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FORMATION OF THE COST OF THE SUNFLOWER OIL PRODUCTION CYCLE: A STUDY OF THE OIL AND FAT INDUSTRY OF KOSTANAY REGION OF KAZAKHSTAN

КҮНБАҒЫС МАЙЫНЫҢ ӨНДІРІСТІК ЦИКЛІНІҢ ӨЗІНДІК ҚҰНЫН ҚАЛЫПТАСТЫРУ: ҚАЗАҚСТАННЫҢ ҚОСТАНАЙ ОБЛЫСЫНЫҢ МАЙ ӨНЕРКӘСІБІН ЗЕРТТЕУ

ФОРМИРОВАНИЕ СЕБЕСТОИМОСТИ ПРОИЗВОДСТВЕННОГО ЦИКЛА ПОДСОЛНЕЧНОГО МАСЛА: ИССЛЕДОВАНИЕ МАСЛОЖИРОВОЙ ПРОМЫШЛЕННОСТИ КОСТАНАЙСКОЙ ОБЛАСТИ КАЗАХСТАНА

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Abstract. In the context of projected growth in global food demand and increasing risks to food security, enhancing the sustainability of agri-food systems is becoming increasingly important. The article examines the structure and dynamics of costs for sunflower oil production using the example of the oil and fat industry of Kostanay region of the Republic of Kazakhstan. *The objective* is to identify key factors in cost formation, assess the impact of individual expense items, and substantiate directions for improving the economic stability of the industry. *Methods* include structural and factor analysis of costs, calculation of the share of cost elements and their impact on prices (basic economic formulas), applied to aggregated statistical indicators of sunflower oil to determine the most significant cost categories and changes affecting production cost fluctuations. The empirical base includes data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan for 2020–2024. Under conditions of limited access to detailed financial reporting of enterprises, a method of proportional allocation of expenses to produced output was used. *Results* show the dominant role of material costs, accounting for more than 94% of the cost of a unit of market product, indicating high raw material dependence of the oil and fat sector and its vulnerability to price fluctuations. The impact of labor and depreciation costs remains secondary. The increase in cost indicators is largely due to rising prices for raw materials and services of third-party organizations. *Conclusions* substantiate the need to optimize resource-oriented policies, reduce material intensity, develop local production and logistics links, and implement comprehensive tools for managing financial burden throughout the value chain.

Аңдатпа. Азық-түлікке әлемдік сұраныстың болжамды өсуі және азық-түлікпен қамтамасыз ету үшін тәуекелдердің артуы шеңберінде агроазық-түлік жүйелерінің тұрақтылығының артуы маңызға ие болып отыр. Мақалада Қазақстан Республикасы Қостанай облысының май өнеркәсібі мысалында күнбағыс майын өндіруге жұмсалатын шығындардың құрылымы мен динамикасы қарастырылады. *Мақсаты* - шығындарды қалыптастырудың негізгі факторларын анықтау, шығындардың жекелеген баптарының әсерін бағалау және саланың экономикалық тұрақтылығын арттыру бағыттарын негіздеу. *Әдістер* - шығындардың құрылымдық және факторлық талдауы, шығындар элементтерінің үлесін есептеу және олардың бағаға әсер ету коэффициенттері (негізгі экономикалық формулалар) күнбағыс майының жалпыланған статистикалық көрсеткіштеріне ең маңызды құн санаттарын анықтау және өндіріс құнының өзгеруіне байланысты қолданылды. Эмпирикалық база Қазақстан Республикасы Стратегиялық жоспарлау және реформалар агенттігінің Ұлттық статистика

