Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 25, Issue 3, 2025
PRINT ISSN 2284-7995, E-ISSN 2285-3952

A PRODUCTION AND ECONOMIC ANALYSIS OF SUNFLOWER: CURRENT SITUATION IN SERBIA AND BULGARIA

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Abstract

The aim of this research is an economic and financial analysis of sunflower production in Serbia and Bulgaria. The authors analyse the cultivated areas, production value, and yield of sunflower in both countries during the period from 2014 to 2023. The analysis also includes producer prices and the role of sunflower in foreign trade exchange in Bulgaria and Serbia during the same period. The applied methods involve descriptive statistics, analysis and synthesis, desk-research, and the comparative research method. The research is based on the fact that both countries have very similar climatic and geographical characteristics, water resources, as well as access to high-quality hybrids and other necessary agrotechnical measures for sunflower production. The difference lies in the financial support for production, given that Bulgaria is entitled to incentives from the EU budget, while Serbia does not have the right to use this financial support. The authors conclude that, despite the similarities and differences between the two countries, successful and profitable sunflower production can be achieved by combining several measures to improve production, as stated in the paper. These measures can help improve the efficiency and yield of sunflower, while minimizing risks and optimizing resources.

Key words: *sunflower, production, yield, prices, foreign trade exchange, Serbia, Bulgaria*

INTRODUCTION

In recent years, agriculture in Serbia and Bulgaria has been facing similar challenges. The main issue is climate change which has been recognized by the European Union as a global limiting factor for agricultural production in the long-term strategic document "The European Green Deal" [7]. In order to prevent climate change from significantly endangering agricultural production, numerous authors underline the significance of insurance as an important strategy for risk management in agriculture [20, 21, 27]. For instance, economic losses caused by natural disasters [3] ranged from 420 to 520 billion euros globally from 1980 to 2020, and in 2022 alone these losses amounted to 251 billion euros, of which only 44% were insured [20].

In addition, in the last few years, the share of agriculture in both Serbia and Bulgaria has been decreasing in gross domestic product (GDP), gross value added (GVA), and in total employment. Some authors [15] believe that the primary cause of the mentioned indicators in Bulgaria is the production of low value-added products. The situation is similar in Serbia, where agricultural producers pay insufficient attention to processing and improving the quality of agricultural products, while adhering to ecological standards, quality standards and food safety regulations [22]. In modern agricultural production, it is essential to follow ecological standards [14] and implement digital technologies that optimize production, reduce costs, and thus enhance profitability and efficiency in production, as well as product competitiveness in the market [1, 12].

As a consequence of climate change, drought has become an increasingly prevalent limiting factor for the production of most crops, although sunflower is considered to be relatively resistant to this risk [35, 36]. Therefore, irrigation represents a necessary agrotechnical measure [9]. However, it is insufficiently implemented in Serbia. According to the results of the latest Census of

Agriculture, during the 2022/2023 production year, only 27.5% of the total number of agricultural households had irrigation systems, and just 8.3% of the total agricultural land was irrigated [25]. This was attributed to the lack of financial resources for investments in production, which is a major problem for most family farms [26]. Family farms account for the majority (99%) of agricultural entities in Serbia. Despite this issue, a group of authors [4] concluded in their research that drought had a significant impact on the decrease in sunflower yield in Serbia from 2015 to 2023. However, they also found that agricultural producers achieved a positive financial result in sunflower production. It is clear that this result was significantly affected by selling prices which, alongside yield and input costs, have an impact on the production profitability [33].

Bulgaria was the largest producer of sunflower seeds in the European Union in 2022, according to the Eurostat data. The same source states that in the same year Bulgaria produced 2.117 million tonnes of sunflower seeds, which accounts for the quarter (23%) of the total production in the European Union. In addition to Bulgaria, leaders in the production of sunflower seeds in the EU are Romania, which produced 2.079 million tonnes in 2022, and France, which produced 1.779 million tonnes in 2022 [6]. According to the data of the Bulgarian Industrial Association, Bulgaria is also one of the global leaders in the export of sunflower seeds [10]. This country ranked second in the world in 2021 with exports valued at 730 million dollars, and its main export markets were Germany and Turkey [2]. Bulgaria ranks third in the world according to sunflower oil exports. In 2021, the revenue from these exports amounted to 700 million dollars. Sunflower oil is mainly exported to Spain, Italy, Turkey and Greece [2]. The area designated for agriculture in Bulgaria is about 47% of the territory of the country. The utilized agricultural area for sunflower production for the last five years varied from 789604 ha in 2029 to 985591 ha in 2022. [17].

It is believed that areas under sunflower cultivation have reached their maximum, and that in the future the efforts should be directed at improving agrotechnics and increasing the average yield and quality [36].

