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**UNIVERSITY OF BELGRADE  
FACULTY OF AGRICULTURE**



## **Book of Proceedings**

### **The Seminar**

# **AGRICULTURE AND RURAL DEVELOPMENT - CHALLENGES OF TRANSITION AND INTEGRATION PROCESSES**

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# CONTRIBUTION OF INVESTMENTS IN RASPBERRY PLANTATIONS TO DEVELOPMENT OF RURAL AREAS OF THE REPUBLIC OF SERBIA<sup>1</sup>

Sanjin Ivanović<sup>2</sup>, Petar Gogić<sup>3</sup>

## Summary

*The Republic of Serbia is the second state worldwide regarding volume of raspberry production and the third one concerning area of raspberry plantations. Therefore, the goal of this paper is to analyze and predict raspberry production in the Republic of Serbia. The paper also aims to determine investments in establishment of raspberry plantations per hectare and total amount of these investments at national level. Appropriate mathematical and statistical methods were used to analyze and predict volume of raspberry production. There were also used adequate calculations of costs needed to establish one hectare of raspberry plantation.*

*It has been determined that establishing costs per one hectare of raspberries are approximately 22,000 EUR. That means it is necessary to invest 35,000,000 EUR each year at national level to maintain areas used for raspberry production at the current level. It was also found that it is possible to expect a slight increase in the volume of raspberry production. Appropriate measures that can contribute to growth of raspberry production and investments in raspberries are proposed. Results of these measures would be increase in employment and faster development of rural areas.*

**Key words:** *raspberry production development model, investments, socio-economic effects of raspberry growing, rural development, employment*

**JEL classification:** *Q14*

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## 1. Introduction

According to FAO statistical data raspberries are produced worldwide on approximately 92,000 hectares. In Serbia raspberry production is present on approximately 15,000 hectares, so that according to this criteria Serbia is on the third place in the world (on the first place is Russia – 26,000 hectares, and the second is Poland – 20,000 hectares). Worldwide raspberry plantations participate by 0.002% in total agricultural area while in Serbia it is 0.30%. Total raspberry production in the world is approximately 500,000 t while in Serbia volume of raspberry production is approximately 85,000 t (which is 17% of total production in the world). Regarding production volume of raspberries Serbia is the second largest producer in the world (the first one is Russia which produces approximately 140,000 t of raspberries).

Production and consumption of raspberries in Serbia are not satisfying, despite very favorable natural conditions for raspberry growing. It is caused primarily by low level of inputs in raspberry production, presence of obsolete cultivars which produce low yields, small plots used for production at family farms etc. Besides, according to Milošević et al. (2001) there are some additional reasons such for such situation - production of raspberries at regions with unfavorable natural conditions, inappropriate organization of transportation of fresh fruits from field to cold storages and processors, unorganized presentation at foreign markets etc. Raspberry production is mostly situated at small family farms in rural areas which do not use appropriate machinery, irrigation and pesticides. Raspberries produced in Serbia are primarily exported frozen.

Obsolete cultivars disable better supply and standard quality in the market. According to Milutinović et al. (2008), the most common cultivar in Serbia is Vilamet (approximately 95%). Increased competitiveness of other countries on international raspberry market is another unfavorable element affecting willingness of Serbian producers to establish new raspberry plantations. During period from 1998 to 2011 areas used for raspberry production remained approximately at the same level (between 14,500 and 15,000 hectares).

The goals of this paper are:

- To analyze importance and volume of raspberry production in the Republic of Serbia during period from 1998 to 2011;
- To asses amount of investments needed to raise one hectare of raspberries;
- To estimate raspberry production development in following years and to determine socio-economical effects of raspberry growing;
- To analyze possibilities and perspectives of investments in raspberry production as well as their contribution to rural development.

## **2. Materials and methods**

Mathematical and statistical methods are used to analyze participation of raspberry production in Serbian agricultural area and to make an assessment of future development of raspberry production in Serbia.

Costs of establishing raspberry plantations as well as estimation of additional working capital were used to determine amount of investments needed per hectare of new raspberry plantation.

