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Analysis of the food problem in the Republic of Kazakhstan

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ABSTRACT

The purpose of the study is to assess the food security of Kazakhstan and analyze the production and consumption of food. The methods that were used are the dialectical method of scientific knowledge, general scientific, special methods, and statistical analysis. The article identifies such priority areas: the production of their own food, the use of innovative, resource-saving technologies in agriculture; integrated use of land resources, solving the problems of degraded pastures; attracting human resources, investments, and technologies to the industrial sector; implementation of the consolidation of agricultural land and the development of animal husbandry; opening of new export markets.

Keywords*: Agriculture; nutrition; food security; level of self-sufficiency; agricultural sector.*

1 Introduction

The term “food security” gained widespread recognition and prominence during the World Food Summit held in 1996 (Food and Agriculture Organization…, 1996). This meeting was an important turning point in the global fight against hunger and malnutrition. It underlined how crucial it is to guarantee that everyone has access to enough food that is safe, nourishing, and sufficient to support an active and healthy lifestyle. It was during this summit that world leaders formally recognized and defined the concept of food security as a fundamental human right. Ensuring food security is a complex global problem and one of the central issues in the systems of economic security of world countries, including the Republic of Kazakhstan. Food security is the provision of all people with physically and economically safe food at all times (Musarova and Adamkulova, 2023). In addition, it is the main goal of agricultural and economic policy. Zeinullina and Aidarkhanova (2019) noted that according to the Strategy “Kazakhstan-2050” (Official Website of the…, 2012), which outlined a clear focus on the future of the country with the main tasks of the 21st century, the threat to global food security is the third challenge in the world, and high rates of population growth on the planet will aggravate the food problem. Kaygorodtsev (2019), in turn, notes that in recent years, the population of the Earth has been increasing annually by 80 million people. As for Kazakhstan, which is home to about 19.5 million people, the population growth in the country will be approximately 23-24 million people in 2050.

According to Gizzatova (2004), Kazakhstan has every opportunity to provide its population with food. There are very large environmentally friendly areas in the republic, so there is an opportunity to produce environmentally friendly food and, as a result, to make a qualitative leap in the agro-industrial complex. But in order to master the huge export market, you need to determine which food products will be the priority of mass production. Competition in global agricultural production will grow; it is necessary to develop agricultural science and create experimental agricultural innovation clusters. Keeping pace with the times, along with natural food, it is important to produce drought-resistant genetically modified foods (Palamarchuk et al., 2023; Balji, 2023).

According to Ayapova (2017), at present, the state of food consumption in the republic has somewhat stabilized as a result of paying special attention to the development of agriculture. But most of the agricultural raw materials are not processed due to the low or insufficient production capacity of processing enterprises. The food market of the state provides natural access to food, despite the fact that economic access to food has slightly decreased. Ensuring the safety of food products is carried out by developing and implementing measures of a socio-economic, scientific, technical, administrative, and other nature (Yemchenko, 2023). These measures have to be aimed at preventing and eliminating threats to food safety and ensuring the economic access of the population to high-quality food products in accordance with physiological norms of consumption, regardless of social status, location, and place of residence.

In their work, Jumabayeva et al. (2023) investigate ways to improve competitiveness and food security in the agro-industrial complex. The authors stress the significance of making sure that everyone has access to a sufficient and wholesome food supply, especially in light of issues like population growth, climate change, and unstable economic conditions. The researchers stress the importance of all-encompassing programs and regulations meant to boost sustainable farming methods, modernize food production and distribution networks, and increase agricultural productivity. The essay emphasizes how infrastructure development and technology developments all contribute to the agro-industrial sector’s increased resilience and competitiveness. Syzdykbayeva et al. (2023) in their study also examine the plans and programs designed to improve food security by modernizing Kazakhstan’s agri-food complex. The writers stress the significance of modernizing agricultural methods, facilities, and technology to support food distribution and production networks and guarantee a more dependable and robust food supply chain.

Jumabayev et al. (2023) examine the frameworks and techniques used to assess the state of food security in various Kazakhstani regions. The authors stress the necessity for comprehensive and region-specific methodologies, highlighting the significance of evaluating food security in the context of changing socio-economic and environmental conditions. The experts elucidated the complex characteristics of food security, encompassing elements like the availability of wholesome food, its cost, its consumption, and the stability of food systems. In order to improve food security throughout Kazakhstan, the authors support customized approaches that take into account the particular difficulties each region faces and encourage cooperation between governmental organizations, academic institutions, and local populations.

Talimova et al. (2022) argue in their writings that the shortage of deeply processed products in the Kazakhstan market is compensated by imported products, the share of which in total consumption is 37% higher than the established level of food safety. The scientifically recommended maximum level of consumption of imported products is 20%, and with a value of 60%, the industry will be completely destroyed; there will be complete import dependence on the world food market. That is why it is necessary to pursue a policy aimed at reducing it by replacing imported products with domestic products. And self-sufficiency in food should be at least 80% of the total consumption. In this regard, the search for

effective ways to regulate food safety will be of particular importance. All this determines the relevance of the research topic.