Sunflower, maize and rape are also important for producing biomass for renewable energy [11]. Sunflower, along with soybeans, is the most prevalent oil crop in Serbia [16]. Sunflower production in Serbia started in the 1930s. Sunflower was planted on 1,907 ha in 1935, and by 1938 it expanded to 23,000 ha. The significant contribution to the development of sunflower production in Serbia was made by the Institute of Field and Vegetable Crops, founded in Novi Sad in 1938 [29]. Over the past decades, the technology of hybrid production, i.e. sunflower breeding, has changed in line with the changing climatic conditions and problems related to plant diseases and pests [32].

Sunflower production in Serbia is most concentrated in the Autonomous Province of Vojvodina, where the majority of oil mills and processing capacities are located [5], According to the results of the latest Census of Agriculture, conducted in 2023, 78,049 of agricultural households, or 15% of the total number of agricultural households (508,325), were engaged in the production of industrial crops. Out of this number of households, 52,760, or as much as 68% of the total number of agricultural households engaged in this production, were located in the region of Vojvodina. In 2023 sunflower was sown on 235,904.97 ha, or 47% of the total area (479,755.53 ha) sown by industrial crops in the same year [24]. Considering that sunflower production is mainly located on family farms, most authors agree that its long-term stability depends on buyers, who influence profitability and, consequently, sustainability of this production through the level of purchase prices, as seen from the perspective of direct producers. Connecting primary agricultural production with processing industry is important for ensuring the placement and stability of primary production, but also for securing the continuity of raw material supply [30].

The research is based on the fact that Bulgaria and Serbia have very similar climatic and geographical characteristics, as well as water resources, which result in similar conditions

for agricultural production. Climatic similarities allow for similar agricultural practices and common challenges in water and soil management. On the other hand, despite some similarities in the support provided to agricultural producers in Serbia and Bulgaria, the main difference is that Bulgaria, as an EU member, has greater opportunities for the financial and infrastructural support through EU funds. Although in the process of joining the EU, Serbia still relies only on domestic subsidies and a slower implementation of European standards.

Therefore, the aim of this paper is to observe the current state of sunflower production in the area of Bulgaria and Serbia by monitoring the cultivated areas, production values and yield levels of this important oil crop. The conducted research also included the analysis of foreign trade exchange, as well as the differences in the sunflower producer price between these two countries. This is important for several reasons. First, understanding the differences in sunflower production between these two countries can help assess their economic strengths and weaknesses. This is important for the development of agricultural policies, i.e. subsidy and investment policies. The comparison can help determine the most efficient ways to enhance yield and decrease production costs. In addition, if one country is more efficient or competitive regarding production, this can affect the understanding of the market and negotiations with other countries. The analysis of these differences can lead to better recommendations for sustainable agriculture. Finally, by learning from each other, both countries can improve production efficiency, reduce negative environmental effects and position themselves better in the global sunflower market.

MATERIALS AND METHODS

For the research in this paper, the authors used data from the Statistical Office of the Republic of Serbia, and the MAF database, Department "Agrostatistics" in Bulgaria. Data from the statistical database of the Food and Agriculture Organization of the United Nations (FAO) were used for the analysis of the state of the global sunflower production, both total and by continent. The research period covered ten years (2014-2023). The data were processed using descriptive statistics indicators, such as arithmetic means, standard deviation for measuring the average deviation from the arithmetic mean, and the coefficient of variation for calculating the stability of occurrences. The paper also uses the analysis and synthesis methods, desk research, and the comparative research method.

When it comes to foreign trade exchange, data from the FAO statistics, Trade Statistics for International Business Development (TRADE MAP), the Ministry of Agriculture and Food of Bulgaria, as well as www.statista.com, were used. The same statistical databases were also used for the analysis of producer prices.

The research results are presented using tables and graphs. In the analysis and interpretation of the research results, the authors used scientific and expert papers by authors from Serbia, Bulgaria and other countries, who focus on the same or similar topics in their scientific work.

RESULTS AND DISCUSSIONS

Sunflower production in the world

Sunflower is one of the most important oil crops in the world.

The largest producers of sunflower are Ukraine, the Russian Federation, Argentina, China, Romania, Bulgaria, Turkey, Hungary, France and the United States of America.

The complex military and economic situation in Ukraine has affected sunflower production over the past three years, although sunflower production has been intensively developing in the country since 2004.

In the period from 2004 to 2020 the gross domestic yield increased by 3.1 times [28], and in 2012 Ukraine produced 25% of the total global sunflower seed production [13].

Between 2014 and 2023, sunflower was produced on an average of about 27 million hectares worldwide.

More than a half of sunflower production, or more precisely, just under 70% is realized in Europe [23].

Regarding the representation of areas under sunflower cultivation, Europe is followed by

Asia with around 12%, America with around 9%, Africa with about 8%, and finally Oceania where sunflower is grown on a much smaller area (Table 1).