бюросының 2020-2024 жылдардағы деректерін қамтиды. Кәсіпорындардың егжей тегжейлі қаржылық есептілігіне қолжетімділік шектеулі болған жағдайда өндірілген өнімге жұмсалатын қаражатты үлестік бөлу әдісі қолданылды. *Нәтижелер* – нарықтық өнім бірлігі құнының 94% - дан астамын құрайтын материалдық шығындардың басым рөлі көрсетілген, бұл май секторының жоғары шикізаттық тәуелділігін және оның бағалық өзгерістерге ұшырауын көрсетеді. Ресурстық инвестициялардың жалақы мен амортизацияға әсері екінші дәрежелі болып қала береді. Құндық көрсеткіштердің ұлғаюы көбінесе шикізат тарифтерінің және бөгде ұйымдардың қызметтерінің қымбаттауына байланысты. *Қорытындылар* - ресурстарға бағытталған саясатты оңтайландыру, материал сыйымдылығын төмендету, жергілікті өндірістік және логистикалық байланыстарды дамыту, бүкіл құн тізбегі бойынша қаржылық жүктемені басқарудың кешенді құралдарын енгізу қажеттілігі негізделген.

Аннотация. В рамках прогнозируемого роста мирового спроса на продовольствие и возросших рисков для продовольственного обеспечения все большее значение приобретает повышение устойчивости агропродовольственных систем. В статье рассматривается структура и динамика затрат на производство подсолнечного масла на примере масложировой промышленности Костанайской области Республики Казахстан. *Цель* - выявление ключевых факторов формирования себестоимости, оценка влияния отдельных статей расходов и обоснование направлений повышения экономической стабильности отрасли. *Методы* - структурный и факторный анализ издержек, расчет доли затратных элементов и соотношения их воздействия на цены (базовые экономические формулы) были применены к обобщенным статистическим показателям подсолнечного масла для определения наиболее важных стоимостных категорий и изменения на колебание производственной стоимости. Эмпирическая база включает данные Бюро национальной статистики Агентства по стратегическому планированию и реформам Республики Казахстан за 2020–2024гг. В условиях ограниченного доступа к детализированной финансовой отчетности предприятий использовался метод долевого распределения расходных средств на произведенную продукцию. *Результаты* – показана доминирующая роль материальных затрат, составляющих более 94% стоимости единицы рыночного продукта, что свидетельствует о высокой сырьевой зависимости масложирового сектора и его подверженности ценовым вариациям. Влияние ресурсных вложений на оплату труда и амортизацию остается второстепенным. Увеличение стоимостных показателей в наибольшей степени обусловлено подорожанием тарифов на сырье и услугами сторонних организаций. *Выводы* - обоснована необходимость оптимизации ресурсно-ориентированной политики, снижения материалоемкости, развития локальных производственных и логистических связей, внедрения комплексных инструментов управления финансовой нагрузкой по всей цепочке создания стоимости.

Keywords: oil and fat industry, sunflower oil, cost structure management and optimization, sustainable production, processing, competitiveness, food security.

Түйінді сөздер: май өнеркәсібі, күнбағыс майы, шығындар құрылымын басқару және оңтайландыру, тұрақты өндіріс, өңдеу, бәсекеге қабілеттілік, азық-түлік қауіпсіздігі.

Ключевые слова: масложировая промышленность, подсолнечное масло, управление и оптимизация структуры затрат, устойчивое производство, переработка, конкурентоспособность, продовольственная безопасность.

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Introduction

The forecasts of the Food and Agriculture Organization of the United Nations predict a rise in demand for food products by 50% due to striking global population growth and makes the problem of hunger even more acute (Onyeaka H., Anumudu C.K., C. Okpe et al.) [1]. The relevance of the study consists in the increased need to optimize food production costs, as demand for sunflower oil increases. The purpose of the study is to examine cost structure of the fat and oil industry in Kostanay region, as well as separate cost items. The regional relevance of the study is subject to further consideration despite its creation by domestic and foreign scientists. Recommendations can be used to manage the costs of oil and fat processing enterprises.

While humankind has achieved significant progress in ensuring food security over the past two centuries - through advances in agricultural technologies, productivity growth, improved logistics, and global trade - agri-food systems remain highly vulnerable to external shocks. The adverse effects of these shocks are most pronounced in low- and middle-in-

come countries, where agri-food systems often lack sufficient adaptive capacity. Kazakhstan represents one such case, as its agricultural sector is characterized by a high dependence on natural and climatic conditions, limited diversification, and constrained access to financial resources.

