

COMPARISON OF ECONOMIC INDICATORS DIFFERENT WAYS OF CULTIVATION SOUR CHERRY (*Prunus cerasus* L.) ON FAMILY HOLDINGS

KOMPARACIJA EKONOMSKIH POKAZATELJA RAZLIČITIH NAČINA UZGOJA VIŠNJE (*Prunus cerasus* L.) NA PORODIČNOM GAZDINSTVU

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ABSTRACT

The research presented in this paper, the economic analysis of production of sour cherry on conventional and organic way. Based on survey data collected from growers sour cherry on family farms and professional technical and technological standard to all appropriate farming technologies, are prepared starting economic parameters. There identified investments in cherry plantation on an area per hectare. Then, they made calculations of average income and expenses for a representative year and based on their income statements prepared for the future exploitation of five years. With the application of static method calculated indicators of the economic feasibility of cherries. Were established the average net profit rate of accumulation, the period of return on capital in the production of cherries and others. And finally, there was a comparison of economic indicators at different ways of growing cherries, which is the primary goal of this research. Based on these results, it was concluded that the production of cherries profitable in both ways, whether favorable economic results achieved in organic compared to conventional production.

Key words: organic and conventional growing, sour cherry, indicators.

REZIME

Predmet istraživanja u ovom radu je ekonomska analiza proizvodnje višnje na konvencionalni i organski način. Na bazi prikupljenih podataka anketom od uzgajivača višnje na porodičnim gazdinstvima i stručnih tehničko-tehnoloških normativa za odovarajuće tehnologije uzgoja, sastavljeni su polazni ekonomski parametri. Utvrđena su investiciona ulaganja u podizanje zasada višnje na površini od 1 ha. Zatim, sastavljene su kalkulacije prosečnih prihoda i rashodi za reprezentativne godine proizvodnje i na bazi njih sastavljeni bilansi uspeha za naredni period eksploatacije od pet godina. Uz primenu statičkih metoda, izračunati su pokazatelji ekonomske opravdanosti proizvodnje višnje. Utvrđeni su: prosečna neto dobit, stopa akumulativnosti, vremenski period povraćaja kapitala u proizvodnji višnje i dr. I na kraju, izvršena je komparacija ekonomskih pokazatelja pri različitim načinima uzgoja višnje, što je i osnovni cilj ovog istraživanja. Na osnovu dobijenih rezultata, zaključeno je, da je proizvodnja višnje na oba načina profitabilna, ali se povoljniji ekonomski rezultati postižu u organskoj u odnosu na konvencionalnu proizvodnju. I pored ispoljenih snaga, mogućnosti i slabosti u proizvodnji višnje u Republici Srbiji, najveće pretnje su, da se zbog visokih cena inputa za organski uzgoj, proizvođači mogu preusmeriti na konvencionalnu proizvodnju višnje, nedovoljna kontrola uvoza i "gušenje" domaće organske proizvodnje, pad platežne sposobnosti građana, a samim tim i tražnje za proizvodima organskog porekla, kao i nedovoljni podsticaji u sektoru prerade organskih proizvoda.

Ključne reči: organski i konvencionalni uzgoj, višnja, pokazatelji.

INTRODUCTION

The favorable growing conditions for fruit production (climate, soil, location, etc.) in the fruit producing regions, have positive impacts on personal and local standards of fruit growers in Serbia (Milić et al., 2011). Changes in fruit assortment and steady introduction of the latest scientific knowledge in plant nutrition, protection and adequate pruning play important roles in modern fruit growing. The priorities in this branch of rural economy are intensification of production and introduction of modern mechanization. Changes of the assortments and introduction of new cultivars with higher quality and biological potential will further improve fruit production. Development of new and cost-effective growing systems, research in crown framework formation suitable for new cultivars and growing environment and improvement in cultural technology (pruning, fertilization, irrigation and protection of the fruit trees from pests and diseases) would substantially benefit Serbian fruit growers.

