IDENTIFICATION AND ASSESSMENT OF THE PRINCIPAL FACTORS DRIVING INNOVATION IN THE FOOD INDUSTRY OF KASHKADARYA REGION

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Abstract

This article examines the identification of priority factors influencing the innovative development of the food industry in Kashkadarya region. The existing potential of the regional food industry and factors related to the technological modernization of production processes, investment activity, innovation implementation, and efficient resource utilization are systematically investigated. The study employs statistical analysis, comparative analysis, correlation and regression analysis, and econometric modeling methods. Particular attention is paid to assessing the relationships among the factors influencing the innovative development of the food industry and determining their direction of influence and relative importance. Based on the research findings, the importance of accelerating innovation and technological processes, increasing investment activity, promoting the deep processing of local raw materials, modernizing production facilities, and expanding the use of digital technologies in the region is substantiated. The obtained results can be used to improve the utilization of the innovative potential of the food industry in Kashkadarya region, identify priority development areas, and formulate scientifically grounded managerial decisions.

Keywords: food industry, innovative development, priority factors, innovation, investment, econometric analysis, Kashkadarya region.

INTRODUCTION

In the modern economic environment, the innovation-driven development of the food industry is one of the essential conditions for ensuring regional economic stability, supplying domestic markets with high-quality and competitive products, and improving the economic efficiency of the food processing industry. Population growth, changes in consumption patterns, and increasing requirements for food quality and safety necessitate the transition of food industry enterprises from traditional production methods to modern, innovative, and resource-efficient technologies. Under these conditions, innovation serves not only as a means of increasing production volumes but also as an important economic factor contributing to improved product quality, reduced production costs, higher labor productivity, and access to new markets.

Kashkadarya region is characterized by a substantial agricultural raw material base and industrial production potential, creating favorable opportunities for the development of the food industry. Deep processing of locally produced agricultural products, reducing losses during storage and processing, manufacturing finished products with high added value, and improving their competitiveness in domestic and international markets are among the priority objectives of industrial development. The effective implementation of these objectives requires the introduction of modern production technologies, increased innovative activity among enterprises, and the rational utilization of investment resources.

The innovative development of the food industry is not limited to technological modernization alone. It also encompasses the development of new products, modernization of production processes, implementation of digital management systems, application of energy- and resource-saving technologies,

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improvement of logistics and storage systems, introduction of marketing innovations, and enhancement of organizational and managerial mechanisms within enterprises. Therefore, factors influencing the innovative development of the industry should be examined not separately but as an interconnected system.

In particular, factors such as investment volume, the level of technological modernization, innovative activity, labor productivity, availability of raw materials, utilization of production capacities, digitalization, and the economic activity of enterprises exert different degrees of influence on the innovative development of the food industry. Treating all these factors as equally important may limit the efficient allocation of available financial and production resources. Consequently, quantitatively assessing their relative importance and identifying the priority factors that most strongly contribute to industrial development constitute important scientific and practical tasks.

Existing scientific studies have examined the development of the food industry, the introduction of innovative technologies, investment activity, digitalization, and production efficiency from various perspectives. However, differences in the economic, resource, and production capacities of individual regions mean that applying general approaches directly to specific regional conditions does not always produce the expected results. In this regard, there is a need to identify the factors influencing innovative development, assess their relative importance, and determine the priority factors while considering the specific characteristics of the food industry in Kashkadarya region.

The purpose of this study is to investigate the economic, investment, production, and technological factors influencing the innovative development of the food industry in Kashkadarya region, evaluate the relationships among these factors, and identify those with the greatest influence on industrial development. To achieve this objective, the study examines development trends in the regional food industry, establishes a system of indicators characterizing innovative development, evaluates relationships among factors using statistical and econometric methods, and develops practical recommendations based on the identified priority factors.

