European Commission

VCA4D
VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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Value chain analysis of sunflower in Moldova

Value chain analyses assist in informing policy dialogue and investment operations. They help the understanding of how agricultural development fits within market dynamics. They permit an assessment of the value chains' impact on smallholders, businesses, society and environment.

The European Commission has developed a standardised methodological framework for analysis (https://europa.eu/capacity4dev/valuechain-analysis-for-development-vca4d-/documents/methodological-brief-eng). It aims to understand to what extent the value chain allows for inclusive economic growth and whether it is both socially and environmentally sustainable.

The value chain context

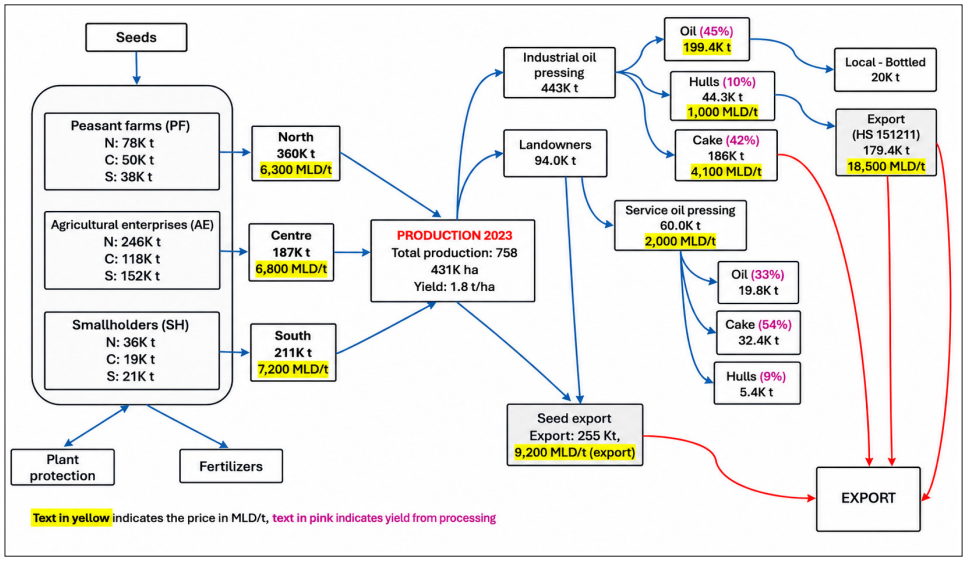
The sunflower value chain (VC) plays a strategic role in Moldova, generating MDL 7.32 billion (€ 372.6 million) in final production and contributing approximately 1.9% to the national GDP. It is critical for rural food security, largely through in-kind lease payments to landowners, and serves as a major export commodity driving foreign exchange earnings.

The agricultural structure is highly dualistic. A small number of large agricultural enterprises operate on extensive leased areas and dominate commercial output (accounting nearly 68% of production), while numerous peasant farms and smallholders operate on fragmented plots.

The VC is heavily concentrated on downstream in industrial processing and export trading. It faces severe structural constraints, most notably a high vulnerability to recurrent climate-induced droughts, very limited irrigation infrastructure (only 10-12% of arable land is irrigated), and a monopolistic processing market structure that limits farmers' bargaining power.

European Union Intervention

European Union (EU) policy alignment is driven by the National Strategy for Agricultural and Rural Development (NSARD) 2023–2030, which aligns Moldova's agricultural framework with the European Green Deal and the Common Agricultural Policy (CAP). Financial support from the EU bolsters local policy implementation, institutional capacity building, and investment grants for farmers.