The areas under sunflower cultivation and its production vary from one year to another, depending on the changes in climatic conditions, agrotechnical and other measures in production, as well as market demands.

Table 1. Distribution of areas harvested to sunflower seed worldwide by continent during the 2014-2023 period (units in ha)

Continents	Average in the 2014-2023 period	Structure (world=100%)
Africa	2,276,498	8.37
America	2,571,202	9.45
Asia	3,461,758	12.72
Europe	18,880,934	69.39
Oceania	17,819	0.07
World (total)	27,208,211	100.00

Source: Authors' calculations based on the FAO database, 2024 [8].

Europe leads in the average annual global sunflower production with 73%, or 36,939,644.8 tonnes. It is followed by Asia (12.51%), America (9.73%), Africa (4.73%) and Oceania (0.04%) (Table 2).

Table 2. Average sunflower production worldwide by continent during the 2014-2023 period (units in tonnes)

Continents	Average in the 2014-2023 period	Structure (world=100%)
Africa	2,393,062.20	4.73
America	4,923,322.8	9.73
Asia	6,331,121.8	12.51
Europe	36,939,644.8	72.99
Oceania	21,096.8	0.04
World (total)	50,608,248.42	100.00

Source: Authors' calculations based on the FAO database, 2024 [8].

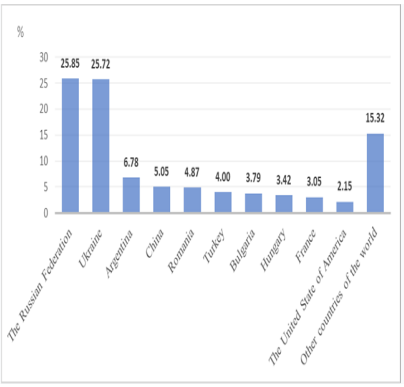
At the global level, the average sunflower yield amounts to 1.85 t/ha, being the highest in Europe with 1.95 t/ha and the lowest in Africa with 1.05 t/ha (Table 3).

Table 3. Average sunflower seed yields worldwide by continent during the 2014–2023 period (units in t/ha)

	Africa	America	Asia	Europe	Oceania	World (total)
Average in the 2014-2023 period	1.05	1.91	1.84	1.95	1.16	1.85

Source: Authors' calculations based on the FAO database, 2024 [8].

The largest global sunflower producers are the Russian Federation, Ukraine, Argentina, China and Romania. Figure 1 shows the ten largest global sunflower producers and their percentage share in the total production.



World	50,608,248
The Russian Federation	13,081,950
Ukraine	13,018,784
Argentina	3,430,608
China	2,557,261
Romania	2,464,059
Turkey	2,023,293
Bulgaria	1,918,204
Hungary	1,730,112
France	1,546,060
The United State of America	1,086,336
Other countries of the world	7,751,581

Fig. 1. The world's largest sunflower producers for the 2014-2023 period (units in tonnes)
Source: Authors' calculations based on the FAO database, 2024 [8].

Ukraine and the Russian Federation account for a large part of the global sunflower production, while Serbia accounts for 1.21% of sunflower production in the world.

Analysis of sunflower production in Serbia and Bulgaria

The average area devoted to sunflower cultivation amounted to 214,531 ha in the territory of Serbia. The smallest area was sown in 2015 (166,192 ha), while the largest was in 2023 (240,520 ha). Compared 2014, taken as the base year, the area under sunflower cultivation rose steadily until 2023, with a coefficient of variation of 12.15%. In Bulgaria, the production area under sunflower cultivation is considerably larger. The average sunflower sown area amounted to 842,031 ha for the research period, which is approximately four times more than in Serbia. The smallest area was recorded in 2017 (788,656 ha), while the largest was registered in 2022 (916,959 ha). Compared to 2014, the area increased, followed by a slight decline from 2018 to 2021, after which the area continued to increase again. The coefficient of variation is 4.63% (Table 4). It can be stated that, for the research period, the value of the sunflower sown area was relatively more stable in the territory of Serbia than in Bulgaria.

Table 4. Annual changes in areas devoted to sunflower cultivation in Serbia and Bulgaria during the 2014–2023 period (units in ha)

Research year	Serbia	Base Index (2014=100)	Bulgaria	Base Index (2014=100)
2014	175,366	100.00	843,644	100.00
2015	166,192	94.77	810,841	96.11
2016	200,299	114.22	817,511	96.90
2017	219,338	125.07	898,844	106.54
2018	239,148	136.37	788,656	93.48
2019	219,404	125.11	815,561	96.67
2020	221,149	126.11	821,922	97.43
2021	212,736	121.31	836,469	99.15
2022	251,155	143.22	916,959	108.69
2023	240,520	137.15	869,907	103.11
Arithmetic mean	214,531	-	842,031	-
Coefficient of variation (%)	12.15	-	4.63	-

Source: Authors' calculations based on the data from MAF [17].