Data sources used in this research could be divided into two groups. Within first group are data from FAO statistical data base as well as statistical yearbooks of the Republic of Serbia. These data were used to analyze situation in raspberry production and to predict its future development.

Besides, realistic organizational, economical, technical and technological data were used to determine amount of investments needed to establish one hectare of raspberry plantation.

## **3. Results and discussion**

### ***3.1. Changes in volume of raspberry production in the Republic of Serbia***

Some areas in Serbia have very favorable conditions for raspberry production, regarding land quality and climate. Such important regions are surrounding areas of following cities: Valjevo, Šabac, Arilje, Kosjerić, Ivanjica, Čačak, Kopaonik, Kraljevo and Leskovac (Tomić and Vlahović, 2003). Raspberry plantations in these areas are mostly situated on hilly lands, which cannot be successfully used for other types of plant production (except for production of blackberries and blueberries).

Land used for raspberry production as well as volume of production in the Republic of Serbia is presented in table 1.

Average area of raspberry plantations in Serbia ranged from 14,531 ha (in period 1998 – 2004) to 15,014 ha in period 2005 – 2011 (average area increased by 3.32%). During observed period area of raspberry plantations has increased while total agricultural area has decreased. This is why participation of raspberry plantations in total agricultural area ranges from 0.28% (in period 1998 – 2004) to 0.30% (in period 2005 – 2011). During observed periods volume of total raspberry production increased more than area of raspberry plantations (11.16% comparing to 3.32%) due to growth of average yield per hectare by 8.10%.

**Table 1:** Area of raspberry plantations and raspberry production in the Republic of Serbia from 1998 to 2011

Year	Agricultural area (ha)	Raspberry plantations		Raspberry production (t)	Yield (kg/ha)
		ha	Participation in agricultural area (%)		
1998	5,698,000	12,806	0.22	63,796	4,982
1999	5,119,000	12,966	0.25	64,680	4,977
2000	5,109,000	13,519	0.26	55,999	4,142
2001	5,112,000	14,753	0.29	77,781	5,272
2002	5,107,000	15,293	0.30	93,982	6,145
2003	5,115,000	16,354	0.32	78,974	4,829
2004	5,113,000	15,995	0.31	91,725	5,735
Ø 1998-2004	5,196,143	14,531	0.28	75,277	5,155
2005	5,074,000	15,413	0.30	84,331	5,471
2006	5,066,000	15,024	0.30	79,680	5,303
2007	5,053,000	14,496	0.29	76,991	5,311
2008	5,055,000	14,680	0.29	84,299	5,742
2009	5,058,000	14,957	0.30	86,961	5,814
2010	5,051,000	15,171	0.30	83,870	5,528
2011	5,056,000	15,354	0.30	89,602	5,836
Ø 2005-2011	5,059,000	15,014	0.30	83,676	5,572
Ø 1998-2011	5,127,571	14,772	0.29	79,477	5,363
Index:	97.36	103.32	107.14	111.16	108.10
Ø 2005-2011					
Ø 1998-2004					

Source: Statistical yearbook of the Republic of Serbia (1999-2012)

According to Mišić et al. (2004) profitability of raspberry growing in Serbia would significantly increase provided that average yield is 10 t/ha or higher. Authors stated that it is possible having in mind genetic potentials of existing as well as new raspberry cultivars.

### ***3.2. Costs of establishing raspberry plantations***

Establishment of raspberry plantations usually lasts for two years. On the beginning of the first year land is prepared for planting and planting is done. During the first and the second year of establishment will appear various costs, such as costs of fertilizers, pesticides and some other costs (including interest costs, costs for trellis etc.), as well as revenues (at the end of the second year). Costs and revenues related to establishment of raspberry plantations are presented in table 2.