S - South C - Central N - North

Figure 1: Flow chart of sunflower value chain in Moldova, 2023

Institutional strengthening focuses on harmonizing national phytosanitary, veterinary, and food safety standards with EU regulations to enhance export competitiveness. Sustainability initiatives are significantly supported by EU funding, particularly the development of the National Program of Conservation Agriculture 2020–2025, although widespread adoption remains

Functional analysis

Production

National sunflower production exhibits severe interannual volatility due to climate constraints. Volumes peaked at 960.1 thousand tonnes in 2021 but fell to 492.5 thousand tonnes in the drought-stricken 2020 season. In the reference year 2023, the sector produced 758 thousand t from 431 thousand ha, with an average yield of 1.8 t/ha (Table 1). Agricultural enterprises (AEs) accounted for 68% of national production, while Peasant farms (PFs) at 22% and Smallholders (SHs) at 10%. Regional differences are pronounced; the Northern region leads with 47% of national output and the highest average yields (2.02 t/ha), while the South suffers from acute water scarcity, limiting yields to 1.57 t/ha.

To mitigate climate constraints and soil degradation, no-till conservation agriculture is increasingly adopted. An estimated 17,220 ha of sunflower are cultivated using no-till practices, reducing diesel consumption from 75 l/ha in conventional systems to 38 l/ha while maintaining competitive yields.

The large share of sunflower retained by smallholders for own consumption underscores the crop's importance for household food security, particularly in rural areas (Table 2). Beyond direct consumption, these quantities also support informal food transfers through gifts and in-kind payments, strengthening the resilience of rural households. Regionally, the North records the highest retained volume (5.8 thousand t), followed by the Centre (4.3 thousand t) and the South (4.3 thousand t).

Processing, Marketing and Trade

The industrial processing sector is highly centralized, with over 90% of the country's industrial crushing capacity concentrated in a single operator. This market structure constrains competition and weakens farmers' bargaining power in price negotiations.

In 2023, industrial mills processed approximately 443 thousand t of seed, while small service mills processed 60 thousand t.

Moldova is a net exporter, shipping 255 thousand t of raw seed and substantial volumes of crude oil in 2023. Trade flows are highly concentrated geographically, with Romania absorbing nearly 60% of seed exports in 2023 due to wartime logistical disruptions in the Black Sea, followed by Turkey and Bulgaria.

Farm type	North	Centre	South	Total
Smallholders (SHs)	4,100	3,200	3,500	10,800
Peasant farmers (PFs)	1,560	1,000	660	43%
Agricultural enterprises (AEs)	120	80	100	300
TOTAL	5,780	4,280	4,260	14,320

Table 2: Quantity of Sunflower Used for Own Consumption, Gifts, and Employee Bonuses (t)

Sub-chains

The sunflower VC is characterized by three primary sub-chains. **Industrial processing sub-chain**, being the largest economic driver, is dominated by corporate crushers processing 443 thousand t of seed into export-bound oil and cake. **Seed export sub-chain** involves independent traders commercializing 255 thousand t of raw seeds. **Service oil pressing sub-chain**, comprises small rural mills processing roughly 60 thousand t, primarily from in-kind rent payments given to rural landowners.

Governance

Governance is managed by the Ministry of Agriculture and Food Industry (MAFI), while the Agency for Intervention and Payments in Agriculture (AIPA) administers the National Fund for Agriculture and Rural Development. Regulatory oversight over food safety, plant health, and seed control is enforced by the National Food Safety Agency (ANSA).

The primary policy framework is the NSARD 2023–2030, which promotes rural modernization, environmental sustainability, and CAP alignment. Financial governance is characterized by state subsidies and credit lines managed by banks and microfinance institutions; however, AIPA subsidy distributions structurally favour large, capital-intensive enterprises over smallholders.

Strategic reforms planned for 2025–2030 aim to institutionalize price transparency via an Integrated Agricultural Information System, scale water security through subsidized irrigation, accelerate land consolidation, and enforce stricter sanitary and phytosanitary (SPS) compliance for EU markets.

Types of farms			Production (K t)	Total area (K ha)	Yield (t/ha)	Average area (ha)	Per farm production (t)	Number of Farms
Conventional	North	PFs	78.2	37.3	2.1	55	115	683
		AEs	245.5	111.6	2.2	186	409	601
		SHs	36.2	18.1	2.0	3	5	7,249
	Central	PFs	50.3	31.4	1.6	88	141	357
		AEs	118.0	73.8	1.6	184	294	402
		SHs	18.8	11.8	1.6	5	8.4	2,244
	South	PFs	38.1	22.4	1.7	43	73	524
		AEs	151.8	108.4	1.4	205	288	528
		SHs	21.3	16.4	1.3	1	5	30,365
Total / Average			**758**	**431.2**	**1.8**	10.0	17.66	42,952

Table 1: Distribution of sunflower production among farms (2023)

What is the contribution of the value chain to economic growth?