The practical significance of the research lies in the fact that identifying priority factors makes it possible to allocate available resources to the most effective areas of food industry development in the region. This creates opportunities to formulate scientifically grounded managerial decisions aimed at stimulating innovative activity, accelerating technological modernization, promoting the deep processing of local raw materials, improving production efficiency, and expanding the manufacture of competitive food products with high added value.

RESEARCH METHODOLOGY AND METHODS

This study applies a comprehensive methodological approach aimed at identifying factors influencing the innovative development of the food industry in Kashkadarya region, assessing their relative importance, and selecting priority factors. The research methodology focuses on examining the innovative development of the food industry through the interrelationships among economic, investment, production, technological, and resource-related factors.

The study employs systematic analysis, statistical grouping, comparative analysis, time-series analysis, correlation and regression analysis, econometric modeling, and scientific generalization. Systematic analysis is used to classify factors influencing the innovative development of the food industry according to their economic characteristics. Statistical and dynamic analyses are conducted to evaluate changes in industry indicators over time, their growth rates, and major development trends.

The information base of the research consists of annual statistical data characterizing production, investment, innovation, and technological processes in the food industry of Kashkadarya region. Particular

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attention is paid to the relevance of the selected indicators to the research objectives, the availability and comparability of statistical data, and their ability to reflect innovative development processes.

At the initial stage of the research, a dependent variable representing the development of the food industry and a system of potentially influential factors are identified. Priority is given to indicators related to investment activity, production potential, technological modernization, labor resources, the local raw material base, digitalization, and innovative activity.

At the next stage, the dynamics of the selected indicators are examined, and the relationships among them are assessed using correlation analysis. Along with identifying factors strongly associated with the dependent variable, attention is also paid to the relationships among the independent variables. This approach helps prevent the inclusion of indicators that duplicate each other in economic meaning and reduces the potential problem of multicollinearity.

In selecting factors, consideration is given not only to their correlation with the dependent variable but also to their economic significance, direction of influence, and statistical significance. On this basis, factors demonstrating strong and stable relationships with the development of the food industry are identified as priority factors.

Multiple regression analysis is employed to quantitatively assess the relationships between the selected factors and the dependent variable. Model parameters are estimated using the ordinary least squares method, allowing the partial association of each factor with the dependent variable to be evaluated while holding other variables constant. This method makes it possible to determine which factors play a more significant role in the innovative development of the food industry.

The statistical reliability of the econometric model is evaluated using the coefficient of determination, adjusted coefficient of determination, Fisher's F-test, Student's t-test, and probability values. These indicators are used to assess the overall statistical significance of the model, the statistical significance of individual factors, and the extent to which the selected variables explain variations in the dependent variable.

The identification of priority factors is not limited to a direct comparison of regression coefficient values, since the indicators included in the study may have different units of measurement. Therefore, the relative importance of the factors is assessed through a comprehensive consideration of their statistical significance, direction of influence, relationship with the dependent variable, and economic interpretation.

At the final stage of the research, the obtained results are interpreted from an economic perspective, and the most important factors associated with the innovative development of the food industry are classified. Based on the identified priority factors, practical directions are proposed for stimulating innovative activity, modernizing production technologies, improving the utilization of investment opportunities, promoting the deep processing of local raw materials, and expanding the introduction of digital technologies.

Thus, the research methodology consists of several consecutive stages: compiling statistical data, analyzing indicator dynamics, evaluating relationships among factors, selecting significant variables, conducting econometric assessments, and identifying priority factors. This approach provides a methodological basis for determining the most important factors associated with the innovative development of the food industry in Kashkadarya region and developing practical recommendations.

RESULTS

The findings of the study indicate that the innovative development of the food industry in Kashkadarya region is shaped by the interaction of various economic, investment, technological, and production-related

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factors. The analysis suggests that these factors do not contribute equally to innovative development and that certain factors are of greater importance in supporting industrial progress.

