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THE TRANSITION OF THE AGRO-INDUSTRIAL COMPLEX OF THE ALMATY REGION TO THE PRODUCTION OF VALUE-ADDED PRODUCTS

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Abstract. This study examines the transition of the agro-industrial complex of the Almaty region toward value-added production within the framework of sustainable regional value chains. The relevance of the research is driven by the need to reduce dependence on raw materials, increase the competitiveness of agricultural products, and strengthen the resilience of rural areas in the context of the structural transformation of the economy. The objective of the study is to substantiate key directions and mechanisms of structural transformation based on the integration of processing industries, cooperative models, and institutional support instruments. The methodological approach combines the analysis of official statistical data on agricultural output and investment dynamics with value chain mapping across key sectors, including dairy, grain, fruit and vegetable production, and poultry farming. In addition, the study employs SWOT and PEST analytical frameworks, complemented by scenario-based modeling of potential value-added growth. The empirical results indicate that, despite relatively stable output levels (KZT 798.4 billion in 2025) and increased investment activity (KZT 148 billion), the region retains substantial untapped potential for deepening processing. At the same time, a set of structural constraints has been identified, including the fragmentation of the raw material base, insufficient development of cooperative linkages, limited cold-chain logistics, and restricted access to working capital. Scenario analysis

demonstrates that increasing the share of corn processing from 20% to 67% could generate additional regional value added in the range of KZT 3.26–13.05 billion annually, provided that coordination mechanisms and production capacities are effectively aligned. These findings suggest that the expansion of value-added production is determined not only by investment levels but also by the quality of institutional and technological environments, including standardization systems, contractual arrangements, export infrastructure, and cooperative governance models. The practical significance of the study lies in the development of a policy-oriented framework aimed at synchronizing value chain development and enhancing the sustainability and competitiveness of the regional agro-industrial sector.

Keywords: agro-industrial complex, Almaty region, value added, processing of agricultural products, value chains, agro-clusters, cooperation

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АЛМАТЫ ОБЛЫСЫНЫҢ АГРОӨНЕРКӘСІПТІК КЕШЕНІНІҢ ҚОСЫЛҒАН ҚҰНЫ БАР ӨНІМ ӨНДІРУГЕ КӨШУІ

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Аннотация. Мақала Алматы облысының агроөнеркәсіптік кешенінің (АӨК) тұрақты өңірлік құн тізбегін қалыптастыру контекстінде қосылған құны бар өнім өндіруге көшуін талдауға арналған. Зерттеудің өзектілігі шикізатқа тәуелділікті төмендету, аграрлық өнімнің бәсекеге қабілеттілігін арттыру және ауылдық аумақтардың тұрақтылығын нығайту қажеттілігіне байланысты. Зерттеудің мақсаты – қайта өңдеуді, кооперацияны және қолдаудың институционалдық құралдарын интеграциялау негізінде өңірлік АӨК құрылымдық трансформациясының бағыттары мен тетіктерін негіздеу. Жұмыстың әдіснамалық негізіне жалпы өнім және АӨК инвестициялары бойынша ресми статистикалық деректерді талдау, азық - түлік тізбектерін картаға түсіру (сүт, астық, жеміс-көкөніс, құс шаруашылығы), SWOT-және

PEST-талдау құралдарын қолдану, сондай-ақ қосылған құнның әлеуетті өсімін сценарийлік модельдеу кіреді. Эмпирикалық нәтижелер шығарылымның тұрақты көлемі (2025 жылы 798,4 млрд теңге) сақталып, инвестициялық белсенділіктің өсуі (148 млрд теңге) кезінде өңір өндеуді терендетудің елеулі әлеуетін сақтап отырғанын көрсетеді. Сонымен қатар, институционалдық және инфрақұрылымдық шектеулер анықталды, оның ішінде шикізат базасының бөлшектенуі, кооперацияның жеткіліксіздігі, суық логистиканың тапшылығы және айналым капиталына қол жетімділіктің шектелуі. Жүгеріні қайта өңдеу үлесінің 20%–дан 67% - ға дейін ұлғаюын сценарийлік бағалау тізбектерді үйлестіру және қуаттарды жүктеу шарттарын орындау кезінде жыл сайын 3,26-13,05 млрд теңге диапазонында өңірлік қосылған құнның өсу мүмкіндігін көрсетеді. Алынған нәтижелер қосылған құн өнімдеріне көшу тек қайта өңдеуге салынған инвестициялармен ғана емес, сонымен қатар сапаны стандарттауды, келісімшарттық тетіктерді, экспорттық инфрақұрылымды және кооперациялық модельдерді қамтитын институционалдық-технологиялық ортамен де анықталатынын растайды. Зерттеудің практикалық маңыздылығы құндылық тізбектерін дамытуды синхрондауға және аймақтық аграрлық экономиканың тұрақтылығын арттыруға бағытталған шаралар портфелін қалыптастыруда жатыр.