Financial viability for the actors

The sunflower VC generates positive economic returns, though profitability is highly skewed (Figure 2). SHs achieve the highest return on turnover (ROT) (28–41%) due to their reliance on family labour and avoidance of cash rent. PFs maintain ROT of 7–12%. Conversely, large AEs face negative ROT in the Centre (-7%) and South (-3%) due to elevated production costs, land rents, and severe climate shocks. Overall, farmers face severe liquidity constraints driven by negative VAT balances, as input VAT (20%) frequently exceeds output VAT (8% or 0% for exports).

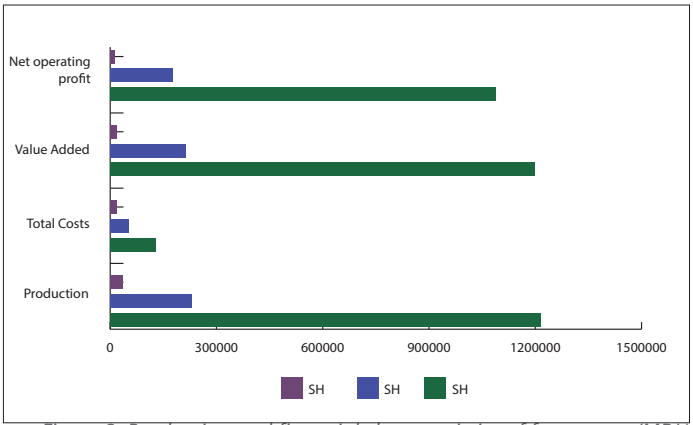


Figure 2: Production and financial characteristics of farm types (MDL)

Industrial mills are the most profitable actors, capturing massive net operating profits (NOP) (MDL 655.2 million~€ 33.4 million) with ROT reaching 19–26%. Small service mills are also highly lucrative locally, generating MDL 3,405 (€ 173) profit per t. Exporters maintain a NOP of around MDL 860 (€44) per t (a ROT of 8.7%).

Impacts of the national economy

The VC contributes significantly to national economy, generating MDL 7.32 billion (€ 372.6 million) in final production. For the reference year 2023, direct value added (VA) amounts to MDL 3.94 billion (€ 200.5 million). When indirect multiplier effects are included, total VA increases to MDL 5.68 billion (€ 289 million), equivalent to approximately 1.9% of national GDP and 12% of agricultural GDP. Wages and NOPs constitute the largest components, each accounting for 35% of total VA (Figure 3). Land fees contribute 17%, followed by depreciation (10%) and interest payments (4%). Taxes represent -1% of VA, reflecting a negative tax balance. The VC is moderately integrated into the domestic economy (77.5%), meaning that 77.5% of value generated remains within the national economy, while the remaining (22.5%) leaks abroad through imports of inputs (seeds, fertilizers, and fuel).

The VC is heavily export-oriented, generating massive foreign exchange earnings and a trade balance surplus of MDL 4.81 billion (€ 244.8 million). However, the impact on public finances is slightly negative, (-0.1% of the public budget) due to agricultural subsidies.

