

ECONOMIC SUSTAINABILITY OF PRODUCTION OF PLUM AND CHERRY ON FAMILY HOLDINGS IN THE REPUBLIC OF SERBIA

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Abstract

The production of plum and cherry, as stone fruit species, occupy a significant place in the plant agricultural activity of the Republic of Serbia. In this paper, on the basis of data from selected family holdings in the southern part of Serbia, the production results and evaluation of the economic justification of these two fruit species were investigated. Data collected through a survey were used for the research, and the economic evaluation was performed using static calculative methods. The most important economic indicators determined were: cost price, net profit (average amount), accumulateness expressed through the rate and time period of investment capital. When producing plums, the average annual financial result is from 503,490 RSD/ha to 594,340 RSD/ha. The analysis determined that by investing RSD 100/ha in production of plum, 40 RSD is accumulated, and the average annual net profit is 425,313 RSD/ha. From the average amounts of net profit, investments made in raising plum trees plantations (1,080,000 RSD/ha) can be recovered during the third year of its exploitation. Although the yield of cherry per unit area is lower compared to the yield of plum, better economic results in the amount of 535,800 RSD/ha to 682,920 RSD/ha are achieved due to a much more favorable selling price per unit measure. For every RSD 100 invested in cherry production, 48 RSD of accumulation is achieved. The average net profit amounts to 492,099 RSD/ha, and the investments made in raising plantations of cherry trees (1,020,000 RSD/ha) can be recovered in the third year of its exploitation. In recent years, cherry have been very profitable fruit species in Serbia, due to the high demand and favorable selling price. With permanent education of fruit producers, as well as with various support measures at the state and local level, it is possible to contribute to the improvement of the existing business and improve the profitability of plums and cherry production.

Key words: production of plum and cherry, family holdings, economic results

INTRODUCTION

The production of stone fruit is very widespread in the world, because it has characteristics that are suitable for processing [2]. Fruit growing is an important branch of agriculture in the Republic of Serbia. Areas under fruit plantations account for 5.2% of the total agricultural areas in Serbia [13]. In the world, from the total area under plum plantations, the largest share is in Asia 78.62%, followed by Europe 16.05%, America 3.08%, Africa 2.12% and Oceania 0.13% [1]. Serbia is one of the leading countries in the world in plum production. The production of plums is realized on small, fragmented and neglected plots where it is not possible to implement productive agro-

technical measures with the use of mechanization. According to the average annual production of 440.91 thousand tons, Serbia ranks third in the world, with a 3.77% share in the total world production of plum. The first and second places are occupied by China and Romania. However, despite the significant production volumes of plums in Serbia, the average yields per unit area are at a low level and are only around 5.35 t/ha according to the Food and Agriculture Organization (FAO) [1], i.e. 6.49 t/ha according to the database Statistical Office of the Republic of Serbia (SORS) [13].

Plum has been cultivated in the Republic of Serbia for centuries due to a number of advantages: it is relatively easy to reproduce, it germinate quickly and it thrive in hilly and

mountainous areas [7]. It is grown in the area of western Serbia, Šumadija and part of southern Serbia around Prokuplje [14]. Over 50 types of products are obtained by processing plums. From it, brandy known as šljivovica is obtained as one of the traditional Serbian products [7]. One of the most important factors in the successful production of fruit is the correct selection of the variety [8]. The leading varieties of plum in Serbia are: Čačanska lepotica, Stanli, Čačanska rodna, Valjevka and Požegača. Protection of fruit trees plantations is the main factor in preserving yield from increased air humidity and moderate temperature [15]. In countries with developed fruit trees growing, associations of producers regularly monitor the state of fruit production in their country, in the surrounding area, as well as in the most important competing countries, and in this way plan the structure of production by types of fruit trees, as well as within the species, represented varieties [10], [11]. In the costs of plum production, the calculation procedure determined that material costs (fertilizer, protective agents, fuel, etc.) account for the largest share, about 45%, followed by labor costs, from 35 to 37%, and other costs, from 18 to 20% [11].