The total average realized production for the research period amounts to 614,483 tonnes with the coefficient of variation of 14.73% for the territory of Serbia. In Bulgaria, this production amounts to 1,564,871 tonnes, while the coefficient of variation is 44.83% (Table 5). Similarly to the production area, production in Serbia is significantly more stable than in Bulgaria.

Table 5. Statistical indicators of sunflower production in Serbia and Bulgaria during the 2014–2023 period (units in tonnes)

Research year	Serbia	Base Index (2014=100)	Bulgaria	Base Index (2014=100)
2014	509,250	100.00	2,010,668	100.00
2015	437,084	85.83	1,699,228	84.51
2016	621,127	121.97	183,767	9.14
2017	540590	106.15	2,056,987	102.30
2018	733,706	144.08	192,704	9.58
2019	729,079	143.17	1,914,072	95.20
2020	636,688	125.02	1,720,299	85.56
2021	607,574	119.31	1,989,068	98.93
2022	643,459	126.35	2,117,319	105.30
2023	686,268	134.76	1,764,594	87.76
Arithmetic mean	614,483	-	1,564,871	-
Coefficient of variation (%)	14.73	-	44.83	-

Source*:* Source: Authors' calculations based on the data from MAF [17].

The average sunflower yield is 2.88 t/ha in Serbia, and 2.26 t/ha in Bulgaria. The coefficient of variation of the yield is 8.33% in Serbia, while it is 5.99% in Bulgaria (Table 6). Variations in the yield are slightly greater in Serbia than in Bulgaria.

In their studies a group of authors [19] found the "predicted sunflower yield in Serbia in years: 2022 (3.09 t/ha); 2023 (3.12 t/ha)". However, based on the data presented in Table 6, it can be concluded that this was not realized. The reasons for this lie in the fact that the cited authors expected that sunflower would be produced on larger areas in the specified years ("predicted sunflower production in Serbia in years: 2022 (736,632 t); 2023 (772,270 t)" (Ibid, p. 1269). In addition, the reasons can certainly be found in the insufficient application of full agrotechnics, due to the lack of financial resources for investing in the development of agricultural production.

Table 6. Statistical indicators of sunflower yields in Serbia and Bulgaria during the 2014–2023 (period units in tonnes/ha)

Research year	Serbia	Base Index (2014=100)	Bulgaria	Base Index (2014=100)
2014	2.90	100.00	2.38	100.00
2015	2.60	89.66	2.09	87.82
2016	3.10	106.90	2.25	94.54
2017	2.50	86.21	2.29	96.22
2018	3.10	106.90	2.44	102.52
2019	3.30	113.79	2.35	98.74
2020	2.90	100.00	2.09	87.82
2021	2.90	100.00	2.38	100.00
2022	2.60	89.66	2.31	97.06
2023	2.90	100.00	2.03	85.29
Arithmetic mean	2.88	-	2.26	-
Coefficient of variation (%)	8.33	-	5.99	-

Source: Authors' calculations based on the data from MAF [17].

While large areas can enable greater overall production, smaller plots allow for more precise and easier control of conditions which directly affect yield. A higher yield is the result of good adjustment of all production factors – selection of the variety, soil treatment and the cultivated plant treatment, as well as efficient resource management.

Foreign trade exchange

The greatest importers of sunflower from Serbia are Bosnia and Herzegovina, Hungary, the Russian Federation, Ukraine, and Germany. Serbia exports 1% of the world exports for this product, and its ranking in the world exports is 16. The average distance of the importing countries is 663 km and the export concentration is 0.34 (Figure 2). On the other hand, Serbia imports sunflower mainly from France, Turkey, Bulgaria, Hungary and Bosnia and Herzegovina. Serbia's imports represent 0.4% of the world imports for this product, and its ranking in the world imports is 37. The average distance of the supplying countries is 1,274 km and the market

concentration is 0.35 (calculations based on [34]).

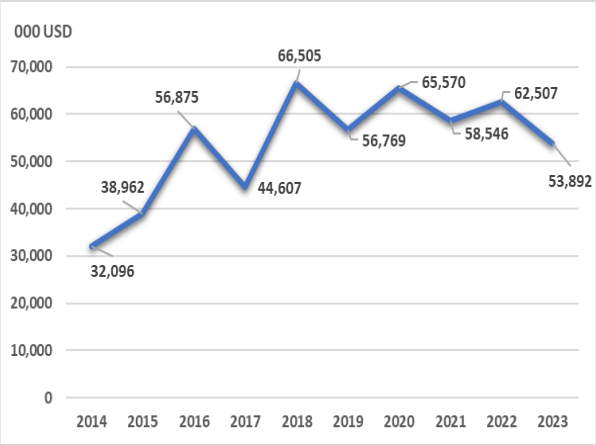


Fig. 2. Value of sunflower seeds exported from Serbia (in thousand USD)
Source: Authors' design based on the data from FAO [8].

