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The grain market in Kazakhstan: An economic analysis of exports and domestic consumption

Assel Rakhimbekova

Doctor of Philosophy, Associated Professor
Esil University

010005, 7 Zhubanov Str., Astana, Republic of Kazakhstan

<https://orcid.org/0000-0001-6144-1844>

Aigul Mukhamejanova*

Doctor of Philosophy, Associated Professor
Esil University

010000, 7 Zhubanov Str., Astana, Republic of Kazakhstan

<https://orcid.org/0000-0001-8891-3522>

Alikhan Babassov

Doctor of Philosophy, Associated Professor
Esil University

010000, 7 Zhubanov Str., Astana, Republic of Kazakhstan

<https://orcid.org/0009-0003-6973-5312>

Zhanat Abzhan

Doctor of Philosophy, Associated Professor
Esil University

010000, 7 Zhubanov Str., Astana, Republic of Kazakhstan

<https://orcid.org/0000-0001-9673-2107>

Nurgul Shaikenova

Doctor of Philosophy, Associated Professor
S. Seifullin Kazakh Agrotechnical University

010000, 62 Zhenis Ave., Astana, Republic of Kazakhstan

<https://orcid.org/0000-0003-2925-1631>

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Abstract. This study aimed to identify contemporary trends in Kazakhstan's grain market functioning. The analysis focused on production, consumption, export, and import indicators, price dynamics, and the self-sufficiency rate of grain in Kazakhstan during 2019-2023. The research utilised official statistical data on Kazakhstan's agricultural sector and grain market performance. A comprehensive analysis of the grain market was conducted. The statistical data analysis revealed both positive and

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*Corresponding author

negative trends that significantly influenced the grain market in Kazakhstan from 2019 to 2023, as well as the country's food self-sufficiency. The findings indicated a 1.7% decline in production rates and a 16.7% reduction in industrial grain consumption, accompanied by an increase in grain usage for seeding purposes. Annual personal consumption by the population did not exceed 1.1% of the total grain utilisation in the country. A 3.9% increase in sown areas did not result in higher yields, which decreased by 9.6%. The highest yields were observed in the Qyzylorda Region, where wheat cultivation dominated. Although imports did not surpass exports, they increased more than sevenfold over time. During the study period, grain reserves in the country grew by 9%, accompanied by a significant rise in market prices. These indicators did not prevent Kazakhstan from maintaining a high level of grain self-sufficiency, enabling further development of grain exports. This research contributed new insights into the future development of the grain market in Kazakhstan, demonstrating that an export-oriented strategy combined with increased production could be a viable pathway for successful sectoral growth. This approach could mitigate the risk of a food crisis while preserving the country's high self-sufficiency in grain

Keywords: production; sown area; self-sufficiency level; resource balance; price index

INTRODUCTION

The Republic of Kazakhstan has long been one of the most successfully developing countries in Central Asia, maintaining its status as the region's economic leader. With a population of 19.8 million, Kazakhstan's gross domestic product (GDP) grew by 97.37% between 2008 and 2023 (Bureau of National..., 2023b; Statista, 2023). Geographically, Kazakhstan benefits from extensive fertile lands, strategic location, and favourable climatic conditions, alongside significant economic potential, natural resources, and human capital. These factors contribute to the development of its agricultural sector and support its food security.

Within the international scientific community, researchers have frequently addressed issues of food security, both at the national and global levels. Reviewing events affecting the food commodity market, M. Ardan *et al.* (2023) noted that the 2008 global economic crisis triggered food collapses in many countries, leading to widespread poverty and threats to food security. As a result, food security became an international priority. During the economic recession, global efforts succeeded in improving food security. However, since 2020, the SARS-CoV-2 pandemic has once again destabilised food security in many countries, including Kazakhstan, as observed by M. Jia *et al.* (2022). Investigations into food system functioning during the pandemic by K. Chen and R. Mao (2020) concluded that the primary threat stemmed from export and import restrictions on agricultural goods. Similar conclusions were drawn by T. Falkendal *et al.* (2021), who analysed the pandemic's effects on the agricultural market, highlighting price surges and food shortages as major consequences. Furthermore, the onset of the Russian-Ukrainian war in 2022 exacerbated the pandemic's impact on the food system. This was demonstrated in research by M. Nasir *et al.* (2022), which examined the effects of military actions in Ukraine on the global food market.

Kazakhstan ranks among the world's largest producers and exporters of food products. The report Global Food Security Index 2021 (The Economist, 2018;

2021) indicated that Kazakhstan was ranked 41st out of 113 countries in terms of food security, a significant improvement from 57th place in 2018. When addressing food security, particular attention must be paid to the grain market, which is of primary importance (Bulgakov *et al.*, 2020). The analysis of Kazakhstan's grain market presents considerable interest. Exploring the trends and challenges in the grain markets of Asia, R. Sendhil *et al.* (2022) concluded that between 2011 and 2022, Central Asian countries experienced a significant increase in sown areas for grain crops and a surge in their consumption. This has heightened demand for grains, particularly wheat, positioning it as a critical commodity in international trade. Analysing Kazakhstan's grain production, S. Tokenova *et al.* (2019) identified that improving the economic efficiency of the grain sector remains a key priority. Other researchers, such as T. Stathers *et al.* (2020), emphasised the importance of reducing post-harvest grain losses as a vital objective. In their study of wheat and maize markets in Asia, U. Grote *et al.* (2021) predicted that the production of these grain crops would decline in the future, underscoring the need to sustain and enhance their cultivation in Central Asian countries. This is particularly relevant to wheat, given that Asian nations are major producers. Increasing maize production is also crucial, primarily due to its growing use as livestock feed in animal husbandry (Havryliuk & Kovalyshyna, 2024).

