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Food security assessment: The example of the Almaty Region

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ABSTRACT

The study analysed the challenges to food security in the Almaty region and developed practical recommendations in this area, using the experience of other countries as an example. The developed model includes assessments of threats to food security in the Almaty region, monitoring of international experience in improving the regulation of food security issues, and practical application of innovative approaches to enterprise performance management, given the state of food security. This model includes theoretical and practical recommendations, in particular, a set of methods to protect the economy from the crisis.

Keywords*: Agricultural production; sustainability; policy implications; environmental Impact*.

1 Introduction

Food security is part of the economic policy strategy of every state. Effective solutions to food security issues determine the social and political stability of society. Food security is an integral part of national security and fully depends on state resources, which must forestall the risks associated with imbalances in the market, production, and social environment of a state. A policy that aims to create state resources for all types of food products, the necessary reserves of grain, and other strategically significant agricultural products in the amount necessary to meet the needs of the population can ensure the country's food security (Unido Technology..., 2005; Musarova and Adamkulova, 2023). At the same time, a number of articles compare food security with the problem of food self-sufficiency in the country, which boils down to the problem of the state of the national agro-industrial complex and the level of agrarian protectionism (Duisenbekova and Daniłowska, 2021; Mizanbekova et al., 2013; Akramov et al., 2018). However, the country's overall economic situation also plays a role in determining food security. Since national security is one of the main functions of the state, the decline in the real demand of the population limits the development of national food production.

An analysis of the global experience of European countries suggests that food security concerns can be caused by insufficient local agricultural productivity and the low level of economic development in the country (Szaryszová et al., 2023). In response, the Food and Agriculture Organisation of the United Nations (FAO) (2006) has developed an international commitment to world food security. Currently, the main priority of the Republic of Kazakhstan is to stabilise agricultural production by increasing the productivity and profitability of the branches of the agricultural sector with effective state regulation. As the implemented measures to improve socio-economic development have so far failed to solve the need for complete food security in the country (Mizanbekova et al., 2013; Karasayev et al., 2020). According to Akramov et al. (2018), the overall economic situation in Kazakhstan is influenced by several factors. Firstly, there are low levels of industrial processing and underutilization of processing capacity. Additionally, the competitiveness of domestically produced foods is inadequate, with experts noting inferiority to foreign counterparts in various aspects such as quality, price, assortment, manufacturing quality, and packaging design. State support for agriculture is insufficiently implemented, and national food production fails to comply with international quality standards.

The Republic of Kazakhstan, therefore, needs to implement an advanced development model to overcome its food and economic security problems. The object of the study is the food security system of the Republic of Kazakhstan and the methods of its implementation at the regional level, including the theoretical principles of its functioning and international experience in this area. The subject of the research is the features, trends, and patterns of the development of food security in the Republic of Kazakhstan and the subsequent formulation of innovative recommendations for its modernisation. The scientific novelty of the study lies in the assessment of the current state of food security in the Almaty region and the development of innovative recommendations for improving the system of economic security, based on international experience. After all, the level of development of a country's economy and its individual regions, a comprehensive approach to solving problems in the agricultural sector, and the establishment of an effective system for food quality control determine the level of food security.

To study the history of food policy, identify negative and positive factors, and analyse food security as a priority direction of the agrarian policy of the Republic of Kazakhstan, the article considered the studies of Mihajlushkin and Barannikov (2013). Researchers have argued that analysis should be carried out at the national and regional levels and have identified types of agri-food policy effectiveness. Altuhov (2014) focused on studying threats that could harm the food security of the country and its regions. Thus, food security is a rather complex and multidimensional economic category.

The purpose of this study is to assess the level of food security in the Almaty region and to develop practical recommendations aimed at the formation of an effective system of food security management at the micro and macro levels. The following main objectives have been formulated to achieve the objective:

- defining the essence and role of food security in the national economy;
- identifying the key factors affecting the level of the food supply;
- studying methodological approaches to food security research;
- monitoring food security in the global economy;
- providing an analytical assessment of food security in the Almaty region;
- considering the features of the food security system in Kazakhstan;
- developing an innovative model for economic security in the food sector, based on international experience;
- preparing practical recommendations for strengthening economic security in the future.

2 Materials and Methods

The study is based on management and economic theory. The article also applied a comprehensive approach to assessing food security based on general scientific methods of investigation. Thus, the following methods were used in the study: analysis and synthesis, functional and structural analysis, system approach theory and methodology, methods of scientific abstraction, modelling methods, statistical and analytical methods, marginal analysis, induction, deduction, and other general scientific methods. At the same time, the theoretical basis for the study of food security issues is based on the works of scientists devoted to the problems of regional development and economic security in the food sector on a global, national, and regional scale. The authors analysed data from the Bureau of National Statistics (2024a, 2024b), the United Nations Sustainable Development Group (2020) report, and the Global Food Security Index (2022).

