CHARACTERISTICS OF PRODUCTION, TRADE AND CONSUMPTION OF PLUMS IN SERBIA[1]

Biljana Grujić Vučkovski[1], Miroslav Nedeljković[1]

[1]*Institute of Agricultural Economics, Belgrade, Serbia*

Corresponding author: biljana_g@iep.bg.ac.rs

Abstract

The aim of the paper is to determine the importance of production, turnover and consumption of plums in Serbia in the period 2013-2022. The main data sources are the Statistical Office of the Republic of Serbia (SORS) and the International Trade Centre (Trade Map). Also, appropriate scientific and professional literature was used with contents that correspond to the topic of the paper. By applying a quantitative research method, the basic characteristics of the production, turnover and consumption of plums in Serbia were analyzed, namely: area, production, yield, statistical indicators (Import dependency ratio-IDR; Self-sufficiency ratio-SSR; Consumption per capita-Cpc) and the export of plums, both in terms of quantity and value. According to the obtained results, it was observed that the features of plums production are constantly decreasing, that Serbia has a low value of dependence on imports, a high rate of self-sufficiency in fresh plums because it exports significant quantities, high consumption per capita and that about 50% of the total value of exports is placed in the top five countries of the European Union (EU).

Key words: Dependence on imports, degree of self-sufficiency, fruit growing, plums, export.

Introduction

Fruit is an important product for proper nutrition of the population (Ostojić et al., 2019). Authors' Kljajić et al., (2015) point out numerous advantages of fruit production comparing the other agricultural fields, primarily because it employs more labor, provides greater opportunities for employment and attracts the attention of various companies. Kljajić et al., (2013) state fruit growing as the most productive branch of agriculture because a significant number of fruit species can be grown on weaker soils in terms of physical, chemical and other properties, as well as on soils with a greater slope. Fruit production achieves up to 10 times higher production value per hectare than wheat and corn production, which is another economic advantage. In fruit growing, the principle of growing

in a protected area is increasingly being applied, which depends on the fruit culture being grown (Marina, Grujić Vučkovski, 2022). The purposes for this type of production are multiple, namely: achieving stable and high yields, easier production management, control of microclimate parameters, etc.

Plums are the most important stone (Birwal et al., 2016) and table fruit (Rozman et al., 2017) which is extensively cultivated worldwide (Maglakelidze et al., 2017). According to FAO data for 2021 year (FAO STAT, Rankings countries by commodity), Serbia is among the first of five countries in the world according to the quantity of plums produced (412,778 t) and ranks fourth place, while the leaders are: China with 6,615,469.1 t, Romania with 807,170 t and Chile with 426,776.28 t. Looking at the production of all stone fruit species, plums take second place in the world (Petri et al., 2018). Plum is most often used fresh, but it is also often processed (Felföldi et al., 2011), particularly drying, canning, making drinks (Birwal et al., 2016). The most well-known varieties of plums are Japanese and European, although the European plum is most often grown for commercial purposes (Zhebentyayeva et al., 2019). Beside, due to its chemical composition, the European variety of plum has a good effect on the preservation of human health

Regarding the great importance of the fruit sector, above all its economic character, the foreign trade of fruit varieties is subject to constant control of the conformity of production and consumption (Ostojić et al., 2019). The economic importance of plums production can also be described as an opportunity for the entrance to the new global markets by which is encouraged the development of entrepreneurship and the national economy (Prodanović, 2015; Nedeljković, 2021).

In Serbia, the largest fruit growing areas are owned by family agricultural holdings that need new investments in order to increase yields and improve soil quality (Mihailović et al., 2008; Grujić et al., 2012), and the dominant fruit variety is the plum. According to the SORS data, in period 2013-2022 an average of 73,438.8 ha was under plum or 42.3% of the area under orchards (eletronical database; agriculture, forestry, fisheries; crop farming). In second place are apples with an average of 25,573.8 ha and 14.7% of the total area under orchards. The third place is dominated by areas under grapes with an average area of 20,676.5 ha and 11.9% of the area under fruit crops. Raspberries and cherries follow, while the smallest area is occupied by walnut plantations with 3,440.3 ha (2%) and quince with 1,882.8 ha (1.1%). In the analyzed ten-year period, the areas under orchards accounted for an average of 5% of the total utilized agricultural area (UAA) (SORS, eletronical database, Census of Agriculture 2012, Farm structure 2018).

Many authors have researched the dependence of countries on the import of various foodstuffs and fresh materials, the degree of self-sufficiency and consumption per capita. Belmahi et al., (2023) have researched the dependence on grain imports in Morocco and found that this country became dependent on food grain imports (IDR = 39.8%) in the decade 2010-2020.