Although previous research has looked at Kazakhstan's food security situation, there is still a big gap in the literature when it comes to offering quantitative predictions of the dangers of future food shortages. A large portion of the research that has already been done is descriptive in nature, recording both historical trends and current patterns of production and consumption. Few, however, have used sophisticated analytical methods, such as mathematical modeling, to predict how the frequency of food insecurity could change based on the trajectories of observable data. This study closes a significant methodological gap by developing a predictive model with the Python programming language, going beyond retroactive evaluations to provide a quantitative outlook on potential future issues for Kazakhstan. With the use of modeling, policymakers are able to project the problem's possible size in the upcoming years and schedule responses appropriately. In order to provide insight into Kazakhstan's food insecurity situation, this proactive strategy that incorporates computational approaches offers a fresh addition to earlier descriptive studies.

The purpose of the study is to conduct a comprehensive analysis of the production and consumption of food in Kazakhstan in its modern manifestation. The main tasks of the work are:

- to analyze the current state of the agro-industrial complex and assess the food security of Kazakhstan;
- to analyze the production and consumption of food by the population;
- to identify the significance of state policy and its effectiveness in addressing the issue of food security;
- to consider measures to provide a food market for the population.

2 Materials and Methods

The theoretical and methodological foundation of the study is based on the decrees of the President of the Republic of Kazakhstan, legal acts of the Republic, regulations of the Government of the Republic of Kazakhstan, and scientific papers on food safety. Also, the theoretical basis of the study was the main provisions and results of the research carried out by scientists relating to the food problem in Kazakhstan. The information base of the research work was: laws and regulations of the Republic of Kazakhstan on the food market, state programs, decrees of the President of the Republic of Kazakhstan and messages to the people, the statistical bulletin of the Ministry of Finance of the Republic of Kazakhstan, and official data. The data of the Agency of the Republic of Kazakhstan on statistics, annual reports of agricultural enterprises, and official Internet resources of the Ministry of Agriculture of the Republic of Kazakhstan were used.

The research methodology is based on the theoretical provisions of the scientific works of scientists on the relationship between production, consumption, and food exchange, as well as a systematic multivariate analysis of the situation in the agricultural sector. To achieve the goals set, the following groups of methods were used: the dialectical method of scientific knowledge, general scientific and special methods. When analyzing the current state of the agrosphere and assessing the methods of its development, statistical analysis was used: the method of average and relative values, trend analysis, index method, coefficient analysis, comparative analysis in order to compare the results obtained over different years. In order to summarize and interpret data, the average and relative values technique entails computing measures of central tendency (mean, median, mode) and measures of dispersion (range, variance, standard deviation). Trend analysis looks at how a variable changes over time to see if there is a trend that is increasing, decreasing, or constant. Fitting a trendline to the data points and determining its slope are common steps in this process. By expressing a variable in relation to its value at a base point in time, the index method enables comparisons across time periods. For instance, use the production in 2021 as a percentage of the production in 2020. Ratios or coefficients between two variables, such as the capital-labor ratio in a production function, are the subject of coefficient analysis. To summarize the scientific and methodological nature, a logical method of approach to the study of the state of the agricultural industry of the Republic of Kazakhstan and conclusions was used. Informational statistical materials from the Food and Agriculture Organization of the United Nations (2022) were also used.

In addition, during the study, methods of logical observation and analysis were used. To analyze the consumption of basic foodstuffs, economic and statistical research methods were used. These approaches entail applying statistical methods to analyze economic data, such as food consumption levels, in order to find important patterns, trends, and linkages. According to this method, the most important and significant patterns in the functioning of the agro-economic systems of Kazakhstan were identified and described. Based on input data and ratios, conclusions were drawn that corresponded to the object of the study according to the assumptions made. The generalization method was also used. It entails extrapolating general conclusions and drawing broad inferences from the study's particular data analysis and findings. To find common themes, patterns, and insights spanning several study components, one must look beyond the specific analytical results. By using the generalization approach, researchers can go beyond merely summarizing specific data and instead create more broadly applicable concepts, hypotheses, or models that encapsulate the essence of the system or processes under study. Mathematical modeling of the population whose dietary calorie content will

be below the minimum allowable level was performed using the interpreted Python programming language. Equations and data are used in mathematical models to characterize and measure relationships between variables of interest. The data used to create the model determines how accurate it is.

The presented scientific work was carried out in three main stages. Theoretical analysis of existing methodological approaches on the issue of ensuring food security in Kazakhstan and its agricultural policy: the problem, the purpose, and methods of research are allocated, and the plan of scientific research is made. At the second stage of the study, an analysis was made of the development of agriculture in the republic, an analysis of the main agricultural activity, the dynamics of sown areas, grain production, consumption of basic foodstuffs, their nutritional and energy value, carried out research work, analysis, and the formation of the results obtained in the course of scientific work. At the third stage of scientific work, based on the results obtained, the findings of the study were summarized and systematized, analyzing the main indicators of the agricultural sector of Kazakhstan and the possibility of ensuring food security. The provisions and proposals formulated and substantiated in the scientific study are the basis for solving the theoretical and practical foundations of the organizational and economic justification for the formation of opportunities for finding ways to solve the global food crisis.

