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SUNFLOWER PRODUCTION AND EXPORT POTENTIAL OF THE REPUBLIC OF MOLDOVA: EVALUATION, VALORIFICATION

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Abstract

This paper analyzes and evaluates sunflower production and export potential of the Republic of Moldova. The article also provides a comparative analysis of sunflower production and export potential in relation to different countries, especially in EU countries. The following research methods were used in the presented work: economic analysis, logical, monographic, synthesis, comparative, etc. The research revealed the main producers, exporters and importers of sunflower in the world, EU, and Republic of Moldova. Based on national statistics, the main sunflower indicators in the country have been analyzed in terms of area, yield, and gross harvest for the period 2017-2023. In 2022, the EU received about 300,000 tones of sunflower seeds, while Ukraine, which is the world's largest producer of sunflower seeds, made a very insignificant contribution - less than 60,000 tones of EU imports. Strengthening trade agreements and improving export logistics can enhance market access and competitiveness of the Republic of Moldova.

Key words**:** *climate change**,** sunflower, production, export, evaluation, Republic of Moldova*

INTRODUCTION

Sunflower is among the most profitable and widely cultivated crops. As one of the world's leading oilseed plants and the primary crop grown for oil production, it attracts significant research interest from scientists worldwide, including those from the Republic of Moldova. As a result of the previous researches, many different theoretical and applied aspects related to this important crop have been revealed, and the knowledge gained is of great importance for further research of this crop in various fields: improvement of cultivation technologies, analysis of national self-sufficiency in this product [20], export of sunflower crops into global markets, especially EU markets, etc. From every 100 kilograms of crushed sunflower seeds, the processors obtain about 40 kilograms of oil, 35 kilograms of protein-rich sprouts and 25 kilograms of sub-products.

The structure of the production cost for sunflower crop, fertilizers and pesticides have a share of 32.1%, seeds 19.3%, petroleum products 12.2 %, 17.7 % CIP, 10.4% labour and 8.3 % others [21].

In recent years, about 35% of Moldovan sunflower exports are exported to Turkey, 20% to Ukraine, the same amount to Romania and about 6% to Great Britain [2]. In the world rating of producers and exporters of sunflower and sunflower oil [10], Moldova ranks quite high. Moldova have ranks 15-16th in the world

ranking of sunflower seed producers with about 1.5% of the world export of this product [9].

Due to the importance and value of this crop worldwide and especially UE, the main purpose of this research is to estimate the production and export potential of sunflower in the Republic of Moldova and to elaborate the recommendations to increase the production and export of this crop, as well as sunflower products for domestic consumption and for export to the world and EU markets [18], [22].

Since the mid-1980s, the sunflower has repeated year after year a regular participation of 9-10% in total grain production.With an annual average of 5.8 Mt harvested between 1996 and 1999, obtained on an average of 3.3 M ha per year (average yield of 1.72 t/ha), it confirms an unfailing presence in the Argentine agricultural panorama [4]. Argentina allows Mercosur (Common Market of the South between Argentina, Brazil, Paraguay and Uruguay) to be among the top producers in the world [5].

The countries of the former USSR and the European Union experience less consistent production. Argentina's production growth follows a pattern similar to that of the European Union. But, since the jump in 1995 (2.1 Mt against 1.4 in 1994), the advance of the old continent tends to fade.For 1996-2000, the average annual production respective of these two zones is 2.26 and 2.91 Mt. world production; Eastern Europe offers 12 to 13%.

Argentina in the world total export decreased between the beginning and the end of the 1990s. Data from Oil World, Argentina fell from 42% of the world market in 1990 to 25% in 1994 and 15% in 1998 (494,000 t out of 3.2 Mt). The countries of the former USSR (Eastern European countries) take over and flow increasingly substantial quantities, resulting from a sharp increase in production. Their participation increased from a rate of 8% of the world market, on average per year, between 1986 and 1990, 30% between 1990 and 1995, and 59% of the market between 1996 and 2000 (1.8 Mt in 1998). The attitude of the European Union, the world's largest importer, also explains the fluctuations in this market. The contraction and then the recovery of its demand is determined by the upheavals of its own production. Its imports vary from 79% of world imports in 1981 (its maximum rate) to 28% in 1989 (minimum rate), 53% in 1992 and 72% in 1998 (2.3 Mt). Major players in sunflower processing are Cargill, OL. Moreno-Glencore, Bunge and Born. The number of players in the global sunflower oil market is small. On the side of exporters, Argentina comes first. Its rate of coverage of global needs has increased regularly and rose from 44%, on average per year between 1981 and 1985, to 54%, on average per year between 1996 and 2000. In 1998, Argentina assumed 56% of world exports, or 1.56 Mt [1]. The United States, the European Union and Eastern European countries share the rest of the market. Of on the importers' side, dispersion is the rule. Turkey, Latin America (Mexico), Asia (India) and the European Union are among the main customers. These are the destinations, among others, of sunflower oil from Argentina: in 1998, India bought 277,000 t from it, the European Union 172 000 t, Egypt 121,000 t, South Africa 112,000 t, Iran 111,000 t, Turkey, etc. [11, 12, [17].