Түйін сөздер: агроөнеркәсіптік кешен, Алматы облысы, қосылған құн, ауыл шаруашылығы өнімдерін қайта өңдеу, құн тізбектері, агрокластерлер

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ПЕРЕХОД АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА АЛМАТИНСКОЙ ОБЛАСТИ К ПРОИЗВОДСТВУ ПРОДУКЦИИ С ДОБАВЛЕННОЙ СТОИМОСТЬЮ

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Аннотация. Статья посвящена анализу перехода агропромышленного комплекса (АПК) Алматинской области к производству продукции с добавленной стоимостью в контексте формирования устойчивых

региональных цепочек создания стоимости. Актуальность исследования обусловлена необходимостью снижения сырьевой зависимости, повышения конкурентоспособности аграрной продукции и укрепления устойчивости сельских территорий. Цель исследования - обосновать направления и механизмы структурной трансформации регионального АПК на основе интеграции переработки, кооперации и институциональных инструментов поддержки. Методологическая основа работы включает анализ официальных статистических данных по валовому выпуску и инвестициям в АПК, картирование продуктовых цепочек (молочная, зерновая, плодоовощная, птицеводческая), применение инструментов SWOT- и PEST-анализа, а также сценарное моделирование потенциального прироста добавленной стоимости. Эмпирические результаты показывают, что при сохранении устойчивого объема выпуска (798,4 млрд тенге в 2025 г.) и росте инвестиционной активности (148 млрд тенге) регион сохраняет значительный потенциал углубления переработки. В то же время выявлены институциональные и инфраструктурные ограничения, включая фрагментацию сырьевой базы, недостаточную кооперацию, дефицит холодной логистики и ограниченный доступ к оборотному капиталу. Сценарная оценка увеличения доли переработки кукурузы с 20% до 67% демонстрирует возможность прироста региональной добавленной стоимости в диапазоне 3,26–13,05 млрд тенге ежегодно при выполнении условий координации цепочек и загрузки мощностей. Полученные результаты подтверждают, что переход к продукции с добавленной стоимостью определяется не только инвестициями в переработку, но и институционально-технологической средой, включающей стандартизацию качества, контрактные механизмы, экспортную инфраструктуру и кооперационные модели. Практическая значимость исследования заключается в формировании портфеля мер, направленных на синхронизацию развития цепочек создания стоимости и повышение устойчивости региональной аграрной экономики.

Ключевые слова: агропромышленный комплекс, Алматинская область, добавленная стоимость, переработка сельскохозяйственной продукции, цепочки создания стоимости, агрокластеры, кооперация

Introduction. Introduction. The reorientation of the agro-industrial complex (agribusiness) of Almaty region to the production of high-value-added products is considered as a strategic direction for increasing the competitiveness of the regional economy and ensuring the sustainable development of rural areas. In modern conditions, the efficiency of the agricultural sector is determined not only by the volume of production, but also by its position in value chains and the level of processing of products. In this regard, one of the main priorities of the regional economic policy is to abandon the raw material orientation and develop high value-added industries.

International experience shows that the development of deep processing of

agricultural products and the integration of producers into stable value chains, in addition to increasing the profitability of agriculture, contribute to the diversification of regional economies and the expansion of export potential (Porter, 1985; Gereffi et al., 2005). Within the framework of the theory of value chains, the formation of added value is considered as a comprehensive system that includes elements of logistics, processing, marketing and institutional coordination, and not limited to production processes.

For territories with a pronounced agrarian specialization, the transition from the sale of raw materials to the production of high redistribution products will increase not only the growth of gross value added, but also stability to price volatility in World agricultural markets, contribute to the creation of additional jobs and strengthening food security (OECD, 2018; FAO, 2021). Against the background of the rising cost of logistics and increased competition in foreign markets, the importance of local processing and the need to form sustainable agri-food chains are growing.

The relevance of the study in relation to the Almaty region is determined by the structural characteristics of the regional agribusiness. The region has significant potential in animal husbandry and crop production, but the share of processed products in the total volume of production remains relatively low, a significant part of the value added is created outside the region (Bureau of National Statistics, 2024). This indicates the presence of an imbalance between primary production and processing, as well as an insufficient level of inclusion of farms in the value chain.

The scientific literature emphasizes that the creation of value added in the agro-industrial complex is not limited only to deepening processing. The most important factors are technological modernization, standardization and certification, the development of cooperative ties, branding and improving logistics, which allows manufacturers to gain a foothold in the most profitable market segments. In Kazakhstan, these areas are of particular importance, given the pronounced spatial heterogeneity of the regions and the concentration of processing capacities.

Despite the implementation of state programs to support the agro-industrial complex, the process of transition to high-value-added products is hampered by a number of institutional and economic restrictions. Among them, a high level of fragmentation of the production base, insufficient development of cooperative ties, limited access to sources of financing, a shortage of modern processing capacities, as well as a weak storage and transportation infrastructure occupy a special place. In the context of the Almaty region, these issues are complicated by the predominance of small and medium-sized agricultural producers, which, in turn, prevents the full implementation of the economies of scale effect.

In this regard, there is an increasing need for a comprehensive study of the factors and mechanisms that ensure the transition of regional agribusiness to high-value-added products. Such an analysis should not be limited to production indicators, but take into account the structure of value chains and the specifics of the institutional environment.

The purpose of the study is to theoretically and practically substantiate the

directions and mechanisms of transition to the production of high – value-added products in the agro-industrial complex of the Almaty region.

Literature Review. In modern scientific literature, the transition of the agro-industrial complex to the production of value-added products is considered mainly in the framework of the theories of value chains and global value chains. The main question of research in this area is aimed at identifying in which links in the chain value is concentrated and the factors that allow manufacturers to rise to higher positions in this chain (Kaplinsky and Morris, 2001; Gereffi et al., 2005).

According to the classical concept, the bulk of value added is formed in functions after the initial production period. In particular, elements such as recycling, standardization, packaging, certification, logistics and marketing increase the consumer value of products and reduce the dependence of income on the volatility of raw material prices (Porter, 1985; Trienekens, 2011). From this point of view, competitiveness in the agricultural sector is determined not by the volume of production, but by the position in the value chain and the complexity of functions.

