

ANALYSIS OF VALUE ADDED IN THE SUNFLOWER VALUE CHAIN IN THE REPUBLIC OF MOLDOVA

Aurelia LITVIN

Technical University of Moldova, Chisinau, Republic of Moldova
ORCID ID: 0000-0003-756-0856

* Corresponding author: Aurelia Litvin aurelia.litvin@gmail.com

Elena CONDREA

Technical University of Moldova, Chisinau, Republic of Moldova
ORCID ID: 0000-0003-2588-356X

elena.scerbacov@em.utm.md

Abstract. Sunflower is one of the most valuable oilseed crops in the Republic of Moldova, contributing significantly to the agricultural trade balance and farmers' incomes. However, the structure of the value chain of this crop reflects a deep economic imbalance, in which a large part of the economic value is captured in the final segments of the chain – processing, packaging and export – while farmers are left with low profit margins. The analysis of the value added on each segment of the value chain – from primary agricultural production, collection, processing, to the export of the finished product – provides a clear picture of how economic benefits are distributed and highlights bottlenecks and potential areas for strategic intervention. In the context of a fragile rural economy and volatile markets, it is essential to identify opportunities through which Moldovan farmers can access higher value segments, whether through vertical cooperation, investments in micro-processing or integration into cooperatives. Methodologically, the assessment of added value involves calculating the difference between the sales value and the input costs for each stage, complemented by qualitative data on bargaining power, market access and managerial efficiency. Thus, the article aims to contribute to the development of economic and managerial solutions based on real data, with the aim of stimulating economic equity and competitiveness of the sunflower value chain in the Republic of Moldova, in an agricultural context in transition and with major structural challenges.

Keywords: sunflower, value chain, agricultural, entrepreneurs, development, sustainable.

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Introduction

The agricultural sector of the Republic of Moldova plays a strategic role in the national economy, and sunflower cultivation represents one of the main sources of agricultural income and export. Sunflower is not only a highly productive oilseed crop, but also a central element of the agro-industrial value chain, generating multiple forms of added value – from seed production and oil processing, to the manufacture of derived products such as protein cakes, biofuels and other usable by-products. The analysis of the added value in this chain provides an essential perspective on the economic efficiency, the distribution of benefits among the actors involved and the competitiveness potential of the sector. In the context of regional economic integration and increasingly stringent requirements regarding the sustainability and quality of agri-food products, the identification of critical points and growth opportunities becomes a strategic priority. Therefore, this study aims to examine the structure and dynamics of the sunflower value chain in the Republic of Moldova, to assess the level of added value generated in the different stages of the process, and to provide recommendations for strengthening innovation capacity and increasing the economic value of domestic oilseed products.

Literature review

The literature on the sunflower value chain highlights the strategic relevance of this crop. However, although production volumes are significant, the analysis of the added value along the entire chain – from production to processing and distribution – remains insufficiently documented. [1].

Studies reveal a constant expansion of the areas cultivated with sunflower, often to the detriment of crop rotation, which has led to soil degradation and the accumulation of pathogens. Sunflower occupies about 25% of arable land, making it the dominant oilseed crop, but raises questions about sustainability. [8].

Moldova is among the top 15 global producers of sunflower, with exports of seeds and oil constituting a significant part of agricultural trade. However, exports are predominantly in the form of raw materials or semi-finished products, which limits local added value. [3].

The literature highlights the decline in soil fertility, biodiversity loss and vulnerability to climate change due to monoculture and intensive use of chemicals. At the same time, there is a growing interest in integrated protection and organic farming. [8]. The existing literature confirms the central role of sunflower in Moldovan agriculture, but the focus is mainly on production trends, sustainability issues and agronomic management. Analyses of value added along the value chain – including processing, distribution and income sharing – are rare and fragmented.

Methodology

The methodology of this study is based on the quantitative and qualitative analysis of official statistical data provided by the National Bureau of Statistics of the Republic of Moldova. The research covered the period of the last relevant agricultural years, in order to identify trends and changes in the sunflower value chain. The data collected included indicators on cultivated areas, production volumes, average yields, purchase prices, processing costs and export and import values of derived products. The analysis was structured on the main stages of the value chain: primary production, industrial processing and commercial distribution. Comparative methods were also applied to assess the degree of vertical integration. The interpretation of the results was supported by graphical analyses and synthetic tables, designed to highlight the correlations between production, processing and export. Thus, the proposed methodology provides a solid basis for understanding the economic structure and development potential of the sunflower value chain in the Republic of Moldova.