A review of previous studies reveals that research on the grain market typically focuses on two primary aspects: production and/or trade. These elements are closely linked to the assessment of food security accessibility. While this has established a solid theoretical foundation, limitations remain, as prior research often considers only select indicators rather than adopting a comprehensive approach. However, statistical data available for analysis, particularly in Kazakhstan, highlight the grain market as a promising avenue for further research. This study aims to address this research gap within the international academic discourse. It

emphasises the importance of analysing not only production and trade but also the functionality of both the domestic grain market and external economic activities related to this commodity. Additionally, it explores price index dynamics and the self-sufficiency level of grain in the country.

This research aimed to identify the main trends in the development of various grain crops in Kazakhstan.

MATERIALS AND METHODS

To achieve the research objectives, a three-stage approach was employed, combining qualitative and quantitative methods. Qualitative methods were used to analyse the theoretical underpinnings of previous studies, while quantitative methods were applied to analyse official statistical data. In the first stage, the role of agriculture in the national economy and the significance of grain crops within the agricultural sector were examined. Additionally, the dynamics of Kazakhstan's grain market from 2004 to 2023 were analysed. This stage involved a comprehensive analysis of the following statistical data: agriculture's contribution to GDP (Bureau of National Statistics, 2024a), employment in the agricultural sector (Bureau of National Statistics, 2024j), the quantity and dynamics of sown areas in the country (Bureau of National Statistics, 2024c), the quantity and dynamics of sown areas for grain (including rice) and legume crops, including a breakdown by region (Bureau of National Statistics, 2024b), and the dynamics of gross harvest and yield of grain (including rice) and legume crops (Bureau of National Statistics, 2024d; 2024e). To analyse the dynamics of these indicators, the growth rate formula (1) was used:

$$\text{Growth rate} = \frac{P_t}{P_b} \times 100\% - 100\%, \quad (1)$$

where P_t is the value of the indicator in the current period and P_b is the value of the indicator in the base period.

Following the initial analysis of agriculture's contribution to Kazakhstan's economy and the dynamics of grain crop development from 2004 to 2023, the second stage involved a more detailed examination of data from 2019 to 2023. The primary focus was on production, consumption, and price dynamics. To analyse production, consumption, exports, and imports, the following statistical data were examined: the structure of production by grain type and gross harvest (Bureau of National Statistics, 2024d; 2024e), major grain producers (Bureau of National Statistics, 2023a), yield by region (Bureau of National Statistics, 2024b), dynamics and structure of the grain balance and grain utilisation (excluding processed products) (Bureau of National Statistics, 2024f). To analyse price dynamics, chainlinked price indices for grain crops in Kazakhstan (Bureau of National Statistics, 2024h) were compared with global grain price indices (Food and Agriculture..., 2024).

The third stage initially analysed the dynamics of grain exports and imports (Bureau of National Statistics, 2024f), the structure of exports and imports (Bureau of National Statistics, 2024g), and then assessed the country's export potential through relative indicators: the level of grain self-sufficiency and the ratio of exports to grain production. The level of grain self-sufficiency was calculated using the following formula (2):

$$\text{SR} = \frac{P}{IU} \times 100\%, \quad (2)$$

where SR is the level of grain self-sufficiency, P is the country's grain production in a given year, and IU is the domestic use of grain in the country, excluding exports, in a given year. Finally, the export-oriented strategy for developing the grain market in Kazakhstan was analysed, and measures to achieve this strategy were proposed.

RESULTS

Agricultural development in Kazakhstan does not occupy a prominent position within the national economy. Given that GDP is one of the most critical indicators of national accounts, reflecting the overall economic performance of a country, attention should be directed towards agriculture's contribution to the GDP. In the first half of 2024, the share of agriculture, forestry, and fisheries accounted for merely 2.5% of total GDP. Together with the industrial and construction sectors, these activities constitute Kazakhstan's productive sector. For comparison, during the same period, the industrial sector contributed 28.3% to GDP, while the construction sector accounted for 5.1%. In the first half of 2023, the share of agriculture, forestry, and fisheries in GDP was slightly higher at 2.7%. By contrast, the industrial and construction sectors contributed 29.32% and 4.92%, respectively. Looking further back, in the first half of 2007, agriculture, hunting, and forestry accounted for 2.23% of GDP, while the industrial and construction sectors contributed 30.78% and 1.7%, respectively (Bureau of National Statistics, 2024a). This data indicates that the share of agriculture in Kazakhstan's GDP has fluctuated over the years, periodically declining but consistently remaining below 3%.

While agriculture's contribution to Kazakhstan's GDP is relatively small, it is crucial to consider the sector from other perspectives, such as employment and production advantages. A substantial portion of the population is employed in agriculture, accounting for 11.9% of the total workforce in 2023, making it the fourth-largest sector by employment in the country (Bureau of National Statistics, 2024j). Moreover, compared to other agricultural products, grain cultivation offers several advantages for any nation. Notably, it typically boasts a higher level of profitability. In the event of adverse social or economic conditions, the grain market tends to experience lower levels of losses compared to other agricultural commodities. Additionally, grains

enjoy a high level of liquidity, meaning they are generally easier to sell than, for example, vegetables (Petryshyn, 2016). A key factor influencing grain production is the area of land under cultivation. The total sown area for agricultural crops in Kazakhstan increased by 32.2% between 2004 and 2023, reaching 23.8 million hectares in 2023 (Bureau of National Statistics, 2024c). Specifically, the sown area for grain crops increased by 22.7% during the same period, from 14.28 million hectares in 2004 to 17.53 million hectares in 2023 (Bureau of National Statistics, 2024b).

