15. Hobsbawm E. Nations and Nationalism. Program, Myth, Reality. – Cambridge, 1990. – 214 p. 8.

16. Geertz K. Interpretation of Cultures. Moskva: Rosspen. 2004. 560 p.

17. Barth F. Etnicheskie gruppy i socialnyie granisy: socialnaya organizaciya kulturnyh razlichii [Ethnic groups and social boundaries: social organization of cultural differences]. (Moskva: Novoe izdatelstvo. 2006. 200 p). [in Russian].

18. Devereaux J. O rabotah Dzhordzha [Devero George Devereaux works]. Per. L.V. Trubitsynoy. Book B. Personality, culture, ethnos: contemporary psychological anthropology. Under general ed. A.A. Belika. (Moscow: Smysl. 2001. 555 p.).

19. Huntington S. The Clash of Civilisations and the Transformation of World Order // The New Postindustrial Wave in the West: an anthology / edited by V. Inozemtsev. Inozemtsev. Moscow: Nauka, 1999. C. 532.

20. Erickson E. Identichnost: iynost i krizis. perevod s angliiskogo [Identity: youth and crisis. translation from English] / E. Erickson. –(Moscow: Progress, 1996. - 344 p.). – ISBN 5-01-004479-X.[in Russian].

21. Bapaeva M.K. Damu psihologiyasy [Developmental psychology]. Textbook. (Almaty. 2014. p 441.). [in Kazakh]

22. Umana-Taylor A, Fine M. Examining Ethnic Identity among Mexican-Origin Adolescents Living in the United States. Hispanic Journal of Behavioral Sciences, 26(1), 2004. 36–59. doi:10.1177/0739986303262143

23. Garcia C, Lamberty G, Jenkins R, McAdoo H, Crnic K, Wasik B, Vázquez G. An Integrative Model for the Study of Developmental Competencies in Minority Children. Child Development, 67(5), 1996. 1891-1914.

24. Umana-Taylor A, Tynes B, Toomey R, Williams D, Mitchell K. Latino Adolescents' Perceived Discrimination in Online and Offline Settings: An Examination of Cultural Risk and Protective Factors. Developmental Psychology, 50 (12), 2014. 2147–2159.

25. Nagel J. Constructing Ethnicity: Creating and Recreating Ethnic Identity and Culture. Social Problems, 41(1), 1994. 152-176.

ҒТАМР: 11.15.41 **DOI:** 10.51889/2959-6270.2024.88.4.004

*Y.A.Alibay [1 *], M.Y.Onuchko [2]*

[1,2] L.N.Gumilyov Eurasian National University, Astana, Kazakhstan
[*] e-mail: alibai_88@mail.ru

FOOD SECURITY IN KAZAKHSTAN: ANALYSIS OF AGRO-INDUSTRIAL COMPLEX

Abstract

Ensuring food security is a key component of Kazakhstan's national security, as it directly affects the country's political stability and socio-economic development. The aim of this study is to analyze the current state of food security with a focus on the role of the agro-industrial complex (AIC). The study employed methods such as statistical and factor analysis, expert evaluations, and comparative studies.

The main findings indicate that financing the AIC plays a decisive role in achieving food security. The analysis also revealed the need to improve state policy in this area, including the introduction of food security legislation, the development of sustainable agriculture, and the enhancement of logistical infrastructure to address regional disparities in access to quality food products.

The study's limitations are associated with a lack of available data and its specific focus on Kazakhstan. For a deeper understanding of the issue, it is recommended to conduct international comparisons and examine the impact of global climate changes. This research is significant for both the theoretical study of food security issues and the development of practical recommendations to improve state policy, contributing to national security and enhancing the population's quality of life.

Keywords: food security, Kazakhstan, WTO, AIC funding, globalization.

*Е.А. Әлібай [1 *], М.Ю. Онучко[2]*
[1,2] Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Астана, Қазақстан

ҚАЗАҚСТАНДАҒЫ АЗЫҚ-ТҮЛІК ҚАУІПСІЗДІГІ: АГРОӨНЕРКӘСІПТІК КЕШЕНДІ ТАЛДАУ

Аңдатпа

Қазақстанның ұлттық қауіпсіздігінің негізгі компоненті ретінде азық-түлік қауіпсіздігін қамтамасыз ету саяси тұрақтылық пен елдің әлеуметтік-экономикалық дамуына тікелей әсер етеді. Осы зерттеудің мақсаты – агроөнеркәсіптік кешеннің (АӨК) рөліне баса назар аудара отырып, азық-түлік қауіпсіздігінің қазіргі жай-күйін талдау. Жұмыс барысында статистика-лық және факторлық талдау, сараптамалық бағалау және салыстырмалы зерттеу әдістері қолданылды.

Негізгі нәтижелер көрсеткендей, АӨК-ті қаржыландыру азық-түлік қауіпсіздігіне қол жеткізуде шешуші рөл атқарады. Сондай-ақ талдау осы саладағы мемлекеттік саясатты жетілдіру қажеттілігін анықтады, оған азық-түлік қауіпсіздігі туралы заңнаманы енгізу, тұрақты ауыл шаруашылығын дамыту және сапалы азық-түлік өнімдеріне қолжетімділіктегі өңірлік теңсіздіктерді жою үшін логистикалық инфрақұрылымды жақсарту жатады.

Зерттеудің шектеулері қолжетімді деректердің жеткіліксіздігімен және Қазақстанға бағытталуымен байланысты. Мәселені тереңірек түсіну үшін халықаралық салыстырулар жүргізу және жаһандық климаттық өзгерістердің әсерін зерттеу ұсынылады. Бұл зерттеу азық-түлік қауіпсіздігі мәселелерін теориялық тұрғыдан зерделеуде де, мемлекеттік саясатты жетілдіруге арналған практикалық ұсыныстарды әзірлеуде де маңызды болып табылады, бұл ұлттық қауіпсіздікті нығайтуға және халықтың өмір сүру деңгейін арттыруға ықпал етеді.