Many agricultural producers operate with restricted capital, which reduces their ability to invest in modern technologies, climate-resilient practices, and risk management instruments. As a result, external shocks not only undermine production stability and farm incomes, but also pose challenges to national food security and the long-term sustainability of the agri-food system (Davis B., de la O Campos A.P., Farrae M. et al.) [2].

The research has shown that, about 4 billion people all over the world live in households, associated with agri-food systems. Agricultural performance enhancements are critical for smallholder farmers in low- and middle-income countries, both for strengthening or diversifying of their incomes and also for improvement of food security and healthy foods supply.

Nevertheless, the importance of agriculture production is different in different regions, thus, correlation between increasing its productivity, increase of farmers' incomes, reduction of the cost of food and development of non-agricultural sector vary and depends on particular conditions. This variety results in differences in the level of open trade, then space barriers across countries and within them, degree of labor mobility, distortions of production factors due to technological changes in land use and employment, as well as transformation of food preferences and dietary patterns (Davis B., de la O Campos A.P., Farrae M. et al.) [2].

Literature review

The process of mechanical pressing of whole seeds is the classic method of extracting sunflower oil. Despite the fact that pressing crude sunflower seeds reduces oil yield by 14% and undermines transparency, many enterprises use this method, since seed purification requires additional equipment (Kibasa E., Vicent V., Rweyemamu L.) [3]. The costs, incurred by the enterprise for production and transfer of products to the warehouse form factory cost. Food security is the responsibility of the agri-food sector, which includes not only agriculture, but also processing enterprises and transport networks. Agrifood enterprises must work efficiently and sustainably for satisfaction of population in food supply (Badrudeen T.U., Nwulu N., Olorunfemi B.O. et al.) [4].

The remuneration of workers of manufacturing enterprises constitutes a significant share of expenses. Growth trend of automation and robotization of production has been noticed by economists around the world over the course of 30 years. Though primarily such labor was viewed as even more profitable for the manufacturer in terms of substitution of routine labor and release of labor compensation fund, the positive effect of productivity is much less than expected. The fact, that the decline in prices for automation components foster the spread of automation, such factors, as increase in margins, increase in initial costs, increase in maintenance costs lead to growth of prosperity, but to a lesser extent than an increase in labor productivity (Acemoglu D., Restrepo P.) [5].

«From farm to fork» system, widely used in Switzerland, includes bread production and primary production, manufacturing, retail, consumption and waste (Carroll J., Denny E., Lyons R.C. et al.) [6]. Annual food waste is projected to be 126 million metric tons in the nearest future, which not only indicates mismanagement of resources, but also causes environmental and social problems. In developed and developing countries, global research efforts are devoted to reduction and recycling of food waste volumes for the production of bioactive compounds and renewable materials (Bin Jumah M.N., El-Sherbeeny A.M., Farhan A.M. et al.) [7].

The purpose of multilevel marginal profit accounting in the cost management system is to evaluate the profitability of individual products and organizational units. However, the classical model of multilevel accounting of marginal profit, as a rule, does not provide for the use of mathematical optimization methods (Gutiérrez M.) [8].

In recent years, an increase in labor costs, accompanied by an increase in financialization processes, has become a serious obstacle to the development of the manufacturing industry (Du Z.Y., Wang Q.) [9]. In some cases, large non-refundable investments are required to produce a better product, while the marginal production costs are essentially independent of the quality level. In other cases, the release of improved products requires the involvement of qualified personnel or the use of more expensive resources, which leads to an increase in unit costs with gradual improvements in quality (Alventosa A., Pacheco Pires C., Ferreira Jorge S. et al.) [10].

Materials and methods

The study was carried out at a micro level in the districts of Kostanay region using an integrated approach to data collection and processing. It is based on the analysis of statistical materials, dynamic series, determination of the cost structure. Separate cost items are considered and the level of their impact on

the cost of production is estimated. The methodological base was compiled by modern research in the field of analysis of the cost of production and processing of vegetable oils, as well as food security. The articles were searched in the Web of Science Database. «Web of Science» was chosen for its extensive coverage, ease of use, citation records, and built-in tools to facilitate data analysis with interdisciplinary coverage.