Sunflower exports from Bulgaria vary significantly over the years depending on the harvest, market conditions and international demand. Bulgaria is among the world leaders in sunflower seed exports and ranks second for 2021 with sales of more than $730 million, according to an analysis by the Bulgarian Industrial Association [2]. Its main markets are Germany and Turkey.
The country **also ranks third in the world in sunflower oil exports with revenues of $700 million in 2021**. The country's sunflower oil is mainly exported to Spain, Italy, Turkey and Greece. Liberalized grain imports from Ukraine threaten the country's export competitiveness, BIA said. The value of sunflower seeds exported from Bulgaria is shown in Figure 3. The organizational, structural and regulatory changes imposed on Bulgaria as part of its EU membership on the one hand, and the economic environment in Bulgaria on the other, influence the development of all branches of plant growing in Bulgaria. These factors determine the changes in the number of farms, the areas sown, the average yields and the production obtained. With the accession of Bulgaria to the EU, new factors appear which the sub-sector must consider, such as the possibility of access to the single European market; elimination of customs barriers; anti-competitive protection of trade with third parties; aid under the Single Area Payment Scheme and national surcharges; specific food safety requirements, product quality standards, and ecological regulations. Some of these factors positively influence the development of this sector in the country, others set specific requirements. Oil crops show continuous growth in their development. This particularly applies to sunflower and canola. After the accession of Bulgaria to the EU, sunflower areas have generally remained at a high level. In the structure of cultivated areas, sunflower has accounted for 13-15% in the last 5 years. The number of sunflower areas shows a steady upward trend (one of the factors for this are secure foreign markets, mainly in Turkey and the EU). Sunflower cultivation areas are considered to have reached their maximum and future efforts should be directed at improving agricultural techniques, increasing average yields and enhancing quality [18].

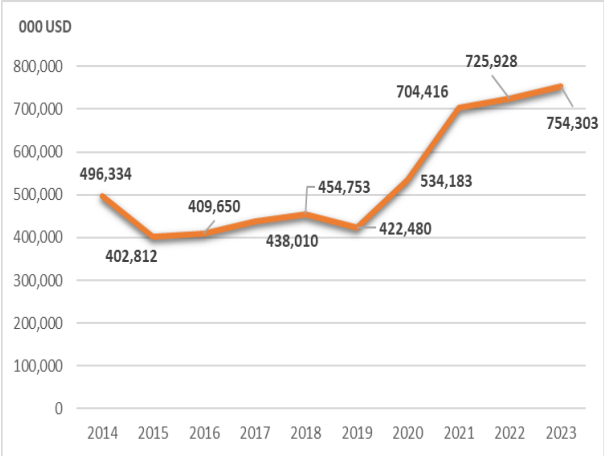


Fig. 3. Value of sunflower seeds exported from Bulgaria (in thousand USD)
Source: Authors design based on the data from FAO [8] and Statista [31]

When it comes to import, Bulgaria imports sunflower mainly Romania, Ukraine, Moldova, France and Hungary. Bulgaria's imports represent 6.8% of the world imports for this product, and its ranking in the world imports is 4. The average distance of the supplying countries is 750 km and the market concentration is 0.32 (calculations based on [34]).
Sunflower exports from Bulgaria are higher than those from Serbia because Bulgaria has a

larger sunflower cultivation area and more favourable geographical and climate conditions for this type of agricultural production. As the EU member country, Bulgaria has different **agricultural policies** and access to subsidies and agricultural support which are not available in Serbia. These subsidies can result in greater sunflower production and export. On the other hand, Bulgaria has a more developed export infrastructure and better access to the European market, where there is a high demand for sunflower. This includes ports and transport networks that facilitate access to European markets. As a result, sunflower exports from Bulgaria are more competitive than exports from Serbia.

The average producer price in Serbia was 344.0 USD per tonne, while the average price in Bulgaria was slightly higher at 443.5 USD per tonne (Table 7).

Table 7. Annual value, producer price, 2014-2023 (USD/tonne)

Research period	*Serbia*	*Bulgaria*
2014	302.5	405.6
2015	337.0	395.4
2016	275.7	394.2
2017	308.3	362.8
2018	269.0	343.4
2019	267.8	336.3
2020	314.5	422.5
2021	521.0	603.3
2022	518.1	619.0
2023	326.2	445.0
Average price	**344.0**	**443.5**

Source: FAO [8].