A series of past years' trends in key indicators of food security in Kazakhstan were also used to identify the risks and outcomes of the COVID-19 pandemic (Kazakhstan has developed a…, 2022). The indicators were compared with those of 113 selected countries to identify the country's strengths and weaknesses in terms of food security. This analysis revealed that the measures taken by the state in 2018-2020 against the backdrop of the pandemic, were effective. However, in 2021, the Republic of Kazakhstan will face challenges in the agricultural sector that directly affect the country's economy and determine the level of food security. Therefore, the weaknesses identified determine the need for immediate modernisation of the agricultural system and the creation of an innovative system to ensure food security. In developing recommendations for attaining a stable level of food security in the Almaty region, an analysis of instruments of state support for the development of the agri-food sector and mechanisms to control the quality and physical availability of food for the entire population was carried out.

There are various methods for making a comprehensive and holistic assessment of a country's food security. The study used a methodology adopted by Bello (2009). This approach is based on a wide range of socio-economic indicators and takes into account various aspects of the socio-economic development of the country, thus producing definitive results. This substantiates the choice of such a method of analysis. Food policy consists of several independent areas of regulation: ensuring food security, improving living standards, developing agricultural production, etc. A comprehensive approach to food security analysis requires the identification of a system of factors that influence its effectiveness at national and regional levels. In this regard, the food security issue in the Almaty region was investigated in five phases.

The first stage considered scientific approaches to the formation of the national food security concept, defined the essence of food security in the aspect of economic globalisation, theoretical points, key factors, principles, tools, and mechanisms of food security, and areas of providing food security at macro- and micro-levels. The second phase examined the methodology to assess economic security in the food sector, defined the actors and levels of food security, identified the main ways and conditions to achieve food security, and identified the indicators of food security in the global and national economies. The third stage involved an analytical assessment of food security in the world economy and the impact of the COVID-19 pandemic on the economies of the world, monitoring the level of food security in the Republic of Kazakhstan, and identifying weaknesses and problems in ensuring food security in the Almaty region (Sohi et al., 2014). In the fourth phase, strategic mechanisms for ensuring food security were evaluated using international experience and innovative approaches and principles for the performance management of agro-industrial enterprises (Baldov, 2018). The fifth phase identified the requirements for a sustainable food security system and developed recommendations for improving food security policy to create an innovative, modernised food security system, using the example of the Almaty region. Proposals have also been made for modernising the agro-industrial complex in the Republic of Kazakhstan and its regions (Baldov, 2017).

3 Results

3.1 The concept of food security

Providing sufficient, safe, and quality food in the right quantities is one of the major challenges of the 21st century. According to FAO (2006), food security is defined by 4 dimensions: food availability, food access, utilisation, and stability. The FAO (2006) established these criteria as the general framework for the definition: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life". Indicators were identified for each of these aspects to analyse and assess progress in the growth of food security. It is worth noting that the consequences of food insecurity may be both short- and long-term. Even short-term food insecurity has a long-term impact on the growth potential of an economy. The global goal of food security is to guarantee a stable supply of raw materials for businesses and food for the population (Shahini et al., 2022). At the same time, the influence of internal and external factors should be reduced to zero. According to Pe'er et al. (2020), achieving food security hinges on several key conditions. These include ensuring economic opportunities are accessible to all social strata, including marginalized groups, and enabling them to procure food. Additionally, it entails ensuring the physical accessibility of food for every individual, ensuring it is available in

ample quantities. Moreover, it involves promoting the consumption of high-quality foods in quantities conducive to a balanced diet.

Depending on the actors that address the issue of food security, there are 5 levels of food security (Table 1) (Willett et al., 2019).

Table 1.
Levels of food security

Global (world) level	This level refers to the overarching perspective of food security that encompasses the entire world population. It includes international organizations, policies and initiatives aimed at ensuring the availability, access and use of sufficient food globally.
State (national) level	This level focuses on individual countries or states within a broader geopolitical framework. National governments and their associated institutions and policies play a critical role in addressing food security issues within their jurisdiction.
Regional level	This level affects geographic regions that may encompass several countries or states. Regional organizations, intergovernmental bodies and collaborative efforts of neighboring states address food security issues specific to their shared geographic, economic and social conditions.
Local level	The local level encompasses communities, municipalities or smaller administrative units within regions or states. Local governments, non-governmental organizations (NGOs), community-based organizations and grassroots initiatives work to address food security issues based on the unique conditions and needs of local populations.
Household level	This is the most detailed level of food security analysis, focusing on individual households and their access to adequate, safe and nutritious food. At this level, factors such as income, employment, education, and household composition influence food security outcomes. Efforts to improve food security can include strategies such as income support, nutrition education, and access to food assistance programs.