SSR has been researched by authors Brankov and Matkovski (2022). The authors analyzed the SSR of selected plant crops and products of livestock origin in the

countries of the Western Balkans. Other authors also analyzed the degree of food self-sufficiency (Slaboch and Kotyza, 2016; Kubala and Stanuch, 2021). Belmahi et al., (2023) emphasize that Morocco has reduced the rate of food self-sufficiency in the last decade (2010-2020), because SSR = 66.72%.

When it comes to the analysis of food consumption per capita, data from the website *Statista* were analyzed. Food products for nutrition were divided into 13 groups. According to their reports, during 2022 year, the population consumed the most Bread and Cereal Products with 78.48 kg/per capita, while the last ranked place was consumption of Fish & Seafood with 4.35 kg/per capita. According to the same resource, fruits and nuts group products were consumed 34.95 kg/per capita.

Material and method of work

The sources of data for the analysis are data from eletronical database of the Statistical Office of the Republic of Serbia (SORS), and the International Trade Centre. The review of the literature includes articles on relevant topics, with an additional analysis of the compatibility of the methodology used in the available literature with the methodology we apply in the paper.

The first step in the evaluation of statistical indicators of the basic characteristics of plums production in Serbia is based on the analysis of descriptive statistics in terms of area (ha), production (t) and yield (t/ha) in the period 2013-2022.

The second step involves the analysis of three indicators that should give us answers to the following questions:

- Has Serbia being dependent on the import of this fruit;

- Does sufficient quantities of this fruit for its own consumption is produced in Serbia;

- Fluctuations in plum consumption per capita (population estimates).

The answers to these questions were obtained using three statistical indicators, namely: Import dependency ratio (IDR); Self-sufficiency ratio (SSR); consumption per capita (Cpc). The mentioned coefficients were analyzed for the period 2013-2022, and were calculated using the initial equations.

The first statistical indicator (IDR) indicates how much of the available domestic food supply has been imported and how much comes from the country's own production (expressed in %). The equation *(Equation 1)* for calculating the IDR have a following form (Belmahi et al., 2023):

$$IDR = \frac{Imports}{Production + Imports - Exports} * 100 \qquad (1)$$

Negative results show that the country is a net exporter (Abdelmajid et al., 2021).

The second statistical indicator (SSR) shows whether domestic production can meet the needs of domestic consumption (expressed in %). The equation *(Equation 2)* for calculating the SSR have a following form (FAO, 2012):

$$SSR = \frac{\text{Production}}{\text{Production} + \text{Imports} - \text{Exports}} * 100 \qquad (2)$$

According to authors' Brankov, Matkovski (2022) the countries with SSR < 100 produce less food than they need. If SSR = 100, that means that the domestic food supply can satisfy domestic consumption. The countries with SSR > 100 produce more food than they consume.

The third statistical indicator (Cpc) shows the trend of plum consumption in Serbia per capita (expressed in t/per capita). The equation *(Equation 3)* for calculating the Cpc have a following form:

$$Cpc = \frac{\text{Production} + \text{Import} + \text{Export}}{\text{Estimated population}} \qquad (3)$$

The values obtained in this way indicate whether the per capita consumption of plums is increasing or decreasing.

Descriptive statistics methods were applied to the results of the aforementioned indicators, which are commented on in the rest of the text.

The third step in the evaluation of statistical data is based on the analysis of the export of this fruit variety in the period 2013-2022, both by quantity (expressed in tons) and by value (expressed in USD). In addition, an overview of the dominant countries importing fresh plums from Serbia, in terms of quantity and value, is also given.

Results and discussion

Calculations based on the ten-year average of area, production and yield under plum for all three characteristics show a downward trend, and the value of the average annual rate of change is in support of this (AARC) (Table 1).

Table 1. Dynamics of plum production indicators in Serbia (2013 – 2022)

Variable	Area (ha)	Production (t)	Yield (t/ha)
Average	73,438.80	465,808.90	6.35
Min.	72,024.00	330,582.00	4.60
Max.	76,805.00	606,599.00	8.00
St. dev.	1,619.00	93,868.93	1.23
AARC (%)	-0.67	-2.38	-1.65
Cv (%)	2.20	20.15	19.45

Source: Authors calculation according to the SORS data

The data from Table 1. show certain changes when it comes to the area, production and yield of plums in Serbia from 2013 to 2022. In the analyzed period, plums were grown on an average area of 73,438.8 ha, with an average production of 465,808.90 t and an average yield of 6.35 t/ha. The values of the coefficient of variation show that the largest oscillations are visible in production (Cv = 20.15%) and plums yield (Cv = 19.45%), while the smallest variability was recorded in the area under plums (Cv = 2.2%). If we observe at the AARC values, we notice that

all three indicators show negative values, which means that during the observed period, the area, production and yield of plums decreased on average annually. Accordingly, the authors conclude that the reduction of the area, production and yield of plums could affect the reduced supply of plums for own consumption, so Serbia, as an alternative, would have to import larger quantities of plums than in the past period.