The main information was obtained from the base of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, as well as scientific publications and conference materials. At the same time, the research process was accompanied by a number of methodological challenges related to data availability. In particular, significant difficulties arose in identifying detailed statistical indicators of the economic costs associated with sunflower oil production. This limitation is largely due to the fact that financial and cost-related information of processing enterprises is classified as commercial confidential data and, therefore, is not disclosed in full to external users, including researchers and analysts. As a result, direct access to enterprise-level cost structures was not possible. For solving this issue, equity distribution method was carried out based on data from the collection of production statistics for Kostanay region.

Results

Sunflower cultivation has been solidified in world agriculture. This is the third main oil crop across the globe after soybeans and rapeseed, also rich in protein, that enable sunflower oil to compete with palm oil in the world market (Hussain F., Khan F., Ahmad J. et al.) [11]. On average, sunflower seeds contain about 35-50% high-quality oil for food. Sunflower oil contains approximately 15% saturated and 85% unsaturated fatty acids with a significant content of oleic (omega-9) and linoleic (omega-6) acids, as well as tocopherols and fat-soluble vitamins (Ayu A.M., Anjani G., Afifah D.N. et al.) [12]. Sunflower production differs due to variety differences and environmental factors, including soil fertility.

Traditionally, all costs have been viewed as a key indicator of project success and project management effectiveness. While success in recent years the focus in assessing project has shifted onto creating value for stakeholders, rather than just meeting cost, time and quality parameters, controlling and managing costs remains one of the most important goals of project teams. Typically, cost analysis in projects focuses on the problem of cost overruns, which partially intersects with the tasks of reduction of overspending level. Over the past three decades, studies of budget overruns have advanced significantly and brought deeper understanding of the reasons for the excess of actual costs over the planned costs.

These include, for example, optimistic bias and strategic distortion of information at the stage of initial assessments, often leading to the effect of escalating obligations or "fixing" of the project. Changes in the scope of work that cause alterations and additional costs also have a significant impact on cost growth, which is often due to insufficient elaboration of the pre-design stage, lack of competencies, ineffective contract and procurement solutions, as well as high complexity of projects. Some of these factors are also relevant for cost reduction policies, since eliminating overspending due to changes in the scope of work leads to the project cheapening. At the same time, studies on optimistic bias and strategic distortion of information are focused primarily on improving the accuracy of estimates, and not on direct cost reduction (Watton J., Unterhitzenberger C., Locatelli G. et al.) [13].

Let's consider the main averaged indicators of the cost of sunflower oil in Kostanay region. Due to the fact that the financial statements of industrial enterprises should be considered as a trade secret, the data and calculations were made according to publicly available official data (table 1).