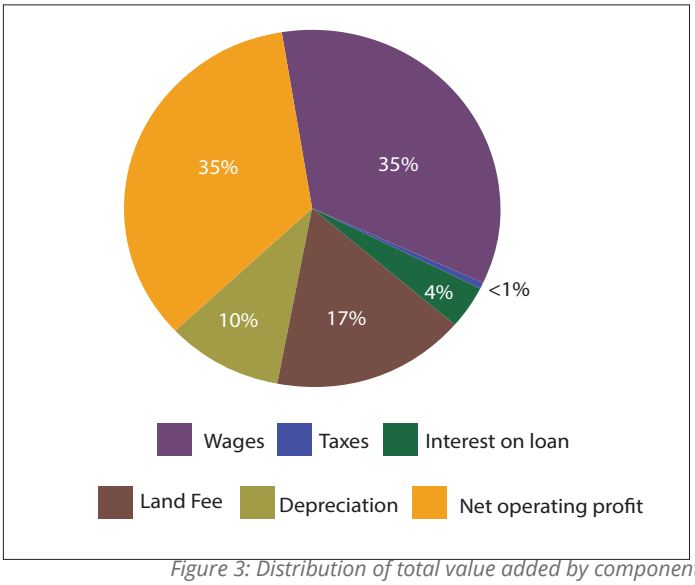


Figure 3: Distribution of total value added by component

Viability in the international economy

The Domestic Resource Cost (DRC) ratio is 0.13, indicating efficiency and a strong comparative advantage. The Nominal Protection Coefficient (NPC) is 0.98, demonstrating effective global integration driven by low production costs. However, Moldova exports raw seeds at slightly below the international average, positioning it in a lower-value market segment. Competitiveness is severely compressed by high domestic transport and logistics costs required to reach the Port of Constanta, particularly penalizing producers in the North. Since late 2023, a government-imposed licensing regime for cheap seed imports acts as a regulatory barrier; while protecting farm-gate prices, it periodically paralyses domestic processing capacities.

Comparison of sub-chains

Industrial processing sub-chain is the largest economic driver, creating the highest VA (MDL 2,912–3,958 ~ € 148-201 per t) and capturing 66% of the VC's total NOPs, but its monopolistic nature limits upstream profit distribution. Seed export sub-chain captures limited VA (17% of production value) because the commodity is exported in its raw form. Finally, although service oil pressing sub-chain processes only a small share of the total production volume, it is highly profitable at the local level, generating MDL 3,405 (€ 173) profit per t, and plays a crucial role in rural employment, income diversification, and local food security.

The value chain strongly contributes to national economic growth, generating 1.9% of GDP and massive export revenues with high global competitiveness. However, structural constraints persist; farmers face severe liquidity crises driven by negative VAT balances and extreme climate volatility, while downstream processors capture disproportionate profits at the expense of upstream actors.

Is the economic growth inclusive?

Distribution of income among the actors

Farmers generate the bulk of the direct VA (66%), followed by industrial processors (25%) and traders (10%). Despite generating most of the value, farms capture only 18% of the total NOP. Downstream actors capture the vast majority; industrial mills alone extract 66% of total NOP. This extreme concentration results in a highly unequal NOP Gini coefficient of 0.84.

Significant structural disparities also exist within primary production. Large AEs capture approximately 63% of public subsidies and possess extensive storage capacities (averaging 1,368 t). This liquidity allows them to delay sales and secure premium prices. Conversely, SHs capture only 4% of subsidies and lack storage, forcing them to sell over 60% of their harvest immediately at depressed spot prices.

Job creation and employment

The VC is a major driver of rural employment, paying MDL 1.3 billion (€ 66.1 million) in direct wages, which scales to over MDL 2 billion (€ 101.8 million) when indirect jobs are included. Primary production generates 85% of all wages. Large AEs provide the majority of formal jobs, predominantly in permanent unskilled positions.

Nearly two-thirds of agricultural employment is informal, stripping seasonal day-labourers of social protection. The rural workforce is ageing rapidly, with youth (under 30) representing only 5.5% of AEs staff and virtually absent from PFs. Women constitute ~42% of the workforce but are heavily concentrated in seasonal, manual, or administrative roles (comprising 70% of seasonal staff), while men completely dominate higher-paid, mechanized positions, driving a 15–17% gender pay gap. Overall, the VC suffers from profound informality, demographic ageing, and gender segmentation.

Growth in the value chain is not fully inclusive. While farms generate 85% of wages and the bulk of value added, highly centralized downstream processors capture 66% of the net profits. Substantial inequalities persist; large enterprises monopolize storage and state subsidies, while marginalized groups, particularly women and seasonal workers, face entrenched informality and wage gaps.