The most common indicators of food security are (Bello, 2009):

1. Household food consumption survey. This includes weighted food intake records, food diaries, and surveys. Weighted food intake is then compared to the recommended minimum daily energy requirements, with households below this threshold classified as food insecure and those above as food secure.
2. Variety in diet and frequency of meals. This indicator includes the establishment of a minimum essential diet or an adequate diet necessary for a safe and healthy life in the population, whereby households below this threshold are considered food insecure and households above this threshold are considered to be food secure.
3. The Coping Strategy Index This is another food security indicator that lists the different strategies and actions related to food consumption adopted by people in times of food insecurity, which is done by monitoring people's behaviours over a defined period of time.
4. A quick assessment of the household economy. This provides a direct assessment of the food deficit by establishing the household food balance, which compares resources, income, and all other sources of food converted into kilocalories or monetary equivalents with minimum requirements in terms of food consumption and other basic needs converted into kilocalories or monetary equivalents. This indicator divides households into different welfare groups.
5. An approach to food poverty or purchasing power. The data on household income and expenditure are relevant for measuring poverty.
6. Household food consumption survey. Assuming that a survey that could somehow provide global data on undernourishment as currently calculated by the FAO is not feasible, it appears as though data on food consumption from household surveys could be used instead. This indicator also includes converting food intake into calories and comparing it with minimum requirements or thresholds, which vary from country to country.
7. Food consumption score. This indicator is similar to the one defining food variety and is often referred to by some authors as a food diversity or food consumption indicator. This method is considered more advanced than the simple calculation of dietary diversity using the frequency of consumption of different foods (Shetty, 2015).

Thus, food security is a global issue. This is primarily due to the world's limited natural resources, climate change, growing populations, failed policies, and the technological backwardness of states. However, a sustainable food supply is key to the well-being of a country and society. Therefore, when choosing a mechanism to address food shortages, the specifics of agricultural development should be taken into account to ensure stable and sustainable production.

3.2 Assessment of food security in the Republic of Kazakhstan after the COVID-19 pandemic

The COVID-19 pandemic has dramatically changed the economic situation across the world, with a particular impact on food security (United Nations Sustainable Development Group, 2020). In the face of the global economic downturn, world hunger and malnutrition levels have worsened dramatically. The cumulative impact of COVID-19 measures to suppress it and the subsequent global economic downturn will worsen the problem of hunger and increase the number of people living in poverty, especially in low-income countries dependent on food imports. Besides, the pandemic came at a time when food systems were already under threat.

The food crisis of 2007-2008 was a global phenomenon that led to food riots across Africa and was caused by a combination of factors such as high food and fuel prices, the global economic and financial crisis, and trade barriers put up by some countries to safeguard national food security in combination with an economic slowdown (Ouko and Odiwuor, 2023). The impact of conflicts, natural disasters, climate change, and the spread of pests and plagues on food availability and access has been studied through various global food security projection studies. These studies have shown that the total global food demand is expected to increase by 35% to 56% between 2010 and 2050, while the population at risk of hunger is expected to change by -91% to +8% over the same period (van Dijk et al., 2021). The impact of COVID-19 on food access has also been significant. The pandemic has disrupted food supply chains, leading to shortages of certain foods and price increases for others (Paudel et al., 2023). Lockdowns and social distancing measures have also made it difficult for people to access food, particularly those who are vulnerable or living in poverty. The closure of schools and workplaces has also disrupted food programmes that provide meals to children and low-income individuals. Furthermore, the economic impact of COVID-19 has led to job losses and reduced incomes for many people, making it harder for them to afford food (Udmale et al., 2020). The pandemic has also highlighted existing inequalities in food access, with marginalized communities and low-income households being disproportionately affected.

3.21 Analysis of Global Food Security Index ratings and implications for Kazakhstan

According to the Global Food Security Index (2022), global food security continues to deteriorate worldwide due to a combination of factors, most notably intensive farming and climate change. Although global food systems were under stress before the pandemic, COVID-19 exacerbated existing problems, further burdening the lives of farmers. The Global Food Security Index is based on 58 unique indicators and measures the state of food affordability, availability, quality and safety, and natural resources and resilience in 113 countries. Ireland has been named the number one country for food security in 2021, ahead of Austria, the UK, Finland, and Switzerland. Whereas, Canada and the USA ranked 7th and 9th, respectively. According to official data for 2021, Russia ranks 23rd, Belarus 36th, and Kazakhstan 41st out of 113 countries in terms of food security. Although the Republic of Kazakhstan was ranked 32nd in 2020, it was 57th in 2018. However, it was lower than average until 2017, and already in 2020, it is almost equal to the average. The Global Food Security Index's assessment of the level of food security in the world ranges from 0 to 100 according to the following coefficients: affordability, availability, quality and safety, sustainability and adaptation (Figure 1).

