske površine, ove su tek malene i zahtijevaju većinom ručno obrađivanje. Širenje vinograda koje je prirodno ograničeno, dodatno je onemogućeno posjedovnom razdrobljenošću, što je posljedica običaja diobe zemlje među svim nasljednicima. To se ogleda u prvom redu u najmu novih površina za vinograde, jer je vrijeme najma dugo, pa se vlasnici za nj gotovo ne odlučuju. Potražnja za teranom stalno je prisutna i sve više raste.

Ako je Kras u prošlosti imao poteškoća s ogoljelim površinama, a različiti se stručnjaci trudili u traženju pogodnih vrsta za pošumljavanje – danas su teškoće upravo suprotne. Ozelenjivanje i zarašćivanje Krasa dostiglo je već kritični stupanj kad je kultivirana pokrajina izrazito ugrožena. Šuma isto tako negativno utječe osobito na lozu refošk, koja je s povećanom relativnom vlagom na tom području ugroženija zbog različitih bolesti.

U usporedbi s ostalim vinima na drugim vinorodnim područjima proizvodnja terana je malena i s toga gledišta nekonkurentna. Ulaskom u EU kraška će vinorodna područja još više biti "izgubljena" među mnogobrojnim poznatijim europskim vinorodnim pokrajinama. Budućnost terana bit će u očuvanosti njegove kakvoće i njegove neponovljivosti. Upravo ovo zadnje veoma je ovisno o uvažavanju pravilnika o teranu koji je početak očuvanja te kraške zaštićene marke.