Results and further discussions

Sunflowers hold a significant share in the structure of crops in the Republic of Moldova, accounting for about 25% of arable land. This share is considered well above the level recommended by agronomic research, which suggests more balanced rotations to maintain soil fertility. However, the high economic interest in this crop has led farmers to expand the cultivated areas, taking advantage of the external demand for sunflower seeds and oil.

At the international level, the Republic of Moldova occupies a privileged position, ranking 15th in the export of sunflower seeds and 2nd in the export of oil. This performance is explained by the combination of the cultivation tradition, the use of high-performance hybrids and industrial processing capacity. At the same time, exports contribute substantially to the country's positive trade balance, playing a role in maintaining macroeconomic stability.

Sunflower seeds are a caloric-dense food (≈ 580 kcal/100 g), but also extremely nutritious. The benefits of sunflower emerge from the following: **Vegetable oils** rich in polyunsaturated fatty acids, essential for cardiovascular health. **Vitamins:** A, D, E, complex B, folic acid. **Mineral:** magnesium, zinc, calcium, iron, iodine, fluorine. **Protein and dietary fiber** (6–7%), contribute to the detoxification of the body and the proper functioning of the digestive system. [7].

Sunflower seeds are used in the following important sectors of the economy of the Republic of Moldova, such as:

1. Food industry: refined and unrefined oil, bakery and pastry products, sweets and salads.
2. Feed industry: Sunflower meal is an important source of protein for animal nutrition.
3. Cosmetology: sunflower oil is used in moisturizing creams and masks, having antioxidant and anti-aging effects.

A notable advantage of seeds is the preservation of their nutritional qualities in the long term, which gives them added value for processors and exporters.

The economic importance of sunflower in the Republic of Moldova is marked by: *high profitability* – the purchase price of seeds makes the crop competitive compared to other crops; *constant demand* – sunflower oil is a

staple food in the domestic market and an important export product; *impact on the rural economy* – ensures stable incomes for farmers, even in conditions of fluctuations on the world market. [8].

Comparing the performance of the Republic of Moldova with that of the world's leading sunflower producers provides a clear picture of the country's positioning:

➤ **Ukraine:** world leader in sunflower production, with cultivated areas of over 6 million ha and an average productivity of 22–25 q/ha. The geopolitical conflict in 2022 affected exports, which created opportunities for Moldova.

➤ **Russia:** ranks 2nd in the world, with a higher average productivity than Moldova (20–23 q/ha). Russian exports strongly influence regional prices.

➤ **European Union:** countries such as Romania, Bulgaria and Hungary are direct competitors of Moldova, with similar productivity, but better access to infrastructure and foreign markets. [1].

Comparatively, the Republic of Moldova has advantages in terms of soil quality and agricultural tradition, but disadvantages in terms of logistics infrastructure and climate stability.

Sunflower plays a significant economic, agronomic, and strategic role in Moldovan agriculture. It is one of the most widely cultivated and exported oilseed crops, contributing substantially to farm incomes, the agricultural trade balance, and crop rotation diversification.

Sunflower is the second most cultivated crop in Moldova after maize. In 2023, it was sown on approximately 392 thousand hectares—representing 24.6% of the total cultivated area. Remarkably, that the share of sunflower in the sown area in 2023 rose to 25%. On the one hand, the phenomenon is beneficial - sunflower is a crop that provides greater profitability for farmers compared to cereal crops, but a negative factor is the failure to comply with crop rotation. For example, if in 2000 sunflower returned to the same land once every 6-7 years, now they return every fourth year, which leads to the degradation of soil quality and increased vulnerability of agricultural land to climatic conditions.

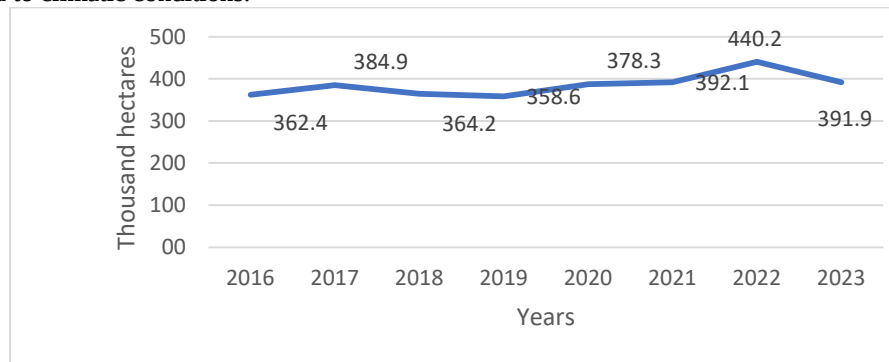


Figure 1: The sunflower sown areas in all categories of producers (thousand hectares)
Source: [4].