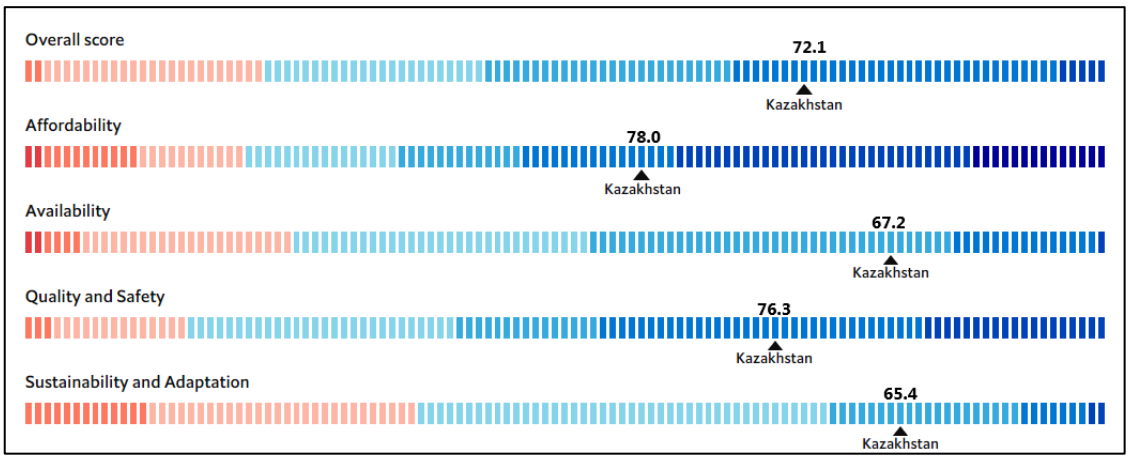

Figure 1. Ranking of the Republic of Kazakhstan on the Global Food Security Index, 2022.
Source: Global Food Security Index (2022)

Depending on the overall score, there are four levels of food security: 0 to 19.9: very weak 20 to 39.9: weak; 40 to 59.9: medium; 60 to 79.9: good; 80 to 100: very good. In 2022, Kazakhstan ranked 32nd, which indicates a medium level of food security (Figure 2) (Global Food Security Index, 2022).

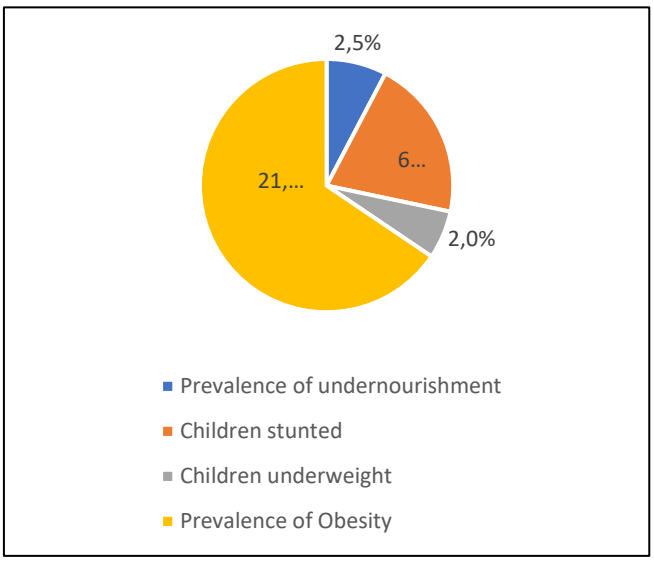

Figure 2. Assessment of the Global Food Security Index of the Republic of Kazakhstan, 2022
Source: created by authors based on Global Food Security Index (2022)

The current situation indicates the need to enhance the state's food security policy. Kazakhstan is the largest landlocked country. Since the republic is located at the farthest distance from the world ocean, the weakest criteria are water, rivers, lakes, and oceans. Therefore, the primary issue is natural resources and sustainability. The Republic of Kazakhstan is an agro-industrial country, an agricultural sector that not only meets the needs of the domestic market but also allows part of its production to be exported. The agro-industrial complex includes agricultural production, its processing, and the consumer supply chain, including industry (Yemchenko, 2023; Kapitonov and Vilks, 2022). An analysis of the impact of the COVID-19 pandemic shows that there have been no major food supply disruptions in Kazakhstan since the beginning of the quarantine. And some delays occurred solely due to the situation at the state borders, where control was strengthened due to the epidemiological situation. This shows that the government has kept the issue of food supply under control on a nationwide scale.