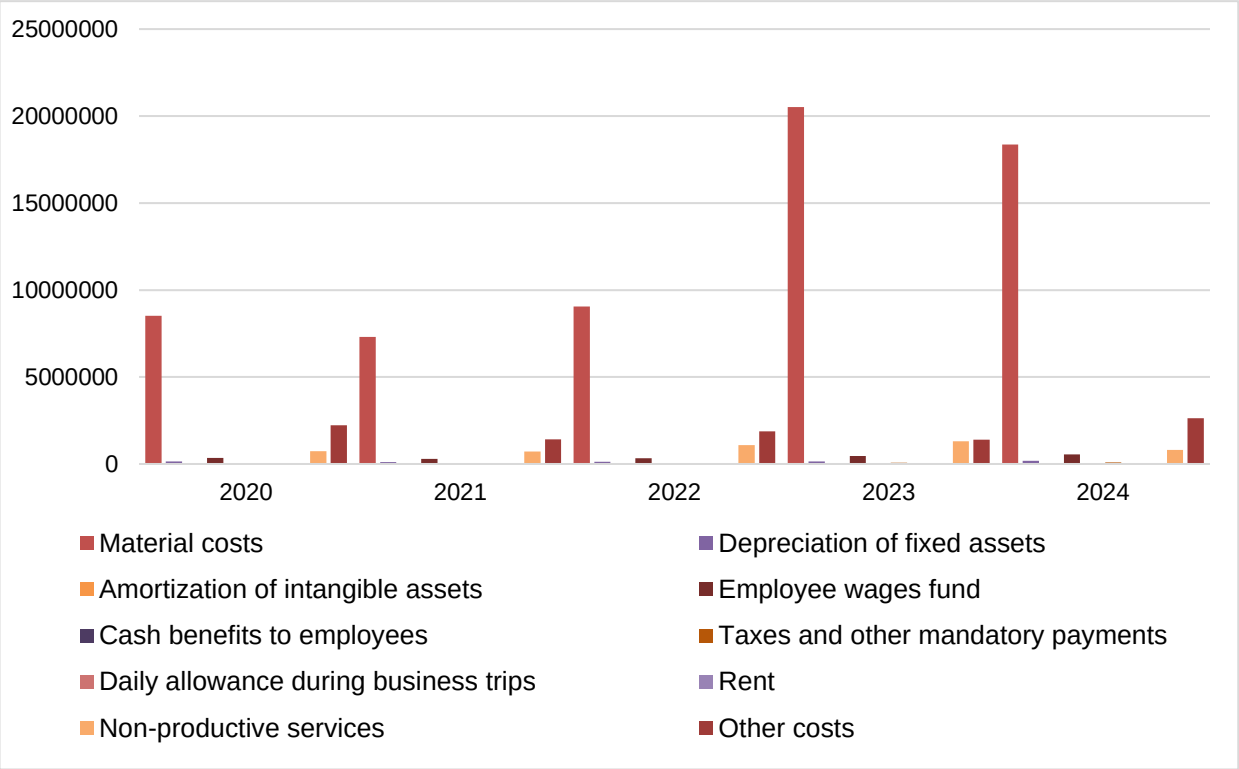
Table 1 - Structure of material costs of enterprises, sunflower oil producers, thousand tenge

	2020	2021	2022	2023	2024
Raw and other materials	7 203 066	546 6615	727 2620	17 899 110	12 058 668
Purchased semi-finished materials and components	891 672	1 519 666	1 369 595	1 235 144	1 124 731
Fuel	23 767	15 372	18 438	29 468	26 871
Energy	47 044	15 372	43 625	58 746	63 550
Production works and services, performed by third parties	152 169	115 809	118 332	687 920	4 627 146
Other materials	53 621	27 229	33 181	35 028	29 798
Note: compiled by the author, based on the source of the (Bureau of National Statistics of the Agency…) [14]					

When analyzing the structure of material costs for the production of sunflower oil, a very consistent high raw material dependence of the industry can be seen. A sharp increase in costs in 2023 and their partial decrease in 2024 indicate a high sensitivity of the cost to commodity prices and processing volumes. Also, a significant share is occupied by the services of third-party organizations, which further indicates the dependence of processing enterprises on third-party agents and the low integration of the production chain. Purchased semi-finished products and components rank second in the structure of material costs. Their dynamics are characterized by growth in 2021 to 1.52 million tenge, followed by a gradual decline to 1.12 million tenge in 2024. This trend may indicate a partial optimization of production processes or the replacement of purchased components with own resources.

Fuel and energy costs remain insignificant in the overall cost structure. Fuel costs throughout the period do not exceed 30 thousand tenge, showing moderate fluctuations without a clear trend. Energy costs are characterized by more noticeable dynamics: after a decline in 2021, they are growing steadily, reaching a maximum in 2024, which may be associated with an increase in energy tariffs and an increase in the energy intensity of production.

Other materials account for a minimal share of the cost structure and show relatively stable values within the range of 27–54 thousand tenge, without having a significant impact on the formation of production costs. The rest of cost items (purchased semi-finished products, fuel, energy and other materials) remain low. This cost structure confirms the necessity to optimize commodity policy, driving down the logistics and service costs and developing local production chains to increase stability and profitability of the industry. Let's review in detail the structure dynamics of the fat and oil industry (figure).