The goal of organic agriculture is enhancing the health and productivity of mutually co-dependent societies (soil, plants, animals and humans). The basic constituent of this system of

food production is the exclusion of synthetic agents and the application of natural materials, which are used to supplant fertilisers, pesticides and additives in food production and processing. The key principle of organic food production is the interaction of all natural components included in the production cycle of safe food, as well as the maintenance and enhancement of long-term soil fertility, the promotion of beneficial and rational agricultural, technical and technological measures, and the protection of life, soil, air, and water. Organic agriculture acknowledges the achievements of conventional agriculture but it harbours a different production concept which is a part of contemporary agricultural production (Milic et al., 2012).

Organic fruit production is a modern course of development of horticulture, which is essentially a traditional production that uses the latest findings in genetics, selection, nutrition, protection and preservation of the fruit in order to get the fruit without the use of synthetic fertilizers and protective means (Milić et al., 2012). The main feature of organic production of fruit is, a complete ban on the use of chemical pesticides, so that the biological measures of struggle, the main measures to protect fruit trees from pests and diseases. In this regard, in Serbia today

this approach breeding (cultivation) of fruit trees is certainly a real prospect, especially considering the resources, but with the organized, or system operation.

Sour cherry is characterized by specific advantages of growing in comparison with other types of fruit: simplicity in terms of cultural practices, resistance to pests and diseases, early ripening of fruits, successfully growing in mountainous areas and high altitudes, good execution and high technological value of fruits. However, despite the modest demands, cherry production is scarce fruit species (Milić et al., 2006).

Sour cherry (*Prunus cerasus*) is a pomes fruit that is their significance in fruit Serbia in third place, behind the plums and apples. The total volume of production of sour cherries in the world Serbia participates with 7%, and compared to other countries, is in the seventh place (Sredojević, 2011).

On average for the period (2010-2011) the quantity structure of exports of fresh fruit from the Republic of Serbia dominated by Apple with 69% share, followed by plums, peaches and nectarines (Vlahović i sar., 2013). Sour cherry with a rate of 4,270 t accounts for 2.74% of total exports of fruits from Serbia. In addition, cherry relend with the amount of 28.556 t occupies a share of 25.74% in the total exports of frozen fruit from Serbia.

The fruit of sour cherry is juicy, intense red or dark red, distinctly tart and aromatic. Most varieties of cherry have a round, oval, elongated circular, and rarely flat or heart-shaped fruit. For some types of cherries and sour cherry fruits are small, at the May cherries are medium sized, a somewhat larger fruits are at Keresk and Spanish cherry. Fruits of sour cherry ripen from late May to late June (Šumić, 2014).

The dry matter content is qualitative characteristics, since on the basis of this data, evaluates the quality of raw materials and finished products. Dry matter consists of all the components of the product other than water. The dry matter content of fresh cherries may be in the range of 18.3 to 27.0% (Doymaz, 2007; Filimon et al., 2011a; Motavali et al., 2011). Akpinar and Bicer (2007) were found that the water content in dried cherries was 19%. Doymaz (2007) was stopping the drying process when the water content of 20%.

Average total sugar content in the fruit cherries ranges from 3.2 to 16%, and most are represented reducing sugars, fructose and glucose. Fruit acids are the fruits of cherries found in amounts of 0.5 to 2.4%, and most often are represented malice acid, citric acid, succinct acid and tartaric acid (Mratinić, 2002). Fruit acids along with fruit sugars give a distinctive sour taste and its processed products, so they are very important sensory component.

The fruit contains vitamins cherries in relatively small quantities. Vitamin C, on average in an amount of 6 to 43 mg / 100 g, while the other vitamins are in trace amounts. Anthocyanins of sour cherry have a unique content and are rich in phenol compounds (Chaovanalikit and Wrolstad, 2004; Melicháčová et al., 2010; Wang et al., 1999). Phenol compounds contribute to the flavor, color and sensory characteristics, such as bitterness and astringency (Lee, 2000). Anthocyanins give the characteristic cherry red or dark red color. In addition to them, the pigments are present to a lesser extent, the flavones and trace carotenes and xanthophylls.