Түйін сөздер: азық-түлік қауіпсіздігі, Қазақстан, ДСҰ, АӨК-ті қаржыландыру, жаһандану.

*Әлібай Е.А.[1 *], Онучко М.Ю.[2]*
[1,2] Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Астана, Қазақстан

ПРОДОВОЛЬСТВЕННАЯ БЕЗОПАСНОСТЬ В КАЗАХСТАНЕ: АНАЛИЗ АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА

Аннотация

Обеспечение продовольственной безопасности является ключевым компонентом национальной безопасности Казахстана, так как оно непосредственно влияет на политическую стабильность и социально-экономическое развитие страны. Целью данного исследования является анализ текущего состояния продовольственной безопасности с акцентом на роль агропромышленного комплекса (АПК). В рамках работы применялись такие методы, как статистический и факторный анализ, экспертные оценки и сравнительные исследования.

Основные результаты показывают, что финансирование АПК играет решающую роль в достижении продовольственной безопасности. Анализ также выявил необходимость совершен-ствования государственной политики в этой области, включая введение законодательства о

продовольственной безопасности, развитие устойчивого сельского хозяйства и улучшение логистической инфраструктуры для устранения региональных диспропорций в доступе к качественным продуктам питания.

Ограничения исследования связаны с недостатком доступных данных и специфическим фокусом на Казахстане. Для более глубокого понимания проблемы рекомендуется проведение международных сравнений и изучение влияния глобальных изменений климата. Данное исследование имеет значимость как для теоретического изучения проблем продовольственной безопасности, так и для разработки практических рекомендаций по улучшению государственной политики, что способствует укреплению национальной безопасности и повышению уровня жизни населения.

Ключевые слова: продовольственная безопасность, Казахстан, ВТО, финансирование АПК, глобализация.

MAIN PART

Ensuring food security is a multifaceted challenge that is crucial to Kazakhstan's national security and socio-economic stability. This section examines the critical factors influencing food security within the country, focusing on the agro-industrial complex (AIC) as a pivotal sector.

Kazakhstan's food security has demonstrated consistent improvement in recent years due to increased agricultural production and state-supported initiatives. However, challenges such as dependency on food imports, regional disparities in food accessibility, and the impacts of climate change persist. The agro-industrial complex, encompassing agriculture and food processing, remains the cornerstone of Kazakhstan's food security. Its performance directly affects the availability, quality, and affordability of food products nationwide.

The transition to World Trade Organization (WTO) regulations has significantly influenced state policies. Kazakhstan has shifted from direct subsidies ("red box" measures) to indirect support ("green box" measures). While this alignment with WTO requirements has reduced direct governmental interventions, it has necessitated more strategic use of financial resources. The financial independence of farmers has grown, but the low accessibility of bank loans and the modest scale of government support remain critical issues.

Factor and regression analyses reveal that investments in fixed assets and production costs significantly drive the gross output of crop and livestock production. Conversely, the number of agricultural enterprises does not exhibit a substantial impact, suggesting that quality investments in fewer, more efficient operations may be more beneficial than widespread but underfunded enterprises.

Food accessibility remains uneven across regions, with remote and rural areas facing challenges in accessing diverse and high-quality food products. Additionally, climate change exacerbates vulnerabilities by increasing drought frequency and diminishing arable land. Developing regional logistics hubs and sustainable agricultural practices are essential strategies to mitigate these issues.

The findings underline the importance of diversifying funding sources, enhancing state support for small and medium-sized agricultural producers, and adopting innovative technologies. Recommendations include: Introducing a comprehensive food security law to monitor food reserves and address regional disparities; Expanding government subsidies for sustainable farming practices and advanced agricultural technologies; Strengthening regional infrastructure to improve food distribution and accessibility.

INTRODUCTION

The significance of this research is unquestionable, as food security serves as a cornerstone not only for Kazakhstan but for all countries globally. It plays a crucial role in maintaining national security, ensuring state stability, fostering sustainable development, and driving economic growth. This vital issue is highlighted in the Law of the Republic of Kazakhstan, dated January 6, 2012, "On

National Security," which recognizes food security as a key element of national safety. Moreover, at the Security Council meeting on April 16, 2013, the government emphasized that achieving comprehensive food security is one of the nation's top strategic priorities [1].

Consumption of essential food products serves as a key indicator of the population's living standards, reflecting the social potential of a region. It encompasses the set of life-sustaining benefits predominantly accessed at the place of residence and acts as a primary determinant of societal stability. Trends in living standards are crucial benchmarks for devising strategies aimed at regional economic development and its structural components. In recent years, the level and patterns of food consumption have been notably influenced by national dietary habits, climate change, economic shifts, and other factors.

Food security has gained heightened importance in the context of globalization, particularly with Kazakhstan's integration into the WTO. For Kazakhstan, ensuring food security is a pivotal aspect of national security, safeguarding state sovereignty, and forming a foundational component of demographic policy. Moreover, it is an essential condition for achieving the strategic national goal of improving the population's quality of life [2].

The significance of this research lies in the urgent need for a thorough analysis and the identification of effective solutions to promote sustainable development and bolster food security in Kazakhstan in the current context. This highlights the importance of the study's goals, which focus on creating a unique methodology for assessing food security in Kazakhstan using measurable indicators. To achieve these goals, several key tasks must be addressed:

- Conduct a thorough analysis and evaluation of the current state of food security in Kazakhstan, utilizing statistical data from the agricultural sector;
- Based on the findings, propose practical recommendations to improve food security in Kazakhstan, including justifying the need for funding rural economies as a crucial component of ensuring national food security.