3 Results

3.1 Food security and economic considerations in Kazakhstan

The global food crisis, unfortunately, already exists and is a problem that is common to the whole world. In this regard, today the attention of all countries is focused on the production and safety of food products. Providing people with high-quality and safe food will always remain a topical issue. Research in this area makes it possible to perfectly determine the state, requirements, legal and economic norms, instructions, and directives of the complex created by the state. The economic self-sufficiency of any country is influenced by internal conditions and the climate. Self-sufficiency in raw materials is possible if food raw materials are produced in one's own country for the production of products that rationally (effectively) affect the level of nutrition. Due to constant fluctuations in production, it is difficult to maintain a constant supply of food. The agro-industrial complex of Kazakhstan has sufficient potential to ensure the country's food security:

- the total area of land for agricultural purposes – 223 million square meters. ha, while the area of arable land is 21.8 million ha (or 1.2 ha per capita);
- grazing land for livestock makes up 85% of the total land area;
- favorable climatic conditions of the republic for the cultivation of basic crops;
- 7.7 million people live in rural areas, or more than 42% of the country's population, including 1.3 million directly employed in agriculture, forestry, and fisheries, which is 15.4% of the total number of people employed in the national economy.

Economic factors that affect the population's access to and affordability of food include household earnings, food costs, and overall economic growth. Data on nutritional inequalities across income quintiles show that, for many Kazakhstani households, poverty continues to be a significant obstacle to food security. Through domestic production volumes, agricultural productivity and the adoption of contemporary farming technologies – such as precision agriculture techniques, drought-resistant plant types, and effective irrigation systems – influence the availability of food on a global scale. Modernizing the agricultural industry requires significant investment. Trade laws pertaining to the import of agricultural products and export controls on foods produced domestically have the potential to either ease or restrict national food access. A constant issue is striking the correct balance between export promotion and import substitution. In order to create a comprehensive national food system that is resilient to shocks, government policies and programs that are specifically designed to promote food security – from strategic food reserves to help for smallholder farmers to nutrition assistance – are essential. Maintaining food security requires robust governance and policy coherence across economic sectors.

Although there are quantitative and qualitative indicators of the provision of the food market, its main meaning is the possibility of realizing national economic interests. The food security of Kazakhstan may be influenced not only by the agricultural sector but also by the economic one. Economic interest affects both the short-term goals of society and the state and the formation of the strategic development of the national economy. Thus, internal economic threats in Kazakhstan include: reduction of the technological base across industries, persistent unemployment issues; inflationary pressures; monopolistic behavior that stifles competition within the economy; an overreliance on exporting raw materials rather than higher value-added goods; and burdensome levels of both domestic and foreign debt owed by both private and public entities. If these kinds of things go unchecked, they have the potential to reduce economic productivity, weaken consumer purchasing power, consolidate market power, stifle innovation, and discourage investment in new economic growth sectors. In the end, these kinds of internal risks have the potential to cause a crisis

or stagnation that ripples over the entire economic system. The external economic threats to the Kazakh economy include the following:

- a high level of deformation of the structure of the economy and its low competitiveness;
- monopoly in the economy;
- insufficient scientific and technical resources;
- low level of investment;
- insufficient funding for production activities.

Proactive legislation, calculated investments in increased industry self-sufficiency, and astute economic diplomacy in the context of global trade and diplomacy are all necessary to navigate these kinds of external headwinds. In addition, the situation with food in Kazakhstan is also caused by a number of problems: a low level of commodity processing and underutilization of the capacities of processing enterprises, which leads to the fact that 70-80% of agricultural products that have been produced are sold as raw materials without processing; non-compliance of Kazakhstani food quality standards with the basic requirements of international standards; insufficient introduction of innovation in agricultural production and the amount of funding for agricultural science; insufficient competitiveness of domestic food products. When determining the criteria for the state of food security in the Republic of Kazakhstan, it is important to take into account the fact that they should characterize not only the degree of sustainability of the food supply but also the level of satisfaction of the population's needs for food. Therefore, the following criteria were used: food production and consumption by the population; food quality (calorie content as well as nutritional and energy value) having the opportunity to ensure food security in the food of their population (Araujo-Enciso and Fellmann, 2020).

3.2 Trends in grain oroduction and food consumption patterns in Kazakhstan

According to the informational statistical materials of the Food and Agriculture Organization of the United Nations (2022), in recent years, Kazakhstan has seen a stable dynamic in the total production of grain crops. Grain production is a key metric for assessing Kazakhstan's agricultural potential and ability to provide food security at home. Grain crops, including rice, wheat, and barley, are among the most significant food staples and sources of calories for the populace in this large country with significant arable territory. The overall production amounts of Kazakhstan's grain crops from 2010 to 2021 are shown on Figure 1. This timeline is crucial because it enables the analysis of longer-term patterns in a recent era in which the national agenda has placed a greater emphasis on food security.