3.22 Assessing agricultural sector growth and food security challenges in Kazakhstan

Despite the harm the pandemic in 2020 caused, the agricultural sector has continued to grow. According to the Bureau of National Statistics (2024a), there was a good grain harvest in 2020. Whereas about 17.4 million tonnes of grain were harvested in 2019, more than 20 million tonnes were harvested in 2020. But in 2021, the situation deteriorated sharply: the gross harvest of grain and legumes is estimated at 16.6 million tonnes, the lowest since 2012, and is 18% lower than the level of the previous season. In the Almaty region, the average yield remained at the level of the previous seasons, while all other regions suffered greatly. Statistics report instability in bakery production, which will result in higher prices for cereal products. An assessment of the components of food security in the Republic of Kazakhstan reveals some shortcomings. In addition to water resource scarcity, other constraints identified by Satybaldin et al. (2020) include inadequate advancement in agricultural research and innovation, low labour productivity within the agricultural sector, inadequate technical equipment, and limited access to technology for small and medium-sized farms. Furthermore, there are challenges related to poor collaboration between agricultural science and business sectors, difficulties in the storage and marketing of agricultural products, underdeveloped trade and logistics systems, and insufficient capacity for preparing goods for sale.

Food security is an important issue in Kazakhstan, and the Almaty region is one of the regions that has been studied in terms of its food security system. In comparison to other regions, the Karaganda region has the highest level of food self-sufficiency, with 95% of its population being able to meet their food needs from domestic sources (Jia et al., 2022). The Kyzylorda region has the lowest level of food self-sufficiency, with only 30% of its population being able to meet their food needs from domestic sources. The North-Kazakhstan region has the highest level of food consumption per capita, with an average of 1200 kg per year, while the Akmola region has the lowest level of food consumption per capita, with an average of 800 kg per year (Wang et al., 2022).

These key areas require special attention from public policy, as their level of development affects the competitiveness of the agricultural sector and determines the country's food security. Thus, there are many unresolved issues in the agricultural sector, not only in the Almaty region but in the Republic of Kazakhstan as a whole. The fact that the 2021 country's food security score marks a drop of 9 positions compared to 2020 gives reason to take immediate action to strengthen the country's weak spots.

3.3 The modernisation of the food security system on the example of the Almaty region

The Almaty region in Kazakhstan grapples with a myriad of food security challenges and agricultural conditions rooted in its unique geography, climate, and socio-economic landscape (Kyrgyzbay et al., 2023). With a climate ranging from semi-arid to continental and diverse topography encompassing steppes, mountains, and valleys, the region faces water scarcity exacerbated by inefficient irrigation practices and competition across sectors. Land degradation, driven by unsustainable agricultural methods and overgrazing, diminishes arable land, while mountainous terrain limits cultivation and livestock grazing (Hu et al., 2020). Economic hurdles like poverty and limited access to markets compound these challenges, particularly for smallholder farmers. Moreover, the region's vulnerability to climate change heightens the risks of crop failures and livestock losses (Suieubayeva et al., 2022). Addressing these issues demands holistic approaches integrating sustainable agricultural practices, water management strategies, and rural development initiatives to bolster resilience and enhance food security for Almaty's communities.

One of the priority development areas of the Republic of Kazakhstan should be a policy ensuring a sufficient and stable level of food security. To achieve it, it is necessary to develop an innovative model that will include proposals for the modernisation of the food security system, both countrywide and regionally. While there are different perspectives and approaches to food security, a sustainable food system must meet the following requirements (Hradilová and Svoboda, 2018):

1. Promoting sustainable intensification and expansion of ecological approaches, namely to maintain yields and efficiency while reducing burdens on the environment.
2. Reducing food waste by encouraging the reuse and recycling of unavoidable food waste.
3. Promoting dietary changes towards healthier, less resource-intensive diets.
4. Building the resilience and reliability of the food system, in particular through diversification, to cope with shocks caused by geopolitical events.
5. Be adaptive to the risks of climate change.
6. Holding producers and consumers responsible and accountable for the environmental, economic, social, and health impacts of the food system.

The Republic of Kazakhstan's food security indicators have remained at a medium level. However, when considering the regions separately, it is clear that the current food security system is far from being ecologically, economically, and socially sustainable. As a consequence, there is a need for a broader approach to food policy that encompasses all key elements of the food system. Recommendations for improving food security policy in the Republic of Kazakhstan and its regions, particularly the Almaty region, emphasize prioritizing environmental, social, and economic sustainability in all policies (Bazerghi et al., 2016). Food should be viewed as a common good rather than solely a consumer good. A comprehensive approach to building a sustainable food system is essential, focusing on balanced environmental, social, and economic sustainability objectives. Addressing power and information imbalances within the food system is crucial, with attention to supporting food producers and retailers, promoting a healthy food environment for citizens, and bolstering the resilience of vulnerable participants. Implementing a combination of regulatory, financial, behavioural, informational, communicative, and educational measures is necessary, recognizing the importance of mandatory interventions such as regulatory and fiscal policies as catalysts for advancing sustainable food security (Pe'er et al., 2020).

