INDICATORS OF ECONOMIC EFFICIENCY OF SOUR CHERRY IN DIFFERENT PRODUCTION SYSTEMS

POKAZATELJI EKONOMSKE EFIKASNOSTI VIŠNJE U RAZLIČITIM SISTEMIMA PROIZVODNJE

Srboljub NIKOLIĆ*, Zorica SREDOJEVIĆ**, Nebojša NOVKOVIĆ***, Slaviša ARSIĆ*
*Military Academy, the University of Defense in Belgrade,
Department of Logistics, Veljka Lukića Kurjaka 33, 11000 Belgrade
**The University of Belgrade - Faculty of Agriculture, Institute of Agroeconomy, Nemanjina 6, 11080 Belgrade - Zemun
***The University of Novi Sad, Faculty of Agriculture, Novi Sad, Trg Dositeja Obradovića 8, Serbia
e-mail: zokas@agrif.bg.ac.rs

ABSTRACT

The subject of this research is the economic results of conventional and organic production of sour cherries in the Republic of Serbia. The aim of the research is to determine the economic efficiency and the possibility of greater representation of organic production, as a system of conservation of natural resources and especially land. A minimum selling price of organic cherries (0.44 €/kg) has been set, at which producers can achieve a gross margin of 2,530 €/ha, as well as in the conditions of conventional production. By selling organic sour cherries at a much better selling price (0.50 €/kg) than the price of sour cherries from conventional production (0.36 €/kg), producers manage to "cover" production costs of 2,840 €/ha and achieve a gross margin of 3,910 €/ha. The gross margin includes the reimbursed lost economic benefit of 1,030 €/ha and a profit of 2,880 €/ha.
Keywords: sour cherry, different production systems, economic indicators.

REZIME

Predmet ovog istraživanja su ekonomski rezultati konvencionalne i organske proizvodnje Oblačinske višnje u Republici Srbiji. Cilj istraživanja je analiza ekonomske efikasnosti i mogućnosti veće zastupljenosti organske proizvodnje, kao sustava očuvanja prirodnih resursa, a posebno zemljišta. Poseban akcenat je dat na utvrđivanju propuštene ekonomske koristi koja se javlja organskom proizvodnjom višnje. Kalkulativnim postupkom utvrđeno je da se od organski proizvedene Oblačinske višnje dobija manji prihod od prodaje za 720 €/ha (13%), a na drugoj strani nastaju viši varijabilni troškovi za 21%, što daje manji iznos bruto marže za 1.030 €/ha (34%) u odnosu na konvencionalnu proizvodnju.

Utvrđena je minimalna prodajna cena organske višnje u iznosu od 0,44 €/kg, pri kojoj proizvođači mogu da ostvare bruto maržu od 2.530 €/ha, u istom iznosu kao i u uslovima konvencionalne proizvodnje. Realizacijom organske višnje po znatno povoljnijoj prodajnoj ceni (0,50 €/kg) od cene višnje iz konvencionalne proizvodnje (0,36 €/kg), proizvođači uspevaju da »pokriju« troškove proizvodnje od 2.840 €/ha i ostvare bruto maržu od 3.910 €/ha. U bruto marži su sadržani refundirana propuštena ekonomska korist od 1.030 €/ha i iznad toga profit od 2.880 €/ha. U konvencionalnoj proizvodnji višnje, prosečan iznos neto dobiti je 2.241 €/ha, a u organskoj proizvodnji višnje je 2.970 €/ha. Kao podrška za poštovanje principa IPARD – agroekološke mere, proizvođačima organske višnje bi trebalo da se izvrši nadoknada u visini propuštene ekonomske koristi u iznosu od 1.030 €/ha. Prema utvrđenim pokazateljima, organska proizvodnja višnje je ekonomski efikasnija i ekološki prihvatljivija u odnosu na konvencionalnu proizvodnju.
Ključne reči: višnja, različiti sistemi proizvodnje, ekonomski pokazatelji.

INTRODUCTION

Sustainability is a three-dimensional concept that encompasses economic, environmental, and social aspects *(Mani et al., 2016)*. The ability of any sector to support a defined level of development is directly linked to the fulfillment of the principles of sustainability *(Acelanu, 2016)*. The development of new technologies in agriculture, not only increases productivity and efficiency but also achieves savings of energy and natural resources, with the improvement of existing and production of new products, as well as methods of management and organization of production *(Sredojević et al., 2014)*. Relatively high shares of organic land in the total utilized agricultural area, the continuous growth of production and number of producers, as well as a rapidly growing market, show good dynamics of organic production *(Vehapi, 2019)*.