Is the value chain socially sustainable?

The following graph and table provide an image of the main social consequences of the VC activities in six strategic domains.

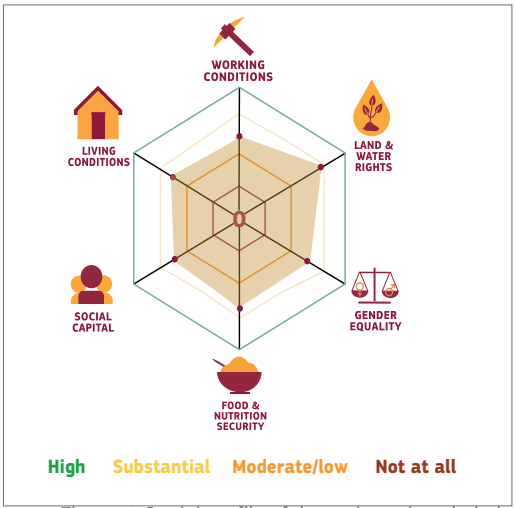


Figure 4: Social profile of the maize value chain in Moldova

Moldova's sunflower value chain is socially embedded, economically vital, and institutionally coherent, yet still marked by selective inclusiveness and structural inequality. More inclusive development will require sustained investment in education, occupational safety, gender equality, and collective capacity—so that the sunflower value chain not only sustains livelihoods but also fosters equitable and resilient rural communities.

Working conditions	▪ Weak labour law enforcement despite labour laws aligned with ILO standards, widespread informal seasonal employment, limited occupational safety, and an ageing agricultural workforce.
Land and water rights	▪ Secure land tenure under stable lease arrangements, but inadequate irrigation and gradual land concentration increasing smallholder vulnerability.
Gender equality	▪ Women's participation in seasonal and administrative work but exclusion from mechanized, higher-paid roles and leadership. ▪ Unequal access to machinery and leadership, and a disproportionate unpaid care burden for women.
Food and nutrition security	▪ Strong contribution of the VC to local food security through domestic oil processing and in-kind lease payments, but cereal- and sunflower oil-based diets with insufficient dietary diversity (protein, fruits, and vegetables) and growing nutrition-related health risks.
Social capital	▪ Weak formal producer cooperation, low interpersonal trust, and reliance on personalized vertical networks rather than horizontal cooperatives limiting collective action and market bargaining power.
Living conditions	▪ High rural home ownership alongside inadequate housing infrastructure, poor energy efficiency, and persistent rural deficits in water, sanitation, healthcare, and education driving outmigration.

Is the value chain environmentally sustainable?

The environmental profile of the VC is examined through a Life Cycle Assessment (LCA) inventory, providing insights into potential impacts across three areas of protection: **resource depletion**, **ecosystem quality**, and **human health**. The LCA inventory also identifies the VC's potential contribution to **climate change**. In addition, a qualitative **biodiversity** assessment was conducted to identify potential risks to biodiversity associated with the VC.

Total impact on areas of protection

The VC drives severe **soil degradation**, particularly through soil erosion and nutrient mining. Across all farming systems, nutrient removals via harvested seeds exceed fertilizer inputs, systematically depleting soil nitrogen, phosphorus, and potassium. For **ecosystem quality**, conventional, intensive tillage accelerates the mineralization of organic matter and destroys soil structure. This degradation is amplified by simplified crop rotations and excessive sunflower saturation. Intrinsic toxicity of authorized inputs is low; however, severe risks arise to **human health** from occupational exposure due to the widespread failure of workers to use personal protective equipment (PPE) during pesticide application. Greenhouse gas (GHG) emissions are primarily driven by mineral fertilizer use and diesel consumption during field operations. Conventional tillage exerts high GHG pressures (up to 96 l/ha of diesel), while no-till conservation agriculture drastically lowers **climate change** impacts by minimizing fuel use (38 l/ha) and soil disturbance (Figure 5).