On the world sunflower meal market, Argentina is the undisputed exporter: it accounts for 75 to 80% of world trade. The European Union is, for its part, the area imports par excellence. With 1.98 Mt imported in 1998, it relegates the other importers to minor levels. In fact, over the past two decades, Argentina has asserted its role as world's leading supplier because it has found in the European Union the market to supply: in 1998, it sold 90% of its exports there (1.82 Mt out of 2 Mt). Other customers are South Africa (29,000 t), Thailand (27,000 t), Chile (26,000 t), Egypt (13,000 t), etc. This level of 2 Mt exported is acquired for the following years. Far behind, the countries of Europe from the East (Poland) complete the offer [16], [19].

In this context, this paper aims to evaluate the cultivated area, yield, production, export, and import of sunflower in the Republic of Moldova from 2017 to 2021 to identify key trends and forecast future performance.

MATERIALS AND METHODS

To analyze sunflower production in the Republic of Moldova we used indicators such as:

- Sunflower cultivated area in the Republic of Moldova (hectares).
- Yield per hectare (tons/ha) – influenced by climatic conditions, fertilizer use and applied technologies.
- Total production (tons) – calculated based on cultivated area and yield.
- Production cost (MDL/ton) – including agricultural inputs (seeds, pesticides, fuel, labor).
- Climate impact – drought and extreme temperatures influence crop productivity.

For export of sunflower and derived products we used:
- Total exported volume (tons/year) by main destination countries – Romania, Turkey, Bulgaria, Ukraine, EU.
-Average export price ($/ton) – depending on international demand and trade policy. Taxes and trade restrictions – legislative changes and trade agreements (DCFTA with EU).
-Export evolution – analysis of trends over the last years.
-Capacity of processing plants (tons/year) – data.

Descriptive statistical analysis (means, dispersion, standard deviations for production and exports) and time series analysis are main methods used to forecast production and exports based on historical data.

RESULTS AND DISCUSSIONS

The world's leading sunflower producers include Ukraine, Russia, the European Union, Argentina, and Turkey. In the 2021/22 season, the global sunflower harvest reached a record high of over 57 million tons, marking a 20% increase compared to the 2017/18 season.- more than 57 million tons, which is 20% higher than in 2017/18.The growth was achieved thanks to increase the oilseed harvests in key oilseed producing countries - Ukraine to 17.5 million tons – i.e. +28% compared to 2017 and Russia to 15.7 million tons – i.e. in 1.5 times [14]. These countries account for more than half of the sunflower cultivation in the world - 58% in 2021. In the EU, Romania contributes about a third of the total oilseed production in global harvest [1], [3], [19].

In 2021, less than 9% of the harvested sunflower crop was commercialized on the world market.In the period 2017-2021, the volumes of sunflower exports to the world market decreased by 5% to 5 million tons, taking into account the restrictions due to pandemic Covid-19 and the development of internal processing for vegetable oil. At the same time, the value of oilseed supplies increased by 30% to $4.7 billion due to higher world prices. The highest sunflower supplies were delivered to the global market in 2019.

Sunflower market in the EU

In 2021, the share of EU countries in the global sunflower market exceeded 60%. The leader from UE is Romania, which despite the ensuring its own needs, trades oilseed mainly to EU partner countries. At the same time, the most significant increase in the physical volume of supplies compared to 2017 was observed in France +33% to 4,000 tons by 505 million$ (+39%). The second place with a market share of 9% belongs to China, which exports sunflower to Turkey, Iraq, Egypt. EU countries are leading in terms of sunflower oilseed purchases mainly due to imports by Bulgaria, the Netherlands, Germany, Hungary - their share in 2021 accounted for 32% of the global market. Turkey accounts for 15% of sunflower supplies, which increased its imports to 742 thousand tons (+ 16% vs. 2017). Russia is among the five key importing countries in terms of the value of imported sunflower due to the purchase of oilseeds for sowing.

According to Eurostat data, in 2022 EU imports from Ukraine decreased for a number of agricultural products and this is due to military actions. From 2021 to 2022, the share of sunflower oil increased from 87.5% to 79.8%. Eurostat (2023) [8] analyzed trade between the European Union and Ukraine over the last year: while in 2021 the EU imported 87.5% of sunflower oil from Ukraine, in 2022 this share reached 79.8% [14], [19].