In today's business conditions, agricultural producers are increasingly successfully assessing production efficiencies and the possibility of achieving adequate profits by growing crops for which there are favorable natural conditions *(Sredojević & Milić, 2008)*. Manufacturers are increasingly following global technology trends and facing global markets The shift from conventional to organic farming practices can contribute to the

sustainability of those areas that would otherwise be at risk of abandonment *(Testa et al., 2015)*.

By production according to conventional principles, the priority is on quantity, that is, on the largest possible volume of production, and thus better profit, and it is considered that "money can solve all problems and lead to prosperity" *(Milić et al., 2007; Milić et al., 2012)*. In organic production, it seeks to connect the ethical, economic, social and societal interests of the individual. Priority is given to quality and more biologically valuable products, and special importance is given to the sustainable use of natural potentials of land and water and the preservation of biodiversity *(Sredojević et al., 2018)*.

The area under orchards is only 182,923 ha, which represents 5.26 % of the total used agricultural land. The subject of this research is the economic results of the production of Oblačinska višnja in conventional and organic conditions in the Republic of Serbia. In terms of location and soil quality, sour cherry is a very modest crop and can be successfully grown on all terrains and in arid areas *(Milić & Lukač-Bulatović, 2005)*. In the Republic of Serbia, of the total area under orchards, about 10.30 % are sour cherry orchards *(SORS, 2021)*.

The largest part of the area under sour cherry orchards is located in Southern and Eastern Serbia (70 %), followed by Šumadija and Western Serbia (13.8 %), Vojvodina (11 %), and

the least in Belgrade (5.3 %). The aim of the research in this paper is to determine the economic indicators of sour cherry cultivation in conventional and organic conditions. Emphasis is placed on determining the lost economic benefits of organic sour cherry cultivation, as a way of preserving natural resources, especially land.

MATERIAL AND METHOD

For the research in this paper, the data collected by the survey from sour cherry growers on family farms in the region of Western and Southwestern Serbia were used. Data from the database was also used by The Research Institute of Organic Agriculture *(FiBL,2021),* as well as data from the records on organic production under the jurisdiction of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia *(MAFWM RS, 2021).* The values of the most important economic indicators of sour cherry production in organic and conventional production were calculated by a calculation procedure.

The indicators determined: gross income, variable costs, gross margin, savings or additional costs, lost profits, lost economic benefit and from the aspect of economic acceptability, the minimum selling price of organically produced cherries. The lowest acceptable volume for a representative year of production during the exploitation of cherry orchards is determined according to the expression: $Q_{min} = FT / (pc - vt)$, where Q_{min} represents the minimum volume of cherry production; pc means the selling price of cherries; vt is a symbol for variable costs; FT represents fixed costs in cherry production.

RESULTS AND DISCUSSION

Areas under organic production in the world and in the Republic of Serbia

Today, there are over 72.3 million hectares of land under organic agriculture in the world. Looking at the continents, the areas under organic production are distributed as follows: there are 35.9 million hectares in Oceania; there are 16.5 million hectares in Europe; there are about 8.3 million hectares in Latin America; there are 5.9 million hectares in Asia; there are 3.6 million hectares in North America, and there are 2.0 million hectares in Africa. Of the total area under organic production and the world, there is 50 % in Oceania. In Europe, in recent years, there has been a steady increase in areas under organic production and make up over 23 %, and in Latin America, it covers about 12 % of the total area in the world *(FiBL, 2021).*

In addition to agricultural land, there are other areas suitable for collecting organic products. The largest share consists of areas for collecting wild plants and fruits, as well as areas for beekeeping. Other areas are aquaculture, forests and pastures. In many countries, the potential of such areas is not recorded, because it counts only on agricultural land. These areas total more than 34.8 million hectares. Areas for collecting wild species of plants, fruits, as well as for beekeeping are distributed in four regions: Europe, Africa, Asia and Latin America, which reflects a completely different pattern from that for agricultural land. The collection of selected wild species is defined by the asic standards of the International Federation of Organic Agriculture Movement (IFOAM), and wildlife collection activities are regulated by the laws on organic products *(FiBL, 2021).* According to the data, more than 91 % of producers of organic products are located in Asia, Africa and Europe. The country with the largest number of producers is India (1,366,226), followed by Uganda (210,353) and Ethiopia (203,602). There is an increase in the number of more than 353,000 producers compared to 2018, or 12.7 %. However, often in group certification, certification holders do not register all producers, so the number of producers of organic products is significantly higher than 3.1 million.