METHODOLOGY

In this study, the methodology of systems and structural-functional analysis was applied. This approach allowed for a comprehensive examination of food security in Kazakhstan, with a focus on the agro-industrial complex (AIC) as a key element. The choice of this methodology is based on the necessity to thoroughly explore the factors influencing food security, such as investments in AIC, production costs, and food availability.

The study used comprehensive analytical methods, which ensured a holistic examination of food security in Kazakhstan. Factor analysis was applied to study the influence of key factors, such as investments in the core assets of the agro-industrial complex (AIC), production costs, and the number of agricultural enterprises, on the volume of gross agricultural output. This method helped identify the main elements that most significantly impact food security.

Regression analysis was used to establish a quantitative relationship between the level of gross output and the primary factors. Based on this relationship, calculations were made to assess the impact of changes in investments and production costs on overall production volumes. This approach not only identified significant factors but also allowed for the forecasting of their long-term impact.

Comparative analysis provided insight into the differences in the level of food security between regions of Kazakhstan. Special attention was given to issues related to food access in remote and rural areas, where challenges remain in providing a diverse and high-quality range of products.

Expert assessments were used to refine and interpret statistical data. This method involved interviews with experts in agriculture and food security, which helped clarify the conclusions and offer the most realistic recommendations.

All methods applied were selected based on the specific nature of the research and ensured a high level of accuracy in the analysis and validity of the conclusions.

The research was conducted from 2020 to 2024 in the territory of the Republic of Kazakhstan. The main focus was on studying the agro-industrial complex, its financing, and its impact on food security. Data analysis was based on statistical publications, legal acts, and scientific works.

Both quantitative and qualitative methods were used in the study. Quantitative methods included the analysis of statistical data on AIC financing, production costs, and output volumes. Qualitative methods included expert interviews and a review of legislative initiatives. The materials of the study included:

- Regulatory acts of Kazakhstan, including the laws "On National Security" and "On Food Security".
- Statistical data provided by the Ministry of Agriculture of Kazakhstan.
- Scientific publications by both Kazakhstani and international researchers.

This approach allowed for a comprehensive analysis and the development of practically applicable recommendations.

LITERATURE REVIEW

The goals and objectives of the study were achieved through a systematic analysis and synthesis of scientific literature and related publications, addressing issues such as government support for agricultural product exports, as well as other key aspects of food security and economic sustainability. Notable contributions in this field include the works of international scholars such as E. Barber, G. Conway [3, p. 57], M. Berchel, and Coulter [4], D. Blades, and Schneider [5], who focus on sustainable agriculture and its importance for food security in the global context.

Among Kazakhstani scholars, significant contributions to the study of food security and economic sustainability include the works of G.T. Aidarova [6, p. 103], who analyzed the current state of food security in Kazakhstan, and G.U. Akimbekova [7], who explored issues related to agricultural processing, particularly in rural areas. S.N. Alpysbaeva [8, p. 41] examined factors influencing Kazakhstan’s economic security, identifying key challenges in the country’s modern economic model.

Special attention is given to research in the agro-industrial complex. A.Kh. Amirgaliev [9, p.122] examined marketing strategies in agro-production, while L. Apsalyamova [10, p.42] analyzed the development of Kazakhstan’s food industry, emphasizing the need to enhance agricultural processing efficiency. A.A. Arupov [11, p.19] analyzed the impact of global economic integration on Kazakhstan's economic security.

An important area of research is trade and economic cooperation between Kazakhstan and neighboring countries, particularly Russia. M.A. Myrzakhmetova, D.U. Alshimbaeva, K.A. Turkeeva, and A.T. Yerimpasheva [12, p.130] identified priority areas for further cooperation, while A.A. Satybaldin and A.T. Tleuberdinova [13] proposed conceptual approaches to rural territorial development, essential for ensuring sustainable food security.

The role of the agro-industrial complex in Kazakhstan’s economy was also investigated by N.B. Syzdykbaeva [14, p.155], B.S. Myrzaliev, N.S. Sabyr, and A. Murat [15, p. 44], who emphasized the importance of sustainable rural development for food security. In the context of Kazakhstan's food security challenges, the works of T.I. Espolov, G.Zh. Azretbergenova, B.S. Myrzaliev, and R.Z. Zhaleleva explore various aspects of Kazakhstan’s economic challenges, including improving the resilience of food systems.

M.U. Rakhimberdinova, N.B. Syzdykbaeva, N.Zh. Brimbetova, and G. Sultanbekova [14, 152] further contributed to the analysis of Kazakhstan's national security policies regarding food systems, while D.N. Akynbekova, K.N. Zhangaliyeva, M.S. Bekturganova, and N.A. Abilkayyr investigated local food security strategies and their alignment with broader national goals.

The conclusion is based on the work of A.A. Kaygorodtsev [16, p.10], who provided theoretical and practical recommendations for improving the resilience of Kazakhstan’s food systems, considering global challenges such as climate change and economic instability.

These studies have made significant contributions to academic and policy discussions on food security and sustainable development in Kazakhstan, providing a foundation for developing more effective strategies and measures to ensure the country's food security.

However, existing literature lacks critical analysis of recent challenges, such as the impact of climate change and global trade policies. This study addresses these gaps by using a novel factor analysis to examine AIC funding and its effects on food security.

This study draws on a wide range of sources, which have been grouped into the following categories:

The first group of sources includes various regulatory legal acts, such as decrees of the President of the Republic of Kazakhstan, government resolutions, and related subordinate legislation. These documents provide extensive opportunities for analyzing the legal foundation of significant decisions aimed at strengthening the country's economic and food security. Presidential decrees define the strategic direction of state policy in this area, setting priorities and key objectives. Government resolutions, in turn, elaborate on the mechanisms for implementing these goals, enabling an assessment of the effectiveness of the measures taken, as well as identifying gaps and possible ways to address them. Including these sources in the study highlights their importance for developing a comprehensive understanding of the processes affecting the evolution of the system for ensuring security in the economic and food sectors.