The largest sown areas for grain (including rice) and leguminous crops in Kazakhstan were located in three regions in 2004: Akmola, Kostanay, and North Kazakhstan. In that year, Akmola accounted for 25.3% of the total sown area for grain and leguminous crops. Kostanay and North Kazakhstan regions followed, contributing 21.4% and 21.2%, respectively. Certain regions, such as Turkistan, Jetisu, Mangystau, and Abai, did not cultivate grain crops at all during this period. By 2023, the Akmola Region retained its leading position in grain cultivation, with sown areas comprising 28.3% of the total national sown area for grain and leguminous crops. Between 2004 and 2023, the sown area for grain in Akmola increased by more than 1.3 times, reaching 4.9 million hectares. Similarly, Kostanay and North Kazakhstan regions remained among the leaders, expanding their sown areas by 44.1% and 12.6%, respectively, during the same period. As of 2023, Akmola, Kostanay, and North Kazakhstan regions achieved the highest levels of grain cultivation area expansion since 2004. Meanwhile, regions such as Turkistan, Jetisu, and Abai, which had previously

not engaged in grain cultivation, began sowing these crops in 2022. However, their combined share of the total sown area remained modest, accounting for no more than 5.9% in 2022 and 5.5% in 2023 (Bureau of National Statistics, 2024b).

The gross harvest of grain, including rice and legumes, in Kazakhstan reached 17.1 million tonnes in 2023, representing a 38.2% increase compared to 2004. However, grain production has exhibited fluctuations over the period from 2004 to 2023, with a record harvest achieved in 2011. The dynamics of the overall grain harvest closely mirror those of wheat, the country's primary grain crop. Field productivity, which determines the gross grain harvest, is expressed through the yield of this agricultural crop. According to official statistical data presented in Figure 1, the grain yield, including rice and leguminous crops, increased by 17% between 2004 and 2023. Following the global financial crisis of 2008-2011, Kazakhstan not only restored grain production to pre-crisis levels but significantly improved its performance. The year 2011 was the most productive, after which the gross harvest and yield of grain demonstrated positive growth until 2019. However, events during 2019-2023, including the SARS-CoV-2 pandemic and its repercussions, as well as the large-scale military conflict in Ukraine, significantly impacted grain cultivation and export in Kazakhstan. Furthermore, changing weather and climatic conditions contributed to fluctuating trends in grain production and yield. Given these developments, a detailed analysis is focused on the 2019-2023 period to examine changes, assess the country's self-sufficiency in grain, and propose measures to mitigate the risk of a potential food crisis.

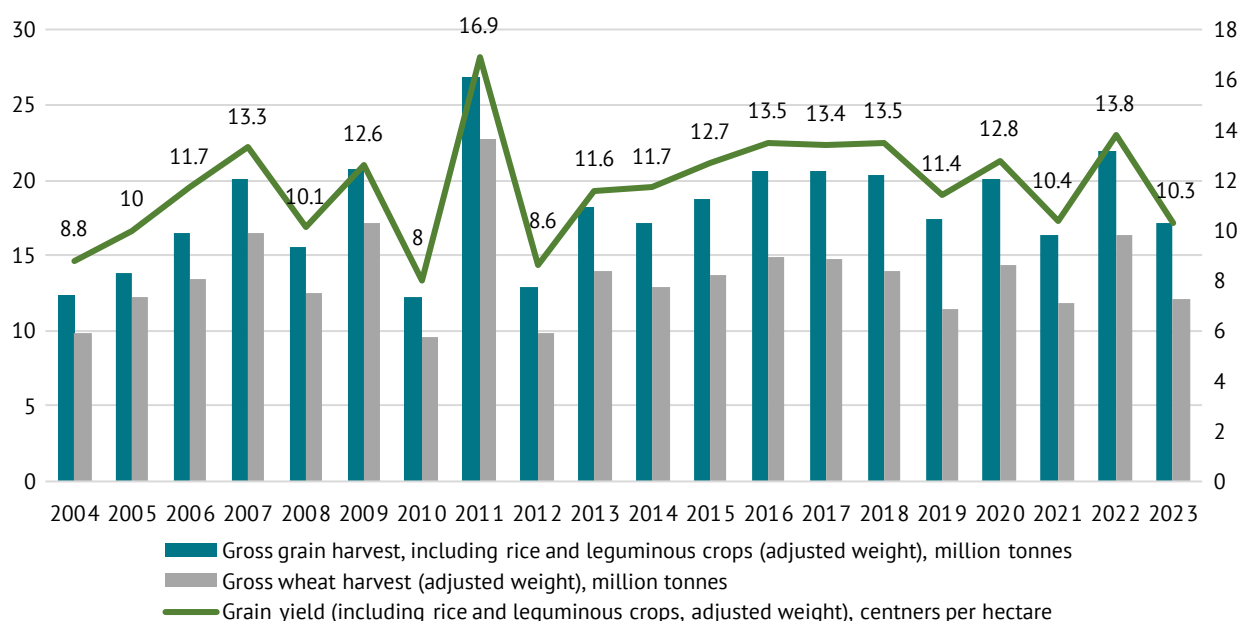


Figure 1. Gross grain harvest and yield (including rice) and leguminous crops in Kazakhstan, 2004-2023