The global market for certified organic food and beverages has reached over 106 billion euros. Compared to 2000, the turnover of organic products has increased over eight times. About 10 % of organic product revenue is generated in North America and Europe. The largest market for organic food is the United States with 44.7 billion euros from the sale of organic products, followed by Germany with 12.0 billion euros and France with 11.3 billion euros *(FiBL, 2021).*The share of areas under organic production in the total agricultural area is gradually increasing and in the last year of observation is 0.61 % (Table 1). Production according to organic principles in the Republic of Serbia takes place on a total area of 21,265.44 ha *(*http://www.minpolj.gov.rs/*).* These areas include certified organic production and those that are in the process of conversion, i.e. phase of transition from conventional to organic production. In the structure of organic plant production in the Republic of Serbia, the most represented are orchards with a share of 43 %. They are followed by cereals with a share of 26 %, industrial plants with 14 % and fodder plants with 10 %. In the last decade, there was a sharp increase in areas under organic production from 6,340.09 ha in 2012 to 21,265.44 ha in 2019. In the same period, by arranging and translating unused areas, the areas for use increased by 0.56 %, i.e. from 3,462,215 to 3,481,567 ha. Control and certification tasks in organic production are performed by control organizations: Examination Center d.o.o. Belgrade; Ecocert Balkan d.o.o, Belgrade; Organic Control System d.o.o, Subotica; Ecovivedi d.o.o. Belgrade; Tms Cee d.o.o. Belgrade; Sgs Belgrade d.o.o. Belgrade.

Economic indicators of cherry production

In the practice of organic production, it is often pointed out from experts that organic production can be expected to lose income, additional costs, or lost economic benefits. However, it is known that organic production not only contributes to the production of quality food but also the preservation and protection of agricultural land and the reduction of water pollution. The economic benefit that is "sacrificed" to achieve a goal is often referred to as a lost or lost benefit (Sredojević, 2018). According to the average amounts of investments and yields, in conventional and organic production, a calculation was made for Oblačinska sour cherry (Table 2). Based on the results determined by the calculation procedure for one production cycle, it was determined that the organic production of Oblačinska sour cherry received a lower sales revenue by 720 €/ha (13 %), and on the other hand, the variable costs increase by 21 %, which gives a total lower amount of gross margin by 1,030 €/ha (34 %) compared to conventional production. In order for producers to reach a gross margin of 2,530 €/ha with organic cherry production, as in the conditions of conventional production, a minimum price of cherries (0.44 €/kg) was set below which it would not be justified to sell organic cherries.

Table 1. Used agricultural land and share of areas under organic production in the Republic of Serbia, 2012-2019

Year	Used agricultural areas		Areas under organic production	
	(ha)	Index **(2012=100)**	**(ha)**	Share **(%)**
2012	3,462,215	100.00	6,340.09	0.18
2013	3,490,632	100.82	8,227.99	0.23
2014	3,506,830	101.29	9,547.82	0.27
2015	3,468,519	100.18	15,298.02	0.44
2016	3,439,887	99.36	14,357.95	0.42
2017	3,438,130	99.30	13,423.13	0.39
2018	3,486,908	100.71	19,254.58	0.55
2019	3,481,567	100.56	21,265.44	0.61

Source: https://www.stat.gov.rs/*;* http://www.minpolj.gov.rs/

The minimum price is 22 % higher than the price of cherries from conventional production (0.36 €/kg). To support producers of organic cherries for compliance with the principles of the IPARD measure, they should be compensated in the amount of lost economic benefits in the amount of 1,030 €/ha. In order to implement agri-environmental measures and support the development of organic production, a special measure should encourage production and another measure to regulate market fluctuations in the selling price of organic products (Sredojević & Simić, 2016; Sredojević, 2018). By applying the determined minimum price, as well as using the actual market price of organic cherries, in Table 3, for all variants, the efficiency indicators of organic cherry production are determined.

As can be seen in Table 3, the gross margin was calculated for three different prices of organic cherries, namely: The first, market (selling, buying) price of organic cherries (0.36 €/kg) is the same as in conventional production, namely is the case when lost income and/or additional cost or lost economic benefit is calculated. The calculated gross margin in organic (2,020 €/ha) is 32 % lower compared to the gross margin from conventional production (3,050 €/ha); Second, the minimum selling price of organic cherries (0.44 €/kg) at which the gross margin in organic is equal to the gross margin from conventional production; Third, the actual market (purchase, sale) price of organic cherries (0.50 €/kg), which is 38 % higher than the price from the conventional, and 14 % higher than the minimum organic, and the gross margin calculated for it (3,910 €/ha) is 28 % higher than the gross margin from the conventional, i.e., from the gross margin organic at the minimum selling price (3,050 €/ha). By selling organic cherries at a better selling price than conventional ones, producers manage to "cover" production costs of 2,840 €/ha and achieve a gross margin of 3,910 €/ha, which includes a refunded lost economic benefit of 1,030 €/ha and above, profit from 2,880 €/ha. The production of Oblačinska sour cherry achieves a positive gross financial result per unit area in both conventional and organic production (Table 4).