In the agri-food sector, this logic is of additional importance due to the peculiarities of the demand structure. In modern markets, consumers and retail chains place high demands on the quality, safety and traceability of products. As a result, "invisible" institutional and technological components such as quality control systems (HACCP, ISO standards), cold chain logistics, contract delivery mechanisms, along with recycling, become important sources of value added (Trienekens, 2011; FAO, 2017).

In this regard, in modern research, the focus is not on increasing individual production capacities, but on the formation of stable and coordinated value chains that combine the stages of production, processing and sales. This approach will not only improve the efficiency of the agro-industrial system, but also strengthen the stability and export potential of regional economies (Figure 1).



Figure 1 — The logic of forming a regional value-added chain: from the raw material base to sales markets

Research on the development of agro-processing shows its multifaceted impact on the economy. On the one hand, the expansion of recycling contributes to an increase in value added, an increase in employment and an increase in tax revenues. On the other hand, it will strengthen the stability of the agricultural sector, reduce seasonal income volatility, reduce post-harvest costs and diversify markets (FAO, 2017; OECD, 2018).

At the same time, in regions dominated by small farms, processing is of

a bilateral nature: it is also seen as a high-risk zone, being at the same time an important driver of economic growth. In conditions of instability of raw material supplies and insufficient coordination of supply chains, there is a complete overload of production capacities, which weakens the financial stability of processing enterprises (Trienekens, 2011; OECD, 2018).

The literature shows that the transition of the agro-industrial complex to a high value-added level is largely determined not by the volume of investments, but by the quality of the institutional environment. Contract agriculture, the introduction of uniform quality standards, the development of storage infrastructure, access to working capital and efficient logistics systems form stable links between the producer and the recycler (Swinnen and Maertens, 2007; World Bank, 2017). These factors ensure the stability of value chains and form the institutional basis for their effective functioning.

At the same time, the role of retail chains and export channels is especially important, since they act as the main source of standards throughout the chain, forming requirements for product quality, packaging and traceability.

In regional development policy, the cluster approach and the formation of agro-industrial "hubs" are considered as an effective means of accelerating innovation, reducing transaction costs and developing service infrastructure (Porter, 1998). Clusters in agribusiness are characterized as a territorial concentration of interconnected participants, such as manufacturers, processors, equipment suppliers, logistics operators, laboratories, and development institutions. Such concentration creates a synergistic effect through joint learning, harmonization of standards and strengthening of market position (Porter, 1998; OECD, 2018).

The effectiveness of cluster development for agricultural regions is due to the fact that it is implemented within specific food chains, and not at the level of agriculture as a whole. For example, dairy, fruit and vegetable or meat chains created on the principle of "production – processing – finished products" create more favorable conditions for the formation of high added value. Research shows that successful clusters are usually formed on the basis of a network of "anchor" companies and small and medium-sized suppliers, and the role of the state is expressed in providing infrastructure, regulatory and institutional conditions rather than direct management (OECD, 2018; World Bank, 2017).

One of the main obstacles to increasing value added in agricultural regions remains the fragmentation of the raw material base and the high share of small producers. In this regard, cooperation is considered as a mechanism for solving several tasks at once: volume consolidation and quality equalization, reducing logistics and storage costs, as well as strengthening the negotiating position in interaction with processors and retail chains (Ortmann and King, 2007; Bijman and Iliopoulos, 2014). In addition, empirical work shows that cooperative models have an impact when they are provided with managerial competence, open revenue sharing rules, access to financing, and the ability to invest in common assets (warehouses, sorting networks, laboratories) (Bijman and Iliopoulos, 2014).

Otherwise, cooperatives often remain official structures that do not form a real increase in value added. For an Applied Analysis of the Almaty region, this means that it is necessary to consider cooperation not declaratively, but as a supply chain management model (supply chain governance), coordinated with the requirements of the processing and sales markets.

The relationship "value added-export / import substitution" in the literature is revealed through the prism of competitiveness: increasing redistribution is recommended only if there is a stable demand and the ability to meet quality standards (Porter, 1985; Trienekens, 2011). In agri-food markets, exports usually require compliance with technical regulations, veterinary norms, safety and supervision requirements, so the increase in added value often relies on investment in quality systems and certification, no less than expanding production capacity (FAO, 2017; World Bank, 2017). In the logic of import substitution, the main task is to replace imports with precisely processed products, that is, to produce competitive products that can combine imports in the ratio of price, quality and supply stability. Sustainable import substitution, according to research, is achieved not by short-term restriction of competition, but by increasing productivity, maintaining standards and scaling the chain (OECD, 2018; World Bank, 2017).

Generalization of scientific sources makes it possible to create a holistic analytical basis for expert and analytical research of the transformation of the agro-industrial complex of the Almaty region, which includes complementary theoretical and methodological blocks. First, the value-added chain approach focuses the analysis on the allocation of priority product chains and links where the bulk of value-added is concentrated, as well as assessing the distribution of functions between members (Kaplinsky and Morris, 2001; Gereffi et al., 2005). Secondly, the agro - processing unit focuses on diagnosing bottlenecks along the "raw materials - processing - quality-sales" trajectory, including technological constraints, logistics, compliance with standards and sustainability of implementation channels (Trienekens, 2011; FAO, 2017). Third, the cluster-territory approach allows you to identify places and niches with prerequisites for agroclusters and assess possible agglomeration effects and specialization (Porter, 1998; OECD, 2018). Fourth, cooperation and supply chain management are seen as institutional tools to overcome production fragmentation and ensure sustainable loading of processing capacity (Ortmann and King, 2007; Bijman and Iliopoulos, 2014). Fifth, export orientation and import substitution through standards highlight the importance of Quality, Supervision, infrastructure and regulatory institutions as conditions for accessing markets and increasing the competitiveness of high-value-added products (FAO, 2017; World Bank, 2017).