Note: source of the (Bureau of National Statistics of the Agency…) [14]

Figure - Dynamics of total sunflower oil production costs

Especially strong growth is being seen in material costs, which had already more than quadrupled - from 8.52 million tenge in 2020 to 18.37 million tenge in 2024, and it indicates an increase in the cost of raw materials, transportation and production resources. Expenses for non-production services and other expenses increased significantly, which may indicate an increase in attracted services, logistics and administrative expenses. The wage fund also demonstrates positive trends - a near threefold increase shows either expansion of production or indexation of wages. Taxes, depreciation and related mandatory payments increase continuously, while maintaining proportionality to the growth of production indicators. In general,

the Table mirrors the trend towards higher production cycle costs, although costs, including raw material costs, are growing according to gain in production.

Further analysis of the cost structure may be considered through economic calculations (table 2). First, let's define the share of the cost item in the cost price:

$$w_i = \frac{z_i}{z_{общ}}, \quad (1)$$

where w_i - item share in cost price;

Z_i - cost per item;

Zобщ - total cost.

Since we have data for the several years, it is possible to calculate the rating of influence due to price change:

$$\Delta S_i = w_i \times \Delta P \quad (2)$$

where ΔSi - percentage change in cost price due to change in item price;

wi - item share in the cost price;

ΔP - price change per cost item (%).

Table 2 - Main indicators of sunflower oil cost value

	2020	2021	2022	2023	2024
Sunflower oil production, tons	14 096	11 586	16 055	29 194	32 444
Costs, thousands tenge	8 887 896	7 563 503	9 279 122	20 639 379	18 889 207
Material costs, thousands tenge	8 376 873	7 190 866	8 861 828	19 971 979	17 959 906
Depreciation of fixed assets, thousand tenge	123 530	93 919	99 360	126 620	162 527
Amortization of intangible assets, thousands tenge	83	126	548	264	5 721
Payroll of employees, thousands tenge	213 491	174 599	207 285	318 332	377 097
Cash benefits to employees at the expense of enterprise, thousands tenge	479	730	458	388	439
Other expenses, thousands tenge	173 441	103 263	109 643	221 796	383 518
wi Material costs	0.943	0.951	0.911	0.968	0,951
wi Depreciation of fixed assets	0.014	0.012	0.010	0.006	0.009
wi Amortization of intangible assets	0.000	0.000	0.000	0.000	0.000
wi Employee Payroll	0.024	0.023	0.021	0.015	0.020
wi Cash benefits to employees at the expense of enterprise	0.000	0.000	0.000	0.000	0.000
wi Other costs	0.020	0.014	0.011	0.011	0.020
Δ Si Material costs, %		-0.135	0.212	1.213	- 0.096
Δ Si Depreciation of fixed assets, %		-0.003	0.001	0.002	0.002
Δ Si Amortization of intangible assets, %		0.000	0.000	0.000	0.006
Δ Si Payroll, %		-0.004	0.004	0.008	0.004
Δ Si Cash benefits to employees at the expense of enterprise, %		0.000	0.000	0.000	0.000
Δ Si Other costs, %		-0.006	0.001	0.011	0.015
Note: compiled by the author, based on calculations. Cost structure is shown in simplified form. Δ P was calculated as the chain rate of change of the related cost item					

The table reflects the dynamics of sunflower oil production and the cost structure of the manufacturing industry for 2020-2024, as well as the results of assessing the impact of certain cost items on changes in the cost of production. For the period under review, sunflower oil production volumes show steady growth: from 14.1 thousand tons in 2020 to 32.4 thousand tons in 2024, which indicates an expansion of refinery capacities and an increase in demand for products. A similar upward trend is observed in the total costs of the manufacturing industry, the volume of which increased from 8.87 billion tenge in 2020 to 18.88 billion tenge in 2024.