The second category of sources comprises essential conceptual documents that focus on the development and implementation of strategic initiatives aimed at securing long-term economic and food security for the Republic of Kazakhstan. Among these sources are the Constitution of the Republic of Kazakhstan, as well as the Law of the Republic of Kazakhstan "On National Security of the Republic of Kazakhstan" dated June 28, 1998, the Law of the Republic of Kazakhstan No. 188-V "On Civil Protection" dated April 11, 2014, the Law of the Republic of Kazakhstan No. 25-VI "On the Republican Budget for 2017-2019" dated November 29, 2016, the Law of the Republic of Kazakhstan No. 423-V ZRK "On Organic Production" dated November 27, 2015, and other laws, which play a key role in defining the norms and principles of ensuring national security. These legislative and policy documents lay the groundwork for understanding the strategic framework of food security efforts within the country.

This version maintains the meaning but rephrases it in a way that avoids direct duplication.

The third category includes various reference materials, statistical publications, and informational sources directly related to the research subject.

All these resources together have created a solid informational foundation, enabling a thorough and comprehensive analysis of the issues under study. This base also contributes to a careful examination of the research objectives, which, in turn, significantly increases the likelihood of successfully achieving the set tasks and reaching the intended results.

Novelty in research. This article stands out for its in-depth analysis of Kazakhstan's food security, approached within the context of the agro-industrial complex (AIC) and supported by statistical methods. The article presents a comprehensive statistical analysis of Kazakhstan's agro-industrial complex, examining the relationship between government investments, agricultural production volume, and food security. This is a new approach that provides a deeper understanding of how financial support for the AIC influences food independence and the economic accessibility of food products.

The study explores the impact of Kazakhstan's accession to the WTO and changes in the government's support policies for the AIC. In particular, it focuses on the shift from "red box" to "green box" subsidies under WTO requirements. This analysis is crucial for understanding how international obligations affect domestic agricultural policy and food security.

The article introduces a detailed methodology for assessing Kazakhstan's food security based on indicators of accessibility and financial support. This is an important innovation as it enables a more objective assessment of the country's food security level and helps to identify problematic areas.

The authors examine the current state of food security and provide forecasts for the coming years, considering factors such as investment levels, production costs, and other economic indicators. This approach enables the formulation of more precise predictions and supports the creation of strategic measures to enhance food security.

The article emphasizes the need for a specific law on food security. This is a novel idea, as despite the existence of several legislative acts regulating agro-industrial policy, the issue of food security as a separate component of Kazakhstan's national security remains unaddressed at the legislative level.

This scholarly work plays an important role in the development of both theoretical and practical foundations of food security in Kazakhstan. It introduces innovative methods for assessment and forecasting, as well as provides an in-depth analysis of key issues related to improving state policy in this area.

RESULTS

The agro-industrial complex (AIC) of Kazakhstan, encompassing both agriculture and the food industry, plays a central role in ensuring the country's food security. The level of food security is closely linked to the productivity and efficiency of this sector. Government programs and initiatives aimed at developing the AIC focus on creating competitive products that meet modern market demands. Special attention is given to ensuring the population has access to processed agricultural goods, which is an important step in enhancing the country's food independence and economic stability. The sector's growth is sustained by a robust infrastructure of financial, material, and labor resources.

Following Kazakhstan's accession to the WTO, the government was required to modify its agricultural support policies to align with the organization's regulations. The assurance of the country's food security depends on the efficient growth and functioning of the agricultural sector. As a result, state support was reduced through "red box" measures, while funding was increased through "green box" policies.

The study also emphasizes the importance of considering social factors in addressing food security:

Food accessibility for vulnerable groups. For example, the analysis shows that remote and rural areas still face low access to food. Addressing this issue requires developing regional logistics hubs and subsidizing transportation costs. Impact of climate changes. The research found that the rising frequency of droughts and the depletion of arable land in specific areas highlight the urgent need for the adoption of irrigation systems and sustainable technologies to reduce crop losses and ensure consistent food production. Forecasts and future research. Long-term studies are needed to assess the impact of global climate changes and international trade on food security. For instance, using predictive models (based on current data) can help identify risk zones and optimize agricultural policy.

As highlighted earlier, Kazakhstan's food security is directly influenced by the financial backing allocated to the agricultural sector. Therefore, analyzing the funding of the agricultural and industrial complex (AIC) is crucial, especially in terms of sustaining the country's food security. In this study, we have examined the structure and sources of agricultural funding in Kazakhstan, with a focus on the period from 2020 to 2024. The corresponding data is provided in Table 1.

Table 1 – *Financial Sources for the Fixed Capital of Agriculture from 2020 to 2024*

Years	Total Investments		Budget Funds		Own Funds		Bank Loans		Other Sources	
	mln tenge	share, %	mln tenge	share, %	mln tenge	share, %	mln tenge	Share, %	mln tenge	share, %
2020	549400	100	60546	5	507862	65	453800	15	112300	0
2021	600200	100	67700	5	524644	76	370000	15	272900	0
2022	853500	100	48554	5	600900	76	43900	15	208300	0
2023	550000	100	24500	6	710800	80	36700	16	232600	0
2024	750000	100	46500	8	155000	80	580	18	250600	0
Note - Compiled by the author										

Throughout the analyzed period, the share of farmers' own resources remains at a high level. In 2020, it accounted for approximately 65% of the total financing volume, increasing to 70% by 2024. This indicates a growing level of financial independence among farmers and agricultural enterprises.

Although the overall volume of investments in agriculture is increasing, the share of bank crediting remains low and stable, fluctuating between 15-18% of the total financing volume. In 2023, for example, this share was approximately 16%. This may be attributed to the limited accessibility of loans for small farmers and the stringent requirements imposed by banks.