Impact per value chain stages

Cultivation is the main environmental hotspot in the sunflower VC. Its impacts are primarily associated with mineral fertilizer use, diesel consumption, soil erosion, and nutrient depletion. Improper pesticide handling and limited use of PPE also create occupational health risks. **Transportation** contributes to fossil fuel depletion and GHG emissions, particularly because sunflower seeds and derived products are transported over long distances by road, including to Romanian export ports. **Industrial processing** of seed and oil extraction generate environmental impacts mainly through electricity and energy consumption. However, these impacts remain lower than those associated with primary production. Trade activities are primarily associated with the long-distance transport of sunflower seeds to export markets, contributing to fossil fuel consumption and GHG emissions.

Biodiversity

Direct agricultural encroachment into protected Emerald Network or Natura 2000 sites is very low, and natural reforestation is occurring on some previously cultivated areas. Agro-biodiversity is threatened by excessive sunflower saturation, which occupies nearly 25% of all arable land. Short rotations and homogeneous landscapes severely fragment habitats, reducing populations of pollinators and natural pest enemies. In terms of conservation frameworks, Moldova is aligning its 61 Emerald network sites with more rigorous EU Natura 2000 conservation standards to strengthen spatial management. Thus, to improve ecological connectivity and biodiversity conservation, policies should strictly enforce limits on sunflower saturation (capping at 14–17% of arable land), extend crop rotations to 6–7 years, and promote semi-natural infrastructure like hedgerows, buffer strips, and riparian tree belts.

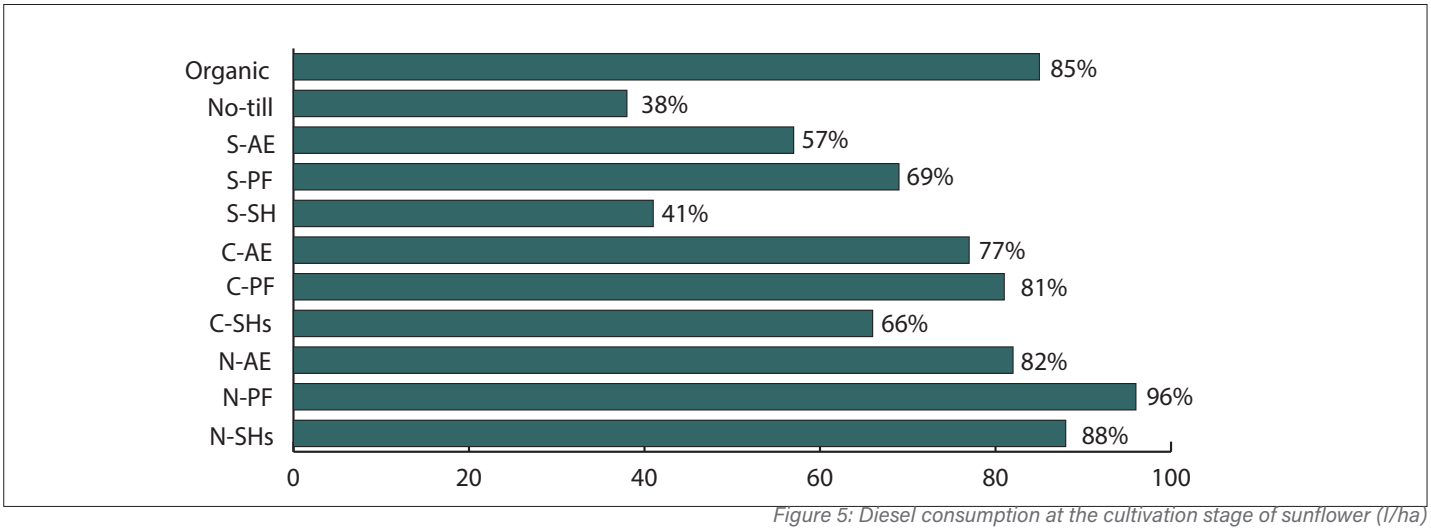


Figure 5: Diesel consumption at the cultivation stage of sunflower (l/ha)

The environmental sustainability of the sunflower value chain in Moldova is compromised by severe soil erosion, chronic nutrient mining, and high vulnerability to climate-induced droughts. Transitioning to no-till conservation agriculture, enforcing crop rotations to 6-7 years, and strengthening ecological infrastructure are critical to reducing climate pressures and preserving long-term resource viability.