Source: compiled by the authors based on data from the Bureau of National Statistics (2024d; 2024e)

The gross harvest of grain (including rice) and legumes, in Kazakhstan exhibited a cyclical pattern between 2019 and 2023. Production peaked in 2020 and 2022, followed by declines in 2019, 2021, and 2023. For instance, grain yields in 2023 experienced a significant 25.4% decrease compared to the previous year (Bureau of National Statistics, 2024d). Winter and spring wheat accounted for the largest share of total grain production. In 2019, wheat contributed 65.7% of the gross grain harvest. This proportion increased annually in subsequent years, except for 2023. Specifically, wheat's share of the gross harvest rose to 71.1% in 2020, 72.1% in 2021, and 74.5% in 2022. However, a sharp decline occurred in 2023, reducing this figure to 70.8% (Bureau of National Statistics, 2024e). In addition to wheat, Kazakhstan cultivates other crops, including winter and spring barley, maize (corn), oats, winter and spring rye, sorghum, millet, buckwheat, triticale (a wheat-rye hybrid), and mixed cereal grains (Bureau of National Statistics, 2023a).

Barley, both winter and spring varieties, ranks second in production volume after wheat. From 2019 to 2021, barley production declined by 38.2%, dropping from 3.8 million tonnes in 2019 to 2.4 million tonnes in 2021. In 2022, barley production rebounded significantly, increasing by 38.9% to reach 3.3 million tonnes. Maize (corn) ranks third in production volume. Between 2019 and 2021, maize production rose by 26.1%, from 0.9 million tonnes in 2019 to 1.1 million tonnes in 2021. However, in 2022, maize production decreased slightly by 2.8% compared to 2021 levels. Oats and rye (winter and spring varieties) rank fourth and fifth in production volume among grain crops in Kazakhstan. Oat production declined by 31.7% from 2019 to 2021, decreasing from 0.3 million tonnes in 2019 to 0.2 million tonnes in 2021. However, it rose by 25.7% between 2021 and 2022. Rye production, in contrast, increased more than 2.5 times over the 2019-2022 period, from 0.02 million tonnes in 2019 to 0.06 million tonnes in 2022 (NatStat..., 2023).

In 2023, the structure of grain production in Kazakhstan was as follows: winter and spring wheat

accounted for 74.5% of the total grain output, followed by winter and spring barley at 16.1%, maize (corn) at 7.3%, oats at 0.9%, and winter and spring rye at 0.1%. Other grain crops, including sorghum, millet, buckwheat, triticale (a wheat-rye hybrid), and mixed cereals, collectively constituted no more than 1.1% of the total grain production in the country (Bureau of National Statistics, 2023a). Agricultural organisations have traditionally been the primary producers of grain crops in Kazakhstan. In 2023, these organisations accounted for 58.7% of the gross harvest of grain and leguminous crops (including rice). Individual entrepreneurs or peasant and farming households contributed 41.1%, while household farms accounted for only 0.2% of the total gross harvest (Bureau of National Statistics, 2023a). Regionally, the highest grain yield (including rice) and leguminous crops in Kazakhstan during the 2019-2023 period was recorded in the Qyzylorda Region (Bureau of National Statistics, 2024b).

The examined trends in grain production in Kazakhstan demonstrate the potential to establish a balance of resources and utilisation of grain within the country (Table 1). From the data in Table 1, it can be concluded that Kazakhstan's grain market during the 2019-2023 period was shaped by both domestic and external sources. Domestic grain production consistently outweighed imports in the market structure. In 2019, domestic production accounted for 53.9% of total resources, but this share decreased to 47.8% in 2023. The country's internal grain needs were met through carryover stocks from previous years and increased grain imports (Bureau of National Statistics, 2024f). This trend indicates that Kazakhstan maintains a level of grain independence from other countries. However, it is notable that grain imports have risen annually. By 2023, imports had grown more than sevenfold compared to 2019. Over the same period, domestic production declined, with the rate of reduction in gross grain harvest (adjusted weight) reaching 1.7%.

Table 1. Dynamics and structure of grain resource balance and utilisation in Kazakhstan (excluding processed products), 2019-2023

Indicator	Year									
	2019		2020		2021		2022		2023	
	million tonnes	%	million tonnes	%	million tonnes	%	million tonnes	%	million tonnes	%
I. Resources										
Stocks at the beginning of the year	14.5	44.9	11.8	36.1	12.7	41.5	11.6	32.4	15.8	44.1
Production (gross harvest in adjusted weight)	17.4	53.9	20.1	61.5	16.4	53.6	22	61.5	17.1	47.8
Imports	0.4	1.2	0.8	2.4	1.5	4.9	2.1	6.1	2.9	8.1
Total resources	32.3	100	32.7	100	30.6	100	35.8	100	35.8	100
II. Utilisation										
Industrial consumption	6	18.6	5.9	18	4.9	16	5	14	5	14