According to the analysis, factors influencing the innovative development of the food industry can be classified into four main groups: investment factors, innovation and technological factors, production and resource factors, and organizational and economic factors. Each group influences specific aspects of industrial development, while their interconnected effects contribute to the overall process of innovative development.

Investment factors constitute the financial foundation for establishing new production capacities, modernizing existing enterprises, and introducing advanced technological equipment in the food industry. Increased investment enables enterprises to upgrade production processes, diversify product ranges, and adopt new technologies. Therefore, investment activity is considered one of the important factors contributing to the acceleration of innovative development.

The analysis of innovation and technological factors highlights the importance of introducing new technologies, automation, and digitalization into production processes to improve the efficiency of the food industry. The application of modern technologies creates opportunities to reduce raw material and energy consumption, shorten production cycles, improve product quality, and lower production costs. From this perspective, technological modernization emerges as a priority direction for ensuring the long-term competitiveness of the industry.

The existing agricultural raw material base of Kashkadarya region provides significant production and resource opportunities for the development of the food industry. However, the availability of raw materials alone does not automatically ensure high economic performance. Their economic value can be increased through deeper processing, improved storage and logistics infrastructure, and a higher share of finished products in total output. Therefore, the deep processing of local raw materials is identified as an important component of innovative development.

The analysis also indicates that labor productivity is closely associated with the innovative development of the food industry. The introduction of modern equipment and automated production lines expands employees' productive capabilities. At the same time, the effective adoption of new technologies requires the training of qualified personnel and the continuous improvement of employees' professional skills.

The use of digital technologies is another important factor in the future development of the industry. Digital monitoring of production processes, enterprise resource planning systems, electronic commerce, digitalization of logistics operations, and data-driven managerial decision-making create opportunities to improve the operational efficiency of enterprises. Digitalization not only represents an independent direction of innovative development but also enhances the effectiveness of other technological and organizational innovations.

The findings suggest that increasing investment alone is insufficient to ensure the innovative development of the food industry in Kashkadarya region. It is equally important to direct investment resources toward technological modernization, digitalization, deep processing of local raw materials, and the production of high-value-added products. In this context, the benefits of innovative development arise not from a single factor but from the coordinated application of several priority factors.

DISCUSSION OF RESULTS

The research findings indicate that the innovative development of the food industry in Kashkadarya region is determined not by a single factor but by the interaction of investment, technological, production

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and resource, and organizational and economic factors. Among the identified priority areas, investment activity, technological modernization, deep processing of local raw materials, digitalization, labor productivity, innovative product development, and improvements in storage and logistics infrastructure are particularly important.

Investment activity is one of the fundamental economic conditions for ensuring the innovative development of the industry. The acquisition of new technologies, modernization of production lines, automation, and development of new product categories require sufficient financial resources. Therefore, alongside increasing investment volumes, it is essential to direct these resources toward the introduction of innovative and resource-efficient technologies.

Technological modernization represents one of the priority directions for accelerating innovative development in the food industry. The introduction of modern production equipment enables enterprises to increase the depth of raw material processing, improve product quality, reduce production losses, and lower costs. As a result, production efficiency and market competitiveness can be enhanced.

The agricultural potential of Kashkadarya region provides favorable conditions for expanding the deep processing of local raw materials. Rather than limiting production to primary processing, manufacturing finished products with higher added value can improve the economic efficiency of the regional industry. Therefore, modernizing processing technologies, diversifying product ranges, and strengthening production value chains are important directions for industrial development.

Digitalization is also an important component of innovative development. Digital management systems enable enterprises to monitor production processes, track the movement of raw materials and supplies, manage inventories, plan product sales, and control expenditures in real time. Consequently, the speed and quality of managerial decision-making can improve, contributing to more efficient resource utilization.

Improving labor productivity is particularly important for translating technological innovations into measurable economic benefits. Modern technologies and automated production lines enable enterprises to increase output per employee. However, technological modernization also increases the demand for highly qualified specialists. Therefore, technological improvements should be accompanied by continuous professional development and the enhancement of employees' digital competencies.