In the following of the paper, an analysis of statistical indicators (IDR, SSR, Cpc) was carried out in Serbia, and their values are presented in tabular form (Table 2).

Table 2. Dynamics of IDR, SSR and Cpc for plum in Serbia (2013 – 2022)

Variable	IDR (%)	SSR (%)	Cpc (t/per capita)
Average	0.21	104.74	0.06
Min.	0.05	103.14	0.04
Max.	0.73	105.92	0.08
St. Dev.	0.20	0.91	0.01
AARC (%)	10.72	-0.05	-1.65
Cv (%)	94	1	21

Source: Authors calculation according to the International Trade Centre date and SORS date

In Serbia, in the observed period, the average IDR was only 0.21%, while the remaining quantities were covered by domestic production. The lowest value of this coefficient was achieved in 2019, and the highest in 2018. (Table 2). If we observe values of AARC, we notice that the value of IDR in the observed ten-year period increased by 10.72% on average per year with a high rate of variability (Cv = 94%). Based on this coefficient, we conclude that Serbia is not dependent on the import of fresh plums.

Serbia achieves a high degree of self-sufficiency with fresh plums because it can produce more than the needs for domestic consumption. Given that the average value of SSR was 104.74%, this means that Serbia can export 4.74% of its production in the analyzed period. The lowest value of this coefficient was recorded in 2019, and the highest in 2021. (Table 2). If we see at the AARC values, we can conclude that the SSR in the observed ten-year period decreased by -0.05% on average per year with a very low rate of variability (Cv = 1%).

The average consumption of fresh plums per capita in Serbia in the observed period was 0.06 t. In other words, each resident of Serbia consumed an average of 60 kg of plums per year. The lowest consumption was recorded in 2017, and the highest in 2020. (Table 2). If we observe at the AARC values, we notice that the Cpc in the observed ten-year period decreased by -1.65% on average per year with a slight rate of variability (Cv = 21%).

In the following is an overview of the participation of certain indicators important for the sector of fruit growing and export of fresh plums from Serbia (Table 3).

Table 3. Dynamics of export of fresh plums from Serbia (2013 – 2022)

Variable	Export of fruit, total (t)	Export of fresh plums (t)	Share of export of fresh plums in total export of fruit (%)
Average	465,982.5	21,921.9	4.9
Min.	368,544.0	15,450.0	2.9
Max.	540,886.0	33,031.0	9.0
St. Dev.	57,803.5	5,024.9	1.6
Cv (%)	12.4	22.9	33.6

Source: Authors calculation according to the International Trade Centre data

The data from Table 3. show that in the observed period there is slight variability in the share of fresh plums exports in total fruit exports (Cv = 33.6%).

The export of fresh plums compared to the total export of fruit was the lowest in 2017, and the highest in 2013. (Table 3). In the observed ten-year period, the number of fresh plums exported decreased by -24.7%, while the total export of fresh fruit increased by 13.6%. Based on these indicators, it can be concluded that the total amount of fruit exports is increasing, while fresh plums are decreasing.

According to the data shown in Table 4. we notice that in the observed ten-year period, the total export of fruit increased by 1.4% on average per year, while the export of fresh plums decreased on average by -3.1% per year.

Table 4. AARC of export of fruits and fresh plums by quantity from Serbia (2013-2022) (%)

	Export of fruit	Export of fresh plums
AARC	1.4	-3.1

Source: Authors calculation according to the International Trade Centre data

An analysis of the countries that import fresh plums from Serbia and the countries from which Serbia imports fresh plums in a ten-year period showed that Serbia exports the largest number of fresh plums to Bosnia and Herzegovina, and imports from North Macedonia. Following of the paper presents the dynamics of import and export of fresh plums in Serbia from 2013 to 2022 period with the first five countries of the world (Table 5).

Table 5. Dynamics of import and export of fresh plums in Serbia (2013 – 2022)

Variable	Import (t)				
	North Macedonia	Italy	Spain	Bosnia and Herzegovina	Russian Federation
Average	456.76	54.53	26.69	82.68	36.20
Min.	2.17	3.47	0.74	20.00	12.01
Max.	2,563.65	199.02	61.86	242.03	101.07
St. Dev.	775.10	60.69	24.09	70.66	30.69
AARC (%)	30.31	44.46	46.32	-19.86	3.65
Cv (%)	169.69	111.30	90.28	85.47	84.78
Variable	Export (t)				
	Bosnia and Herzegovina	Germany	Austria	Russian Federation	Czech Republic
Average	2,490.65	3,074.66	1,488.47	7,048.20	1,521.35
Min.	683.73	215.84	225.63	1,212.94	688.59
Max.	5,852.70	6,567.25	2,927.06	18,259.86	2,833.28
St. Dev.	1,768.05	2,027.02	896.90	6,196.06	704.28
AARC (%)	17.00	12.69	3.65	-20.85	-7.08
Cv (%)	70.99	65.93	60.26	87.91	46.29

