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Optimisation of credit strategies in the agro-industrial complex under conditions of market instability

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Abstract. The purpose of this study was to analyse the problems of lending to the agro-industrial complex of Kazakhstan and to develop a methodology for its sustainable financing. The study was based on a systematic approach, including theoretical analysis of economic and financial factors, comparative analysis of international practices, as well as the development of subsidy, insurance, and monitoring methods to optimise the sustainability of lending to the agro-industrial complex. The findings of the

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study revealed that ensuring the sustainability of lending to agro-industrial complex requires a comprehensive approach, including the integration of mechanisms of state regulation, market instruments, and risk management methods. The analysis of existing practices of agro-industrial complex financing in Kazakhstan revealed that the key problems continue to be the high cost of borrowed funds (in 2024 the loan rate was 6% for soft loans, and reached 25-27% in the case of commercial loans), limited access of small and medium-sized farmers to credit resources, as well as the underdevelopment of agricultural risk insurance mechanisms. In this context, the study confirmed the effectiveness of such instruments as interest rate subsidies, state credit guarantees, and the expansion of preferential lending programmes for agricultural producers. According to the findings, this enabled small farmers to access financing in the amount of 10 billion tenge and increase production capacity by 15-20%. Additionally, the study found that in an unstable macroeconomic environment, regular monitoring of macroeconomic factors and adaptation of credit policy to changes in financial markets are significant, as a tonne of grain cost around 80,000 tenge in 2020 and could reach 135,000 tenge by 2024. The use of digital platforms and analytical tools to assess risks and forecast market trends can greatly improve the efficiency of agribusiness credit management. Furthermore, international practices in agricultural finance, particularly models of credit support used in developed and transition economies, can be adapted to the conditions of Kazakhstan, considering the specific features of its agricultural sector and financial system. The obtained findings provided a basis for improving the mechanisms of lending to the agro-industrial complex, increasing the availability of financial resources for agricultural producers, and minimising credit risks in conditions of economic instability

Keywords: macroeconomic factors; subsidies; insurance; agricultural products; currency fluctuations; financing; interest rates

INTRODUCTION

The agro-industrial complex (AIC) plays a key role in the economy, providing food security, employment, and export potential. Its development depends on the availability of financing, long-term investments, and the stability of credit mechanisms. High capital intensity, seasonality, and income instability make the sector less attractive to lending institutions, while macroeconomic instability, volatile interest rates, and poorly developed agricultural risk insurance force farmers to turn to short-term loans with high costs. Measures to subsidise interest rates, develop insurance mechanisms, and improve risk management are required to increase the sustainability of financing. The use of international practices will enable the creation of a stable financial system that supports the modernisation of the agricultural sector, increases its competitiveness, and reduces the influence of external economic factors.

One of the principal factors affecting the sustainability of lending to the agro-industrial complex is the difficulty of forecasting risks associated with market volatility (Boiko *et al.*, 2024). R. Tazhibayeva (2021) noted the effects of market fluctuations on credit availability for agrarians, emphasising the significance of state support for agribusiness, but without considering long-term market volatility and its impact on risk forecasting under volatile conditions. G. Esimkhan *et al.* (2024) also considered risks associated with market volatility, focusing on short-term price changes and their effects on financial flows of agricultural producers, but the study did not address the factors of predicting long-term market trends, which limited the applicability of its findings in conditions of uncertainty and high volatility inherent in modern agricultural markets.

External factors such as changes in international trade and global economic crises also significantly affect the sustainability of agribusiness lending (Luchechko & Gordiichuk, 2023). M. Afolabi *et al.* (2021) examined the effects of external economic instability on credit availability of agrarians, revealing the value of risk diversification using currency hedges, but without considering the effects of global economic crises on long-term credit strategies, which limited its application in the face of global uncertainty. R. Sodoma *et al.* (2021) highlighted the influence of international trade on agrarian credit, emphasising the significance of foreign trade for the agribusiness sector as well as the role of international financial institutions in supporting agribusiness, but without considering the relationship between external economic shocks and internal economic conditions, making the conclusions insufficiently precise for real-world application. T.G. Abdulova *et al.* (2022) examined the state of bank lending to agricultural enterprises in Kazakhstan, identifying problems of access to credit and noting insufficient financial support to the agribusiness sector, but without addressing the influence of macroeconomic factors, which limited the generalisability of the findings.