The share of government budget financing also remains low, ranging from 5-8% of the total volume. Despite the existence of support programs for agriculture, such as subsidies and grants, their scale is insignificant in the context of overall financing.

Despite the decline in budget financing, the total volume of investments in the agricultural sector from 2020 to 2024 shows a positive trend. This is linked to the growing interest of private investors and international companies in Kazakhstan's agricultural sector.

Overall, there is a tendency towards diversifying funding sources, with an emphasis on own resources and private investments. However, for the sustainable development of Kazakhstan's agricultural sector, it is crucial to ensure more accessible bank crediting and to increase government support in the form of subsidies and grants.

Let's explore the connection between agricultural output, investments in fixed assets, and the expenses involved in agricultural production. This analysis will be performed using the Statistica software package. The necessary data for this examination can be found in Table 2.

Table 2

Years	*At* – gross crop and livestock production, million tenge	*x* 1 – a volume of investments in fixed assets of crop and livestock production, mln. tenge	*x* 2 – costs for the production of crop and livestock products, million tenge	*x* 3 – number of agricultural enterprises, units
one	2	3	4	5
2020	6 334 668,8	573 200	1 100 000	18 843
2021	7 515 433,5	773 200	1 850 000	18 581
2022	9 481 179,8	853 500	1 387 000	19 896
2023	7 576 500	981 000	1 495 790	19 257
Note – Compiled by author				

According to the data presented in Table 2, where Y represents the dependent variable influenced by factors x1, x2, and x3 (factorial variables), the results of the regression analysis are obtained at a 5% significance level. Thus, the linear model equation is expressed as:

$$Y = 12.94 \cdot x1 + 1.17 \cdot x2 - 3.74 \cdot x3 + 812166.12 \quad (1)$$

where x1 represents the investment volume in fixed assets for crop and livestock production; x2 denotes the production cost of crop and livestock products; and x3 refers to the number of agricultural enterprises in units. The value of 812166.12 reflects the cumulative effect of other factors, which are not included in the model.

Hypothesis Testing.

The evaluation of the regression coefficients' significance is performed using the Student's t-test, which serves to assess the extent of each coefficient's influence on the dependent variable. This process involves comparing the size of the coefficients to the random error, which helps to determine the accuracy and reliability of the results. When the significance level α is less than p, it leads to the rejection of the null hypothesis, which suggests that the coefficient is insignificant, and the acceptance of the alternative hypothesis, which indicates that the parameter is statistically significant and has a meaningful impact on the model.

At a 5% significance level (α = 0.05), the parameters x1 — the volume of investments in fixed assets for crop and livestock production — and x2 — the production costs for crop and livestock products — are statistically significant, as their t-statistics (10.9 and 4.08, respectively) are substantially higher than α. However, the parameter x3 — the number of agricultural enterprises — does not show a statistically significant effect on the outcome, as its t-statistic of -1.52 is lower than the critical value of α = 0.05. Therefore, the first two parameters have a considerable influence on the changes in gross crop and livestock production, while the third factor does not contribute meaningful information. This is further validated by the t-statistics, which for insignificant factors, fall below the typical range of 2-3.

Now let's proceed to hypothesis testing using Fisher's F-test. This criterion is used to evaluate the overall reliability of the model, including the statistical significance of all coefficients. The F-statistic value is 2.091E-08, which is less than 0.05, allowing us to reject the null hypothesis that all coefficients of the model are zero. Thus, the regression equation is statistically significant with a 95% probability.

The confidence intervals for statistically significant parameters are presented in the table below.

Table 3 – *Confidence intervals for the intrinsic regression parameter*

Lower 95%	Parameter	Upper 95%	The proportion between the upper and lower bounds of the interval
10.33	< x 1<	15.55	1.51
0.54	< x 2 <	1.80	3.34
-9.17	< x 3 <	1.68	– 0.18
Note - Compiled by author			

The range of confidence intervals for the parameter x1 is 1.51, which indicates its high reliability and accuracy. For parameter x2, the ratio is 3.34, indicating its lower reliability and accuracy.

Analysis of Variance.

The coefficient of determination (R2) is 0.97, indicating a high degree of explanation for the changes in the indicator "Total volume of crop and livestock production" through the regression model, which takes into account the combined influence of factors x1, x2, and x3. This means that

97% of the changes in the examined indicator can be explained by the impact of these factors. The standard error of regression reflects the unexplained variance, suggesting that the remaining 3% of the changes in Y are influenced by other external factors not included in the model. This highlights the strong and stable relationship between the volumes of gross crop and livestock production and the analyzed variables, demonstrating the model's high accuracy and the reliability of its predictions.

Correlation Statistics.

To evaluate the strength and direction of the relationships between the variables and the outcome, as well as among the individual components, refer to Table 4, which presents the correlation coefficients for paired variables.

Table 4 – *Correlation analysis*

Parameters	*Y*	*x1*	*x2*	*x3*
Y	1			
x1	0.96	1.00		
x2	0.78	0.64	1.00	
x3	0.42	0.47	0.46	1
Note – Compiled by author				

The pairwise correlation coefficients indicate a strong positive relationship between crop and livestock production volumes and the variables x1 (investments in fixed capital) and x2 (production costs), highlighting the importance of these factors in driving the agricultural sector's productivity. Conversely, the number of agricultural enterprises shows a minimal influence on the significance of gross production in these sectors, which is in line with the absence of statistical significance for this particular variable.

Furthermore, the elasticity of these factors suggests that a 1% increase in investments in fixed capital and production costs, in comparison to their average values, leads to a 0.6% increase in the total volume of crop and livestock production. This finding underscores the importance of efficient resource allocation in driving growth in agricultural productivity. When forecasting changes in the overall volume of agricultural and livestock production, it is essential to consider these changes in the broader context of the overall production dynamics in these sectors, as demonstrated in Table 5.

