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## **An Analysis of Raspberry Production Conditions in Serbia**

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**Abstract:** For several decades now, the raspberry has been traditionally cultivated in major raspberry growing areas in Western Serbia. Serbia ranks second worldwide in raspberry production with the average production of 78,500 tones for the 1999-2005 period. Frozen raspberry exports to the world market account for up to 95-98% of the total production, the remaining percentage of the crop being processed for domestic market needs. The world market has high quality requirements on raspberry fruit, the best price being attained for individually quick-frozen (IQF) raspberry.

Variable economic conditions in the last years have not positively affected raspberry production in Serbia. Raspberry production is frequently limited by and highly affected by organisational and economic conditions. Only intensive and profitable raspberry production can provide regular abundant yields and high quality of fruit. Only this production can yield higher total output to cover production costs and gain the expected return.

This paper gives a SWOT analysis of raspberry production conditions, aimed at defining strengths and weaknesses, as well as opportunities and threats of this production. The results of this analysis can be used to eliminate and mitigate all adverse tendencies in raspberry production. They can also help develop a strategy for further development of raspberry production in Serbia focused on limitations in this production, the creation of a national brand - the raspberry from Serbia, and the maintenance of its position in the world market, in view of increasingly stronger competitiveness in raspberry production (raspberry exports from Poland and Chile, and, in the past several years, from China).

**Key words:** raspberry, production, conditions, SWOT analysis.

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## **Introduction**

For several decades now, Serbia has ranked among leading world countries in raspberry production, with raspberry being cultivated on about 15.000 ha of soil in Serbia. Although raspberry crops do not cover large areas in Serbia, they produce good yield. Over the 1999-2005. period, an average production amounted to 78.500 t. Long-term experience in this production which has turned into a tradition has been used to analyse major conditions for raspberry production.

High investments are required for the establishment of raspberry plantings, raspberry being a perennial plant. Prior to investing, a detailed analysis of agroenvironmental and other conditions relevant for selected raspberry sites should be conducted.

## **Material and Methods**

The material has been mostly collected in the field in line with the previous experience of producers in raspberry production in Serbia. The analysed raspberry production conditions have been identified and grouped using methodology developed by Petrovic and Zomic-Veljkovic (1999 and 2004, respectively). Determination was made of two groups of environmental factors associated with the said production, including all internal and external aspects, both positive and negative.

The analysis used is twofold, both internal and external, the internal factors related to a company being classified into opportunities, i. e. strengths (S) or weaknesses (W) and the external ones into opportunities (O) or threats (T). This strategic environmental analysis is referred to as SWOT analysis.

## **Results and Discussion**

### *An Analysis of Conditions Associated with Raspberry Production*

To achieve profitability, all necessary conditions which can have a considerable limiting effect on production should be fulfilled. Successful production can be attained only if suitable agroenvironmental and technical/organisational conditions are met, without neglecting socio-economic conditions and market effects which can be crucial to achieving good economic results.

Prior to deciding on raspberry planting establishment, an analysis should be made of all conditions, including: agroenvironmental (natural), technical/organisational, socio-economic and market-related conditions, i. e. those associated with potential supply and demand for raspberry in home and foreign markets.

**Agroenvironmental conditions** – including climate, soil and orography.

Prior to planting establishment, soil pedological and agrochemical analyses should be conducted and other natural conditions analysed and assessed.

Major climatic factors for raspberry cultivation include air temperature, air humidity, water and sunlight.

Moderately warm and moderately humid areas are most suitable for cultivation of raspberry varieties. The most favourable climatic conditions can be found in well-known raspberry growing areas of Serbia (Arilje, Valjevo, Ivanjica, Mt. Kopaonik, Sabac and Mt. Zlatar), where good yields and high-quality well-flavoured fruits rich in sugar are produced.

Adequate sum and distribution of air temperatures over the year and the growing season are required for the production of a good raspberry crop.

Certain raspberry cultivars are tolerant to cold to  $-30^{\circ}\text{C}$ , provided the canes are covered with snow. However, if the canes are not covered with snow, they can be killed by frost at temperatures below  $-18^{\circ}\text{C}$ . The root is more sensitive, being frost-killed at temperatures ranging from  $-12$  to  $-14^{\circ}\text{C}$ . The short dormancy period makes raspberry cultivars relatively sensitive to fluctuating winter temperatures, particularly if they vary between  $+6^{\circ}\text{C}$  during the day and  $-7^{\circ}\text{C}$  at night (Petrovic and Milosevic 2002).

Heat stress, sometimes occurring at certain sites during warm, humid summers, can cause damage to raspberry during harvest.

Temperature extremes (very rare, though) may in some years (without snow cover during winter or with low relative air humidity during summer months) cause certain damage to raspberry canes and fruit. Therefore, hilly regions with milder climate and, hence, a far rarer occurrence of temperature extremes, and a thicker snow cover, are most suitable for raspberry orchard establishment. Raspberry can be successfully cultivated at altitudes of up to about 1,000 m.