MATERIAL AND METHOD

Based on survey data collected on farms and interviews with producers during 2015 in the area of Fruska Gora, and according to the technical, technological and organizational-economic conditions of production on households, fortified the average figures for economic analysis. Calculations are made in different

production conditions cherries, and then for the next period planned input-output and is determined economic indicators justification production. Were used for statistical and statics calculative methods. Of the parameters the coefficient of economy, the average net profit rate of accumulation and the time of return on investment. Besides, by using SWOT analysis, were established strengths, weaknesses, opportunities and threats in the production of cherries on the farm household.

RESULTS AND DISCUSSION

In the Republic of Serbia (RSOS, 2016) the average household size is 5.4 hectares, which is 2.7 times less than the average in the EU, which amounts to 14.4 ha (Eurostat, 2014). In Vojvodina, the structure is more favorable than the average in Serbia and the average size is around 10.9 hectares. The largest numbers of household is up to two hectares (i.e. 47.23%) and occupy about 8% of total arable land.

Under organic production of fruit in Serbia is 1,527 ha, and the area that are under conversion amounted to 357 ha. In households where grown organic fruits are located in different regions of Serbia. Based on data obtained from the owner of the analyzed farms in the area of Fruska Gora the calculations made in the ordinary production of cherries in conventional and organic conditions (Table 1).

Cultivation of cherry organic way, it is 1,000 Euros higher gross profit per unit area. Due to better quality fruits organically produced cherries over conventional, achieved favorable sales price which reflects positively on the business results of manufacturers. According to the calculated annual cash income and expenses in the production of cherries on analyzed farms are planned cash flows for the five-year period of operation (Table 2).

Table 1 Economic indicators of different ways of sour cherry production (€/ha)

Indicators	Organic production (I way)	Conventional production (II way)	Difference (I-II)
I Total revenue*			
Sour cherry	7.200	6.300	900
II Total expenditure			
Fertilizers (organic, mineral etc.)	520	610	-90
Plant protection (biological, chemical etc.)	650	630	20
Labor force	1.050	850	200
Machine work	480	730	-230
Amortization of fixed assets	120	120	0
Certification and control* (organic produc.)	-	-	-
Interest on the loan for working capital	80	90	-10
Other costs	100	70	30
Total (II):	3.000	3.100	-100
III Gross profit (I-II):	4.200	3.200	1.000

* The cash expenditures for the certification and control in organic production were not included in the calculation. Specifically, based on the account for the amount paid for the certification and control, the manufacturer shall refund the amount to support for organic production by the Ministry of Agriculture.

Table 2 Cash flows different ways of sour cherry production (€/ha)

On.	Indicators	Amounts per year (€)				
		1 year	2 year	3 year	4 year	5 year
Organic production						
I	Total revenue	7.200	7.500	6.900	7.400	7.100
II	Total expenditure	3.000	3.100	2.900	3.200	3.000
III	Gross profit	4.200	4.400	5.000	4.200	3.100
IV	Income tax	420	440	500	420	310
V	Net profit	3.780	3.960	4.500	3.780	3.000
Conventional production						
I	Total revenue	6.300	6.400	6.100	5.900	6.300
II	Total expenditure	3.100	3.300	3.200	2.900	3.200
III	Gross profit	3.200	3.100	2.900	3.000	3.100
IV	Income tax	320	310	290	300	310
V	Net profit	2.880	2.790	2.610	2.700	2.790

Source: Author's calculation according to the calculations of cherry production on the holding

Assessment of the economic justification for cherry production on the farm is done using the static method. In the analysis, as the representative of the economic parameters of the data were taken from the 2015 production. The final amount of economic indicators established calculative methods are given in Table 3. In terms of *organic production* economy coefficient is 2.40, and the fact that over 1.0 production is economical, and acceptable. The average net profit is € 3804 and significantly above 0 €, which means that the production of cherries economically efficient. The rate of accumulation is 63.40%, which is above the assumed, the marginal rate of 20%, while production is economically justified. Done investment can be recovered in a more second year exploitation period of extension and is far shorter than the five-year period analyzed, so it is according to this criterion production economically feasible. on the obtained accumulation rate of 40.94%, it can be seen that for every 100 Euros invested capital in production, is achieved through the accumulation of 40 Euros. Given that the rate of accumulation is far greater than the marginal rate of accumulation i.e. 20%, the production of cherries in conventional terms is acceptable.