Cherry is one of the oldest fruit species. According to calculative procedures, in the structure of the total costs of cherry production, the largest share is material costs, about 45%, followed by labor costs, about 36%, and other costs, about 19%. Realized production results, dynamics and structure of costs in the process of fruit production are influenced by a number of factors such as, for example location of production, terrain configuration, type of soil, type of fruit culture, level of production technology, etc. [10], [12]. The leading cherry varieties for production plantations are: burlat, stella, van, stark hardy giant and binge [4], [9], [5], [6]. The orchards of plum and cherry trees represent long-term investments. That is why it is important to consider the important factors for their successful exploitation before raising them. Mistakes made during planting cannot be corrected later. In order to make a successful investment, one should try to avoid

or possibly mitigate potential risks when planning and designing orchards [10, 12].

Based on data on the production of plums and cherries on selected family holdings in the southern part of the Republic of Serbia, the subject of this research is the focus on the situation on the ground and determining the indicators of the economic justification of growing these two fruit species. The main goal of the research is to identify problems, find opportunities and propose solutions for improving the key organizational, technological and economic factors for the improvement and sustainability of the production of the analyzed fruit species, i.e. plum and cherry.

MATERIALS AND METHODS

A survey with representative producers of plums and cherries in the southern part of Serbia was used as the basic source of data for this research. In addition to the data collected by the survey, available internal records on family farms were used, as well as the database of the Statistical Office of the Republic of Serbia (SORS). On the basis of the collected input and output data, the average values of the initial parameters were determined and an analysis of the economic justification of plum and cherry production was performed using a calculative procedure. By applying static calculation methods, more important indicators of economic justification were determined: average net profit, accumulative rate and period of return of financial investments.

The average net profit is determined as the quotient of the sum of net profits in individual years and the number of years of the analyzed period. This value is compared with marginal net profit. The higher the average net profit is than the marginal, the more economically efficient production is, and vice versa. The accumulative rate is determined as a quotient between the average net profit and the total investment in production. Given that it is a relative indicator, the calculated amount is multiplied by 100%, thereby obtaining the answer to the question: What is the financial effect on each euro of invested capital?

The return on investment period was determined as a quotient between total investments and average net profit, and during the economic assessment, it was compared with the period of the projected cash flow analysis.

RESULTS AND DISCUSSIONS

According to statistical data [13], of the total area of agricultural land in the Republic of Serbia, i.e. of 27,860,228 ha, family holdings include 20,174,205 ha of agricultural land, while within the framework of business companies, cooperatives, etc. they use 7,686,022 ha. 72.41% of the land area is cultivated on family agricultural farms, and 27.59% is cultivated within economic companies, cooperatives, etc. Given that the production of plum and cherry in Serbia mainly takes place on family holdings, the possibility of their economic sustainability was investigated. As the main criterion for the sustainability of holdings in the southern part of Serbia, the profitability of the production of plum and cherry in the past two-year period was analyzed and projected for the next six years. Profitability was determined on the basis of data collected by a survey of 18 family holdings, on which there are different areas with plantations with plum and cherry trees. Average amounts were used in the analysis, and all indicators were calculated per 1 ha of area.

Economic analysis of the production of plums at family holdings

According to the data collected by the survey, the average yields, production costs and cost price of plums were determined, then the sales prices achieved by individual classes during 2021 and 2022 and the amounts are shown in Table 1.

In order to see the real picture of the economic results per unit of measure and other economic indicators of the production of plum, the analysis did not take into account incentives for plant products and other financial support from the state.

As can be seen in Table 1, the yield of plum was higher in 2022 compared to 2021.

However, production costs per unit area were also higher in 2022 compared to 2021.

During both analyzed years, in the structure of plum production costs, the largest share was material costs - fertilizer, protection agents, fuel, etc., on average 45%, then labor costs 36% and other costs on average 19%. The amount of yield, the costs of individual inputs, as well as the economic result, vary by individual years, as well as by plum plantations.

Table 1. The cost of production in plum trees growing per 1 ha, 2020-2022

Indicator	Year			
	2021		2022	
Yield (t)	27.20		30.40	
The first class (t)	19.04		21.28	
The second class (t)	8.16		9.12	
Selling price (RSD/kg)				
The first class	38.00		40.00	
The second class	30.00		32.00	
Costs	Amount (RSD)	Share (%)	Amount (RSD)	Share (%)
Material	208,270	45.00	252,370	46.00
The work of workers	161,990	35.00	202,990	37.00
Depreciation	55,540	12.00	54,860	10.00
Foreign services	9,260	2.00	10,970	2.00
Other	27,770	6.00	27,430	5.00
Total:	462,830	100.00	548,620	100.00
Cost price per unit of measure (RSD/kg)				
The first class	18.00		19.00	
The second class	14.00		15.00	

Source: Author's calculation based on family holdings data.