A higher production price of sunflower in Bulgaria compared to Serbia is conditioned by specific economic, agricultural and market factors which indicate the following: - ***Difference in production costs:*** Bulgaria may have greater labour, fuel, fertilizer, pesticide or other input costs required for sunflower production. These costs can be higher due to various economic factors, such as wages, energy costs or material import; - ***Different agricultural policies***: Bulgaria and Serbia have different agricultural subsidies, incentives and taxes which affect the total production costs; - ***Difference in yields***: Difference in climate, soil or technologies used in sunflower production affect yield and production efficiency. Since this research has shown that Bulgaria has lower sunflower yields than Serbia, this can increase production costs; - ***Differences in market conditions:*** There is a higher market demand for sunflower in Bulgaria, which also increases the market price. Also, if there is a specific need for certain sunflower types in Bulgaria (e.g., for industries requiring specific quality), production can be more expensive; - ***Currency and economic factors:*** Differences in currencies and economies of the two countries also affect the production price. A higher cost for importing inputs due to a weaker currency or other economic factors could increase the production price.

Measures for improving sunflower production

Improvement of sunflower production (increase of yield and enhancement of quality) requires the implementation of modern agrotechnical measures and use of new/innovative technologies which can increase the yield and seed quality. Some of the possible measures are the following:

Selecting the appropriate variety, one that is resistant to diseases, to drought caused by pronounced climate changes, and to specific soil conditions, can significantly contribute to higher yields. In addition, it is important to use high-quality seeds. Innovative hybrids, which are resistant to diseases and pests, can significantly increase yield.

Proper timing of planting: sunflowers grow best when planted in spring when soil temperatures are stable.

Soil preparation, fertilization and regular irrigation: Thorough soil preparation is crucial. Sunflowers grow best on well-drained, fertile soils. Before planting, check the soil's pH value and, if necessary, adjust it by adding lime or other treatments. Introducing crop rotation can improve soil quality and decrease the risk of diseases. Sunflowers are plants that love both sunlight and water. Regular irrigation during dry periods can significantly improve yield, especially during the flowering and seed formation phases.

Weed, disease and pest control: Regular monitoring and controlling of weeds, diseases and pests are crucial for preserving plant health. The use of herbicides and pesticides

must be in accordance with recommendations and legislation. Biological treatments and integrated protection from pests can be efficient alternatives to chemical treatments.

Optimal timing of harvesting: Sunflowers must be harvested at the right moment, when the seeds reach maturity. This ensures high oil quality and decreases the risk of losing seeds due to dropping from the plant.

Application of precision agriculture: Technologies such as GPS, drones and sensors allow precise monitoring of field conditions, which enables better risk management and optimization of all production phases.

Training and education: Continuous education of farmers about new technologies, plant protection methods, as well as market trends can contribute to higher yields and increased income from production. Investing in farmer education and their training on new methods, technologies and innovations in agriculture can be the key to long-term improvements in sunflower production.

Using subsidies and other support measures for agricultural producers. Combining all these measures can improve the efficiency and yield of sunflower, while minimizing risks and optimizing resources.

CONCLUSIONS

Based on the above mentioned in the research (2014-2023), the following can be concluded:

-The total area under sunflower cultivation in the world amounts to 27,208,211 ha. The production of 50,608,248.42 tonnes with the average yield of 1.85 t/ha is realized on this area. The largest areas are located in Europe and amount to 18,880,934 ha, which accounts for approximately 70% of the total sunflower production in the world;

-The largest global sunflower producers are the Russian Federation, Ukraine, Argentina, China, etc. Bulgaria ranks seventh in this list, while Serbia is far below the leading global producers in terms of sunflower production;

-In Serbia, sunflowers are grown on 214,531 ha. The average annual production is 614,483 tonnes, with the average yield of 2.88 t/ha. In Bulgaria, sunflowers are produced on 842,031 ha, with the production of 1,564,871 tonnes and the average yield of 2.26 t/ha.

-The largest amount of sunflower from Serbia is exported to Bosnia and Herzegovina, Hungary, the Russian Federation, Ukraine and Germany, while the largest quantities of sunflower from Bulgaria are exported to Germany and Turkey.

-The producer price of sunflower fluctuates over the years and depends on the exchange rate, import tariffs, weather conditions, as well as supply and demand. The average price of sunflower in Bulgaria is 443.5 USD per tonne, while it is 344.0 USD per tonne in Serbia.

-The long-term stability of sunflower production is greatly dependent on buyers, since they directly affect profitability and, consequently, sustainability of this production through purchase prices.

The growth and stability of production can also be achieved by improving production and introducing innovations, along with the continuous support and assistance from the government, ranging from production and subsidies to helping with the placement of products on the global market.

This applies to both countries that were the subject of research in this paper, without exception.

ACKNOWLEDGEMENTS

The paper is a part of research financed by the MSTDI RS, agreed in decision no. 451-03-136/2025-03/200009 from 04.02.2025.