The formed framework corresponds to the selected format of the expert and analytical article and allows you to combine statistical analysis and value chain diagnostics in a coherent analytical narrative format with strategic assessment tools (SWOT/PEST), barrier mapping and the formation of a portfolio of measures and project initiatives, including "anchor" investment and cooperation models.

Materials and methods. The study was carried out in the format of an expert-analytical article that combines elements of quantitative scenario modeling and structural analysis of value chains. The methodological scheme is built according to the logic of the results obtained and includes three additional blocks: (1) processing and analysis of official statistics, (2) product chain mapping with the identification and interpretation of bottlenecks (value chain mapping), (3) the use of strategic analysis tools (SWOT, PEST) and the cost of a scenario assessment of the possible growth of the added product.

The information base consists of official statistical data describing the total output of agricultural, forestry and fisheries products (services) in the Almaty region, investments in fixed assets of agriculture, processing parameters for the main food areas (milk, corn, fruit and vegetable products, poultry), as well as data on export supplies. When selecting sources, priority was given to verifiable publications of regional statistics and official reviews of Agribusiness Management Bodies, which ensured the comparability of indicators in the spatial and temporal division.

The object of the study is the agro-industrial complex of the Almaty region as a system of interconnected links of primary production, processing, storage infrastructure and logistics, as well as product sales channels. The subject of the study is the transition to the production of value-added products at the regional level and within the framework of key product chains (institutional, infrastructure, technological and market factors) and mechanisms for limiting this transition.

At the first stage, the dynamics of gross output and investment activity was analyzed, which made it possible to assess the scale and stability of the region's production base. Relative indicators in current and relative prices, as well as the rate of change (in % for the previous year) were used. Next, a comparison of the volumes of production and processing of raw materials in the allocated product areas was carried out, which made it possible to determine the gap between the production potential and the depth of redistribution (for example, the case when the share of corn processing is about 20% with a significant gross harvest). Then a structural comparison of segments (dairy industry, poultry, grain and fruit and vegetable chains) was carried out, which ensured the differentiation of areas by the level of integration in the value chain and the degree of export orientation.

The boundaries of the study are established at the regional level (Almaty region) and cover both domestic markets and export-oriented implementation channels, provided that there are requirements for quality and safety standards. The methodological basis is based on the value chain approach, within which value added is formed not only at the processing stage, but also at the expense of such accompanying functions as standardization, quality and safety control, packaging, branding, logistics and access to markets. Accordingly, the development of recycling is interpreted as an element of the broader task of forming sustainable chains "raw materials → processing/storage → recycling → sales", which increase the profitability of participants and their resistance to price and infrastructure shocks.

Practical recommendations are formed as a portfolio of solutions grouped by

the nature of the impact: (i) short-term impact measures (quality standardization, contracting, service cooperation, packaging and logistics); (ii) infrastructure solutions (storage/sorting centers, cold capacities, quality laboratories); (iii) recycling investment projects (creation of "anchor projects" (IV) export-oriented measures (certification, supervision, access to markets, promotion). The portfolio approach ensures comparability of the proposed measures on the implementation horizon, resource capacity and expected impact on Value Added growth.

The main limitations of the study are associated with the lack of complete and uniform availability of open data on the actual loading of processing capacities, the parameters of contractual relations and the cost structure at different links in the value chain. Such heterogeneity of data can affect the accuracy of empirical estimates and requires a certain degree of caution when interpreting the results of the analysis.

In order to reduce the impact of these restrictions, the study used methods of comparative analysis of several sources, selection of verifiable and representative indicators, as well as structural division of the results into statistically justified and expert-interpretive parts. Such a methodological approach made it possible to increase the reliability of the results obtained and ensure the integrity of the analysis.

Result. Analysis of official statistical data shows that the agro-industrial complex of the Almaty region shows moderate positive dynamics in the medium term, while maintaining a relatively stable scale of production. According to the results of 2025, the total output of agricultural, forest and fisheries products (services) amounted to 798.4 billion tenge, which in real terms increased by 2% compared to 2024. This indicator expresses the stability of the agricultural sector and the preservation of production potential even in conditions of macroeconomic uncertainty.

At the same time, there is an increase in investment activity at the regional level. The volume of investments in fixed assets of Agriculture in 2025 will reach 148 billion tenge, which indicates the formation of structural prerequisites for the technological modernization of the industry and the expansion of processing capacities. As one of the most important factors ensuring industrial sustainability, we can note the expansion of water-saving irrigation technologies: their application area exceeds 66 thousand hectares, contributing to increasing the productivity and sustainability of crop production. This, in turn, will strengthen the potential for providing the processing industry with sustainable raw materials.

However, aggregate production indicators reflect only the volumetric characteristics of the agro-industrial complex and do not fully reveal the depth of structural transformation. To assess the level of transition to high-value-added products, the analysis of changes in the production structure, in particular the ratio between primary production and processing, as well as the degree of integration of economic entities into value chains, is of particular importance.

In this context, the formation of stable sales channels, the introduction of standardized quality requirements and the presence of mechanisms for coordinating

delivery processes are seen as decisive factors. These elements will not only increase the efficiency of value chains, but also transfer the efficiency of agricultural production to the level of value-added formation.