The global sunflower harvest mostly has an upward trend except for 2023 and 2024. These years were marked by a severe drought, which contributed to the decrease in the harvest. [2]

Table 1: Main indicators of sunflower seed production in the Republic of Moldova

Year	Global harvest (thousand tons)	Productivity (q/ha)	Average price (lei/ton)
2016		15,9	6 532
2017	268,6	15,7	–
2018	331,1	15,9	–
2019	382,3	13,0	–
2020	484,8	26,0	–
2021	492,5	14,8	7 418
2022	960,1	19,8	9 287
2023	627,1	14,8	10 568
2024	758,4	19,8	6 554

Source: [10]

The analysis of statistical data highlights several essential aspects: global production peaked in 2022, with over 960 thousand tons, a double value compared to the average of the analyzed period. This increase was driven by both the expansion of the areas and the favorable climatic conditions. In 2023–2024, a decrease was observed, and 2023 was marked by instability. *Productivity*: varied strongly, reaching a minimum level of 13 q/ha in 2019, in the context of a dry year, and a maximum of 26 q/ha in 2020. This volatility demonstrates the dependence of the crop on climatic conditions and the technological level of the farms. *Prices*: fluctuated depending on the international market. The highest level was recorded in 2023, amid regional market disruptions and this year's small harvest, while in 2024 there was a steep decline, which diminished farmers' incomes.

Both raw sunflower seeds and sunflower oil are key export commodities, with major destinations including the European Union, the CIS countries, and the Middle East.

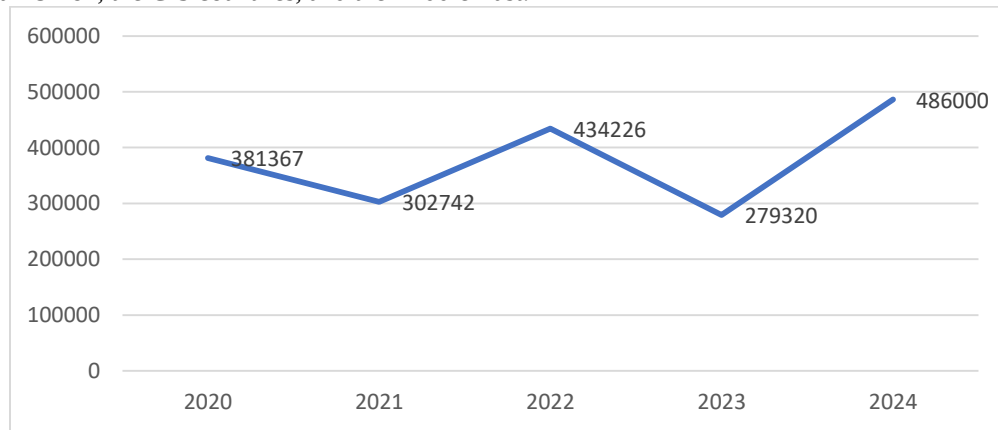


Figure 2: Export of sunflower seeds from the Republic of Moldova, tons
Source: [14]

The information presented in Figure 2 shows us a negative trend in sunflower seed exports. This trend is caused by the negative impact of climatic conditions in the Republic of Moldova, on the sunflower harvest, especially drought. In the 2024–2025 agricultural season (July–March), exports reached a record volume of ≈ 486 – 487 thousand tons (an increase of 28% compared to the previous season) [5,6,12]. Thus, more than 91 % of production is destined for export as a raw material, which indicates minimal domestic processing. Exports of processed products (oil and meal) are extremely low: only $\approx 18,100$ tonnes of oil and $\approx 14,200$ tonnes of meal between July 2024 and April 2025. [13].