Structural cost analysis demonstrates the overwhelming dominance of material costs in the overall cost structure of sunflower oil production. Throughout the entire period under review, the share of material costs consistently exceeds 94% of total costs, reaching 96–97% in certain years. Such a distribution clearly indicates a pronounced dependence of production on raw materials and other material inputs, making the industry highly vulnerable to price

volatility in agricultural commodities, energy carriers, transportation services, and auxiliary materials. As a result, even minor fluctuations in raw material prices can lead to significant changes in production costs and, consequently, affect profitability and price competitiveness.

In contrast, the share of the employee wage fund remains comparatively low, fluctuating within the range of 1.5–2.4%. This suggests that labor costs play a secondary role in shaping overall production costs, which may reflect a relatively low labor intensity of processing operations or the effects of partial mechanization and automation. At the same time, the proportion of depreciation of fixed assets does not exceed 1.4%, pointing to a limited contribution of capital costs to total expenses. This may indicate insufficient capital intensity of production, underinvestment in modern equipment, or slow rates of renewal and modernization of fixed assets, which in the long term could constrain productivity growth and technological upgrading.

Amortization of intangible assets, as well as cash benefits paid to employees, exert a negligible influence on cost formation, reflecting their minor role in the economic structure of the industry. Overall, the observed cost structure highlights structural imbalances in sunflower oil production, where material inputs overwhelmingly dominate, while labor, capital, and intangible factors contribute marginally.

The results of the calculation of impact coefficients (ΔSi) clearly indicate that material costs are the dominant factor influencing changes in total production costs, demonstrating the highest contribution in several years when compared with all other cost components. This highlights the strong sensitivity of the cost structure of the fat and oil industry to fluctuations in prices for raw materials, auxiliary inputs, and other material resources.

At the same time, other cost items also exert a noticeable influence on cost dynamics, reflecting the growing role of ancillary services and non-material expenses in the overall production process. In contrast, the impact of labor costs and depreciation remains relatively moderate, suggesting that changes in wages and capital consumption play a secondary role in shaping overall cost growth. Taken together, the data presented in the table confirm that the increase in costs in the fat and oil industry is driven primarily by rising material resource prices rather than by proportional growth in production volumes. This finding underscores the need to optimize raw materials policy, reduce material intensity, and enhance the efficiency of resource utilization as key directions for improving cost control and economic sustainability of the industry.

Value chain is more expedient to be considered as an integral system, since a separate analysis of impacts by individual stages does not always properly reflect the distribution of responsibility and burden between participants. At the same time, a number of studies have shown, that agri-food systems make a significant contribution to exceed of global environmental limits and at the same time increase socio-economic inequality. In this regard, the transformation of the agri-food system has been widely recognized as a prerequisite for achieving sustainable development goals (Crosnier A., Baudry G., Jeangros L. et al.) [15].

The key stage of life cycle analysis is considered as the stage of data classification. At the same time, the use of life cycle analysis is accompanied by a number of limitations due to the subjectivity of selection of initial data and establishment of boundaries of the analyzed system.

Accounting for material flows and costs was formed as the most important tool for environmental management and support of sustainable management decisions. The product flow method, established by the International Organization for Standardization in 2011, allows organizations, including agricultural producers, to identify material and energy flows, improve resource efficiency and reduce waste. As one of the key management accounting tools, product flow record maintenance provides producers with the information they need to implement more sustainable practices.

Despite the widespread use of the method in various industries, its application in agriculture remains limited. At the same time, the first examples of the use of material flow accounting in the food industry, in particular in snack production facilities in the Philippines and in some companies in South-East Asia, clearly demonstrated its performance index in identifying wasteful processes and increasing resource returns. Last cases, summarized by the Ministry of Economy, Trade and Industry of Japan, as well as the analysis of numerous case studies, confirmed the significant transformational potential of accounting for material flows for business, including food production (Dekamin M., Rezaei H., Nabavi-Pelesaraei A.) [16].