Table 1— main indicators of the agro-industrial complex of Almaty region (Official publications)

Indicator	Value	Period / warning
Gross output of agricultural, forestry and fisheries products (services)	798 381.7 million tenge	January–December 2025, 2024 to the level of 102%
Gross agricultural output (agrosholu)	798.4 billion tenge	Results of 2025
Investments in agribusiness	148 billion tenge	2025
Irrigation area with the introduction of water-saving technologies	>66 thousand hectares (3.3 times increase)	2025

The recorded increase in gross output with a simultaneous increase in investment activity indicates the presence of an economic base for the regional agribusiness to gradually move from the Priority Raw Material model to deeper redistributions. At the same time, the dynamics of aggregate indicators is not the same as the growth of value added: It is to determine how much of the produced raw materials will be involved in processing and related links (storage, sorting, standardization), as well as how effectively cooperative and contractual mechanisms between producers, infrastructure and processors are built, ensuring the regularity of supplies and stable loading of capacities.

Processing as the main mechanism for the formation of added value in product areas:

1) milk chain. The dairy direction is one of the most institutionally formalized segments of the agro-industrial complex of the Almaty region and is characterized by the presence of a processing base: nine milk processing enterprises operate in the region. This creates the prerequisites for the redistribution of added value to produce a higher redistribution from primary production. In 2025, the volume of production of finished dairy products amounted to 241 thousand tons, an increase of 9.3% compared to the previous year, and gross milking increased to 313 thousand tons (+7.9%). The combined growth in export supplies of processed dairy products is significant: exports reached 31.8 thousand tons, which is 15.7% higher than last year's level. This dynamics indicates the formation of stable sales channels and confirms the high competitiveness of recycled products in comparison with raw materials.

2) deep processing of corn and grain. Almaty region concentrates a significant part of corn production in the Republic of Kazakhstan—about 28% of the total Republican acreage (49 thousand hectares), with a total harvest of about 347 thousand tons. At the same time, the involvement of raw materials for processing remains limited: the current share of processing is estimated at about 20%, which indicates a clear gap between the raw material base and the depth of redistribution. The declared strategic orientation - an increase in the share of corn processing to

67%-involves the transition from the export of raw materials to the export of deeply processed products (including starch, food ingredients, feed components). The growth of starch exports to 27.3 thousand tons (+34.1%) is an empirical indicator of the expansion of this segment and reflects the formation of value added through technological complication and diversification of the product line.

3) fruit and vegetable products and processing. The fruit and vegetable segment is characterized by high seasonality, which, together with significant post-harvest costs, limits the potential for added value. Fruit production is estimated at 97 thousand tons, while the existing processing capacity provides processing of about 37 thousand tons. It is planned to build a processing enterprise with a capacity of 80 thousand tons and increase the total volume of processing to 54 thousand. By 2028, the tons are aimed at reducing costs, stabilizing supply and forming a uniform (including year-round) production of processing products. In this case, the economic effect is manifested not only in the increase in value added, but also in increasing the stability of producers' incomes by smoothing seasonal price volatility.

4) poultry farming and standardized products. Poultry farming is characterized by relatively high industrialization and standardization of production processes. Almaty region accounts for about 28% of the total national production of poultry meat and shows export activity: exports amount to 11.9 thousand tons in the amount of 16.6 million US dollars. US. This segment is an example of an effective combination of production scale, recycling and export orientation, which allows it to be considered as a potential model for the repetition of standardization, logistics and contracting practices in other food chains of the region.

Table 2 — food chains showing the transition to value added

Chain	"Recycling" / range indicator	Value
Milk → recycling	Production of finished products	241 thousand tons (+9.3%)
Milk → market / external supplies	Export	31.8 thousand tons (+15.7%)
Corn → deep processing	Recycling share (actual → target)	20% → 67%
Starch (processing product)	Export	27.3 thousand tons (+34.1%)
Fruits → processing	Recycling (plan)	37 → 54 thousand tons, until 2028
Fruits → processing	New capacity	80 thousand tons
Poultry → market / export	Export	11.9 thousand tons (16.6 million US dollars.)

A comparative analysis of gross product dynamics with processing parameters reveals a complex of systemic factors that inhibit the accelerated transition of the agro-industrial complex to products with high added value. These restrictions are expressed in an interconnected way at the production, infrastructure, institutional and financial levels.

First, the high heterogeneity of the quality characteristics of raw materials remains, which leads to an increase in technological and operational costs during processing. As a result, the yield of finished products decreases and the efficiency of value-added formation weakens.

Secondly, the insufficient development of storage, sorting and cold chain logistics infrastructure exacerbates seasonal fluctuations in supply and hinders the constant loading of processing enterprises. This situation also limits the stability of export supplies.

Thirdly, the weakness of stable cooperative and contractual ties between producers and processors leads to instability of raw material flows and risks of underutilization of production capacities.

Fourth, financial constraints, especially insufficient access to working capital, make it difficult to ensure the continuity of the production cycle. This limits the possibilities of purchasing raw materials in advance, financing packaging and covering logistics costs.

Overcoming the identified restrictions requires the formation of a set of systematic measures, coordinating the main links of value chains. In this context, the proposed policy directions are considered not as a set of separate initiatives, but as a system of interrelated and complementary tools.

Table 3 — Portfolio of measures for the transition to value-added products (expert systematization)

Policy measure block	Problem addressed	Expected outcome
Standardization of raw materials and quality	Quality variability, losses at the processing stage	Increased yield of usable products, improved supply stability
Storage, sorting, and cold chain infrastructure	Seasonal losses, price volatility, export constraints	Reduced losses, increased share of processing and exports
Contract farming and cooperation (service model)	Supply chain disruptions, weak bargaining position of farmers	Predictable utilization of processing capacity, increased producer income
Working capital financing instruments	Cash flow gaps, high logistics and packaging costs	Stability of supply and sales, market expansion
Export infrastructure (certification, traceability)	Market access barriers	Growth of export revenues from processed products
Note: Compiled by the authors.		