In the period of full fertility, the costs of maintaining and cultivating the soil in the total costs have a small share, about 10%, the costs of fertilization about 13%, the costs of protection about 15%, the costs of pruning about 12%, the costs of harvesting about 45% and other costs make up 5%.

The selling prices of plums were different by year and in 2021 it amounted to 38.00 RSD/kg and is significantly higher than the cost price per first class unit in the amount of 18.00 RSD/kg. Also, the sales price of the second class in the amount of 30.00 RSD/kg is higher than the cost price of plums in the amount of 14.00 RSD/kg. In 2022, the sales price in the amount of 40.00 RSD/kg is above the cost price of the first class in the amount of 19.00 RSD/kg. Also, the selling price of the

second class in the amount of 32.00 RSD/kg is above the cost price in the amount of 15 RSD/kg. Therefore, in both years, plum production was economically justified, and the achieved more favorable financial results are shown in table 2. According to the results determined by the calculative procedure (Table 2), on the analyzed family holdings, with the production of plum, a more favorable financial result was achieved in 2022 (594,340 RSD/ha) compared to 2021 (503,490 RSD/ha).

Table 2. Financial result of in the production of plum

Indicator	Amounts by year (RSD/ha)		
	2021	2022	Average 2021-2022
Gross Income	966,320	1,142,960	1,054,640
Total cost	462,830	548,620	505,725
Financial result	503,490	594,340	548,915

Source: Author's calculation based on family holdings data.

Gross income and therefore the financial result largely depend on the amount of yield. The yield of plum, to the greatest extent, depends on the variety, substrate, cultivation form and applied care measures. It is important to point out that, in addition to the natural consumption of inputs and yields, an important role in business is played by the relationships between input and output prices. If the market conditions are stable for a long period of time, it is possible to forecast the tendency of future business indicators. In order to analyze the economic sustainability of plum production on family holdings based on the average production and economic results for 2021 and 2022, projected revenues and costs for the next six-year period.

During the projection, the impacts of potential risk factors were taken into account, and the amounts per year for the period 2023-2028 year, are given in Table 3.

Table 3. Projected revenues and costs in the production of plum on family holdings, 2023-2028 (RSD/ha)

Indicator	Year					
	2023	2024	2025	2026	2027	2028
Income	1,050,500	980,450	1,100,050	1,030,300	980,600	1,110,080
Costs	510,300	490,700	520,150	500,200	80,750	560,030
Gross profit	540,200	489,750	579,900	530,100	499,850	550,050
Tax on gross profit	108,040	97,950	115,980	106,020	99,970	110,010
Net profit	432,160	391,800	463,920	424,080	399,880	440,040

Source: Author's calculation based on data collected on family holdings.

Given that it is a shorter period of time (six years), the amount of interest has no significant impact on the projected amounts of income and expenses, so static calculative methods were applied to assess the economic justification of investment for plantations of plum and cherry trees. At the same time, the efficiency coefficient, average net profit, accumulation rate and investment return time were determined from the indicators. The final amounts of indicators are given in Table 4.

Table 4. Indicators of economic justification of the production of plum on family holdings

Indicator	Amount
Investment investments (RSD/ha)	1,080,000
Coefficient of economy	2.04
Average net profit (RSD/ha)	425,313
Accumulation rate (%)	0.40
Payback period	2.53

Source: Calculation of the authors.

Although the analyzed plum tree plantations are in the period of full fertility, when determining the economic indicators, previously made investments in planting plantations were also taken into account (according to data from the producer's internal documentation on his own holding).

According to established indicators (Table 4), for every 100 RSD invested, 40 RSD of accumulation is achieved. Therefore, plum production is economical, and the average net profit is 425,313 RSD/ha. From the average amounts of net profit, the investments made in raising plantations (1,080,000 RSD/ha) can be recovered during the third year of exploitation of plum plantations. According to some researches in Serbia [8], one of the problems of plum production is the unfavorable way of using the fruits. About 75 percent of the fresh

plums grown in Serbia are processed into brandy.

Certain producers of plum have a contract on business and technical cooperation with economic entities, with the aim of connecting within the market chain, improving competitiveness and improving the placement of fruit products. If risk events will occur, they will have a negative impact on agricultural manufacturing activities from a financial point of view and that may trigger bankruptcy for agricultural entities [3]. Agricultural insurance is particularly useful for risks caused by natural disasters.