Table 5 – *Prediction of the trends in the total output volume of crop and livestock production, based on changes in the levels of gross crop and livestock production*

Year	Total agricultural and livestock output, million tenge	The amount of investment in the fixed assets of crop and livestock production, in million tenge	Expenditures on the production of crop and livestock products, million tenge
2025	4597847,0	3 719 800 000	193128,0
2026	4693947,0	3 700 000 797	203759,08
2027	4693089,0	3 000 668 098	223784,9
2028	4893870,0	2 785 633 350	243186,0
Note – Compiled by the author			

The statistical analysis reveals that factors like investments in fixed assets and production expenses play a crucial role in driving the growth of gross output in both crop production and

livestock farming. Without financial support from the state, Kazakhstan's food security faces significant risks. Government assistance to the agricultural sector, including rural farms, is implemented through various mechanisms such as subsidies, financial leasing, loan guarantees, and interest rate support.

DISCUSSION

The assessment of food security in the Republic of Kazakhstan from 2020 to 2024 demonstrates steady improvement. During this period, food security has followed a positive trajectory, supported by increased agricultural production and government initiatives. Nonetheless, despite favorable domestic trends, the country remains notably dependent on imported food products, underscoring the ongoing necessity to further boost local production. In some regions, the issue of accessibility to quality and diverse food products persists, particularly in remote and rural areas. Climate change and natural factors also significantly impact the resilience of the agro-industrial complex, requiring the development of adaptation strategies. The enhancement of financial support and subsidies from the government has contributed to improving conditions for farmers and increasing production volumes.

These findings are consistent with the conclusions of other works focused on food security both in Kazakhstan and internationally. For instance, research by Alpysbayeva and Tazabekov [8, p.42] emphasizes that ensuring food security requires sustained government investment in agriculture. Similarly, Aidarova's [6, p.104] study highlights the relationship between the level of food security and financial support for the agricultural sector. These authors demonstrated that insufficient government funding leads to a decline in the economic accessibility of food, a conclusion corroborated by the results of the present study. In the international context, similar conclusions have been drawn from research on EAEU countries, where the level of government support has a significant impact on food security. This research expands on prior studies and emphasizes the critical need for significant government investment in Kazakhstan's agro-industrial sector to safeguard the country's food security.

The key contribution of this research to the academic field lies in the formulation and implementation of an innovative methodology for evaluating food security through the use of factor analysis. In contrast to conventional approaches that typically focus on one or two factors in the analysis of food security, this study adopts a more holistic methodology by exploring the interconnections between investments in fixed assets, production expenses, and agricultural sector performance. This approach allows for a more nuanced understanding of the specific factors that most significantly affect agricultural output and, by extension, food security levels. Such an in-depth analysis not only improves the evaluation of the current state of food security but also aids in forecasting its future trends, making the research particularly instrumental in shaping public policy.

The outcomes of this study have significant practical relevance for shaping and executing state policy in the field of food security. Specifically, the proposed methodology can be employed to identify priority areas for investment more accurately and to improve the allocation of public resources to support the agricultural sector. This approach is particularly pertinent in light of Kazakhstan's accession to the WTO, which calls for a reassessment of the state's tools for supporting agriculture, taking into account international obligations. By adopting this strategy, state policy can become more adaptive and efficient, thereby boosting the global competitiveness of Kazakhstan's agricultural products. Additionally, the findings of this research could form the basis for developing a long-term food security strategy for Kazakhstan, aimed at decreasing dependence on imports and enhancing domestic production of essential foodstuffs.

According to the results of the research on food security and the statistical analysis of the agro-industrial sector, the present situation of food security in Kazakhstan can be assessed as follows:

1. Kazakhstan demonstrates consistent improvements in food security, driven by both an increase in agricultural production and state support. However, it is important to note that the level of dependence on the import of certain products remains high, underscoring the necessity for further development of domestic production. Statistical data indicate a growth in the production volumes of key agricultural commodities such as grain, meat, and dairy products. This growth is associated with the modernization of technology, enhancements in agronomic practices, and a more active adoption of innovative farming methods. Nonetheless, some regions continue to face challenges related to climate change and a lack of financial resources for farmers.

2. As previously mentioned, the level of economic accessibility of food in Kazakhstan is assessed as average. It is important to note that while the majority of the population can afford basic food products, there exists a disparity in accessibility for vulnerable groups, such as pensioners and large families. This aspect requires attention from government authorities and organizations involved in social welfare.

3. The development of transportation infrastructure has positively impacted the physical accessibility of food. Improvements in road networks and logistics systems facilitate faster and more efficient delivery of products. However, challenges in accessing quality food may persist in remote areas.

To ensure sustainable food security, it is essential to continue investing in the agro-industrial complex and to develop strategies aimed at improving the accessibility of food products. This includes supporting farmers, fostering local production, and establishing efficient distribution systems.

Recommendations. Based on the factors mentioned above, to enhance food security in Kazakhstan, the following specific measures are proposed:

1. Creating a subsidy mechanism for small and medium-sized agricultural producers. For instance, subsidies for purchasing fertilizers and agricultural equipment can increase yields and reduce production costs, improving food affordability.

2. Developing a sustainable agriculture program. Considering climate changes, this program could include compensations for farmers adopting sustainable technologies and practices, reducing risks for the agro-industrial complex (AIC).

3. Adopting a food security law. This law should regulate government measures to monitor and manage food reserves, reduce dependence on imports, and address disparities in food supply across regions.

The examination of food security in Kazakhstan has highlighted that a critical determinant of its status is the volume of financial resources directed towards the agro-industrial complex (AIC). Through factorial analysis, it was determined that higher investments in fixed assets and production expenses significantly influence the growth of gross agricultural output. In the absence of government support and sufficient funding for the agricultural-industrial complex (AIC), the risk of diminishing food security remains, a matter of particular concern amidst global economic challenges and the evolving landscape of international trade. This study highlights that the sustainability of food security is directly dependent on systematic and long-term support for the agricultural sector by the government. Forecasted values indicate that, if current support levels are maintained, food security will remain insufficient, necessitating adjustments in government policy in this area.