The portfolio of measures presented in Table 3 systematizes priority areas for the transition to high-value-added products. In particular, quality standardization measures are aimed at reducing the variability of raw materials and improving the efficiency of processing. The development of storage and cold chain logistics infrastructure will reduce seasonal costs and ensure the stability of supplies. The institutionalization of cooperation and contractual relations will strengthen the continuity of production chains and increase the projected loading of processing capacities. At the same time, the expansion of working capital financing instruments

will ensure the stability of market operations, while the development of export infrastructure will expand access to foreign markets.

Thus, the proposed set of measures makes it possible to consider the transition of the agro-industrial complex to high-value-added products not as a set of isolated investment projects, but as a targeted structural transformation of the regional economy. This approach ensures the achievement of systemic efficiency through the synchronous development of all links in the value chain.

Table 4 — SWOT analysis of the transition to value-added products (Almaty region)

Strengths	Weaknesses
<ul style="list-style-type: none"> • Stable production scale of the agro-industrial complex (KZT 798.4 billion in 2025) with positive real growth dynamics (102% in 2024) • Increasing investment activity (KZT 148 billion in 2025), creating a foundation for modernization • Presence of established “anchor” value chains with processing and export potential (dairy: 241 thousand tons, exports 31.8 thousand tons; poultry: exports 11.9 thousand tons) • Expansion of irrigated areas using water-saving technologies (>66 thousand ha), strengthening the stability of the raw material base • Limited access to working capital (procurement, packaging, logistics), acting as a bottleneck in commercialization 	<ul style="list-style-type: none"> • Gap between raw material base and depth of processing in certain value chains (e.g., maize processing remains around 20% despite high production volumes) • Limited storage, sorting, and cold chain infrastructure leading to losses, seasonality, and price volatility • Inconsistent quality of raw materials and insufficient standardization, increasing processing costs and technological losses • Weak cooperation and contract farming, resulting in unstable supply and underutilization of processing capacities
Opportunities	Threats
<ul style="list-style-type: none"> • Increasing the share of processing and production of higher value-added products (including deep processing of grain/maize and expansion of fruit and vegetable processing) • Growth of export revenues through standardization and traceability (quality, safety, and supply stability enabling price premiums) • Development of agro-clusters around processing and infrastructure (economies of scale, shared services, reduced transaction costs) • Reduction of seasonal income volatility through storage and processing, transition to contract-based models 	<ul style="list-style-type: none"> • Price volatility in agricultural markets and rising logistics costs, reducing profit margins • Intensifying competition from imported products in domestic markets and increased competition in export markets • Increasing requirements from retail chains and export markets regarding standards, veterinary and phytosanitary regulations, and traceability • Climate risks and water scarcity affecting the stability of the raw material base despite expansion of irrigation
<p>Note: Compiled by the authors.</p>	

In a generalized form, the SWOT matrix shows that the Almaty region has a sufficient production "scale" and growing investment potential for the transition to deeper processing. However, the main restrictions are associated not only with the volume of capital investments, but primarily with the compatibility of functional "bundles" in the chain: standardization of raw materials → storage infrastructure → cooperation and contract → working capital supply → access to markets. Increasing

recycling in the absence of synchronization of the specified elements can lead to risks of non-loading of capacities and a decrease in return on investment.

PEST analysis, in turn, makes it possible to correlate the identified portfolio of deadlocks and measures (Table 3) with the parameters of the external environment, which determine the institutional and market conditions for the functioning of producers and processors, that is, practically determine the "rules of the game" for the implementation of the strategy for the transition to high redistribution products.

Table 5 — PEST analysis (Almaty region)

P – Political / Institutional	E – Economic
<ul style="list-style-type: none"> • Government support measures for the agro-industrial complex, including instruments for stimulating investment and exports • Regulatory framework related to food safety, veterinary and phytosanitary standards, and certification (both a barrier and a competitiveness factor) • Institutional conditions for the development of cooperation and contract farming (quality of law enforcement, standard contracts, guarantee mechanisms) 	<ul style="list-style-type: none"> • Increasing investment activity (KZT 148 billion) as a driver of modernization, while access to working capital remains limited • Logistics costs, packaging availability, energy supply, and water provision as key determinants of processing costs • Differences in profitability between raw and processed products, shaping incentives for upgrading
P – Political / Institutional	E – Economic
<ul style="list-style-type: none"> • Government support measures for the agro-industrial complex, including instruments for stimulating investment and exports • Regulatory framework related to food safety, veterinary and phytosanitary standards, and certification (both a barrier and a competitiveness factor) • Institutional conditions for the development of cooperation and contract farming (quality of law enforcement, standard contracts, guarantee mechanisms) 	<ul style="list-style-type: none"> • Increasing investment activity (KZT 148 billion) as a driver of modernization, while access to working capital remains limited • Logistics costs, packaging availability, energy supply, and water provision as key determinants of processing costs • Differences in profitability between raw and processed products, shaping incentives for upgrading
Note: Compiled by the authors.	

The PEST profile shows that the region's move towards higher value-added products is not dictated by individual recycling projects, but by the quality of the institutional and technological environment. State support and regulatory mechanisms form requirements for the safety, standards and export suitability of products; economic parameters determine the availability of investments, especially working capital; the social structure of production (SME dominance) strengthens the importance of cooperative forms; technological elements - storage, cold chain and control-are necessary conditions for scaling recycling.