The coefficient of the economy in conventional production is 1.80, which means that such production is economical for producers. In organic production, the coefficient of the economy is 1.95, which confirms that even though production is more economical, a higher income per unit of expenditure is achieved compared to conventional production.

Table 2. Missed economic benefits of organic Oblačinska sour cherry production

Economic indicators	Production		Difference(I-II)
	Conventional (I)	Organic (II)	
Yield of sour cherries, *kg/ha*	15,500.00	13,500.00	-2,000.00
Selling price, *€/kg*	0.36	0.36	-
I Revenues, *€/ha*			
- Sales of products	5,580.00	4,860.00	-720.00
- Incentives			-
Total *(I):*	5,580.00	4,860.00	
Lost / Additional Income, €/ha:			*-720.00*
II Costs, *€/ha*			
Fertilizers			
- mineral	640,00	-	+640,00
- organic	-	730,00	-730,00
Plant protection			
- chemical	580.00	-	+580.00
- biological	-	720.00	-720.00
Mechanical services	660.00	490.00	+170.00
Work of workers	590.00	700.00	-110.00
Certificate. and control	-	130.00	-130.00
Other costs	60.00	**70.00**	- 10.00
Total *(II):*	2,530,00	2,840.00	
Savings / Additional cost, €/ha:			*-310.00*
III *Gross margin* (I-II):			
Gross margin, *€/ha*	3,050.00	2,020.00	**-**
Gross margin, *€/kg*	0.20	0.15	
Missed economic benefit, €/ha:			*-1,030.00*
Missed economic benefit, €/kg:			*-0.07*

Source: Authors' calculation based on survey data

Table 3. Economic indicators of organic production Oblačinska sour cherry with different prices

Economic indicators	Conventional production	Gross margin (BM) organic production with different cherry prices		
		Price of convent. products	Minimum price*) (BM=conv.)	Actual market price
Yield, *kg/ha*	15,500.00	13,500.00	13,500.00	13,500.00
Price, *€/kg*	0.36	0.36	**0.44**	0.50
Revenues, *€/ha*	5,580.00	4,860.00	5,890.00	6,750.00
Costs, *€/ha*	2,530.00	2,840.00	2,840.00	2,840.00
Gross margin, *€/ha*	**3,050.00**	2,020.00	**3,050.00**	3,910.00

) Minimum selling price of organic sour cherries at which the gross margin (BM) is obtained in the same amount as in conventional production Source: Authors' calculation based on survey data

Table 4. Economic indicators of Oblačinska sour cherry production

Production	Production	
	Convent.	Organic
The average yield of sour cherries, *kg/ha*	15,500.00	13,500.00
The sales price of sour cherries, *€/kg*	0.36	0.50
Gross sales revenue, *€/ha*	5,580.00	6,750.00
Variable costs, *€/ha*	2,530.00	2,840.00
Amortization, interest, etc., *€/ha*	560,00	610,00
Total cost, *€/ha*	3,090.00	3,450.00
Gross profit, *€/ha*	2,490.00	3,300.00
Gross profit tax, *€/ha*	249.00	330.00
Net profit, *€/ha*	2,241.00	2,970.00
Accumulation rate, *%*	72.52	86.09
The cost of cherries, *€/kg*	0.14	0.22
Coefficient of economy	1.80	1.95
Profitability threshold, *kg/ha*	10,540.00	8,505.00

Source: Authors' calculation based on survey data

The average net profit in conventional cherry production is 2,241 €/ha and in organic 2,970 €/ha, which shows that organic cherry production is more economically efficient than conventional production. The profitability threshold in conventional production is around 68 % of yield, and in organic around 63 % of yield. According to the results of the economic analysis, it can be concluded that, for producers, organic production of cherries is more economically efficient than conventional ones.