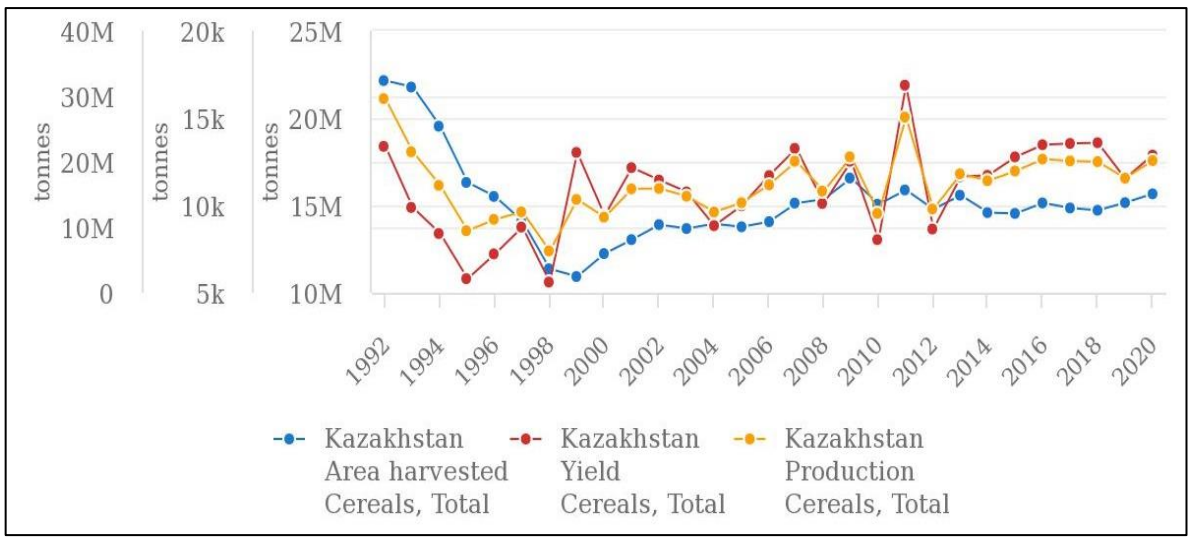

Figure 1. Grain production in the Republic of Kazakhstan.

According to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022), it is important to note a slight decrease in the consumption of basic food products by the population of the country in 2021 compared to the last five years, mainly: bread and cereals, milk and dairy products, meat and meat products, fruit, eggs, and sugar (Table 1). The decline in the consumption of staple foods highlights the seriousness and applicability of the issues raised about food security, supporting the need to give priority to mitigating these trends in light of the observed nutritional regression. One of the important reasons for the reduction in food consumption and the deterioration of its nutritional structure is the decrease in effective demand caused by the outstripping growth in food prices compared to the income of the population.

Table 1.
Consumption of basic food products by the population of Kazakhstan, on average per person per month, kg

Monthly consumption of staple foods	2014	2015	2016	2017	2018	2019	2020	2021
bakery products and cereals	10.2	10.7	10.6	11	11.7	12	12.2	10.9
meat and meat products	6	6.2	5.9	6	7.4	7.6	8.3	7.7
fish and seafood	0.9	0.8	0.8	0.8	1.1	1.4	1.6	1.6
milk and dairy products	21.2	21.9	21.8	22	26.2	26.2	26.7	23.5
eggs (pcs.)	14.8	15.1	14	15.2	20.7	20.2	21.2	19.8
oils and fats	1.7	1.8	1.8	1.9	2.1	1.7	1.7	1.6
Fruit	4.5	4.4	4	4.2	5.6	6.4	6.6	5.9
Vegetables	5.8	6.1	6	5.9	7	5.7	5.7	5
Potato	4.3	4.1	4	3.9	4.3	4.9	5	4.4
sugar, honey, chocolate, jam, confectionery	3.2	3.4	3.3	3.4	4.2	4.2	4.4	4.1

According to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022), in 2021, the proportion of the population with dietary calorie indicators below the minimum acceptable level was 6.7%, which is 2.6% and 2.3% higher than in 2019 and 2020, respectively. The number of people whose dietary caloric intake is below the minimum acceptable level also exceeded the figures for 2019 and 2020 in 2021. The number of people with such food in rural areas was below the urban level in the indicated years. This difference indicates a less nutritious composition of the food consumed by the population in urban areas (Table 2).

Table 2.
Proportion of the population whose dietary energy intake is below the minimum acceptable level

	The number of people whose dietary calorie content is below the minimum allowable level, thousand people			Percentage of the population whose dietary calorie content is below the minimum allowable level		
	2019	2020	2021	2019	2020	2021
Republic of Kazakhstan, including:	763.9	832.5	1286.4	4.1	4.4	6.7
urban area	448.5	445.9	845.1	4.1	4	7.5
countryside	238.5	323.6	384	3.1	4.2	4.9

Mathematical modeling of the predicted number of the population whose dietary calorie content will be below the minimum allowable level demonstrates stable growth. The minimum allowable calorie intake level is defined as the lowest number of calories required to meet basic nutritional needs and support normal physical activity levels without experiencing hunger or undernutrition. The modeling approach fits a trend line to data points showing the proportion of Kazakhs who have gone without enough calories in recent years. If we continue on this track, the number of people who are predicted to consume insufficient amounts of calories each day could rise alarmingly. The model effectively captures and expands upon the current trend, as evidenced by the high confidence level of R=0.9973 (Figure 2).