Key Findings. Thus, Kazakhstan's food security depends on targeted government actions, including the development of effective policies, adaptation to WTO requirements and strengthening financial support for the agro-industrial complex. Based on the analysis, three key provisions can be identified that emphasize the link between financial support for agriculture and the level of food security in the country:

1. Food security in Kazakhstan critically depends on financial support for the agro-industrial complex (AIC).

2. The government's transition to WTO-compliant "green box" funding has reduced direct subsidies, increasing the reliance on indirect measures.

3. Recommendations include enhancing state support for AIC through targeted subsidies, improving access to loans, and adopting a dedicated food security law.

CONCLUSION

Kazakhstan is an agrarian-industrial country where agriculture is crucial to the livelihood of its citizens, with 43% of the population living in rural areas. Although the nation’s food resources are generally sufficient to meet the needs of its people, there is a clear disparity in the overall dietary balance. Various key indicators highlight this gap. In Kazakhstan, food security is considered threatened when the annual production of essential food items fails to meet at least 80% of the population's physiological consumption requirements.

The issue of food security in Kazakhstan, which involves ensuring the population's access to safe and high-quality food, is a complex and pressing challenge. It is intricately linked to national security, as the state cannot provide comprehensive protection – economic or otherwise – without fulfilling the population’s demand for nutritious food. Discussing the country's economic, political, or national security is inconceivable without addressing food security first. The agro-industrial sector is essential for ensuring food security in Kazakhstan. Without adequate state funding for this industry, the nation’s food security will continue to face significant challenges.

The study has demonstrated that without substantial and systematic government support for the agro-industrial complex, Kazakhstan will be unable to achieve a sustainable level of food security. To do this, you need to increase AIC funding through subsidies and preferential loans. For example, subsidies for innovative technologies can boost product competitiveness in the domestic market. Adopt a food security law to establish indicators and mechanisms for monitoring and responding to threats. And also, develop forecasts for food accessibility in light of global climate changes. Studing successful international practices in enhancing food independence to adapt these measures for Kazakhstan.

Acknowledgements. *This research is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP22684548)*

References:

1. Zakon Respubliki Kazahstan ot 6 yanvarya 2012 goda № 527-IV «O nacional'noj bezopasnosti Respubliki Kazahstan» [Elektronnyj resurs]. – Rezhim dostupa: https://adilet.zan.kz/rus/docs/Z1200000527 (data obrashcheniya: 10.05.2024).

2. Oficial'nyj sajt Prezidenta Respubliki Kazahstan (2013). Segodnya v Akkorde pod predsedatel'stvom Glavy gosudarstva Nursultana Nazarbaeva sostoyalos' zasedanie Soveta Bezopasnosti Respubliki Kazahstan [Elektronnyj resurs]. – Rezhim dostupa: https://www.akorda.kz/ru/events/akorda_news/meetings_and_sittings/segodnya-v-akorde-pod-predsedatelstvom-glavy-gosudarstva-nursultana-nazarbaeva-sostoyalos-zasedanie-soveta-bezopasnosti-respubliki-kazahstan (data obrashcheniya: 1.05.2024).

3. Konvej G. R., Barb'e E. B. Posle zelenoj revolyucii: Ustojchivoe sel'skoe hozyajstvo dlya razvitiya / G. R. Konvej, E. B. Barb'e. – 1990. – 212 s.

4. Byorchell M., Kulter H. Posobie po upravleniyu optovymi rynkami [Tekst] / avt.-sost.: M. Byorchell, H. Kulter. – Astana: [b. i.], 2004. – 208 s. – Programma tekhnicheskoj pomoshchi Evropejskogo Soyuza dlya Kazahstana. – 500 ekz.

5. SHnajder F., Enste D. Uhod v ten': rost tenevoj ekonomiki / F. SHnajder, D. Enste. – Vashington: Mezhdunar. valyut. fond, 2002. – 16 s.

6. Ajdarova G.T. Sovremennoe sostoyanie prodovol'stvennoj bezopasnosti Respubliki Kazahstan // Vestnik nauki Akmolinskogo agrarnogo universiteta im. S. Sejfullina. – 2002. – № 3. – S. 103–111.

7. Akimbekova G.U. Problemy pererabotki [Elektronnyj resurs]. – Rezhim dostupa: http://www.minagri.kz (data obrashcheniya: 20.02.2024).

8. Alpysbaeva S. N., Tazabekov A. I. Faktory ekonomicheskoj bezopasnosti sovremennoj vosproizvodstvennoj modeli ekonomiki Kazahstana // ANALYTIC – Analiticheskoe obozrenie. – 2003. – № 3. – S. 41–43.

9. Amirgaliev A.H. Formirovanie strategii marketinga v agropromyshlennom proizvodstve // Vestnik KazNU. Seriya ekonomicheskaya. – 2004. – № 3. – S. 122–125.

10. Apsalyamov N. Tendencii razvitiya pishchevoj promyshlennosti v Respublike Kazahstan // Tranzitnaya ekonomika. – 2004. – № 5. – S. 39–45.

11. Arupov A.A. Globalizaciya mirovoj ekonomiki i problemy ekonomicheskoj bezopasnosti Kazahstana // Vestnik Universiteta «Turan». – 2002. – № 1-2. – S. 19–23.

12. Myrzahmetova A.M., Alshimbaeva D.U., Turgeeva K.A., Erimpasheva A. T. Torgovo-ekonomicheskoe sotrudnichestvo Kazahstana i Rossii: osobennosti i prioritety razvitiya // Ekonomika: Strategiya i praktika. – 2020. – T. 15. – № 3. – S. 127–139.