As for integration into value chains, until 2021 our country exported more sunflower as a raw material, compared to sunflower oil. The massive export of seeds provides significant volumes of foreign currency and supports farmers' incomes, especially in the context of a relatively stable price, despite variable harvests. But, the drastic reduction of in-house processing (value-added products) represents a significant economic loss. Local operators in the processing industry (oils, meals) are marginalized, and some have had to suspend their activity due to lack of raw material or difficult access to imports [3]. The concentration of exports on raw materials undermines the development of local industry and vertical integration capabilities.

Moldova currently exports ≈ 90 – 92% of sunflower production as a raw material. Only 2–3% of production is domestically converted into oil and meal for export. This structure indicates a lack of integration in the value chain, leading to loss of added value. [9,11].

The potential of the value chain:

1. Step 1 – primary production: seed cultivation (currently dominant).
2. Step 2 – primary processing: oil extraction, production of meals.
3. Step 3 – secondary processing: finished products (refined oil, margarine, biofuels, cosmetics).
4. Step 4 – residual recovery: use of husks and by-products for biomass or fertilizers.

The sunflower value chain is made up of a series of interconnected links, which determine the degree of added value created in the economy.



Figure 3: The Sunflower Value Chain

Source: Author's own contribution

1. *Raw material production:*
 - ✓ Use of high-quality hybrid seeds (domestic and imported);
 - ✓ Application of fertilizers and pesticides, adapted to pedoclimatic conditions;
 - ✓ Influence of natural factors (drought, precipitation distribution, extreme temperatures).
2. *Collection and storage:*
 - ✓ The existence of modern silos and dryers;
 - ✓ Post-harvest losses, estimated at 5–10%, affect the profitability of the sector.
3. *Industrial processing:*
 - ✓ Obtaining crude and refined oil;
 - ✓ By-products: meal used in animal husbandry, biodiesel;
 - ✓ Industrial capacity is concentrated in a few large enterprises, which creates advantages of scale, but also risks of economic concentration.
4. *Distribution and export:*
 - ✓ Main foreign markets: Romania, European Union;
 - ✓ The contribution of refined oil exports is higher than that of crude seeds, but requires additional standardization and certifications.
5. *Consumption and end use:*
 - ✓ Edible oil is the main domestic destination;
 - ✓ By-products are used in animal feed and the bioenergy industry.

The added value is concentrated in the industrial processing stage, where the market price of the finished products exceeds the value of raw seeds by 150–200%. Oil exports make a substantial contribution to Moldova's foreign exchange earnings, but dependence on foreign markets is a strategic risk.

The advantages of value chain development are: increasing the incomes of local farmers and processors; diversification of the export market, reducing dependence on unstable external markets; job creation in the food and biochemical industries; increasing national food security.

However, the sector faces *challenges*, mainly due variable yields, depending on climatic conditions (frequent droughts, typical for southern Moldova); increase in production costs; lack of technological stability in some farms. Thus, the implementation of **modern agricultural practices** and the strengthening of local processing capacities are essential for increasing competitiveness. Also is very important to implement the development of production lines for premium refined oils, bioplastics and biodiesel. For the development of value chains, it is advisable to create agricultural cooperatives and agro-industrial clusters to integrate small producers into the global market. Great attention must be paid to climate adaptation, promoting drought-tolerant hybrids and efficient irrigation systems and reducing the consumption of pesticides and adopting environmentally friendly agricultural practices.

Conclusion

Sunflower is a strategic crop for the Republic of Moldova, generating significant added value both through the production of raw material and through industrial processing. The statistical analysis highlights the sector's vulnerability to climatic and geopolitical factors, but also its growth potential through the integration of the links in the value chain. To ensure long-term sustainability, a strategic approach combining technological innovation, climate adaptation and product diversification is needed.

Recent data highlight a paradox: although Moldova manages to consolidate its position as a regional exporter of sunflower seeds, the success is gloomy due to the lack of domestic processing and poor economic capitalization. Production is growing and exports are breaking records, but prosperity falls on the shoulders of raw materials, not finished products. Market modernization, investments in local industry and proactive agricultural policies are crucial for transforming this sector — not just a revenue generator, but a sustainable pillar of the Moldovan economy.

Sunflower remains a fundamental crop for the Republic of Moldova, generating both *high caloric value* for consumers and *economic opportunities* through processing and export. Climate instability mainly affects the south of the country, but through modern technologies yields can be stabilized. The export of raw materials must be gradually replaced by processed products, in order to increase the added value.

The development of the value chain – from seeds to food, cosmetics and biofuels – is the key to strengthening the strategic role of this crop in Moldova's economy.