**Table 2:** Costs of establishing raspberry plantation (EUR/ha)

The costs of establishing	Year			Total
	0	1	2	
1. Land preparation	1,915.00			1,915.00
2. Planting	7,420.00			7,420.00
3. Trellis, wires		3,055.00		3,055.00
4. Pesticides, fertilizers, etc. (year 1)		2,235.00		2,235.00
5. Pesticides, fertilizers, etc. (year 2)			3,213.00	3,213.00
<b>A. Costs without interest (1 to 5)</b>	<b>9,335.00</b>	<b>5,290.00</b>	<b>3,213.00</b>	<b>17,838.00</b>
6. Interest in year 1		746.80		746.80
7. Interest in year 2			1,229.70	1,229.70
<b>B. Total costs including interest (A+6+7)</b>	<b>9,335.00</b>	<b>6,036.80</b>	<b>4,442.70</b>	<b>19,814.50</b>
8. Revenue in year 2			3,000.00	3,000.00
<b>C. Total costs of establishing (B-8)</b>	<b>9,335.00</b>	<b>6,036.80</b>	<b>1,442.70</b>	<b>16,814.50</b>

*Source: authors' calculations*

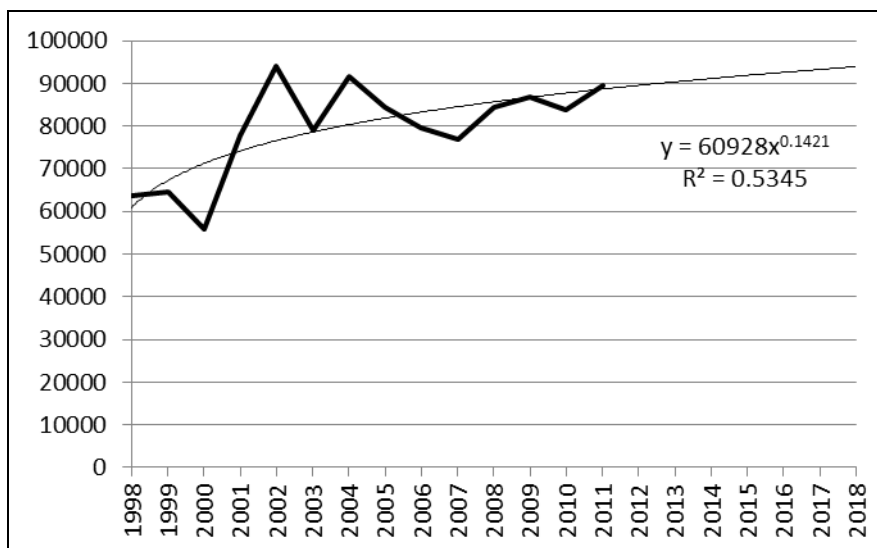
Apart from above enlisted costs it is necessary to increase amount of total investments by additional working capital which is needed to ensure uninterrupted production process. Having in mind that amount of additional working capital for raspberry production is 5,511.09 EUR/ha, total investment for raspberry plantation establishment rises to 22,325.59 EUR/ha. This is very high investment per hectare, so that small family farms usually cannot finance it only with equity. Therefore, establishment of raspberry plantation is financed mostly by combining equity and borrowed sources.

Nevertheless, while projecting investments in raspberry growing it is necessary to analyze not only financial, but also some other limitations. According to Veljković et al. (2008) the main limitation factor for establishment of larger raspberry plantations at family farms is labor needed for harvesting (which is in Serbia mostly performed manually). These authors stated that size of plantation is determined primarily by available labor (at farm and labor market).

### ***3.3. Estimation of future raspberry production and investments in raspberry plantations***

Volume of raspberry production in future period is estimated for period 2012 – 2018 having in mind previous volume of raspberry production (for period 1998 – 2011) as well as the fact that establishment of raspberry plantation lasts for two years. Future production volume is estimated using power type trend line (graph 1).





Source: authors' calculations

**Graph 1** Expected volume of raspberry production in Serbia (t)

This type of trend line is the most appropriate (regarding  $R^2$  – value). According this trend line raspberries production volume in Serbia is expected to rise from 89,524 tons (in 2012) to 93,908 tons (in 2018).

Relationship between average estimated raspberry production (in period from 2012 to 2018) and average achieved production in previous period (from 2005 to 2011) is presented in table 3.