Table 3 Indicators of economic feasibility of sour cherry per 1 ha

Indicators	Organic production	Conventional production
Total investments	6.000 €	5.500 €
Coefficient economy	2,40	1,97
The average net profit	3.804 €	2.252 €
The rate of accumulation	63,40 %	40,94 %
Pay back of investment	1,58 years	2,44 years

Source: Author's calculation based on the results of a five-year period of exploitation cherry plantations

In terms of *conventional production* economy coefficient was 1.97 and is higher than 1.0, which means that the production cost. The average net profit is €2252 and significantly above 0 €, which means that production is economically justified. Based The obtained result shows that the capital invested in the cultivation and production of cherries can return more in one production cycle. How is it determined period of 2.44 years shorter than the economic limit of five years, which means that according to this criterion cherry production acceptable and economically viable for producers

Based on these indicators, the production of cherries and the organic and the conventional method is economically acceptable. However, organic farming provides more favorable economic results. The average net income in the production of organic cherries is bigger than that of conventional eye €1,552 / ha. The rate of accumulation in organic cherry production is higher than in conventional to 22.46%. Also, the period of return of investment in this production is more favorable, i.e. shorter compared to the conventional production. Based on the technology of growing and established economic indicators in Table 4. was given SWOT analysis and identified as: strengths, weaknesses, opportunities and threats sour cherry production on a family household.

Table 4 SWOT analysis of different ways of sour cherry

Strength	Weaknesses
<ul style="list-style-type: none"> • Are there suitable soil for growing cherries, especially organic • There is support from the state for organic production • There is enough able-bodied family members to work • Achieve higher price of organic cherries over conventional, and therefore a better income on the holding 	<ul style="list-style-type: none"> • High prices of inputs, especially in organic production the fruits are very sensitive and require extensive work by workers in the short term (at harvest time) • High costs for certification and control in organic production • Need special packaging for transport in order to preserve the quality of the fruit, which increases the production of organic cherries
Possibilities	Threats
<ul style="list-style-type: none"> • Using funds from the IPARD and other funds • Investments in processing capacities and processing of cherries to be achieved higher profits • With current technology, it is easier to obtain information about the inputs, current markets for organic products and the like. • The growing demand for organic products 	<ul style="list-style-type: none"> • Due to the high cost of inputs for organic farming, can redirect conventional cherry production run • Insufficient control of imports and "suppression" of domestic organic production • The fall of the purchasing power of citizens, and therefore the demand for organic product • Insufficient incentives in the sector of processing of organic products

The issue of quality is very important hence the quality itself provides the means of market conquest and advantage over competition (Milić et.al., 2009). The quality should be managed during production, processing, transport, storage, packaging, i.e., during all the stages through which a product must go to reach the final consumer. With well-organised management and managing, the competitiveness is established as well as the increase in profit and satisfaction of the customer's demand.

CONCLUSION

Cherry is one of the promising fruits whose production increases in the world and in our country. Areal distribution

cherry is very wide, because this kind of fruit does not set specific requirements in terms of environmental conditions. However, despite the modest demands, cherry production in Europe and the world is scarce in the market. Permanently raises the problem of harvesting and providing a large number of workers to carry out the harvest.

In terms of organic production economy coefficient is 2.40 average net profit of € 3,804, while in terms of conventional production economy coefficient 1.97, and the average net profit of €2,252. Based on these indicators, the production of cherries and the organic and the conventional method is economically acceptable. However, organic farming provides more favorable economic results. The average net income in the production of organic cherries is bigger than that of conventional eye €1,552 / ha. The rate of accumulation in organic production of cherry is higher than in the conventional for 22.46%. Also, the period of return of investment in this production is more favorable, i.e. shorter compared to the conventional production.

Despite existing strengths, opportunities and weaknesses in the production of cherries in the Republic of Serbia, the biggest threats to the high price of inputs for organic farming, manufacturers can redirect conventional cherry production, insufficient control of imports and "suppression" of domestic organic production, the decline in spending the ability of citizens, and therefore the demand for organic products, as well as insufficient incentives in the sector of processing of organic products.

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