CONCLUSIONS

Compared to conventional production, organic production of Oblačinska sour cherry yields lower sales revenue by 720 €/ha (13 %), and on the other hand, variable costs increase by 21 % and based on all this, a lower gross margin of 1,030 €/ha (34 %). In order for producers to reach the gross margin of 2,530 €/ha with organic production of Oblačinska sour cherry, as well as in the conditions of conventional production, the minimum selling price of organic cherries was set at 0.44 €/kg. By achieving a more favorable selling price for organic cherries compared to conventional ones, producers manage to "cover" production costs of 2,840 €/ha and achieve a gross margin of 3,910 €/ha. The stated amount of gross margin contains a reimbursed lost economic benefit of 1,030 €/ha and above that, a profit of 2,880 €/ha. The procedure of determining the amount of lost income and /or additional costs, and thus lost economic benefits can be useful for the successful implementation of IPARD measures (agroecological - climatic measures and measures of organic production in Serbia). The coefficient of the economy of sour cherries in the conventional is 1.80 and in the organic, it is 1.95. In both cases, the coefficient is higher than one, but the production of sour cherries in organic is more economical than conventional production. Also, sour cherry production achieves a positive gross financial result per unit area in both systems. The average net profit in conventional cherry production is 2,241 €/ha and in organic 2,970 €/ha, which shows that organic cherry production is economically more efficient than conventional. The profitability threshold in conventional production is around 68 % of yield, and in organic around 63 % of yield. According to the results of economic analysis, it can be concluded that, for producers, organic production of cherries is more economically efficient than conventional.

REFERENCES

Aceleanu, M.I. (2016). Sustainability and competitiveness of Romanian farms through organic agriculture. Sustainability, 8, 245.
FiBL (2020). Data on organic agriculture 2007-2017. The Organic-World.net website maintained by the Research Institute of Organic Agriculture (FiBL), Frick, Switzerland, https://statistics.fibl.org/
(Date of access, 05.12.2021)
Mani, V., Agarwal, R., Gunasekaran, A., Papadopoulos, T., Dubey, R., Childe, S. (2016). Social sustainability in the supply chain: Construct development and measurement validation. Ecol. Indic., 71, 270–279.
Milić, D., Lukač Bulatović, M. (2005). Stanje i tendencije proizvodnje voća u Srbiji. Journal on Processing and Energy in Agriculture, 9(3-4),94-97.
Milić, D., Lukač Bulatović, M., Kukić, Đ. (2007). Ekonomska opravdanost proizvodnje sušenog voća na porodičnoj farmi. PTEP - Časopis za procesnu tehniku i energetiku u poljoprivredi, 11(1-2),14-16.
Milić, D., Sredojević, Z., Marjanović, S. (2012). Ekonomska analiza integralne i organske proizvodnje voća. Journal on Processing and Energy in Agriculture, 16 (1), 23-27
MAFWM RS (2021). Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. (MPŠV RS) Ministarstvo poljoprivrede, šumarstva i vodoprivrede Republike Srbije
www.minpolj.gov.rs (Date of access, 30.01.2021.)
Sredojević, Z., Milić, D. (2008). Mogućnost procene rizika poslovanja poljoprivrednog preduzeća. Nacionalno društvo za procesnu tehniku i energetiku i Poljoprivredni fakultet, Novi Sad, PTEP - Časopis za procesnu tehniku i energetiku u poljoprivredi, Vol. 12, br. 1-2, str. 53 – 57.
Sredojević, Z. (2014). Value Chain Analysis of Region Specific Organic Products in Serbia. Study for FAO UN by Project: Assistance to the Development of Capacity and Support Services for Organic Agriculture in Serbia, GCP/SRB/001/HUN, pp. 97.
Sredojević, Z., Simić, I. (2016). Priručnik: Kako ostvariti profit u organskoj proizvodnji? Nacionalno udruženje za razvoj organske proizvodnje "SERBIA ORGANIKA", Beograd.
Sredojević, Z., Oljača, S., Kresović, B., (2017). Organska poljoprivredna proizvodnja - *osnove planiranja i analiza poslovanja*, Monografija, Univerzitet u Beogradu, Poljoprivredni fakultet, Beograd, str. 262.
Sredojević, Z. (2018). Ekonomska efikasnost organske proizvodnje, Poglavlje u monografiji, Efikasnost organske proizvodnje – malina, višnja i paprika, Sredojević Z., Oljača, S., Poljoprivredni fakultet, Beograd, str. 235-284.
Statistical Office of the Republic of Serbia, https://data.stat.gov.rs/Home/Result/13050101?languageCode=sr-Cyrl, (Date of access, 28/01/2021).
Testa, R., Foderà, M., Trapani, A.M., Tudisca, S., Sgroi, F. (2015). Choice between alternative investments in agriculture: The role of organic farming to avoid the abandonment of rural areas. Ecol. Eng., 83, 227–232.
Vehapi, S. (2019). Determinante razvoja tržišta organske hrane u zemljama Zapadnog Balkana. Marketing, 50(1), 43-56.