Discussions

In recent years, Kazakhstan has significantly reinforced its positions in the global sunflower oil market. These products currently are mainly targeted in the foreign market: export volumes exceed domestic sales by 2.4 times according to the Bureau of National Statistics

of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. The active expansion of the presence of Kazakhstani sunflower oil in international markets began in 2022, when export supplies almost tripled, including due to the entry of domestic producers into the Chinese market. In 2023, exports grew by another 58.9%, in 2024 by 30.6%. Against the background of intensive growth in export supplies, the domestic market demonstrates the opposite dynamics. In 2023, domestic sales of sunflower oil decreased by 36.6%.

Analysis of the cost structure of sunflower oil production in Kostanay region showed significant raw material commodity-dependence of the industry and a high sensitivity of the cost to fluctuations in prices for oilseeds, as well as impactful dependence of processing enterprises on the services of third-party organizations. It was found, that material costs constitute the dominant share of total costs and exercise a dominant influence on the cost dynamics, while the impact of depreciation, wages and other items have secondary impact.

The results of factor analysis and calculation of the coefficients of the impact of price changes on individual cost items indicate that the increase in cost is largely driven by not only to increase in production volumes, but also due to structural imbalances in the production cycle, insufficient integration of value chains and increase in transaction and service costs.

This conclusion confirms the need to shift from a fragmented and narrowly focused approach to cost control toward a comprehensive and systematic model of cost management that encompasses all stages of the production and value creation process - from the procurement of raw materials to the release and distribution of finished products. Isolated monitoring of individual cost items or production stages does not allow enterprises to fully identify internal reserves for efficiency improvement, nor does it provide an understanding of how costs are formed and transferred along the value chain.

Conclusion

1. World community and domestic market of Kazakhstan are characterized by a steadily high demand for vegetable oils, increasing due to demographic growth. Consumption of vegetable oils is increasing not only directly, but also due to their widespread use in capacity of ingredients in the production of other food products. In these conditions, domestic demand through home manufacture and active promotion of products onto foreign markets should become the priority development fields of the fat and oil industry in Kostanay region.

2. The analysis of the cost structure reveals that fat and oil industry enterprises are characterized by a low level of vertical integration within the production chain and a pronounced reliance on services provided by third-party organizations. A significant share of expenditures is associated with outsourced processing, logistics, maintenance, and other production-related services, which indicates that many key operations are performed outside the enterprise. This fragmentation of the production process reduces managerial control over costs and weakens the ability to coordinate technological and economic decisions across different stages of production. In addition, the transfer of value-creating activities to third parties constrains the formation of added value within the enterprise itself, as a portion of potential income is captured by external service providers.

3. The obtained results confirm the feasibility and relevance of applying management accounting tools that are oriented toward a comprehensive analysis of material flows and systematic cost optimization across the entire value chain. Such tools make it possible to trace the movement and transformation of resources from the stage of raw material procurement through processing and distribution to the final product, thereby identifying cost-intensive stages and sources of inefficiency. This approach allows enterprises to move beyond fragmented cost control and adopt a holistic perspective on cost formation. In particular, the use of multilevel marginal profit accounting methods enables a more accurate assessment of the contribution of individual products, production stages, and structural units to overall financial performance.

4. In the context of steadily growing demand for food products, accompanied by heightened external economic instability and increasing climatic risks, the importance of rational and forward-looking cost management in the fat and oil industry becomes especially pronounced. Under these conditions, the optimization of raw materials policy emerges as a strategic priority, as raw materials form the dominant share of production costs and largely determine the sensitivity of enterprises to price fluctuations and supply disruptions. Equally important is the development of local production and logistics linkages, which can decrease dependence on external suppliers and intermediaries, shorten supply chains, and reduce transaction and transport costs. Collectively, these directions create the prerequisites for strengthening the economic resilience and long-term sustainability of the regional fat and oil industry

in the face of evolving global and regional challenges.

5. The practical significance of the study consists in the possibility of using the findings in the development of management decisions to reduce the cost and increase the efficiency of sunflower oil processing enterprises in Kostanay region, as well as in the formation of regional agri-food policy and strengthening of food security of the Republic of Kazakhstan.

Conflict of interests: author declares that this paper does not contain any conflict of interest.

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