References

- [1] The Observatory of Economic Complexity, 2024, Sunflower seeds, Rep. of Moldova, 2016-2023 <https://oec.world/en/profile/hs/sunflower-seeds>, <https://oec.world/en/profile/hs/sunflower-seeds?countryComparisonGeoSelector=eu>, Accessed on June 5, 2025.
- [2] AgroExpert, 2023 (26 August), Producția de floarea-soarelui în Rep. Moldova și Europa de Est: date și estimări (Sunflower production in the Republic of Moldova and Eastern Europe: data and estimates). <https://agroexpert.md/rom/moldova/productia-de-floarea-soarelui-in-r-moldova-si-europa-de-est-date-si-estimari>, Accessed on June 18, 2025.
- [3] The largest vegetable oil producer in moldova suspends operations due to sunflower seed shortage. <https://www.infotag.md/economics-en>, Accessed on September, 25.
- [4] Banca de date statistice. Biroul Național de Statistică al Republicii Moldova (The Statistical Data Bank. National Bureau of Statistics of the Republic of Moldova), https://statbank.statistica.md/PxWeb/pxweb/ro/40%20Statistica%20economica/40%20Statistica%20economica__16%20AGR__AGR020/AGR020060.px/table/tableViewLayout2/?rxid=b2ff27d7-0b96-43c9-934b-42e1a2a9a774, Accessed on August, 25.
- [5] Bolea, V., 2023 (September 15). Producția și exportul de ulei din floarea soarelui sunt vitale pentru economia Moldovei. (Sunflower production and oil are vital for the economy of Moldova). In Romanian. Portalul independenței din Bălți. <https://esp.md/ro/sobytiya/2023/09/15/vladimir-bolea-productia-si-exportul-de-ulei-din-floarea-soarelui-sunt-vitale#>, Accessed on July 16, 2025.
- [6] Danila, L., 2024, (March 7), Exportul de semințe și ulei de floarea soarelui: cine exportă și unde. (Sunflower seeds and oil export: Who exports and where). In Romanian, Agroexpert. <https://agroexpert.md/rus/tseny-i-trendy/exportul-de-seminte-si-ulei-de-floarea-soarelui-cine-exporta-si-unde>, Accessed on June 12, 2025.
- [7] Dima, D., Pamfilie, R., Procopie, R., Păunescu, C., 2004, Merceologia și expertiza mărfurilor alimentare de export-import (Merchandise and expertize of food-export-import goods). In Romanian. Academy of Economic Studies Publishing House, București, 324 pag.
- [8] Duca M., Clapco S. Management approaches for sustainable growth in Moldova's sunflower sector, 2021. In: Helia, nr. 44(74), p. 0. ISSN 1018-1806. DOI: <https://doi.org/10.1515/helia-2021-0002>.
- [9] Latiș, D., 2024 (January 18), Analiză: Republica Moldova este principalul exportator de semințe de floarea soarelui în UE (Analysis: The republic of Moldova is the only exported of sunflower seeds in the EU). In Romanian, Agora. <https://agora.md/2024/01/18/analiza-republica-moldova-este-principalul-exportator-de-seminte-de-floarea-soarelui-in-ue>, Accessed on May 18, 2025.
- [10] National Bureau of Statistics of the Republic of Moldova. Balances of food resources and their use for 2022. https://statistica.gov.md/ro/balantele-resurselor-alimentare-si-utilizarii-lor-pentru-anul-2022-9515_60723.html, Accessed on May 10, 2025.
- [11] NOI,MD., 2024 (January 19), Moldova a exportat o cantitate record de ulei de floarea soarelui în 2023 (Moldova exported a high amount of sunflower in 2023). In Romanian. <https://noi.md/md/economie/moldova-a-exportat-o-cantitate-record-de-ulei-de-floarea-soarelui-in-2023>, Accessed on May 7, 2025.
- [12] Record Moldavian sunflower exports. <https://logos-pres.md/en/news/record-moldovan-sunflower-exports>, Accessed on June 24, 2025.
- [13] Moldova's sunflower seed exports hit record high in 4 years. <https://ukragroconsult.com/en/news>, Accessed on September, 25.
- [14] WITS World Bank, Integrated Trade Solution, 2024, Exports of sunflower seeds, <https://wits.worldbank.org/trade/comtrade/en/country/ALL/year/2021/tradeflow/Exports/partner/WLD/product/120600>, Accessed on June 24, 2025.