These risks, by definition, cannot be controlled and are the effect of several factors, among which climate change plays an important role [3], [16], [17].

The potential in the production of plum and hers products, which Serbia as a country has, should be used better and more successfully. Given that the production of Serbian plum brandy was included in UNESCO's intangible cultural heritage in 2022, this should be used for greater European promotion and the European production market.

The income generated by the production of this alcoholic beverage was the driving force and incentive for the producers to work on restoring, improving and maintaining the long tradition of plum production in these areas.

Economic analysis of cherry production on family holdings

On the analyzed family farms, the ccherry yield was more favorable in 2022 compared to 2021. Due to rising input prices, cherry production costs per unit area were higher in 2022 compared to 2021. In the total costs of cherries production, the largest share was material costs 45-46%, followed by labor costs with a share of around 35-36%.

Cherries producers in Serbia have been in a very favorable economic position in recent years. Due to high demand, cherry trees plantations have been expanding in Serbia in recent years. The purchase price of cherry increases from year to year. Parameters and indicators of cherry production in 2021 and 2022 are shown in Table 5.

In the structure of cherry production costs, in both years, the largest share was the cost of

materials (fertilizer, protection agents, fuel, etc.), about 46%, followed by the labor costs of workers, about 36%.

In the period of full fertility of the plants, the costs of maintaining and cultivating the soil in the total have an average share of about 9%, fertilization costs about 13%, protection costs about 17%, pruning costs about 10%, harvesting costs about 46% and other costs about 5% .

Table 5. The parameters of the production of cherry on family holdings, 2021-2022

Indicator	Year			
	2021		2022	
Yield (t)	8.00		9.00	
The first class (t)	5.60		6.30	
The second class (t)	2.40		2.70	
Selling price (RSD/kg)				
The first class	120.00		140.00	
The second class	105.00		125.00	
Costs	Amount (RSD)	Share (%)	Amount (RSD)	Share (%)
Material	174,690	45.00	246,830	46.00
The work of workers	135,870	35.00	193,170	36.00
Depreciation	46,580	12.00	59,020	11.00
Foreign services	7,770	2.00	8,050	1.50
Other	23,290	6.00	29,510	5.50
Total:	388,200	100.00	536,580	100.00
Cost price per unit of measure (RSD/kg)				
The first class	51.40		62.60	
The second class	45.10		56.00	

Source: Author's calculation based on family holdings data.

As for plum and cherry's the sales prices were different by year and in 2021 it was 140.00 RSD/kg, which is significantly higher than the cost price per unit of the first class in the amount of 51.40 RSD/kg.

Also, the sales price of the second class in the amount of 105.00 RSD/kg is higher than the cost price of plums in the amount of 45.10 RSD/kg. In 2022, the sales price in the amount of 140.00 RSD/kg is above the cost price of the first class in the amount of 62.60 RSD/kg. Also, the selling price of the second class in the amount of 125.00 RSD/kg is higher than the cost price in the amount of 56.00 RSD/kg.

Therefore, cherry production is economically justified in both analyzed years of production, and the amounts of income, costs and financial results are given in Table 6.

Table 6. Financial result of cherry production on family holdings

Indicator	Amounts by year (RSD/ha)		
	2021	2022	Average 2021-2022
Gross Income	924,000	1,219,500	1,071,750
Total cost	388,200	536,580	462,390
Financial result	535,800	682,920	609,360

Source: Author's calculation based on family holdings data.

According to the results determined by the calculative procedure (Table 6), on the analyzed family holdings, the financial result per unit of area in cherry production is significantly better than the financial result in plum production.

The amount of 682,920 RSD/ha was achieved in 2022, and is significantly higher than the result in 2021 (535,800 RSD/ha).

Although the yield per unit area is lower compared to the yield of plums, better economic results are achieved by the production of cherry due to a far more favorable selling price.

Based on the assumption that the market conditions are stable and that there are no significant price fluctuations in a long period of time, in order to sustain the production of cherry, it is necessary to forecast profitability in the future based on the current state of business results.

In order to analyze the economic sustainability of production of cherry on family holdings, similarly to plum, based on the average production and economic results for 2021 and 2022, projected revenues and costs for the next six-year period 2023-2028, and the amounts are given in the Table 7.