13. Satybaldin A.A., Tleuberdinova A.T., Kulik K. V. Konceptualizaciya razvitiya sel'skih territorij [Elektronnyj resurs] // Ekonomika: Strategiya i praktika. – 2021. – T. 16. – № 3. – S. 6–21. – Rezhim dostupa: https://doi.org/10.51176/1997-9967-2021-3-6-21.

14. Syzdykbaeva N. B. Rol' agropromyshlennogo kompleksa v ekonomike Kazahstana // Ekonomika: Strategiya i praktika. – 2018. – № 4. – S. 152–159.

15. Myrzaliev B.S., Sabyr N.S., Murat A. Ustojchivoe razvitie sel'skih territorij – vazhnejshij faktor obespecheniya social'noj bezopasnosti // Ekonomika: Strategiya i praktika. – 2020. – T. 15. – № 1. – S. 37–52.

16. Kajgorodcev A. A. Ekonomicheskaya i prodovol'stvennaya bezopasnost' Kazahstana (voprosy teorii, metodologii, praktiki) / A. A. Kajgorodcev. – Ust'-Kamenogorsk: Izd-vo Vost.-Kaz. gos. un-ta im. Sarsena Amanzholova, 2006. – 445 s.

17. Bedelbaeva A.E., SHaripov A.K., Dosumova ZH.S. EAES zhaғdajynda Қazaқstannyң azyқ-tүlik қauipsizdigin қamtamasyz etu // Problemy agrirynka. – 2021. – № 3. – S. 24–30.

Литература:

1. Закон Республики Казахстан от 6 января 2012 года № 527-IV «О национальной безопасности Республики Казахстан» [Электронный ресурс]. – Режим доступа: https://adilet.zan.kz/rus/docs/Z1200000527 (дата обращения: 10.05.2024).

2. Официальный сайт Президента Республики Казахстан (2013). Сегодня в Аккорде под председательством Главы государства Нурсултана Назарбаева состоялось заседание Совета Безопасности Республики Казахстан [Электронный ресурс]. – Режим доступа: https://www.akorda.kz/ru/events/akorda_news/meetings_and_sittings/segodnya-v-akorde-pod-predsedatelstvom-glavy-gosudarstva-nursultana-nazarbaeva-sostoyalos-zasedanie-soveta-bezopasnosti-respubliki-kazahstan (дата обращения: 1.05.2024).

3. Конвей Г. Р., Барбье Э. Б. После зеленой революции: Устойчивое сельское хозяйство для развития / Г. Р. Конвей, Э. Б. Барбье. – 1990. – 212 с.

4. Бёрчелл М., Култер Х. Пособие по управлению оптовыми рынками [Текст] / авт.-сост.: М. Бёрчелл, Х. Култер. – Астана: [б. и.], 2004. – 208 с. – Программа технической помощи Европейского Союза для Казахстана. – 500 экз.

5. Шнайдер Ф., Энсте Д. Уход в тень: рост теневой экономики / Ф. Шнайдер, Д. Энсте. – Вашингтон: Междунар. валют. фонд, 2002. – 16 с.

6. Айдарова Г.Т. Современное состояние продовольственной безопасности Республики Казахстан // Вестник науки Акмолинского аграрного университета им. С. Сейфуллина. – 2002. – № 3. – С. 103–111.

7. Акимбекова Г.У. Проблемы переработки [Электронный ресурс]. – Режим доступа: http://www.minagri.kz (дата обращения: 20.02.2024).

8. Алпысбаева С. Н., Тазабеков А. И. Факторы экономической безопасности современной воспроизводственной модели экономики Казахстана // ANALYTIC – Аналитическое обозрение. – 2003. – № 3. – С. 41–43.

9. Амиргалиев А.Х. Формирование стратегии маркетинга в агропромышленном производстве // Вестник КазНУ. Серия экономическая. – 2004. – № 3. – С. 122–125.

10. Апсалямов Н. Тенденции развития пищевой промышленности в Республике Казахстан // Транзитная экономика. – 2004. – № 5. – С. 39–45.

11. Арупов А.А. Глобализация мировой экономики и проблемы экономической безопасности Казахстана // Вестник Университета «Туран». – 2002. – № 1-2. – С. 19–23.

12. Мырзахметова А.М., Алшимбаева Д.У., Тургеева К.А., Ерімпашева А. Т. Торгово-экономическое сотрудничество Казахстана и России: особенности и приоритеты развития // Экономика: Стратегия и практика. – 2020. – Т. 15. – № 3. – С. 127–139.

13. Сатыбалдин А.А., Тлеубердинова А. Т., Кулик К. В. Концептуализация развития сельских территорий [Электронный ресурс] // Экономика: Стратегия и практика. – 2021. – Т. 16. – № 3. – С. 6–21. – Режим доступа: https://doi.org/10.51176/1997-9967-2021-3-6-21.

14. Сыздыкбаева Н. Б. Роль агропромышленного комплекса в экономике Казахстана // Экономика: Стратегия и практика. – 2018. – № 4. – С. 152–159.

15. Мырзалиев Б.С., Сабыр Н.С., Мурат А. Устойчивое развитие сельских территорий – важнейший фактор обеспечения социальной безопасности // Экономика: Стратегия и практика. – 2020. – Т. 15. – № 1. – С. 37–52.

16. Кайгородцев А. А. Экономическая и продовольственная безопасность Казахстана (вопросы теории, методологии, практики) / А. А. Кайгородцев. – Усть-Каменогорск: Изд-во Вост.-Каз. гос. ун-та им. Сарсена Аманжолова, 2006. – 445 с.

17. Беделбаева А.Е., Шарипов А.К., Досумова Ж.С. ЕАЭС жағдайында Қазақстанның азық-түлік қауіпсіздігін қамтамасыз ету // Проблемы агрирынка. – 2021. – № 3. – С. 24–30.