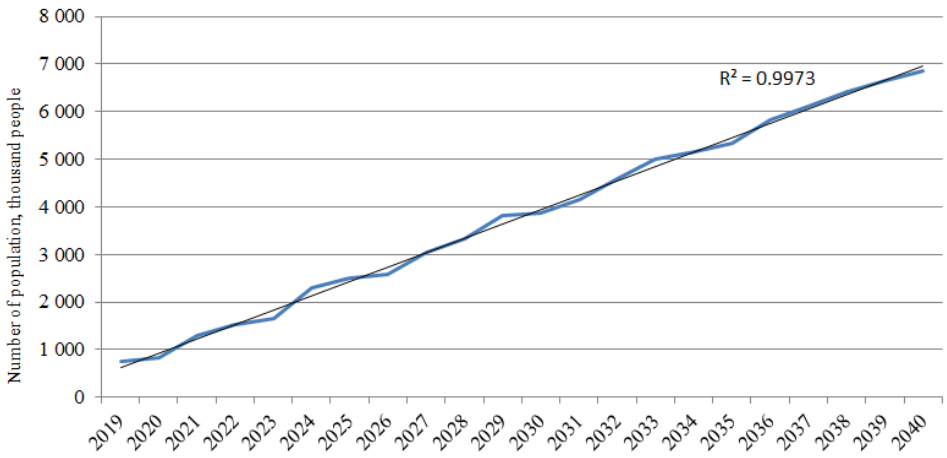

Figure 2. Modeling the number of the population whose dietary caloric intake will be below the minimum allowable level.

3.3 Strategies for enhancing food security and agricultural sustainability in Kazakhstan

On average, across the Republic, the average minimum energy requirement is 1861 kcal, which largely depends on household income (Talimova et al., 2022). If we divide the population by the level of monetary income into the corresponding twenty percent groups – quintiles, where the 1st group has the smallest incomes, the 5th group – the largest, then differences in nutritional and energy value will appear between them (Table 3-5). When comparing the highest and lowest quintiles, stark discrepancies become evident right away. According to the most recent data from 2021, the 5th quintile ingested more than twice as much fat, protein, and calories as the 1st quintile. This kind of nutrition gap shows how access to food and dietary quality can be significantly restricted by poverty. These statistics give important evidence that food insecurity in Kazakhstan is significantly influenced by economic position, even though they only display averages within each quintile group. The evidence supports giving policies aimed at lowering nutritional disparities between socioeconomic classes and increasing food affordability top priority.

Table 3.
Value of food consumed by 20% population in 2021

	Quintiles				
	1	**2**	**3**	**4**	**5**
Nutritional value (g per day):					
proteins	76.5	93	107.6	127.5	163.2
fats	81.2	101.6	121.7	147	196.3
carbohydrates	332.3	374.9	411.1	470.3	554.9
Energy value, kcal per day	2406	2832	3225	3780	4730

Table 4.
Value of food consumed by 20% of the population in 2020

	Quintiles				
	1	**2**	**3**	**4**	**5**
Nutritional value (g per day):					
proteins	78	94.4	112.6	134.7	178.7
fats	97.8	116.3	143.3	173.6	235.8
carbohydrates	344	387.4	442.4	508.6	628.3
Energy value, kcal per day	2608	3022	3567	4207	5451

Table 5.
Value of food consumed by 20% of the population in 2019

	Quintiles				
	1	**2**	**3**	**4**	**5**
Nutritional value (g per day):					
proteins	81.8	93.3	106.6	125.7	161.5
fats	87.9	106.3	124.7	152.6	203.5
carbohydrates	367.5	386.5	423.2	474.2	564.9
Energy value, kcal per day	2632	2925	3298	3841	4830

Thus, the average energy value of food consumed in 2021 decreased by 13% compared to 2020. In addition, unfortunately, over the past three years in Kazakhstan, according to Food and Agriculture Organization of the United Nations (2022) data, the number of people suffering from moderate and severe food insecurity has increased, as has the prevalence of moderate and severe food insecurity (Figure 3, 4). Situations when households are unsure of their ability to obtain food and are compelled to make dietary intake compromises in terms of quality and variety are referred to as moderate food insecurity. Severe food insecurity is characterized by recurrent bouts of complete starvation and insufficient calorie intake. The two charts' visually arresting upward trajectories highlight how serious the situation is and how urgently sensible policy measures must be put in place to stop the rising trends in food insecurity that are affecting millions of people in Kazakhstan. If we let them go unchecked, the nation's economy and humanitarian situation can become seriously unstable.