To ensure normal development, productivity and optimum yields per unit of area, soil should have sufficient moisture during the growing season (75-80 %) and average relative air humidity should be 75%.

Critical humidity periods in raspberry occur in the phenophase of intensive growth of fruiting branches and flowering (May), fruit growth and ripening (June) and cane growth for the following year (August, September).

High-density and highly productive raspberry production without irrigation can be achieved only in areas with over 800 mm of annual rainfall, with more than 50 % thereof being adequately distributed during the growing season. This also requires optimum agroenvironmental and other conditions, as well as adequate use of cultural and pomological practices.

Raspberries are non-tolerant to excessive soil moisture. The underground water level in the growth and fruit ripening phenophases should be at least 70 cm below the soil surface.

Should excess water enter the root zone and last for several days without running off, undesirable compounds and favourable conditions for the development of fungal diseases causing root and cane rot may ensue.

Furthermore, raspberries have specific soil requirements. As compared to other small fruits, raspberries require better soils, preferably deep, fertile (with about 5 % of humus), loose, well-permeable, moderately heavy (with about 50 % of clay) and mildly acid ones (with a pH ranging from 5.5 to 6.5) with the  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$  contents of 8-10 mg and 18-20 mg, respectively, per 100 g air-dry soil (Petrovic *et al.*, 2002, 2005).

These properties are mostly characteristic of brown low-acid soils on Paleozoic schists and other substrata, newly developed soils in the first zone of

deluvial deposits (gentle slopes), eutric cambisol, deeper alluvial-deluvial deposits predominated by smaller fractions and having an adequate clay content, and older forest glades.

Considering the fact that raspberries in Serbia are produced on relatively small plots due to the labour-intensive character of production, each plot should be properly selected and necessary pedological and agrochemical analyses conducted.

#### **Technical-organisational conditions**

Raspberry production is characterised by extremely high commodity quality – over 95 % of the crop, either processed or fresh, are marketed internally and worldwide. Therefore, the provision of (heat and freezing) processing, storage and delivery facilities is a necessary condition for the development of primary production of this fruit.

Apart from developing primary raspberry production, preparations for the construction of cold storage facilities used for export-oriented product preparation should be conducted.

In the raspberry growing areas of Serbia, small-size cold storage facilities of 300-500 ton capacity with deep-freezing tunnels and sorting and packaging lines for raspberry and other small fruits are most commonly constructed using funds provided by private entrepreneurs (Petrovic *et al.*, 2003).

Construction costs for small-capacity cold storage facilities of up to 500 ton capacity with deep-freezing tunnels and accessories are estimated at EUR 750.000.

Good organisational conditions can be provided not only by investments into small-capacity facilities, but also by the extension and technological modernisation of large-capacity ones. These large-capacity cold storage facilities act as distribution centres used for the receipt and further delivery of frozen raspberry and other fruits from smaller facilities to domestic and foreign customers.

The main specific quality of raspberry production management lies in the well-known fact that this production is set up, as a rule, on private farms, i. e. on plots of generally up to 0.10-1.00 ha, and rarely on larger ones. The main limiting factor for establishing larger plantings on household farms is the amount of labour needed for harvesting (being mostly manual), due to which the size of the planting is determined by the harvesting capacity.

By contract farming arrangements between enterprises, agricultural cooperatives or other organisations and several thousand farmers, higher quantities of raspberries are purchased to be further distributed in the market.

#### **Socio-economic conditions**

Socio-economic conditions make up a general framework for establishing fundamental socio-economic preconditions for the development of any type of production, including raspberry production.

Both agricultural and raspberry productions are highly dependent on the state agrarian policy, regardless of their market orientation. In the last years, economic policy measures have been used to stimulate the development of fruit production, with subsidies and suitable funds being provided for planting establishment and

irrigation system construction and modernisation. Furthermore, slightly more favourable agricultural loans have been offered by commercial banks, resulting in the facilitation of machinery procurement, rationalisation and modernisation of raspberry production.

Raspberry production is labour-intensive, mostly restricted to small-size family household farms. Decision on raspberry planting establishment also involves labour plans referring to available permanent and seasonal workers to count on during the production and harvesting of raspberry.

Raspberry production in Serbia went beyond home market a long time ago, having focused mainly on world market needs ever since. Therefore, further production should be thus oriented in terms of quality and assortment of products.

**Market** – is among the socio-economic conditions, being singled out here for its superb importance.

The Serbian raspberry has maintained its position in the world market for many years, a difficult task, in view of the fact that with one wrong move, one misstep, like in tightrope walking, the attained positions in the world market can be lost. In order to avoid these undesirable effects, a continuous analysis of world raspberry market should be conducted in conjunction with monitoring of the following:

- The elasticity of demand in the world market of developed countries in particular;
- Unexpected changes in consumer taste for quality, flavour, colour and appearance of raspberry fruits, which can considerably affect the total demand for raspberry;
- Raspberry production in other competitive countries which also have good export potentials in the world market and which can, owing to favourable production conditions (cheaper labour etc.), supply fruits of satisfactory quality at considerably lower price.