In this logic, the portfolio of measures (Table 3) should not be interpreted as a set of isolated management decisions, but as a means of consistent influence on the entire value chain. The effectiveness of each direction is determined by the degree of its synchronization with other links of the system - from the raw material base to sales channels. It is very important that the measures do not give a permanent result



individually: their effect is expressed in a simultaneous and complementary effect on several sections of the chain.

First, the standardization of raw materials and the approval of uniform quality requirements will serve as the basis for the estimated loading of processing capacities. In the absence of Equalization of the parameters of the raw material base, investments in processing are accompanied by an increase in sorting costs and technological costs, which reduces overall efficiency.

Secondly, the development of storage infrastructure and cold logistics reduces the seasonality of supply and creates the prerequisites for the transition to a contractual model of interaction between producers and processors, that is, to a managed supply chain instead of spot sales.

Third, the institutionalization of cooperation will change the configuration of market power in the chain: volume consolidation and standard alignment will increase the ability of small and medium-sized farms to enter revenue segments, including export channels. In this context, cooperation primarily acts not as a formal organizational form, but as a supply chain governance mechanism.

Fourth, working capital financing instruments are an important condition for the continuity of the chain. Even in the presence of power and demand, the liquidity deficit limits the purchase of raw materials, the purchase of packaging and the coverage of logistics costs, thus inhibiting commercialization and the growth of value added.

Finally, the price premium for the quality and standards of export infrastructure (certification, supervision, compliance with technical regulations) provides access to more capacious and margin markets, which allows us to consolidate the advantages of recycled products compared to raw materials.

The integrated implementation of these blocks shifts the development of the industry from the fragmentary expansion of individual enterprises to the formation of sustainable agri-food chains. Value chain - in the terminology of the approach, this corresponds from a raw material specialization to a functional and process upgrade-the expansion of the set of functions performed within the region and the complication of production operations.

Thus, Table 3 records not a list of scattered activities, but the architecture of the structural transformation of the regional agribusiness. Its implementation provides potential:

- increase in the share of processing in the structure of gross output;
- increase in export revenue for high redistribution products;
- decrease in seasonal price volatility;
- increase the income of agricultural producers;
- strengthening regional food stability.

To quantitatively illustrate the effect of the transition from the raw material model to the deepening of processing, consider the scenario of increasing the share of corn processing in the Almaty region from 20% to 67%, while maintaining the current volume of the raw material base. According to the regional review, the total

collection of corn is estimated at 347 thousand tons, which makes it possible to compare the volume of processed and non-processed flows in the base and target states.

Calculation of additional processing volumes. Marking:

Q-the total corn harvest, t;

s_0 -current share of recycling;

s_1 -target share of recycling.

Then an additional volume that needs to be redistributed from the feed of raw materials to processing:

$$\Delta Q = Q \cdot (s_1 - s_0)$$

Replacing values:

Q-347 000 t;

$s_0 = 0.20$,

$s_1 = 0.67$.

we get:

$$\Delta Q = 347\,000 \times (0.67 - 0.20) = 347\,000 \times 0.47 \approx 163\,090 \text{ t.}$$

That is, the transition to the target processing route implies additional processing of ≈ 163.1 thousand tons of corn annually (if there are others).

Table 6 — raw material flows for recycling: current and target scenarios

Indicator	Value
The gross corn yield (Q), T	347 000
20% recycling (Q \ s0), t	69 400
67% recycling (Q \ S1), t	232 490
ΔQ is the additional volume of recycling, t	163 090

The added value of the transition to recycling can be presented as a "redistribution premium" for 1 ton of raw materials-the difference between:

- value / income (or margin contribution) of recycled products,
- and the cost/yield of the feedstock (sale of grain as raw materials), taking into account additional processing costs.

We mark:

ΔVA_{it} is the added value generated by recycling per 1 ton of raw material compared to the feedstock (TG/).

Then the total increase in value added:

$$\Delta VA = \Delta Q \times \Delta VA_{it}$$

Due to the variability of prices, technological performance, and cost structures across enterprises (and the limited availability of detailed cost data), a range of conservative assumptions is applied for expert estimation based on the "value-added premium" from processing:

- Conservative scenario: $\Delta VA_{1t} = 20,000\text{KZT/t}$
- Baseline scenario: $\Delta VA_{1t} = 50,000\text{KZT/t}$
- Optimistic scenario: $\Delta VA_{1t} = 80,000\text{KZT/t}$

Table 7 — Scenarios of Value-Added Growth under Increased Processing

Scenario	ΔVA_{1t} (KZT/t)	ΔQ (tons)	ΔVA (KZT)
Conservative	20,000	163,090	3,261,800,000
Baseline	50,000	163,090	8,154,500,000
Optimistic	80,000	163,090	13,047,200,000

The scenario assessment shows that with the involvement of about 163 thousand tons of additional raw materials for corn processing, the annual increase in regional value added may be in the range of 3.26–13.05 billion tenge, while the basic (average) estimate is about 8.15 billion tenge.

These results indicate that the increase in value added is not limited to an increase in the volume of processing, its scale depends on the harmonious development of The Associated elements of the value chain. The introduction of standardization Systems, stable loading of production capacities, effective organization of logistics and packaging solutions, as well as ensuring access to export markets are seen as the main determinants of the aggregate effect.

In this regard, the magnitude of Value-Added growth in real conditions depends on product specialization, the yield of finished products and the structure of by-products, the level of use of production capacities, requirements for quality and logistics, as well as the availability of working capital to finance seasonal purchases of raw materials.