Source: Authors calculation according to the International Trade Centre data

In the observed period, Serbia imported the largest number of fresh plums from North Macedonia (456.76 t on average), and the least from Spain (26.69 t). The highest average annual growth rate of plums imports was recorded in Spain and amounted to 46.32%, while imports from Bosnia and Herzegovina decreased on average annually at a rate of -19.86%. Regarding the countries from which Serbia imports fresh plums, we notice that the coefficients of variation are very high.

In the observed period, Serbia exported the largest quantities of fresh plums to Russia (average 7,048.20 t), and the least to Austria (1,488.47 t). The highest average annual growth rate of plums exports was recorded in Bosnia and Herzegovina and amounted to 17%, while exports to Russia and the Czech Republic decreased on average annually at the rate of -20.85% and -7.08%, respectively. When it comes to the countries to which Serbia exports fresh plums, we notice that the coefficients of variation are very high, which means that the exported quantities deviate significantly from the average values.

Based on the International Trade Centre data, in 2022, Serbia exported fruit (group *08 Edible fruit and nuts; peel of citrus fruit or melons*) worth approximately USD 894.4 mln. The leading fruit importing countries from Serbia (according to their share in the total export of fruit from Serbia) in 2022 were: 1) Germany (18.7%); 2) Russian Federation (17.8%); 3) France (12.1%); 4) Belgium (6.4%) and 5) USA (5.7%). To the mentioned world countries, Serbia exported fruit worth approximately USD 542.6 mln, which accounts for about 60.7% of the total fruit export from Serbia.

According to the International Trade Centre data, Serbia ranks 14th in the world in terms of export value of fresh plums (product subgroup 080940) in 2022, and Serbia's exports represented 1.5% of world exports for this product.

Export of subgroup 080940 from Serbia in the ten-year period 2013-2022 was on average USD 13.1 mln and from USD 7.8 mln (2019) exports increased to USD 14.5 mln (2022), i.e., by approximately 86% (International Trade Centre).

In 2022, Serbia exported products (by value) from the subgroup 080940 mostly to Russia Federation with a share of 17.3% of Serbia's total exports for this product group, followed by the Bosnia and Herzegovina (16.5%), Germany (15.3%), Poland (9%), and Austria (8.9%). Serbia exported 67% of the total value export of products of subgroup 080940 to the first five countries of the world.

If we look at the quantity of exported products from subgroup 080940, we see that the largest import partner of Serbia is Bosnia and Herzegovina, which during 2022 imported as much as 5,853 t, which is 23.5% of the total export of Serbia in the world. The top five countries in the world (including Bosnia and Herzegovina) according to the quantity imported are: Germany with 4,157 t or 16.7%; Austria with 2,596 t or 10.4%; Russia Federation with 2,226 t or 9%; Croatia with 1,698 t or 6.8%. In general, Serbia exported 66.4% of the total export of products of group 080940 to the first five countries of the world.

Regarding export prices for product subgroup 080940, in 2022 Serbia was achieve an average export price of 685 USD/t, which is higher than the export price achieved on the world market (584 USD/t).

Conclusion

The analyzed characteristics of plums production in Serbia in the ten-year period (area, production and yield) showed a downward trend, which may affect the reduced supply of plums for consumption at domestic market and the increase in imports.

The results of statistical indicators (IDR, SSR, Cpc) shown that Serbia:

　　a. *is not dependent on the import of fresh plums,*
　　b. *achieves a high value of the coefficient of self-sufficiency, which is the reason of being recognized as the leading exporting country in the world,*
　　c. *plums consumption per capita records relatively high values (up to 80 kg / per capita in 2021).*

Regarding that in the observed period the total export of fruit increased, and the export of fresh plums decreased, we can conclude that this result was influenced by the decrease in area, production and yield in the same period.

Serbia records significant results in the export of fresh plums, both in terms of quantity and value. Serbia is recognized as an important plum exporting country, with the first five EU countries exporting almost 50% of the total value of fresh plums exports.

The current situation in the fruit growing sector shows that future development should be focused on even more intensive production, characterized by high yields and quality fruits.

Also, the favorable natural conditions in Serbia should be used to the maximum for the production of quality table plums. In this way, producers can make more profit, and consumers get quality table fruit.

The conducted research also has its limitations, which were not analyzed in this paper, and should be mentioned: industrialization level, exchange rate, employment, etc. Future research directions could include the indicators just mentioned, because each of them to a certain extent affects changes in fruit and plum growing.

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