**Table 3:** Comparison of average raspberry production in observed periods

Production (t)		Index <u>Ø2012-2018</u> <u>Ø2005-2011</u>
Achieved Ø2005-2011	Projected Ø2012-2018	
83,676	91,805	109.71

Source: authors' calculations

On the basis of presented data it can be concluded that in future period raspberry production will increase by 9.71%, while average growth rate will be 0.80% per year.

Average area of raspberry plantations in period 1998 – 2011 was 14.772 hectares. Having in mind this fact as well as average economic life of raspberries (which is

approximately 10 years), dynamics of establishment of raspberry plantations (two years), need for regular re-establishment of existing plantations and some other factors it is possible to conclude that in Serbia it is necessary to establish 1,600 hectares of new raspberry plantations each year. Bearing in mind that investment needed to establish one hectare of raspberry plantation is approximately 22.000 EUR that means it is necessary to invest in average 35,000,000 EUR in establishment of raspberry plantations in entire Serbia each year. On the other hand, existing raspberry plantations in Serbia are older than it is expected regarding economic life, which means that it is needed to provide even higher financial resources to ensure faster re-establishment of existing plantations.

Keeping volume of raspberry production on present level or production increase significantly influences employment in rural areas. According to Petrović, S. (2004) if analysis starts from the fact that raspberries are grown on area of 15,000 hectares it is possible to conclude that only in raspberry production is provided employment on annual level for 22,500 employees. This author also estimates that 4,000 employees work each year in other activities connected to raspberry production (trade, processing, marketing and similar activities). Employment in raspberry production and processing involves primarily casual labor, especially for harvesting.

Investments in raspberry plantations should be directed towards enlargement of production plots. The investments should be also directed to other factors which make raspberry production more economically efficient such as irrigation equipment, appropriate machinery, facilities needed to store and distribute raspberries etc. Although such an equipment and buildings are expensive they provide very favorable effects regarding quality of raspberries and labor productivity. In other words, investments in raspberry plantations should not only enlarge size of plantations but also change technical and technological characteristics of production.

One of main problems regarding investments in raspberry production in Serbia is financing of investments. Costs of establishment of raspberry plantations are very high, so that it is necessary to use loans at some extent. On the other hand, interest rates for agricultural loans in Serbia are rather high as well as other costs connected to borrowed capital (even for loans subsidized by the state). Besides, repayment period for loans is short (for example, only 3 years for subsidized loans). Therefore, financing of investments in agriculture is one of the first issues that have to be solved in order to improve raspberry production.

On the basis of the results of previous analysis it is possible to give some suggestions how to facilitate development of raspberry production in Serbia. Apart from solving issues related to investments and financing, many other incentives could be done:

- Introduction of new cultivars and use irrigation,
- Increase in consumption of raspberries in Serbia,
- Specialization of raspberry producers,
- According to Stevanović et al. (2006) it is necessary to produce some final products from raspberries (such as juices or concentrates) to achieve better economic effects from this production,
- Better cooperation between raspberry producers, processors and exporters. If this is not a case than production volume and quality of raspberries will significantly fluctuate. As a consequence production risks, market risks and costs will increase.
- The state is expected to facilitate closer connections between raspberry producers (to support cooperatives and associations).
- Small storage facilities should be formed (by individual owners or cooperatives) in remote rural areas, because producers in such areas have significant problem concerning transportation of fresh raspberries from field to processors.
- It is necessary to ensure that increase of input prices (fuel, fertilizers and pesticides) is not higher than increase of raspberry prices.

All above mentioned factors could have positive influence on profitability of raspberry growing, volume of investments in raspberry production as well as economic effectiveness of these investments.

#### **4. Conclusions**

In this paper has been analyzed raspberry production in the Republic of Serbia, investments in establishment of raspberry plantations as well as possibilities of future development of that production. Very favorable natural conditions for raspberry growing are not appropriately used. Anyway, it is expected that volume of raspberry production will increase in following period. Average annual growth rate is estimated at 0.80%.

To keep area of raspberry plantations at current level existed plantations have to be regularly re-established – only for this purpose is required 35,000,000 EUR annually. It will be very difficult to achieve this goal without significant state support such are subsidized loans. Such investments have to provide enlargement of plots as well as technical and technological improvement of raspberry production.

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