Table 1. Continued

Indicator	Year									
	2019		2020		2021		2022		2023	
	million tonnes	%	million tonnes	%	million tonnes	%	million tonnes	%	million tonnes	%
	Including:									
Feed for livestock and poultry	3.9	12.1	3.7	11.3	2.7	8.8	2.8	7.8	2.6	7.3
Sowing purposes	2.1	6.5	2.2	6.7	2.2	7.2	2.3	6.2	2.4	6.7
Processing for food purposes	4.3	13.3	4.4	13.5	4	13.1	4.5	12.6	4.5	12.6
Other industrial uses	1.9	5.9	2.2	6.7	2.3	7.5	2.1	5.9	2.1	5.9
Losses	0.58	1.8	0.49	1.5	0.46	1.5	0.36	1	0.36	1
Exports	7.4	22.9	6.6	20.2	6.9	22.5	7.5	20.9	9	25.1
Personal consumption by the population	0.35	1.1	0.36	1.1	0.36	1.2	0.36	1	0.35	0.9
Stocks at the end of the year	11.8	36.5	12.7	38.8	11.6	37.9	15.8	44.1	14.5	40.5

Source: compiled by the authors based on data from the Bureau of National Statistics (2024f)

An analysis of the grain utilisation structure reveals a decline in industrial consumption during the 2019-2023 period, with a reduction rate of 16.7%. This decrease specifically pertains to the use of grain as feed for livestock and poultry (Bureau of National Statistics, 2024f). For instance, the reduction rates in livestock numbers during this period were significant: cattle declined by 11% (from 7.4 million head in 2019 to 6.6 million in 2023), sheep and goats by 2.5% (from 19.1 million to 18.7 million), swine by 40.1% (from 0.8 million to 0.5 million), and poultry by 1.8% (from 45 million to 44.2 million) (Bureau of National Statistics, 2024j). This trend is directly linked to the decline of animal husbandry in Kazakhstan, leading to a reduced demand for grain-based feed in 2023 compared to 2019. The drop in demand for feed for dairy and meat production has consequently diminished grain consumption for industrial purposes.

Conversely, the use of grain for sowing purposes has increased. The rate of decline in grain usage for livestock and poultry feed during 2019-2023 reached 33.3%. According to the Government of Kazakhstan, the annual demand for grain seeds for sowing in the country is 2 million tonnes (Resolution of the..., 2023). Throughout the 2019-2023 period, this figure consistently exceeded 2.1 million tonnes, with an increase in grain utilisation for sowing purposes of 14.3% during the same period. A portion of the grain produced in Kazakhstan has been processed for food purposes, such as flour, groats, and other food products derived from grain, as well as for industrial purposes, including the production of compound feed. Grain processing for food purposes increased by 4.7% during the 2019-2023 period, while processing for other industrial purposes grew by 10.5%. Grain losses have also been observed during utilisation. Throughout 2019-2023, grain losses did not exceed 1.8% of the total grain volume. The trend in this indicator has been positive, with annual reductions in

grain losses. Over the entire period, losses decreased by more than 1.5 times, highlighting improvements in grain management efficiency.

Beyond production and utilisation processes, it is essential to consider price dynamics for grain crops. Between 2019 and 2023, grain crops accounted for an average of 70.6% of Kazakhstan's sown areas. Specifically, in 2019, grain (including rice) and leguminous crops comprised 69.6% of the total sown area, followed by 70.3% in 2020, 70.2% in 2021, 69.6% in 2022, and 73.5% in 2023. Given these statistics, price trends in Kazakhstan's grain market largely influence the overall production efficiency of domestic grain producers. The demand for bakery products and bread – and consequently for domestic grain consumption for food purposes – remained stable during 2019-2023 (Bureau of National Statistics, 2024f). However, it is important to note that this market accounted for an average of only 13% of total grain utilisation during the analysed period. As such, it cannot serve as the primary determinant of grain pricing, even under conditions of intensified or reduced state regulation.

One of the key determinants of grain pricing on the global market is the price of oil and its derivatives. Previous research has demonstrated that a decline in global oil prices could result in a corresponding reduction in grain prices, particularly wheat, by approximately 4% (Petryshyn, 2016). During 2018-2023, oil prices increased by a factor of 1.1 (Minfin, 2024). Following this logic, the researchers suggest that a higher increase in oil prices could lead to an even more pronounced reduction in grain prices on the global market. The dynamics of chain-linked indices for global grain price indices reported by the Food and Agriculture Organization and producer price indices in Kazakhstan during 2019-2023 are presented in Figure 2. Furthermore, in 2020, Kazakhstan introduced trade restrictions, including a temporary ban on the export of socially

significant products within Central Asia. Export restrictions on wheat and other goods were imposed from 2 April to 1 September 2020 (Kim *et al.*, 2020). These bans and export quotas, particularly on wheat and its

products, led to a local increase in prices for these commodities (Giap, 2020). Additionally, the trade war between the USA and China during 2020 and 2021 contributed to the rapid rise in prices.

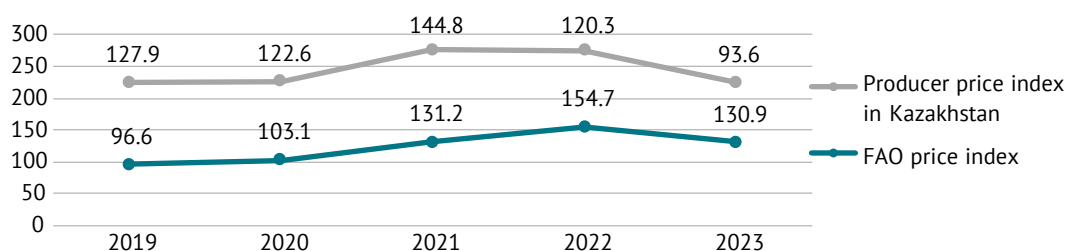


Figure 2. Chain-linked indices of Food and Agriculture Organization Global grain prices and producer price indices in Kazakhstan, 2019-2023