Instability of financial institutions also poses a serious threat to the sustainability of lending to the agro-industrial complex, as economic shocks in the banking sector can lead to limited availability of credit resources and increase the cost of borrowing for agricultural producers. S. Khalatur *et al.* (2023) focused on analysing the impact of banking system crisis on the availability of financial resources for agribusinesses,

identifying key risks for agrarians in the context of instability of financial institutions, but not considering the long-term effects of such crises, thus limiting the scope of application of their findings. J. Glauber *et al.* (2021) investigated the measures taken by public and private financial institutions to ensure the sustainability of agricultural credit in the face of financial shocks, but without considering the possibility of integrating the latest financial instruments, which limited the practical relevance of the findings for the development of the agricultural sector in the long term. Y. Liu *et al.* (2022) analysed the effects of financial crises on financial institutions working with the agricultural sector and proposed a series of methods to stabilise lending, but without assessing the impact of financial risks specific to the agricultural sector, which limited the accuracy of the proposed solutions for agribusiness in the context of global economic instability.

The purpose of the present study was to develop an effective methodology for assessing and optimising the sustainability of agribusiness lending under conditions of market instability. To fulfil this purpose, the objectives of the study included the analysis of the current problems of lending to agribusiness associated with market volatility, instability of financial institutions and external economic factors; development of recommendations to improve credit mechanisms for agrarians, including the optimisation of state support programmes, and the use of alternative financial instruments that help reduce risks and improve the availability of credit resources to agricultural producers.

MATERIALS AND METHODS

The methodology for assessing and optimising the sustainability of lending to the agro-industrial complex was based on a comprehensive study of financial, institutional, and macroeconomic factors affecting the availability and stability of credit resources in the agro-industrial complex, as well as on market mechanisms and risk management. The study employed a systematic approach that allowed considering the interconnection of various elements of financial infrastructure, such as credit institutions, state regulators, and agrarian enterprises. The study was based on a comprehensive analysis of materials that included official statistical data, regulations, strategic documents, and reports of state and international organisations handing the issues of financing and lending of the agro-industrial complex. This approach helped to assess the current state of the lending system in the agricultural sector, as well as to identify internal and external factors affecting its stability and efficiency. Particular attention was paid to the study of international best practices aimed at increasing the availability of financial resources for agricultural producers, development of risk minimisation tools, as well as the application of public and private financing mechanisms.

The principal sources of information included data from the National Bank of Kazakhstan (n.d.), specifically, reports on monetary policy, official statistical compilations and analytical reports containing information on the dynamics of interest rates, the structure of the loan portfolio of second-tier banks, and the volume of financing of the agro-industrial complex. The study also used the materials from the Ministry of Agriculture of the Republic of Kazakhstan (n.d.), including annual reports on the development of the agrarian sector, strategic documents related to the financial support of agrarians, and regulations governing the procedure for subsidising interest rates and granting soft loans to agricultural producers. Additionally, the Ministry of National Economy of the Republic of Kazakhstan (n.d.) reports containing macroeconomic indicators, forecasts on inflation, exchange rate, and other factors affecting the availability of credit resources for agribusiness, as well as open data from the Bureau of National Statistics (n.d.) were studied. The study used analytical materials from Agrarian Credit Corporation (n.d.), including information on existing agricultural finance programmes, as well as reports from Baiterek National Managing Holding Joint Stock Company (n.d.), which coordinates government policy on agricultural finance.

International sources included statistics and analytical publications of the World Bank Group (n.d.), specifically, reports on the investment climate in Kazakhstan and assessment of the stability of financial institutions, as well as reports of the International Monetary Fund (IMF) (n.d.), containing macroeconomic assessments of the sustainability of the country's credit system. A significant role in the analysis was played by the materials of the Food and Agriculture Organisation of the United Nation (FAO), including reports on sustainable development of the agricultural sector and adaptation of agricultural producers to economic instability (Resolution of the Government of the Republic of Kazakhstan No. 960, 2021). To examine the international practices of crediting the agro-industrial complex, the study used the reports of the Organisation for Economic Co-operation and Development (OECD) (n.d.), which analysed the mechanisms of agricultural support in countries with developed and transition economies. The study also considered the research of the European Bank for Reconstruction and Development (EBRD) (n.d.) on the issues of financing the agro-industrial sector in the countries of Central Asia, as well as publications of the Asian Development Bank (ADB) (n.d.), which included recommendations for improving agricultural policy and access to financial resources.

RESULTS

Kazakhstan's agro-industrial complex is a strategically significant sector of the economy that ensures internal food security and a considerable share of the country's exports. In 2024, the contribution of the agro-industrial

complex to the gross domestic product (GDP) was about 5.2-5.5%, which is equivalent to more than KZT 4.8 trillion. Therewith, this indicator showed a steady upward trend despite macroeconomic challenges. The structure of agricultural production in Kazakhstan is mainly represented by crop production (about 60% of total production), livestock breeding (38%), and agro-processing (2%). One of the most competitive segments of the agro-industrial complex is the grain sector, which provides Kazakhstan with a strong position in the world market. According to the Food and Agriculture Organisation of the United Nations (n.d.), Kazakhstan ranks 7th in the world in wheat exports, behind such leaders as the USA, Canada, and the European Union (EU). In 2024, wheat exports were estimated at ~8.5 million tonnes, with the geography of supply covering over 30 countries, including Uzbekistan, China, Afghanistan, and Iran.