In addition, it is necessary to take into account the scenario nature of the estimates obtained. The implementation of the expected economic effect depends on the coordinated development of the raw material base, investments in storage and logistics infrastructure, the availability of working capital financing tools, as well as the provision of sales channels and quality standards. If these conditions are not met, there is a possibility of a decrease in the expected effect as a result of incomplete loading of production capacities and an increase in equity costs.

In general, the scenario analysis confirms that an increase in the share of processing from 20% to 67% creates a potential for significant growth in regional value added even in conservative conditions. However, the realization of this potential is not automatic and depends on institutional coordination between the participants of the chain, the actual loading of production capacities, financial availability and market stability.

From this point of view, the proposed calculations should be considered not as the final economic result, but as an indicative orientation that determines the structural conditions and mechanisms necessary for the transition of the agro-industrial complex of the Almaty region to a model for the production of high-value-added products.

Discussion. The results show that the agro-industrial complex of Almaty region is in the stage of structural transformation. This transformation is characterized by a transition from the priority of the raw material model to a development trajectory aimed at deepening processing within the region and preserving a significant part of the value added. A comparative analysis of the dynamics of production volumes, investment activity and processing parameters proves the existence of economic prerequisites for such changes. At the same time, the identified restrictions determine that this process should be carried out not by individual point solutions, but by systematic management of value chains.

According to the value chain approach (Kaplinsky and Morris, 2001; Gereffi et al., 2005), value added is formed not only at the processing stage, but also in functions such as standardization, logistics, marketing positioning and access to markets. Empirical observations show that in dairy and poultry chains, it is the harmonious relationship of these functions that allows the formation of high added value. Industrial processing, export orientation and relative stability of supplies combine here, forming a synergistic effect in accordance with the logic of cluster development (Porter, 1998).

In contrast, the chains for grain and horticultural products maintain a structural gap between primary production and processing. On the example of corn, a low level of processing share (about 20%) indicates a mechanism for the formation of value added outside the region. Scenario assessments prove that reducing this gap can have a significant economic impact. However, the stability of such an impact depends on the development of storage infrastructure and logistics, the effectiveness of contractual mechanisms and the availability of financial instruments necessary for stable loading of production capacities.

One of the most important conditions is the institutional coordination of the participants of the chain. Research shows that fragmentation of production leads to instability of supplies and variability in the quality of raw materials, reducing processing efficiency (Ortmann and King, 2007; Bijman and Iliopoulos, 2014). In the context of the priority of small and medium-sized farms in the Almaty region, cooperation is of particular importance as the main tool for managing the supply chain. It increases the predictability of raw material flows and reduces the risk of non-loading of production capacities, making it possible to concentrate production volumes, agree quality standards and develop contractual relations.

The export direction of the transformation is also of particular importance. The transition to high-value-added products is accompanied by increased requirements for quality, safety and traceability, which requires investments in the development of certification, control and regulatory systems (FAO, 2017; World Bank, 2017). From this point of view, export is not only a sales channel, but also an important element of institutional modernization, which forms a price mark on product quality.

The results obtained from the point of view of regional policy allow us to highlight two interrelated levels of transformation. The first is the production and infrastructure level, which includes the development of processing capacities,

the expansion of the cold chain and technological modernization. The second is the institutional and organizational level, which includes the development of cooperation, the institutionalization of contractual relations, the provision of access to financing and the standardization of quality.

Only the harmonious and synchronous development of these levels can provide a stable model in which a significant share of added value is formed within the region.

Thus, it can be shown that the transition of the agro-industrial complex of the Almaty region to the production of high-value-added products is not limited to investments in processing, its effectiveness depends on complex structural modernization based on the formation of managed and coordinated agri-food chains. At the same time, quantitative estimates determine the economic potential of transformation, while institutional mechanisms ensure its long-term stability.

Conclusion. The reorientation of the agro-industrial complex of Almaty region to the production of high-value-added products is defined as a strategic direction for structural modernization of the regional economy. The analysis showed the stability of the production base of the region and the growth of investment activity, but revealed that the potential for value added formation is not fully realized due to incompatibility between the links of the value chain.

Empirical results showed the heterogeneity of development in different product chains: in dairy and poultry farming, the relatively high integration of processing and export allows the added value to be fixed within the region, while in grain and fruit and vegetable directions, the raw material orientation remains. The scenario assessment of corn proves that an increase in the share of processing from 20% to 67% can provide a significant increase in regional value added, but the stability of this effect depends on the Coordination of supplies, the development of infrastructure and logistics, and the availability of financial resources.

The results of the study confirm that the formation of value added is not limited only by production factors, its effectiveness depends on the quality of the institutional environment, which includes cooperation, standardization, contractual relations, certification and export infrastructure. In this sense, the transformation of the agro-industrial complex requires the formation of managed and coordinated agri-food chains, in addition to expanding recycling.

The practical significance of the study is associated with the justification of a set of systematic measures aimed at eliminating the main restrictions in value chains. Their consistent implementation will ensure an increase in the share of processing, an increase in export revenues, a decrease in seasonal volatility of revenues and an increase in the competitiveness of the region's products.

The limitations of the study are due to the fact that the data is not fully and evenly available, especially in terms of capacity loading, cost structure and contractual relationships. Future research should focus on detailed value-added calculations across specific product chains and assessing the multiplier effect of recycling on employment and gross regional product.

In general, the results of the study show that the transition of the agro-industrial complex of Almaty region to high-value-added products is an economically justified and institutionally implemented direction, but its effectiveness depends on a comprehensive and coordinated policy approach.

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