So far, raspberries, mostly frozen (IQF raspberry, whole and broken deep frozen raspberry, frozen raspberry crumble and deep frozen raspberry of standard quality), have been exported to economically most developed countries of Europe (Germany, France, Switzerland, the Netherlands, Belgium, Sweden, Norway etc.) and the USA. The above markets demand high quality of raspberry products and conformity with the HACPP and Euro-GAP standards in raspberry production and processing. The increase in raspberry product assortment can result in better economic results in this production. For further improvement, raspberry production should be focused on export to the world market, with simultaneous development of home market and increase in fresh raspberry supply.

A detailed analysis of all necessary conditions in raspberry production has been used to make a SWOT analysis assessing main strengths and weaknesses, being internal factors of analysis, and opportunities and threats, as external ones, in raspberry production.

*The analysis of raspberry production conditions using the SWOT method*

**Strengths (S):**

1. Increase in raspberry demand in the world and internal markets (over 90% of production is export-oriented);
2. Economic interest of producers due to the high profitability of raspberry production;
3. Favourable agroenvironmental and other conditions enabling higher yields and better quality as compared to most surrounding countries;
4. Developed road network and other municipal infrastructure;
5. Employment of unemployed and underemployed labour.

**Weaknesses (W):**

1. A lack of farmer organisation in terms of product supply and raspberry purchase;
2. Deficient relatively outdated cooling and other processing facilities and a low level of processing;
3. A relative lack of technical equipment on agricultural estates;
4. A lack of favourable loan conditions for raspberry planting establishment and processing facilities;

**Opportunities (O):**

1. Raspberry production is of strategic importance to agriculture in the region;
2. A positive effect on the development of other economic activities (fruit processing, trade etc.);
3. The agrarian policy of the Republic of Serbia in the last several years has stimulated the development and intensification of fruit growing.

**Threats (T):**

1. Since it is not a member of the European Union, Serbia is not able to benefit from the many economic advantages enjoyed by its members,
2. Increasing raspberry production in a number of world countries (Russia, Poland, Chile, China, etc.).
3. World market fluctuations in the raspberry commodity, indirectly affecting the purchase price of raspberry in Serbia.

**Conclusion**

The analysis of the above conditions which have a significant impact on the development of raspberry production in Serbia, as well as the results identified by the SWOT analysis may suggest that there are optimum conditions for further development and intensification of raspberry production in Serbia. Naturally, weaknesses and possible threats of this production should be borne in mind. Therefore, modern achievements should be applied in raspberry production, the processing assortment should be expanded, the proportion of fresh raspberry

production should be increased due to a constant demand for fresh raspberries in the market of developed countries, production should be adapted to market demands and necessary quality standards should be satisfied. Better organisation and coordination at all levels of primary production, processing and further distribution of raspberries as well as the cooperation with relative ministries will acknowledge the strategic importance of raspberries, thus facilitating the achievement of better results.

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## **ANALIZA USLOVA PROIZVODNJE U KOJIMA USPEVA MALINA U SRBIJI**

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### **Rezime**

Već nekoliko decenija malina se tradicionalno gaji u poznatim malinogorjima zapadne Srbije. Srbija je druga zemlja u svetu po proizvodnji maline. Veliki deo ove proizvodnje 95-98% izvozi se na svetsko tržište u vidu smrznute maline, a mali deo proizvodnje se prerađuje za potrebe domaćeg tržišta. Zahtevi svetskog tržišta u pogledu kvaliteta plodova maline su visoki i najbolja cena se postiže za smrznutu malinu roland.

Promenljivi ekonomski uslovi poslednjih godina nisu pozitivno uticali na proizvodnju maline kod nas. Proizvodnja maline je često ograničena i visoko zavisna od uticaja organizacionih i ekonomskih uslova. Jedino se intenzivnom i profitabilnom proizvodnjom maline može obezbediti redovna i obilna rodost i visoki kvalitet ploda. Samo se takvom proizvodnjom može postići veća vrednost proizvodnje kojom bi se pokrili troškovi proizvodnje i ostvario očekivani profit.

U radu je data analiza uslova proizvodnje maline primenom SWOT metode, koja ima za cilj da definiše prednosti i nedostatke, kao i mogućnosti i rizike proizvodnje. U cilju otklanjanja i ublažavanja svih negativnih tendencija u proizvodnji maline mogu se koristiti rezultati ove analize. Takođe mogu pomoći planiranju strategije daljeg razvoja proizvodnje maline u Srbiji čime bi se uticalo i na ograničenja u ovoj proizvodnji, izgradio bi se nacionalni brend - malina iz Srbije, a održale bi se i pozicije na svetskom tržištu s obzirom da je konkurencija u proizvodnji maline sve jača (izvoz maline iz Poljske i Čilea, a poslednjih godina i iz Kine).