REFERENCES

[1]Aleksiev, G., Nencheva-Ivanova, I., 2023, Identification of opportunities for digitalization of management processes in sunflower production, Trakia Journal of Sciences, 21 (1): 148-152. doi:10.15547/tjs.2023.s.01.026.

[2]Bulgarian Industry Association (BIA), https://en.bia-bg.com/, Accessed on 1 March, 2025.

[3]Čop, T., Njavro, M., 2023, Pregled ekonomskih šteta kao posljedica prirodnih nepogoda u poljoprivredi, (Overview of economic damages as a result of natural disasters in agriculture), Agroeconomia Croatica, No. 13(1), pp. 34-50.

[4]Cvijanović, V., Bajagić, M., Petrović, M., Cvijanović, G., Dimitrijević, B., 2024, Impact of climate change on sunflower production, 479-485. In:

Kovačević, D. (Ed.) Book of Proceedings of the XV International Scientific Agricultural Symposium "Agrosym 2024".
[5]Đerčan, B., Vujasinović, V., Bjelajac, D., Radivojević, G., Vukić, M., Vujadinović, D., 2023, Sunflower production in Vojvodina Province (Serbia): trends, challenges, and opportunities, Researches Reviews of the Department of Geography, Tourism and Hotel Management 52 (2): 98-110. doi: 10.5937/ZbDght2302098D
[6]Eurostat, Crop production in national humidity, Dostupno na: https://ec.europa.eu/eurostat/databrowser/view/APRO_CPNH1__custom_6867851/default/table?lang=en, sajtu pristupljeno Accessed on 21 February 2025.
[7]Fetting, C., 2020, The European Green Deal, ESDN Report, December 2020, ESDN Office, Vienna. https://www.esdn.eu/fileadmin/ESDN_Reports/ESDN_Report_2_2020.pdf. Accessed on 21 February 2025.
[8]FAOSTAT, Crops and Livestock products, https://www.fao.org/faostat/en/#data/TCL, Accessed on 1 March 2024.
[9]Georgieva, V., Kazandjiev, V, Georgiev, S., Rashev, S., Valkova, D., Mihova, G., Valchev, D., Dobreva, V., 2024, Agro-climatic conditions for growing of sunflower in different climatic area in Bulgaria, Scientific Papers. Series A. Agronomy, LXVII (2): 224-231.
[10]Hristov, K., Beluhova-Uzunova, R., Shishkova, M., 2019, Competitive advantages of Bulgarian sunflower industry after the accession into the European Union. Scientific Papers Series Management, Economic Engineering in Agriculture & Rural Development, 19(2):197-202.
[11]Ivanova, B., Shishkova, M., Beluhova-Uzunova, R., 2020, Agricultural biomass potential in Bulgaria. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 20(2), 273-280.
[12]Jeločnik, M., Subić, J., Nastić, L., 2021, Upravljanje troškovima na poljoprivrednim gazdinstvima, Monografija, Institut za ekonomiku poljoprivrede, (Cost Management on Agricultural Farms, Monograph, Institute of Agricultural Economics), Belgrad.
[13]Kondratyuk, N., 2015, Formation of sunflower production efficiency in the agricultural enterprises, Agricultural and Resource Economics: International Scientific E-Journal, 1(1): 14-22.
[14]Kraeva-Miteva, A., Harizanonva-Bartos, H., 2019, Consumers attitudes towards environmental standards implementation in Bulgaria, WBJAERD, 1 (2): 101-112.
[15]Lakov, P., Levkov, K., 2023, Sustainable regional trends in the development of agriculture on the example of selected crops grown in Bulgaria, Dezvoltare economică și cercetare, 20-31.
[16]Miklič, V., Ovuka, J., Marjanović Jeromela, A., Terzić, S., Jocić, S., Cvejić, S., Miladinović, D., Hladni, N., Radić, V., Ostojić, B., Jocković, M., Dušanić, N., Đorđević, V., Miladinović, J., Balešević-Tubić, S., Balalić, I., 2018, Breeding and seed production of oil crops in Serbia. Selekcija i semenarstvo, 24 (2):1-9.
[17]Ministry of Agriculture and Food. MAF, Annual report on the state and development of agriculture. https://www.mzh.government.bg/media/filer_public/2025/01/16/ad_2024_en.pdf, Accessed on 21 February 2025.
[18]Mitova, D., 2013, Trends and problems in the development of olive crops - before and after the accession of Bulgaria to the EC". In Bulgarian. Economics and farm management.58(2), 2013. https://journal.jaem.info/page/en/details.php?article_id=357, Accessed on 1 March, 2025.
[19]Nedeljković, M., Subić, J., Prodanović, R., 2022, Prediction of sunflower production in the Republic of Serbia, 1265-1270. In: Kovačević, D. (Ed.) Book of Proceedings of the XIII International Scientific Agricultural Symposium "Agrosym 2022".
[20]Njavro, M., Čop, T., 2022, Risk management of Dalmatian grape and wine producers facing climate change, Journal of Central European Agricult*ure*, 23 (1), 232-245.
[21]Njegovan, Z., 2023, Agroekonomija – kratka istorija, Institut za ekonomiku poljoprivrede (Institute of Agricultural Economics),Beograd.
[22]Paraušić, V., 2023, Lanac vrednosti hrane: dostignuća Srbije u dodavanju vrednosti poljoprivredno prehrambenim proizvodima (Food value chain: Serbia's achievements in adding value to agri-food products), Monografija, Institut za ekonomiku poljoprivrede, Beograd.
[23]Pilorge, E, 2020, Sunflower in the global vegetable oil system: Situation, specificities and perspectives. Oilseeds & Fats Crops and Lipids, 27(34):1-11.
[24]Popis poljoprivrede 2023, Pregled osnovnih pokazatelja, Površine pod industrijskim biljem, Republički zavod za statistiku, Beograd, Republika Srbija. https://popispoljoprivrede.stat.gov.rs/sr-Cyrl/tabele/
[25]Popis poljoprivrede 2023, Brošura, Republički zavod za statistiku, (Census of agriculture 2023, Brochure, Republic Institute of Statistics), Beograd, Republika Srbija. https://popispoljoprivrede.stat.gov.rs/sr-cyrl/brosura/, Accessed on 21 February 2025.
[26]Radović, G., 2014, Finansiranje poljoprivrede u Republici Srbiji (Financing of agriculture in the Republic of Serbia), Monografija, Zadužbina Andrejević, Beograd.
[27]Radović, G., 2024, Osiguranje poljoprivrede u Republici Srbiji, (Agricultural insurance in the Republic of Serbia), Monografija, Institut za ekonomiku poljoprivrede, Beograd.
[28]Shyian, D., Ulianchenko, N., Honcharova, K., 2021, An innovative component in generating efficiency of sunflower production, International Scientific Journal "Economics & Education" 6 (2): 23-28. https://doi.org/10.30525/2500-946X/2021-2-4.
[29]Škorić, D., Jocić, S., Jovanović, D., Hladni, N., Marinković, R., Atlagić, J., Panković D., Vasić, D., Miladinović F., Gvozdenović, S., Terzić, S., Sakač, Z., 2006, Dostignuća u oplemenjivanju suncokreta, Zbornik radova, Sveska 42, Naučni institut za ratarstvo i