Note: chain-linked indices compare the current year to the previous year's indices

Source: compiled by the authors based on Food and Agriculture Organization (2024), Bureau of National Statistics (2024h)

An analysis of the data presented in Figure 2 suggests that global market dynamics significantly influenced Kazakh grain producers, with domestic pricing closely aligned with the global grain price index. Notably, grain reserves in Kazakhstan grew by more than 9% over the period 2019-2023. This increase in reserves may either reflect declining grain prices, which could reduce producers' motivation to sell, or a reduction in domestic consumption within the country. Upon reviewing statistical data, it becomes evident that the increase in grain reserves in Kazakhstan was not driven by a drop in prices for certain types of grain or a corresponding lack of interest among producers in selling their stock. During the analysed period, the producer price index for grain in Kazakhstan showed a consistent upward trend (Bureau of National Statistics, 2024h). Therefore, the larger carry-over grain stocks in Kazakhstan are attributed to a decline in domestic consumption rather than price-related factors (Bureau of National Statistics, 2024f).

One of the key indicators of the balance of grain resources and utilisation in Kazakhstan is the performance of exports and imports. Over the period 2019-2023, wheat and meslin were the most imported and exported types of grain. Wheat and meslin imports increased more than 25-fold during this period, while their exports grew by over 1.1 times. Barley also accounted for a significant portion of both imports and exports during this time. Barley imports rose tenfold, whereas its exports decreased by 1.4 times. In 2018, grain sorghum was not exported. Except for this grain type, the export of other cereals, including oats, maize, rice, buckwheat, millet, and miscellaneous grains, increased by 1.4 times between 2019 and 2023. All these grain types, including sorghum, were also imported, but their import volumes decreased by 3.2 times over the analysed period (Bureau of National Statistics, 2024g).

To determine whether Kazakhstan has the potential to export grain, it is crucial to consider not only the absolute figures provided in Table 1 but also the relative indicators. The country's self-sufficiency in grain simultaneously ensures food security and imposes constraints on the growth of grain exports (Wei *et al.*, 2019). Based on calculations using Formula 2, the level of grain self-sufficiency in Kazakhstan was 132.5% in 2019, 150.6% in 2020, 136.4% in 2021, 178.6% in 2022, and 138.9% in 2023. In 2021 and 2023, there were significant declines in the self-sufficiency level, amounting to 14.2% and 39.7%, respectively, compared to the preceding years. Despite fluctuations in grain yield between 2019 and 2023, an analysis of Kazakhstan's grain requirements suggests that the production levels were sufficient to meet domestic demand, whether for industrial use, household consumption, or seed reserves for the following calendar year. This trend indicates the country's complete self-sufficiency in grain and the feasibility of exporting without jeopardising food security. The ratio of grain exports to production in Kazakhstan was 42.5% in 2019, 32.8% in 2020, 42.1% in 2021, 34.1% in 2022, and 51.7% in 2023.

The Government of Kazakhstan has developed a strategy for the development of the agroindustrial complex for the period 2021-2030, outlining target indicators for the cultivation and export of agricultural crops. Given the significant proportion of wheat in overall grain production, it is critical to prioritise the development of this specific crop. The target yields for wheat cultivation in Kazakhstan for 2021, 2022, and 2023 were set at 9.3 centners per hectare (cwt/ha), 10.2 cwt/ha, and 11.4 cwt/ha, respectively (Resolution of the..., 2023). Based on official statistical data, it can be concluded that the target indicators for 2021 and 2022 were fully achieved, with the 2022 yield surpassing the target by 1.2 times, reaching 12.8 cwt/ha

compared to 9.2 cwt/ha in 2021. However, in 2023, grain producers in Kazakhstan failed to meet the target yield of 11.4 cwt/ha, as the actual figure was only 9.2 cwt/ha (Bureau of National..., 2024d). This data highlights the importance of not only increasing production volumes but also improving the sustainability of wheat production. Achieving this requires the adoption of innovative approaches to modelling cultivation practices (Kubitza et al., 2020). One of the objectives set by the Government of Kazakhstan for 2030 is to triple the export of agro-industrial products compared to 2020 levels (Resolution of the..., 2023). Based on these target indicators, it can be inferred that Kazakhstan has adopted an export-oriented strategy for grain crops. However, considering the trends in yield indicators and domestic demand, it is crucial to enhance the productivity of grain crops, particularly wheat, to avoid a food crisis and maintain a high level of self-sufficiency in grain.

DISCUSSION

Agriculture represents a significant component of Kazakhstan's economy. Sown area, yield, and gross harvest are the primary criteria for assessing success in grain cultivation (Hartmane et al., 2024). Analysis reveals that the sown area for grain, legumes, and rice in Kazakhstan increased by 32.2% from 2004 to 2023, with gross harvest rising by 38.2% and yield improving by 17% over the same period. The Akmola Region consistently accounts for the largest sown area among all regions of Kazakhstan, a trend that has persisted since 2004. The analysis indicates that Kazakhstan reached its peak gross grain harvest in 2011, and the figure has continued to rise since 2012. However, between 2019 and 2023, fluctuations in both gross harvest and yield levels were observed. Notably, a downturn in these metrics coincided with global events such as the SARS-CoV-2 pandemic and Russia's full-scale invasion of Ukraine. Similar conclusions were drawn by L. Liu et al. (2023), who investigated the impact of global shocks on grain trade. They found that the pandemic heightened Central Asian countries' reliance on Ukrainian and Russian grain. In 2021, Kazakhstan, alongside Eritrea, Mongolia, and Armenia, sourced 99% of its wheat from Russia and Ukraine (Babets et al., 2024). The onset of the Russian-Ukrainian war in February 2022 led to a 50% reduction in grain imports from these two countries to Kazakhstan (Kim et al., 2025). However, the findings of this study demonstrate that imports accounted for only 6-8.1% of Kazakhstan's total grain resources. Thus, the claim that the Russian-Ukrainian war significantly impacted Kazakhstan's grain resources was not supported by this research. It was established that the war influenced grain price dynamics rather than import volumes. This aligns with the conclusions of T. Hassen and B. Bilali (2022), who, in their study on food security, argued that military conflicts primarily affect pricing policies.