3.31 Proposals for the creation of an innovative food security system in Almaty region

Recommendations for improving food security policy are needed to create an innovative and modernised food security system in the Republic of Kazakhstan. First and foremost, the agricultural system needs to become more innovative to make suitable use of scientific approaches and modern technologies for various aspects of food security. Such an innovation system, developed to suit the Almaty region environment, should include: a research programme targeting smallholder farmers; investment in human capacity; the creation of infrastructure for food systems; the establishment of appropriate governance structures for agricultural innovation; and the strengthening of knowledge exchange between farmers and academics. The agricultural innovation system will be a useful tool for analysing the ecosystem and supporting mechanisms that promote innovation. The key stakeholders of the agricultural innovation system include (Monteiro et al., 2018): farmers; research and education systems; business (input suppliers, agricultural producers, processors, distributors, wholesalers, and retailers); institutions and government ministries; and international and non-governmental actors.

In addition to the modernisation of the agricultural sector, an innovative food security system for the Almaty region should include the following set of proposals:

1. Export promotion. It is essential to apply practices that will ensure the reduction of taxes and customs duties on exported highly processed products, as well as provide consulting support to exporters (Dziubynskyi et al., 2023).
2. Establishment of a system for the permanent buying and selling of agricultural products.
3. Launch of staff training to improve the agricultural competence of employees. According to statistics, about 80% of the subjects of the agro-industrial complex are in dire need of specialists.
4. Creating a favourable environment for research organisations. Additional investment in high-quality studies relevant to production models and adapted to the needs of smallholder farmers. With constantly changing environmental conditions, it requires continuous investigation and development to generate resources and disseminate knowledge. This will help maximise agricultural yields while preserving the environment.
5. Introduction of effective technologies. Labour productivity indicators in the agricultural sector of the Almaty region remain low compared to other sectors of the economy.
6. Equipment upgrade. The introduction of effective agricultural technologies will help to increase labour productivity.
7. Facilitating the exchange of knowledge between farmers and scientists. Enhancing agricultural knowledge and human capacity will help farmers address a range of issues, including agronomic practices, natural resource management, and access to financial support.
8. Comprehensive development of a trade and logistics system that will ensure an even supply of quality raw materials over a period of time.
9. Taking measures to overcome problems related to the storage and marketing of products, thus initiating an increase in competitiveness in the agricultural sector.

Therefore, overcoming the challenges of the current food security system in the Almaty region of the Republic of Kazakhstan becomes possible with effective agricultural management mechanisms and the application of a systematic approach. This approach views the achievement of food security as an integrated objective across sectors and stakeholders, rather than as a single sectoral objective. Moreover, management processes related to food security and sustainable agriculture need to be responsive to the needs and interests of all users. That said, it is important to take appropriate measures and apply methods for their effective participation in the relevant processes.

4 Discussion

4.1 Policy measures and effectiveness in achieving food security

Concerns about food security first emerged in the years following the Second World War (1939-1945). The most important issue and a real demographic and environmental problem is precisely the demand for food (Elbushra and Ahmed, 2020). Besides, the growing world population and the limited natural resources are at the heart of food security concerns across the globe (Maxwell and Frankenberger, 1992). A major threat is that human populations may someday exceed the world's food supply (Elbushra and Ahmed, 2020). Meanwhile, the poor distribution of food around the world is linked to poverty, political and geopolitical issues, and natural disasters (Ihab et al., 2015). Equally, food insecurity may be caused not only by a lack of food but also by insufficient purchasing power, inefficient use of resources, and misallocation of food (Elbushra and Ahmed, 2020). An active search for ways and mechanisms to ensure a sufficient level of food security and improve the competitiveness of the agro-industrial complex began in the early 20th century (Mostova and Hutorov, 2023). Recent studies by western scholars such as Stouks (2001) on modern agri-food policy have focused on food security issues and the various factors and risks associated with food shortages. Researchers underlined that agri-food policy has a complex, synergistic influence on the economy and society as a whole. When evaluating the feasibility of the policy measures being considered, it is essential to consider different aspects of efficiency. This includes economic efficiency, which pertains to the prudent utilization of agricultural resources and the maintenance of profitability in agricultural production. Social efficiency is also crucial, focusing on enhancing the standard and quality of life for the populace. Environmental efficiency must be taken into account to safeguard the natural resource capacity of the agro-industrial complex, thereby mitigating adverse environmental effects and ensuring safe production practices.