Expanding the production of innovative food products increases the market opportunities available to enterprises. Consumer requirements regarding product quality, composition, safety, packaging, and consumption characteristics are constantly evolving. This requires enterprises not only to improve existing products but also to develop new product categories and introduce them effectively into the market.

The development of storage and logistics infrastructure is another important factor influencing the effectiveness of innovation in the food industry. In particular, the application of modern refrigeration, storage, packaging, and transportation technologies for perishable products helps reduce product losses. These improvements contribute to expanding the geographical reach of sales, preserving product quality, and strengthening export opportunities.

The analysis indicates that simply increasing investment volumes is not sufficient to ensure innovative development. The allocation of investment resources among different areas is equally important. Directing financial resources toward technological modernization, digitalization, deep processing of local raw materials, modern storage and logistics systems, and new product development can generate substantial economic benefits.

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Furthermore, the identified priority factors are complementary. Investments directed toward technological modernization contribute to improved production efficiency; modern technologies expand opportunities for deeper raw material processing; and digitalization strengthens the efficiency of production and management processes. Together, these improvements can increase labor productivity, product quality, and enterprise competitiveness.

CONCLUSIONS AND RECOMMENDATIONS

The findings of the study indicate that the innovative development of the food industry in Kashkadarya region is shaped by the interaction of economic, investment, technological, production, and infrastructure-related factors. Alongside the utilization of existing resources, technological modernization, digitalization, and the transition toward the production of high-value-added products play an important role in promoting innovation-driven industrial development.

The study identifies investment activity, technological modernization, deep processing of local raw materials, digitalization, labor productivity, innovative product development, and improvements in storage and logistics infrastructure as priority factors and directions associated with the innovative development of the food industry. Since these factors complement one another, they should be managed not separately but within an integrated system of innovative development.

To improve the utilization of Kashkadarya region's agricultural raw material potential, it is necessary to move from basic processing toward deeper processing activities. This requires the introduction of modern processing and packaging technologies, diversification of finished products, and development of production value chains focused on generating higher added value.

Based on the research findings, the following recommendations are proposed for promoting the innovative development of the food industry in Kashkadarya region:

1. Targeting investments toward innovative projects. The share of investment allocated to modern technological equipment, automated production lines, and energy- and resource-efficient technologies in food industry enterprises should be increased.

2. Accelerating technological modernization. Existing production capacities should be upgraded through the introduction of modern equipment, low-waste production methods, and resource-saving technologies to reduce production costs and improve efficiency.

3. Developing the deep processing of local raw materials. It is advisable to expand production value chains specializing in transforming agricultural products grown in the region into finished food products with high added value.

4. Strengthening the digitalization of food industry enterprises. Digital monitoring and automated management systems should be gradually introduced into production, warehousing, logistics, sales, and resource management processes.

5. Stimulating innovative food product development. Mechanisms for developing and marketing new, high-quality, safe, and high-value-added food products should be improved in response to changing consumer preferences.

6. Modernizing storage and logistics infrastructure. Refrigerated warehouses, advanced packaging technologies, storage facilities, and transportation systems should be developed to reduce product losses and expand producers' access to domestic and international markets.

7. Improving human capital for innovative technologies. Cooperation between food industry enterprises and higher education institutions should be strengthened, while the technological and digital competencies of specialists should be continuously developed.

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Overall, the innovative development of the food industry in Kashkadarya region should be based on an integrated approach following the sequence:

Investment → Technological Modernization → Deep Processing → Digitalization → Labor Productivity → Innovative Products → Competitiveness.

The implementation of this approach can contribute to more efficient utilization of the industry's existing resource potential, increased production efficiency, higher added value, and stronger long-term competitiveness of the food industry in Kashkadarya region.

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