The period from 2019 to 2023 was selected for a more detailed analysis. Given the numerous advantages of grain cultivation in Kazakhstan, this market was examined over the specified timeframe across five key aspects: production, consumption, foreign economic activities, price dynamics, and self-sufficiency levels. These findings align with the conclusions of C. Elleby et al. (2019), who studied changes in the global agricultural market following the pandemic. Their research highlighted that the pandemic and its aftermath impacted not only grain cultivation but also its pricing mechanisms. However, the present study did not account for other potential determinants of influence. For instance, possible climatic changes in Kazakhstan, which might have affected grain production, were explored by X. Yu et al. (2020). The researcher suggested that Kazakhstan could enhance its grain exports and reduce imports due to climatic factors, particularly changes in precipitation levels and temperature. An increase in rainfall by 1 millimetre from the late spring through the summer months could potentially boost wheat exports by 0.7% and decrease imports by over 1.5%. An increase in temperature by 1°C, starting from the late spring through the summer months, could potentially lead to an increase in wheat exports by over 20% and a reduction in imports by more than 49%. Examining the impact of climate change on production in the agricultural sector, M. Habib-ur-Rahman et al. (2022) determined that a decrease in minimum temperatures by 2.2°C and an increase in maximum temperatures by 2.8°C could result in a 12% decline in wheat yields and a 17.2% decrease in rice yields. In their study of the global grain market, O. Balkhausen and S. Vogel (2012) noted that favourable climatic conditions in 2011 contributed to record wheat productivity on a global scale and a sharp rise in wheat yields in Kazakhstan.

In analysing grain productivity in Kazakhstan, the following indicators were considered: production levels, the structure of gross output, and key producers. Grain production decreased by 6.1% during the study period. The largest share of total grain production in Kazakhstan was accounted for by winter and spring wheat, representing over two-thirds of the total gross grain harvest. The primary producers of grain were agricultural enterprises, which cultivated the majority of the grain crops. Despite the Akmola Region having the largest sown area for grain, the highest yields were recorded in the Qyzylorda Region. When examining grain consumption within the country, the following indicators were analysed: industrial usage, consumption for food purposes, and individual consumption by the population. The use of harvested grain for livestock and poultry feed decreased by more than 33%, reflecting a decline in livestock farming activities. Conversely, the use of grain for sowing purposes increased by 14.3%, and for food purposes by 4.5%.

An analysis of grain price trends revealed that the pricing of Kazakhstan's grain market is predominantly influenced by external factors and closely linked to the global grain price index, rather than by domestic determinants (Yaheliuk *et al.*, 2024). However, in studying the relationship between prices and wheat self-sufficiency, T. Tanaka and J. Guo (2020) concluded that the interplay between global and local prices is bidirectional, with self-sufficiency playing a crucial role in mitigating external impacts of international price volatility. An evaluation of Kazakhstan's foreign economic activity in the grain sector indicated that during 2019-2023, the grain market operated through both domestic and external sources, with production exceeding imports. Imports increased by more than sevenfold during the period. The largest share of grain imports into Kazakhstan consisted of wheat and meslin.

According to the findings of C. Elleby *et al.* (2019), the consequences of the pandemic, such as supply chain disruptions and income losses, led to food insecurity in many countries. However, based on the present study, an analysis of grain self-sufficiency in Kazakhstan reveals a decline in this indicator during 2021 and 2023. Nonetheless, this did not prevent the country from maintaining a high level of self-sufficiency in grain without compromising food security, even while accounting for exports. The researchers also determined that self-sufficiency is directly influenced by the size of sown areas. In examining food security across Central Asian countries, Y. Zhao *et al.* (2022) argued that many nations in the region have a surplus of agricultural land, meaning the available agricultural area exceeds domestic demand. This characteristic is also evident in Kazakhstan, where agricultural land reserves surpass domestic requirements. Consequently, the country has significant potential to expand its exports in this sector. Research into Kazakhstan's grain trade potential by Y. Wang *et al.* (2022) suggested that, despite holding a small share in the global grain market, the country has strong export advantages in wheat, buckwheat, and barley. These findings partially align with the results of the present study.

To achieve the government's goal of increasing agricultural exports by 2030, and given the trends in consumption and yields, Kazakhstan must enhance wheat productivity to maintain a high level of self-sufficiency and prevent a domestic food crisis. These conclusions align with the study by M. Wang and F. Wei (2021) on regional disparities in grain production efficiency in Kazakhstan. The researchers emphasised the importance of increasing grain production to support potential export growth, particularly to the People's Republic of China. Further, a more detailed analysis of Kazakhstan's grain market is required to deepen understanding and optimise development strategies.