Recently, the state has been actively combating food security-related concerns in the Republic of Kazakhstan and its individual regions. The analysis of economic issues in the agri-food sector and the development of organisational measures have been addressed in the studies of renowned scientists, such as the study of Alshanov (2006). For example, Alshanov (2006) points out that analysis should be conducted at two levels, namely regional and national. The first focuses on the effectiveness of regulation at the level of individual regions. The second is related to the impact on the agro-industrial complex and society as a whole. The study on food security as a priority direction of agrarian policy in the Republic of Kazakhstan is reflected in the collaborative effort of Korolev et al. (2011), in the article by Kulikov and Minakov (2016), and also in the study of Serova (2001). Some researchers focus on threats to food security. For example,

Altuhov (2014) identified the following phenomena as threats: oversaturation of the domestic market with imported food products, price imbalances, insufficient development of the infrastructure of the agro-food market, and a lack of qualified personnel in certain professions and specialties in the agro-industrial complex. Other high-risk threats include a low level of effective demand for food and an underdeveloped system of food market monitoring and forecasting.

4.2 Factors affecting food security and economic stability in post-Soviet states

Many scholars have addressed the influence of factors on the food security of post-Soviet states. An analysis of a study by Koshevoy (2015) offers grounds for defining food security as economic security. The author regards the regulation of food markets as a mechanism for reducing threats resulting in a loss of economic security. The inability of the economy to provide sufficient food for the population leads to an unbalanced diet and a low standard of living. The study also looks at the cost of the food basket and the factors that influence its content. The authors argue that more effective development of the agro-industrial sector is needed to resolve issues related to food security and the economy (Kulagina, 2014). For instance, Duisenbekova and Daniłowska (2021) consider food security as a dependent variable of such factors as resource security, the provision of the agro-industrial complex with qualified personnel, land, and material and technical resources. The effectiveness of agri-food policy cannot be assessed by one indicator since it includes a number of independent areas: agricultural production, improving the standard of living of the rural population, and increasing the incomes of agricultural producers. According to Mihajlushkin and Barannikov (2013), agri-food policy effectiveness encompasses sectoral efficiency, which involves enhancing the socio-economic status of agriculture, the processing industry, and enterprises focused on food storage and marketing. Additionally, it includes corporate efficiency, which assesses the effectiveness of agrarian policy among specific groups of agricultural producers and their associations. Furthermore, technological efficiency plays a significant role, as it influences the production of quality, competitive food products.

Evaluation of the effectiveness of agrifood policies should include a detailed analysis of the different strands using customised metrics. Noteworthy are the theoretical and methodological issues of food security, as reflected in the studies of Kajgorodcev (2006) and Muhtarova et al. (2003). According to Bello (2009), the fundamental rules of agri-food policy effectiveness are as follows:

1. The principle of system analysis, where agri-food policy is part of the economic policy of the state, which strictly controls the agricultural sector and the agro-industrial complex as a whole;
2. The principle of the effectiveness of agri-food policy. This principle involves the analysis and evaluation of the applied measures in agri-food policy and the economic effects of the social and environmental changes made. As a result, the state is in a position to assess the complex effect and impact of agri-food policy on the economy, including at the regional level;
3. The principle of a structural and functional approach to the analysis of agri-food policy and its effectiveness. Agri-food policy consists of several independent areas of regulation: ensuring food security, improving the standard of living of the rural population, and developing agricultural production.

4.3 Challenges and inconsistencies in assessing food security

It is worth noting that a comprehensive approach to the analysis of agrifood policy requires the identification of a system of factors on which its effectiveness at the state and regional levels depends. Through the analysis of Satybaldin et al.'s (2020) study and examination of leading countries' practices, it becomes evident that key aspects of national and regional agro-food policy effectiveness encompass economic, social, and environmental factors. These include initiatives aimed at modernizing and advancing the agro-industrial complex, ensuring food security at both national and regional levels, fostering the development of social infrastructure, and elevating the stable income of rural inhabitants. Additionally, emphasis is placed on preserving the natural resources inherent to the agro-industrial complex, employing resource-saving technologies, and promoting the production of environmentally safe products and goods (Amanova et al., 2020).

However, current models for assessing food security in conditions of crisis and pandemic, as well as methods and tools for carrying out comprehensive food security analysis at different levels, are far from complete and require further investigation. Notably, the subject of food security remains one of the important issues addressed by academics in various disciplines. However, studies in this area point to some inconsistencies (Koshevoy, 2015). For example, nutrition and medical scientists prioritise calorie deficiencies and micronutrients and their impact on human health. When considering the policy of food supply and distribution, one may note that both economists and policy experts are concerned with the pricing of foodstuffs. Accordingly, there are obvious inconsistencies between the international definition of food security and how it is used for measurement and policy development (Alshanov, 2006). Unfortunately, past studies have addressed all aspects and components related to food security partly, rather than comprehensively. Apart from the local food system, lifestyles and food cultures are also important aspects. Furthermore, given that different groups in society, namely low-income households, use different coping strategies, there is a need for research that will develop coping strategies for these groups (Koshevoy, 2015).