Table 7. Projected revenues and costs of the production of cherry on family holdings, 2023-2028 (RSD/ha)

Indicators	Year					
	2023	2024	2025	2026	2027	2028
Income	1,130,200	1,216,400	1,071,750	1,090,100	1,089,700	990,100
Costs	510,900	560,420	462,390	508,800	495,500	359,500
Gross profit	619,300	655,980	609,360	581,300	594,200	630,600
Tax on gross profit	123,860	131,196	121,870	116,260	118,840	126,120
Net profit	495,440	524,784	487,490	465,040	475,360	504,480

Source: Author's calculation based on data collected on family holdings.

Taking into account various production, market, social and social factors, revenues in the following six-year period are in the interval from 990,100 RSD/ha to 1,216,400 RSD/ha, costs from 359,500 RSD/ha to 560,420 RSD/ha, and net profit from 487,490 RSD/ha to 524,784 RSD/ha.

Therefore, these indicators confirm that the production of cherry is very profitable and provides stability in business, and this is a key indicator of the sustainability of production and, therefore, of family holdings. The analyzed plantations with cherry trees are in the period of full fertility, and when determining the economic indicators, the investments made in raising the plantations were also taken into account (according to the data of the internal documentation of the producer, that is, the owner of the plantations). Of the economic indicators, the coefficient of economy, average net profit, and rate of accumulateness and return time

of investments made in the raising of cherry trees were determined, and the final amounts are given in Table 8. For every 100 RSD invested in cherry production, 48 RSD of accumulation is achieved. The economy coefficient of cherry is 2.75 and is significantly higher than 1.

The average net profit is 492,099 RSD/ha. Based on the established economic indicators, it is concluded that cherry production is economical and profitable.

Table 8. Indicators of economic justification of the production of cherry on the family holdings

Indicators	Amount
Investment investments (RSD/ha)	1,020,000
Coefficient of economy	2.75
Average net profit (RSD/ha)	492,099
Accumulation rate (%)	0.48
Payback period	2.07

Source: Calculation of the authors.

From the average amounts of net profit, the investments made in the raising of the

plantations with cherry trees (1,020,000 RSD/ha) can be recovered in the third year of exploitation of the plantations.

During the last years in Serbia, due to the high demand and favorable sales price, cherry is a very profitable fruit species and the producers achieve profits above expectations. This basically provides producers with security to cover business costs settle family obligations and to a significant extent achieve accumulation with which they can plan new investments on the family holdings.

CONCLUSIONS

Research results that were obtained by a calculative procedure according to data from representative family farms in the area of southern Serbia a more favorable financial result was achieved with plum production in 2022 (594,340 RSD/ha) compared to 2021 (503,490 RSD/ha). For every 100 RSD invested in plum production, 40 RSD is accumulated, and the average amount of net profit is 425,313 RSD/ha. Investments in raising plantations in the amount of 1,080,000 RSD/ha can be recovered in the third year of exploitation of plum plantations from average amounts of net profit. Observing per unit area, the financial result per unit area is very favorable in production of plum. The amount of 682,920 RSD/ha was achieved in 2022, and is significantly higher than the result in 2021 (535,800 RSD/ha).

Although the yield per unit area is lower compared to the yield of plum, better economic results are achieved by due to a much more favorable selling price, the production of cherry is more profitable. Significant accumulateness is achieved, where for 100 Serbian dinars invested in the production of cherries, 48 Serbian dinars of accumulation is realized. Also, the results show that cherry production is economical, during its production an average net profit is achieved in the amount of 492,099 RSD/ha.

From the average amounts of net profit, the investments made in the raising of cherry plantations (1,020,000 RSD/ha) can be recovered in the third year of exploitation of the plantations.

During the last years in Serbia, due to high demand and favorable purchase price, cherry is a very profitable fruit species. According to the results of the analysis, the production of plum and cherry on family farms in Serbia is economically viable. In order to improve the production results of these two fruit species in Serbia, there is a need to carry out micro-regionalization and determine favorable areas for raising plum and cherry plantations.

The possibility of improving the production of plum and cherry can be realized through various support measures at the state and local level. By using scientific achievements and engaging professional services in the raising and use of plantations, it is necessary to carry out a proper selection of plum and cherry products and to enable competitiveness on the domestic and foreign markets through marketing. With permanent education of plum and cherry producers, it is possible to contribute to the improvement of the existing business and improve profitability results.

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