The EU produces about 30 million tons of oilseeds per year and has traditionally been a net importer. Most oilseeds are processed to obtain oil for food or biofuels and meal for animal feed. The EU produces about 5 million tons of protein crops per year. Protein crops are used for food and feed purposes.

Sunflower areas planted in the European Union in the current year 2023 amount to a record 5,153.57 thousand hectares - against 4,368.72 thousand hectares a year earlier. Due to this factor - increase in sown areas and possible favorable weather conditions, the gross yield of sunflower of the new crop could exceed the volume of the harvest compared to the previous year.

Historically, sunflower area in the European Union reached a maximum in 2014 at4,582.42 thousand hectares and a minimum in 2019 at 4,025.65 thousand hectares. In 2023, sunflower area was only 4.7 million ha [8].

Table 1. EU area cultivated with sunflower in period 2014-2023, thousands hectares.

№	Year	Area (ha)
1	2014	4,582.42
2	2015	4,266.05
3	2016	4,197.59
4	2017	4,133.13
5	2018	4,311.63
6	2019	4,025.65
7	2020	4,337.84
8	2021	4,396.74
9	2022	4,368.72
10	2023	4,700.00

Source: [8].

The leader in sunflower cultivation in the European Union is Romania, with the largest sunflower cultivation area of more than 1.2 million hectares. According to prior years' data, Bulgaria ranks second and France third.

According to latest updated Eurostat data, in 2022 the situation has changed slightly with EU countries in terms of area under sunflower cultivation. Today, in the European Union - Romania has also the largest area under sunflower cultivation - about 1.1 million hectares under cultivation, second place - Hungary, third place – Italy [8], [14].

In the period 2022/2021, the area under sunflower cultivation decreased compared to the previous year 2021 in the following EU countries: Romania - from 1,123.96 thousand ha to 1,081 thousand ha, i.e. by 42.17 thousand ha, Italy - from 116.99 thousand ha to 110.82 thousand ha, i.e. by 6.17 thousand ha, Slovakia - from 73.36 thousand ha to 73.13 thousand ha, Italy - from 116.99 thousand ha to 110.82 thousand ha, i.e. by 6.17 thousand ha, Slovakia - from 73.36 thousand ha to 73.13 thousand ha, i.e. by 0.23 thousand ha, Austria - from 24.68 thousand ha to 24.29 thousand ha, i.e. by 0.39 thousand ha, Netherland - from 0.74 thousand ha to 0.65 thousand ha, i.e. by 0.09 thousand ha. In Hungary the area of cultivated land with sunflower increased from 654.69 thousand ha. to 681.67 thousand ha. i.e. by 26.98 thousand ha. as compared to last year, and in the Czech Republic - from 17.98 thousand ha. to 22.49 thousand ha. i.e. by 4.51 thousand ha. and Portugal - from 5.59 thousand ha. to 6.80 thousand ha. i.e. by 1.21 thousand ha.

Totally, in 2022 in the EU, approximately 10.5 million of tonnes of sunflowers were produced. Approximately the same quantity was also consumed. About 450 thousand tonnes were imported from non-EU countries, but about 300 thousand tonnes were exported. These data do not include numbers for sunflower oil or for shives used in animal feed.

In 2021, around 10.5 million tonnes of sunflower were produced in EU countries. About the same quantity was consumed. Of the total tonnes consumed, about 450 thousand tonnes were imported from third countries and about 300 thousand tonnes were exported.

Table 2. EU volume of sunflower harvest in the main producing countries (2021)

№	Country	Volume of harvest Miilion tonnes
1	Romania	3.0
2	France	2.0
3	Bulgaria	2.0
4	Hungary	1.7
5	Spain	800
6	Greece	230
7	Slovakia	200
8	Croatia	120
9	Germany	100

Source: [8].

As a result of the war in Ukraine, sunflower prices have increased sharply to a record high of $1,100 per tonne, or more than 20 MDL per kilogram, almost twice as much as the previous year.

Sunflower market in the Republic of Moldova

The cultivated area with sunflower increased year by year from the minimum in 2010 accounting for 252 thousands ha to the peak of 359 thousands ha in the year 2019 [6].

The total seed production reached 811 thousand tons in 2019, being by 112% higher

than in 2010. It was noticed a trend of a constant gross seed production [6].

The yield level differs depending on the region. It was proved that in the Northern region, sunflower carried out higher seeds yields due to the favorable soil and climate conditions the average yield is usually higher in the Northern region due to more favourable climatic and relief conditions. But, sometimes it is not so, yield could be different, for example, in the central region has an average level and the peak yield is achieved in the south region. For instance, Domenco et al (2020) affirmed that in the year 2016, in the South area it was harvested 21.7 q/ha, in the Center 19.2 q/ha and in the North 18.6 q/ha [7, 6].