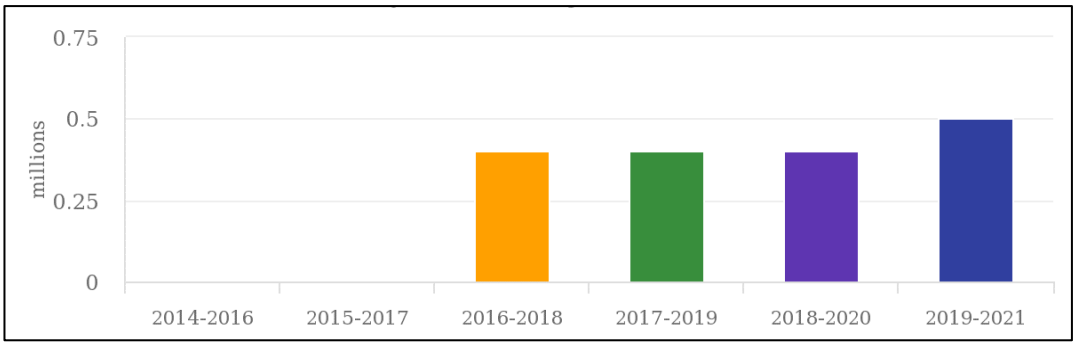

Figure 3. Number of people suffering from moderate and severe food insecurity (million) (average over 3 years)

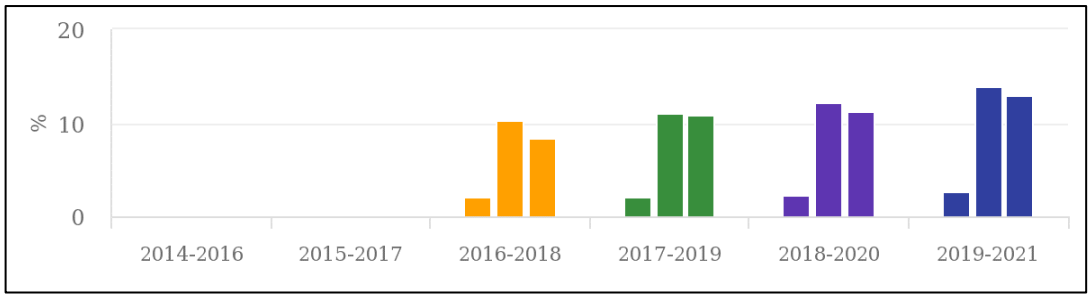

Figure 4. Prevalence of moderate and severe food insecurity (%) (average over 3 years)

Analyzing food security indicators, it can be concluded that for many of them, food security in the country is not fully ensured today. Ensuring the country's food independence can be achieved by a combination of using the potential of its own food industry and importing supplies. The solution to import substitution issues is possible by significantly increasing the competitiveness of Kazakh agricultural enterprises through the introduction of innovative and resource-saving technologies. Diversification in a market economy will reduce risks, respond to imbalances between supply and demand, ensure the growth of profits and profitability for agricultural producers, and maintain production capacity. It is also necessary to use complex land resources and solve the problems of degraded pastures. Summing up, it can be said that for a possible solution to the country's food problem, it is necessary:

- increasing the volume of food production and reducing its imports in the Republic of Kazakhstan;
- associations of small, medium, and large industries in the cluster, taking into account specialization;
- innovative technologies and renewal of the material and technical base;
- implementation of an effective state policy with the support of domestic producers aimed at the production of competitive products.

The primary directions of development within Kazakhstan's food sector involve multiple critical areas with the objective of augmenting food security, endorsing agricultural sustainability, and stimulating economic expansion. In order to increase productivity and efficiency in the food production process, updating agricultural practices through the adoption of cutting-edge technology and techniques is the first priority (Kusherbayev et al., 2023). Furthermore, efforts are focused on diversifying agricultural production in order to guarantee a large variety of food goods and lessen reliance on imports. Furthermore, measures to improve food safety and quality standards, as well as infrastructure and logistical investments, are necessary to make it easier for food products to be processed, stored, and distributed across the nation. The long-term growth of Kazakhstan's food industry depends on advancing agricultural innovation and research, helping smallholder farmers, and building relationships with foreign investors and organizations.

It is important to note that increased competition in the domestic market can contribute to structural changes and further productivity growth in the country's agriculture. Also, the food industry and agriculture are closely interconnected due to the demand and supply of raw agricultural products. Consequently, domestic agriculture must improve the production and supply systems to meet the needs of the food industry. Basically, these aspects can be done right by combining imports and available food stocks, strengthening the response to risks that threaten the sustainability of agriculture. Also, it is advisable to carry out a system to stimulate work in the agricultural sector since the country has a huge resource and human potential. Establishing sustainable agri-food systems in Kazakhstan should be a major national challenge to ensure proper functioning for a long time to come. Therefore, it is necessary to create conditions

for ensuring that the sustainability of agri-food policy is fully taken into account, as well as a close relationship between government institutions and sectors, in order to strengthen policy coordination.