CONCLUSIONS

Grain is a vital commodity for Kazakhstan's national economy. Significant fluctuations in grain production indicators, particularly evident from 2019, prompted a detailed analysis of the Kazakh grain market between 2019 and 2023. Given its high liquidity and profitability, the grain market holds a prominent position within the agricultural sector. Grain production trends from 2019 to 2023 indicate a 1.7% decline in production growth rates, a 9.6% reduction in grain crop yields, and a 3.9% increase in sown areas. The market remains heavily concentrated on a single type of grain – winter and spring wheat. Additionally, over half of the total grain production is carried out by agricultural enterprises, which demonstrate the highest efficiency in the Qyzylorda Region. This region consistently reports the highest annual yields for cereals, legumes, and rice. Grain utilisation trends show a 33.3% decline in its use as livestock and poultry feed, alongside a 14.3% increase in its use for seeding purposes. Processing grain for food purposes and other industrial uses grew by 9.8% and 10.5%, respectively. Grain losses decreased by more than 1.5 times over the study period, while personal consumption by the population remained stable from 2019 to 2023, accounting for no more than 1.2% of the total grain usage in the country. Price formation in the grain market is predominantly influenced by external determinants rather than internal factors.

The grain market in Kazakhstan operates through both external and internal sources. Export and import trends for grain during the analysed period demonstrate a more than sevenfold increase in imports and a 1.2-fold increase in exports. Self-sufficiency in grain decreased in 2021 and 2023, yet this did not pose a threat to food security and allowed for continued grain exports. Thus, Kazakhstan needs to develop its grain market by increasing production and focusing on an export-oriented strategy. A limitation of this study is the absence of analysis of additional factors influencing the market's functioning beyond external global shocks, such as the pandemic and the Russian-Ukrainian war. For instance, the importance of weather conditions, soil fertilisation, and other factors in grain cultivation warrants further exploration.

Kazakhstan's grain market demonstrates effective performance indicators and significant development potential. To formulate improvement measures, further research is essential. It would be prudent to analyse the market in greater detail through the lens of sustainability – not only from an economic perspective but also from social and environmental viewpoints. This approach would enable an assessment of the grain market in Kazakhstan in the context of sustainable development, identifying challenges that need to be addressed in both the short and long term. Addi-

tionally, it would be beneficial to evaluate all factors affecting the wheat market to identify vulnerabilities and develop measures for enhancing the export-oriented development strategy, considering emerging challenges.

None.

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CONFLICT OF INTEREST

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Ринок зернових культур у Казахстані: економічний аналіз експорту та внутрішнього споживання

Асель Рахімбекова

Доктор філософії, доцент
Університет Есіль

010005, вул. Жубанова, 7, м. Астана, Республіка Казахстан
<https://orcid.org/0000-0001-6144-1844>

Айгуль Мухамеджанова

Доктор філософії, доцент
Університет Есіль

010000, вул. Жубанова, 7, м. Астана, Республіка Казахстан
<https://orcid.org/0000-0001-8891-3522>

Аліхан Бабасов

Доктор філософії, доцент
Університет Есіль

010000, вул. Жубанова, 7, м. Астана, Республіка Казахстан
<https://orcid.org/0009-0003-6973-5312>

Жанат Абжан

Доктор філософії, доцент
Університет Есіль

010000, вул. Жубанова, 7, м. Астана, Республіка Казахстан
<https://orcid.org/0000-0001-9673-2107>

Нургуль Шайхенова

Доктор філософії, доцент

Казахський агротехнічний дослідницький університет імені С. Сейфуліна

010000, просп. Женіса, 62, м. Астана, Республіка Казахстан
<https://orcid.org/0000-0003-2925-1631>

Анотація. Мета даного дослідження полягала у виявленні сучасних тенденцій функціонування ринку зерна в Казахстані. Інтерес представив аналіз показників виробництва, споживання, експорту та імпорту, динаміки цін і показника самозабезпечення зерном у Казахстані за 2019-2023 роки. У дослідженні аналізувалися офіційні статистичні дані функціонування казахстанської сільськогосподарської галузі та ринку зерна. У цьому дослідженні було проведено комплексний аналіз ринку зернових. В результаті аналізу статистичних даних встановлено як позитивні, так і негативні тенденції, які чинили значний вплив на ринок зернових культур в Казахстані за 2019-2023 роки і продовольче самозабезпечення країни. У результаті аналізу встановлено, що темпи виробництва знизилися на 1,7 %, а показники споживання зерна характеризувалися зниженням виробничого споживання на 16,7 %, але збільшенням споживання на посівні цілі. Особисте споживання населенням щорічно не перевищувало 1,1 % від загального обсягу використання зерна в країні. Збільшення посівних площ на 3,9 % не призвело до збільшення врожайності, яка зменшилася на 9,6 %. Найбільша врожайність спостерігалася в Кизилординській області, де найбільше вирощувалася пшениця. Імпорт не перевищував експорт, але з плином часу збільшився більш ніж у 7 разів. За досліджуваний період збільшилися запаси зерна в країні на 9 % та значним збільшенням цін на ринку. Такі показники не завадили Казахстану залишатися країною з високим рівнем самозабезпечення зерном і надають можливість надалі розвивати експорт зернових культур. Дане дослідження вносить нові дані в майбутній розвиток ринку зерна в країні, оскільки встановлено, що експортоорієнтована стратегія з подальшим збільшенням виробництва може бути одним із варіантів успішного розвитку галузі без загрози продовольчої кризи та зі збереженням високого рівня самозабезпечення зерном

Ключові слова: виробництво; посівна площа; рівень самозабезпечення; баланс ресурсів; індекс цін