Main findings and recommendations

The Moldovan sunflower VC is highly polarised, dominated by smallholder subsistence farms and large, export-oriented agricultural enterprises. While the VC remains critical for trade and food security, structural weaknesses—including high climate vulnerability, dependence on imported inputs, fragmented land ownership, and limited domestic value addition—constrain sector resilience and economic returns.

STRENGTHS	WEAKNESS
▪ Significant contribution of maize production to food security ▪ Availability of local varieties ▪ Suitable climatic and environmental conditions for maize cultivation in some regions ▪ Significant role of white maize production in country's gastronomy and culture	▪ Fragmented small and micro farms limiting mechanization and modernization, with labour shortages from labour-intensive practices, in contrast to more mechanized medium and large farms. ▪ Dependency on imported agricultural inputs and exposure of farmers to price volatility ▪ Limited capacity for storage and access to machinery and equipment, particularly in small-scale farms ▪ Poor infrastructure for effective irrigation systems ▪ Weak soil fertility management practices and a lack of high-quality organic compost and fertilizers ▪ Farmers' limited connection with downstream actors ▪ Absence of effective organizations for maize VC
OPPORTUNITIES	**THREATS**
▪ Increased demand of livestock industries for maize ▪ Presence of feed miller companies, that are also oriented to export ▪ High demand for maize flour by the HoReCa sector	▪ Price and quality competition with the imported maize ▪ Non-diversified import market (solely dependent on Russia's risky market) ▪ Climate change impacts ▪ Soil degradation due to continuous maize cropping ▪ Lack of effective water and wetland management ▪ Abandonment of farming activities by young generation

Recommendations

Market competitiveness and value addition. Harmonize VAT rates across the VC, streamline VAT refunds, and expand affordable credit and collective storage systems to improve farmers' liquidity and bargaining power. Fiscal incentives should encourage reinvestment in farm modernization, post-harvest infrastructure, and digital technologies. At the same time, policies should promote domestic processing, refining, branding, and marketing of sunflower products to reduce reliance on raw seed exports and increase value addition.

Social inclusion and labour conditions. Strengthen labour formalization by linking public support to compliance with employment, social protection, and occupational safety standards. Expand vocational education in agriculture and food processing while promoting women's and young people's access to technical training, productive assets, and leadership opportunities to address labour shortages and demographic ageing.

Environmental sustainability and climate resilience. Accelerate the adoption of conservation agriculture, longer crop rotations, integrated soil fertility management, and efficient irrigation to improve resilience to drought and halt soil degradation. Biodiversity should be enhanced through the restoration of shelterbelts, riparian buffers, and other semi-natural habitats in line with Natura 2000 standards.
Governance and institutional capacity. Simplify agricultural support schemes through digitalized administration, strengthen extension services with real-time agronomic and market information, and modernize soil conservation legislation to align with EU environmental requirements and support sustainable land management.

Value Chain Analysis for Development (VCA4D) is a tool funded by the European Commission / INTPA and is implemented in partnership with Agrinatura. Agrinatura (http://agrinatura-eu.eu) is the European Alliance of Universities and Research Centers involved in agricultural research and capacity building for development. The information and knowledge produced through the value chain studies are intended to support the Delegations of the European Union and their partners in improving policy dialogue, investing in value chains and better understanding the changes linked to their actions. VCA4D uses a systematic methodological framework for analysing value chains in agriculture, livestock, fishery, aquaculture and agroforestry. More information including reports and communication material can be found at: https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d-

This document is based on the report Value Chain Analysis of maize in Moldova by Litvin, A., Negura, P., Rurac., M., Kotyza, P., Bajan, B., Shubitidze, B., Villani, R. 2025 for the European Union, DG-INTPA Value Chain Analysis for Development Project (VCA4D CTR 2018/392-416), 146 p + annexes. Only the original report binds the authors.