4 Discussion

The main goal of the state in any process of economic development is to ensure food security, which supports agricultural production, provides food for the population, and guarantees food independence. At present, the issue of providing the population with high-quality and safe food products is a very complex and urgent problem when the market is at its peak. Guaranteeing food security is part of the country's national security. This is due to the fact that no country can ensure its national security, including economic security, without meeting the demand for quality food. According to Viana et al. (2022), the current global food security situation poses a serious threat to people's lives. The world's food production has been growing for more than 50 years, but the number of undernourished people, with a high rate of population growth, has not been reduced at an insufficient rate. In addition, the phenomenon of famine is significantly differentiated by region. Climate change and the depletion of productive natural resources are becoming a global problem (Shemet and Hulai, 2023). As the world's population increases, the problem of providing people with food is becoming more acute. That is why the food crisis and its prevention are the main problems that worry the world community. There is currently a shortage of food, and many countries are suffering from famine. Today, the number of chronically hungry people in the world reaches 925 million, which is equal to 14% of the world's population. Also, 29 countries are experiencing severe food insecurity.

Food security is defined in many different ways and at many levels: domestic, individual, global, national, social, health, economic, and physical. Internationally, when it comes to the meaning and definition of global security, it means first of all the need to fight hunger, and food is a public good. Nationally, efforts are being taken to improve legislation that effectively supports food security. The economic approach to food security focuses on affordability. This means enough food for the entire population at all times to sustain life and adequacy when the health aspect is taken into account, as well as the provision of a balanced diet free of diseases and toxic substances (Veldhuizen et al., 2020). Solving the issue of food security is an integral part of the national security of the Republic of Kazakhstan. And improving the provision of food to the population is an important socio-economic task, the solution to which is of great importance for the development of the state. According to many scientists, such as Kim et al. (2020), Guine et al. (2020), Maikanov et al. (2020), Jiang et al. (2020) food supply depends on the availability and quality of land, environmental and climatic conditions, agrotechnical means, as well as the level of development of food production industries, the provision of certain groups of the population and certain regions with food, which is also reflected in the study. The consideration of food security issues in Kazakhstan is due to a number of factors, including:

- reduction in the volume of production of agricultural products;
- destruction of the resource potential of the industry;
- strengthening of negative moments in the structure of nutrition – a decrease in the consumption of protein foods and fats with an increase in the proportion of carbohydrates;
- economic inaccessibility in the acquisition of certain vital foodstuffs for many families in the republic, caused by low purchasing power.

One specific food problem in Kazakhstan was the wheat shortage experienced in 2023 due to adverse weather conditions, including a severe drought. The government took action to stabilize prices and guarantee food security as a result of this scarcity, which raised questions about the availability of wheat in the country. In order to boost domestic wheat producers' output, the government interfered by limiting wheat exports and enacting subsidies (Asangalieva et al., 2015). Although these steps assisted in lessening the shortage's immediate effects, there are still issues with climate change and agricultural sustainability, suggesting that the issue has not been entirely solved. Long-term solutions to these problems depend on ongoing efforts to strengthen agricultural resilience and diversify food sources (Buyanov, 2023).

An analysis of the consumption of basic foodstuffs indicates that the current level of consumption by the population of the republic for many vital foodstuffs corresponds to physiological norms, which are thresholds, i.e., consumption levels below these limits are life-threatening. However, for individual food products, the consumption level is even lower than these norms. The problem of hunger can be prevented when the need for economic security of the entire world society is met, as well as social security is achieved, and organic food with a minimum of chemicals is produced, which will provide enough calories (Chen and Mao, 2020). To create a situation of such security, the conditions for universal access to food must be met. This means that the country's economy must be at such a level as to at least meet domestic food and economic needs, so that even the poorest have the opportunity to purchase food. This requires financial support from the state.

According to Rockstrom et al. (2017), in an unstable market economy, there may be an increase in private food production and imports, which will lead to factors that determine the risks of providing food to the population and,

accordingly, the problems of the country's food security. On the one hand, economic entities strive to produce as much as possible to realize their existing competitive advantages and create products as quickly as possible. On the other hand, competition for consumers appears, and the market satisfies the expanding interests and preferences of other national and world goods (Kuralbayeva et al., 2023). The conducted research correlates with the opinion of Ray et al. (2013). The researchers argue that food security is one of the main factors in ensuring state security and maintaining its sovereignty. It's an important component of demographic policy, a prerequisite for ensuring food security and improving the quality of life of citizens by guaranteeing high standards. Also, food security is a priority of state policy because it includes a wide range of national, economic, social, demographic, and environmental issues.

As it was studied, import substitution plays a significant role in solving the food security problem in Kazakhstan. According to the Ministry of Agriculture, Kazakhstan supplies 40% of dairy products, 29% of food, and 43% of fruits and vegetables (Zeinullina and Aidarkhanova, 2019). That is, the country is significantly dependent on food imports, which poses a threat not only to the country's food security but also to its economic security. An important factor in the decline in agricultural production's efficiency is the violation of the principle of the optimal combination of crop and livestock production, which leads to inefficient use of the main means of production in the industry: land. The constraining factor in the development of agriculture is still the financial condition of agricultural producers and the lack of seasonal lending. The unsatisfactory condition of machinery, its insufficient quantity, the high cost of fuels and lubricants, mineral fertilizers, and plant protection products have led to a violation of agricultural practices for cultivating crops (Jain et al., 2020).