In 2023, sunflower was cultivated on 385 thousand ha, average production reached 2.4 tonnes/ha and total seed production accounted for 940 thousand tonnes.

Sunflower seeds balance reflected that in ten year 2021, internal production was 960 thousand tonnes, only 21 thousand tonnes were imported, the stock variation accounted for -360 tonns, so that the total resources reached 621 tonnes (Table 3)

Table 3. The level of sunflower seeds balance in the Republic of Moldova, 2016-2021

	2016	2017	2018	2019	2020	2021	2021/2016 %
Resources							
Production	677	804	789	811	493	960	141.82
Import	6	5	3	5	5	21	350.00
Change in stocks	-53	-118	33	83	112	-360	679.20
Total resources	630	691	825	900	610	621	98.57
Ulilizations							
Export	446	521	526	577	381	303	67.93
Seeds	2	2	2	4	3	2	100.00
Forages	3	3	3	5	4	3	100.00
Processing	170	155	282	301	211	300	176.47
Losses	4	5	8	8	6	9	2.25
Own consumption of the population	5	5	4	4	4	4	80.00
Total utilization	630	691	825	900	610	621	98.57
Level of self-supply, %	446	521	526	577	381	303	67.93

Source: National Bureau of Statistics of the Rep. of Moldova [13].

For the period 2023/2024, the sunflower balance was a little different from the previous years as shown in Table 4.

In 2023, it was cultivated an area of 434 thousand ha.

Table 4. Sunflower balance, 2023/2024

	Harvest Thou. tonnes	Average yield Tonnes/ha	Export Thou. tonnes	Import Thou. tonnes	Domestic consumption Thou. tonnes
2023	622	1.43	236	37	390
2021	960	2.21	303	21	309
Differences 2023 versus 2021	-338	-0.78	-67	+16	-81

Source: [15].

The total production was by 338 thousand tonnes lower than in the year 2021, reflecting the negative impact of climate change (higher temperatures and a long and severe drought).

Average yield was only 1.43 tonnes per ha, by 0.78 tonnes less.

While export declined by 67 thousand tonnes, import increased by 16 tonnes.

Consumption increased in 2023 versus 2021.

In the year 2023-2024, the sunflower seeds stocks stored represented 100 thousand tonnes [15].

The domestic market is not so much influence by sunflower export of Ukraine, because the Ukrainian farmers prefer to sell their seeds on the Romanian market where the price level is higher than in the Republic of Moldova [15].
In 2022, Republic of Moldova exported approximately $155 million worth of sunflower seeds to the European Union market, and 50% less vegetable oil and other fats.
As for sunflower oil, the price of which has risen sharply: Ukraine delivered about 1.4 million tonnes in 2021. This represents about 85% of total imports, while Moldova accounts for a very small amount.
Sunflower is an export-oriented crop, so its imports (excluding seed) are insignificant. The changes over 40 years such important indicators across the country as total sunflower area planted, production of sunflowers and average harvest reveals the total sunflower area was increased on +2.28 times, sunflower production – on +1.97 times and average sunflower harvest was decreased on -2 quintals/hectare.

CONCLUSIONS

Sunflower production plays a crucial role in Moldova's agricultural sector, being one of the main oilseed crops. The country benefits from favorable climatic conditions and fertile soils, making sunflower a key component of the national economy.
While sunflower production has remained relatively stable, but in the last years, yield was affected by weather conditions, such as droughts and high temperatures.
Improved irrigation systems and climate-resilient seed varieties are essential to sustain and increase productivity.
A large share of Moldova's sunflower production is exported, primarily as raw seeds or crude oil. Key markets include Romania, Turkey, Bulgaria, and Ukraine. Strengthening trade agreements and improving export logistics can enhance market access and competitiveness.
Moldova has a growing but underutilized processing industry for sunflower oil. Expanding local processing capacities would allow the country to export higher-value products rather than raw materials, increasing revenue and economic sustainability.
Despite its export potential, the sunflower sector faces challenges such as fluctuating global prices, dependency on foreign markets, and insufficient modernization of processing facilities. Encouraging investments in value-added production and adopting advanced processing technologies could improve sector performance. With strategic investments and policy support, Moldova can significantly increase its sunflower production efficiency and export competitiveness. The development of a well-integrated value chain, from cultivation to refined product export, will ensure long-term economic benefits for the country.
The positive result was achieved due to the growth of sunflower harvests on +20%. Sunflower accounts for about 9% of the global oilseed production structure.

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