povrtarstvo (Achievements in Sunflower Breeding, Proceedings, Volume 42, Scientific Institute for Field and Vegetable Crops), Novi Sad, 131-171.
[30]Sredojević, Z., Čule, N., 2024, Lanci vrijednosti odabranih proizvoda kao elementi održivosti poljoprivredne proizvodnje, 131-173. In: (Eds.) Ostojić, A, Vaško, Ž, Pržulj, N., Agroekonomski aspekti održivog razvoja poljoprivrede. Akademija nauka i umjetnosti Republike Srpske (Value chains of selected products as elements of sustainability of agricultural production, 131-173. In: (Eds.) Ostojić, A, Vaško, Ž, Pržulj, N., Agroeconomic aspects of sustainable agricultural development. Academy of Sciences and Arts of the Republic of Srpska), Monografija LVIII, Banja Luka, Republika Srpska.
[31]Statista, 2024, Sunflower export value, Bulgaria, https://www.statista.com/statistics/753315/sunflower-seeds-export-value-bulgaria/, Accessed on 1 March 2024.
[32]Terzić, S., Miklič, V., Čanak, P., 2017, Review of 40 years of research carried out in Serbia on sunflower pollination, OCL, 24(6): 1-7, D608. https://doi.org/10.1051/ocl/2017049
[33]Todorović, S., Filipović, N., Munćan, M., 2010, Economic analysis of sunflower production on family farms in the Republic of Serbia, Research Journal of Agricultural Science, 42 (3): 833-837.
[34]UN Comtrade Database, https://comtradeplus.un.org/, Accessed on 1 March 2025.
[35]Valkova, D., Penchev, E., Encheva, V., 2017, Hybridization between cultivated sunflower and wild species *Helianthus praecox* Engelm.& Gray, Bulgarian Journal of Crop Science, 54(4): 9-13.
[36]Valkova, D., 2023, Testing results of new IMI sunflower hybrids in Dai-General Toshevo, 271-277. In: (Eds.) Subić, J., Vuković, P., Vasile Andrei, J., Thematic Proceeding of International Scientific Conference "Sustainable Agriculture and Rural Development III", December, 15-16, 2022, Belgrade, Serbia.