Due to the poor state of the mineral and technical resources of agriculture and the lack of private ownership of agricultural land, agricultural producers cannot provide collateral for loans (Vela and Sinaj, 2023). All this aggravates their situation. Agrarian reforms remain unrealized for a number of reasons. First of all, these are external reasons. The systemic crisis that engulfed society and the national economy as a whole had a destabilizing effect on agriculture, which is closely related to the entire national economy and led to a decrease in the income of the population, which led to a decrease in food demand (Li et al., 2020). Given the above, the main tasks for ensuring food security are:

1. Stabilize domestic food production with sufficient quality and safe raw materials to ensure food security.
2. Ensure the availability of safe food in sizes and assortments for each person, in accordance with the established norms for the consumption of products necessary for a healthy lifestyle.
3. Timely detection and, if possible, prevention of threats to food safety, maintaining the food supply system for citizens.
4. Forecasting the negative consequences of food cuts through the formation of strategic stocks.

Food security affects all countries without exception; it is inextricably linked with other global problems of the modern world – energy, raw materials, environment – and is considered an important part of the national and economic security of the state, its social stability, independence in international relations, and geopolitical strategy. A number of scientists, such as Artuzo et al. (2021), Boyaci-Gunduz et al. (2021), Yuan (2021), Conrad et al. (2020), agree that ensuring the global food system is impossible without a highly developed agricultural sector; therefore, stimulating the growth of agriculture without exhausting natural resources and pursuing a strategy of diversifying the economy is the main task of the government of Kazakhstan. The consequences of the food crisis worsen the social and political situation throughout the world. At the same time, it is necessary to stabilize food security at the regional and international levels and carry out coordinated and rational actions.

The multifaceted approach to food security also raises questions about the relationship between agricultural production, processing, food distribution, and nutrition. From the definition of food security, it follows that agriculture and related industries should provide healthy food, ensuring human development and life in good health (Kerimkhulle et al., 2023). Based on this assumption, it is necessary to support the paradigm of sustainable and ecological development of agricultural production that provides nutritionally valuable food and against the concentration of production, its excessive intensification, processing, concentration of nutrients, and the use of genetically modified organisms. Thus, the constant and complete provision of the population with food, guaranteed by the development of Kazakh agriculture, is an important factor in strengthening the welfare of the country. In this regard, it is important to form a full-fledged and healthy food market for the sustainable development of society.

5 Conclusions

Food security is one of the main interests of countries. This follows, among other things, from the intensification of global phenomena such as positive population growth, climate change, environmental degradation, resource exhaustibility, and increased interdependence between countries, which is the result of deepening cooperation. Therefore, it has become extremely important to develop solutions focused not only on ensuring the physical and economic accessibility of food, but also on the observance of certain standards that guarantee their quality. The policy of Kazakhstan to address the issue of ensuring food security is to reform the agricultural structure and develop methods

for stabilizing domestic food production, ensuring their availability, timely detection and prevention of food safety threats, as well as predicting the negative consequences of food reduction through the formation of strategic stocks. Based on the study, authors believe that for the development of the agricultural sector, and as a result, to ensure the food security of the Republic of Kazakhstan, it is necessary to: launch rapid progress by including and building a value chain; application of innovative, resource-saving technologies in the field of nutrition and agriculture, training of farmers using such technologies; integrated use of land resources, solving the problems of degraded pastures; attraction of human resources, investments and technologies to the industrial sector in various forms; develop domestic and international social and economic changes, such as creating opportunities for production, consumption and investment; increase own agricultural production; carry out the accumulation and consolidation of agricultural land and the development of animal husbandry; opening of new export markets.

The state policy of Kazakhstan in the land issue should be focused on the following main areas: stimulating the efficient use of land through the development of a system of support measures and state regulation of land use in Kazakhstan, as well as institutional support for state policy in the field of land. At the same time, a competitive market for land plots should be created, which will make it possible to put land into circulation as a real estate object, to replace land fees with a real estate tax established on the basis of its market value, and to develop mortgage lending. The result of this will be an increase in the efficiency of the use of fertile lands and a real withdrawal from the circulation of low-productive lands that do not provide for the production of competitive products. The prospect of further research may be to study the cooperation of the agricultural sector with the food industry to promote a harmonious relationship, proving that raw materials meet the needs of the industry and the benefits and concerns of consumers, such as food safety.

This article provides a thorough, multifaceted analysis of Kazakhstan's current food security situation using recent data, quantitative modeling techniques, and a synthesis of various policy, agricultural, and economic factors unique to the nation. All of these methods constitute an original contribution to the field. The article provides an evidence-based analysis that may help direct and strengthen food security strategies and interventions in line with Kazakhstan's particular circumstances and development objectives by combining statistical trends, mathematical forecasting of future food insecurity risks, and customized policy recommendations. This new method of contextualizing and forecasting food security matters pertains to a particular country and advances food security research and policy-making.

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