Food security at the macroeconomic level is assessed through an analysis of food self-sufficiency. This analysis is based on the assumption that food self-sufficiency determines the degree of economic availability of food for the population (Yerzhanova et al., 2021). The lack of developed methods for assessing food security has attracted the interest of the business community, which has encouraged research and improved new mechanisms for food security analysis at regional, national, and international levels. As the existing literature on food security focuses on addressing food security indicators in various dimensions, particular attention should be paid to identifying indicators and methods for assessing food security (Serova, 2001). Further, when examining economic security, it is necessary to focus on identifying the short- and long-term consequences of food insecurity in order to choose the right solutions and coping mechanisms. The strategy should be adapted to the specific conditions of the region and the country as a whole. Therefore, based on the new perspectives on food security, the state should direct its policies towards research, planning, implementation, and evaluation of applied measures to achieve and improve food security (Bello, 2009).

4.4 Assessing the impact of crises on food security

Given that various crises and natural disasters, such as climate change, disease, and pandemics, affect all aspects of food security, it is essential to have access to reliable information in order to assess the full impact of disasters on food in the future. Although the impact of the COVID-19 pandemic on food security has generated much interest among scientists (United Nations Sustainable Development Group, 2020), most studies have focused on the direct impact of the disease on physical and economic access to food. However, information on the impact has been limited. Also, information related to COVID-19, namely the exclusionary policy on the entire food system, is not entirely accessible. For example, food safety, food policy and management, and sustainable food supply (United Nations Sustainable Development Group, 2020). Thus, the current situation suggests that there are global imbalances and a lack of transparency in the data for a comprehensive study of the issues, suggesting that further investigation of the topic of food and economic security is a priority.

One important indicator of sustainable food security is precisely the elimination of hunger (Pe'er et al., 2020). Various international organisations, such as the United Nations, FAO, the International Fund for Agricultural Development, and the World Health Organisation, have programmes and measures in place to achieve this objective. It is worth noting that studies in this area provide different strategies for food security, depending on the specific climatic conditions and requirements of the time period. However, their objectives are grouped into four common groups: improvement of food quantity and quality, food safety, environmental friendliness, and socio-cultural acceptance. Given that future agricultural practices and the food security strategy to be implemented will have a significant impact on the global ecosystem, it is sustainable agriculture that should be given special attention to achieve an adequate, safe, and sustainable food supply.

5 Conclusions

Summarising the findings of the study, it is important to highlight the effectiveness of the current state policy of the Republic of Kazakhstan and its individual regions in supporting food security at an acceptable level. The measures taken made it possible to improve food security indicators during the pandemic in 2020 compared with the previous years. In 2021, however, the overall food security index declined, which was due to the food policy applied, where agriculture and food processing were treated as separate spheres. The current situation requires the state to conduct a complex review of measures in agricultural policy, income security, infrastructure development, food, and other key indicators.

Statistics on food security have shown some weak points. Such disadvantages as access to oceans, rivers, and lakes cannot be resolved for the Republic of Kazakhstan. However, issues such as changing the average cost of food, increasing productivity levels, stimulating agricultural research and development, using technical equipment, introducing innovative methods and models into production, establishing interaction between business and the scientific community, and encouraging the development of small and medium-sized businesses are manageable. Other important aspects include the management of human resources, which needs to be modernised as soon as possible; the storage and sale of agricultural products; the underdeveloped trade and logistics system; and the virtual absence of pre-sale preparation facilities. Particular attention should be paid to the issue of rational placement of production, the characteristics of soil and the climatic conditions of the economy, and the efficiency of using the reserves of economic regions, considering the specialisation of food zones. Also, the current state of economic security requires a rational redistribution of raw material processing and agricultural production based on climatic conditions.

The adoption of these measures will increase the investment appeal of the agro-industrial complex and improve its efficiency and competitiveness, thereby positively affecting the food security of the country and its individual regions. The level of economic and food security is influenced not only by the availability of the national food base but also by the competitiveness of the agro-industrial complex, the measures applied to local producers of agricultural products, and the effective implementation of social policy aimed at increasing the population's income. Therefore, the effective

functioning of the agro-industrial complex and the stable provision of a sufficient level of food security require a policy in which state regulation and support play a greater role than in other sectors of the economy.

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