The flour milling industry deserves special attention, where Kazakhstan consistently ranks 1st in the world in flour exports. In 2024, Kazakhstan's flour exports reached 1.9 million tonnes, which was greater than its nearest competitors such as Turkey. The high export potential is explained not only by favourable climatic conditions for growing durum wheat, but also by the developed network of milling complexes, most of which are located in Northern and Southern Kazakhstan. Apart from its economic role, Kazakhstan's agriculture plays a vital social function. The sector employs more than 1.3 million people, which is over 20% of the economically active population of the country. The dependence of rural regions on agro-industrial production is particularly strong: for instance, in Kostanay and North Kazakhstan regions, up to 45% of the employable population is working in agriculture.

At the same time, despite its promising potential, Kazakhstan's agro-industrial complex faces a series of financial constraints, among which the excessive cost of loans continues to be one of the key problems. The average interest rate on loans in Kazakhstan ranges from 12-25% per annum, which is significantly higher than in some other agricultural countries (Table 1). For instance, the EU has preferential loan programmes with rates of 2-5% per annum.

***Table 1**. Indicators of lending to the agro-industrial complex of Kazakhstan in 2021-2024*

Indicator	2021	2022	2023	2024
Volume of investments in agriculture	KZT 704.8 bn	KZT 853.5 bn	KZT 910 bn	KZT 980 bn
Average interest rate on agricultural loans	15.9-18%	15.9-20%	6% (preferential) and 22-25% (commercial)	6% (preferential) and 25-27% (commercial)
Volume of lending to agriculture (including soft and commercial loans)	KZT 600 bn	KZT 725 bn	KZT 800 bn	up to KZT 900 bn
Total volume of concessional lending	KZT 400 bn	KZT 510 bn	KZT 550 bn	Over KZT 600 bn
Number of loans issued	~20,000	~22,000	~22,000-23,000	up to 25,000
Share of concessional loans in the total volume of lending to the agro-industrial complex	65-70%	70%	70-75%	about 75%
Volume of overdue debt (share of non-performing loans)	14-15%	13-15%	~13%	~11-12%

***Source:** compiled by the authors of this study based on Olzhas Bektenov on support for farmers: For the first time the volume of preferential lending has reached 580 billion tenge (2024); A. Tishchenko (2024); Agricultural lending in the Republic of Kazakhstan for 2021 (2021)*

Several factors contribute to the elevated interest rate environment in Kazakhstan. Agriculture continues to be a high-risk sector for banks and other lenders due to the seasonality of production, dependence on weather conditions, and fluctuations in commodity prices. Furthermore, inflation in Kazakhstan has historically been high, reaching 20.3 per cent. in 2022 and 11.8 per cent. in 2023, forcing banks to set interest rates accordingly. In 2024, inflation in Kazakhstan slowed to 8.6% compared to 9.8% in 2023. During this period, food prices rose by 5.5%, non-food prices – by 8.3%, and paid services – by 13.3% (Bureau of National Statistics, 2025). Despite the decline in the overall inflation rate, the significant surge in prices of paid services continued to put pressure on the financial sector, forcing banks to maintain corresponding interest rates. Furthermore, commercial banks are limited in long-term financing of the agro-industrial complex, as agrarian projects require a long payback period, and the banking system is oriented towards short- and medium-term loans. Access to credit is particularly problematic for small and medium-sized farms, which do not hold sufficient collateral assets. Banks require collateral covering 120-150% of the loan amount, which often becomes an insurmountable barrier for farmers. Land that could be used as collateral is state-owned and leased to farmers in Kazakhstan, which complicates lending. In addition, the market value of agricultural equipment used as collateral is estimated by banks at a discount of up to 50%, which limits the size of possible loans. Another factor complicating lending is the lack of flexibility in loan programmes. Most commercial

loans in Kazakhstan are issued for terms of 1 to 5 years, which does not always meet the real needs of agricultural producers. For instance, to purchase machinery or build livestock complexes, long-term loans for 7-10 years with a grace period are needed, but such offers are practically absent in the market.

Another key problem of lending in the agro-industrial complex of Kazakhstan is the limited availability of long-term loans. As of 2024, most bank loans in the agricultural sector were for up to 3 years, which does not correspond to the life cycle of agribusiness. For comparison, in EU and US countries, the term of agricultural lending reaches 7-15 years, which enables farmers to plan development for the long term and evenly distribute the financial burden. The short-term lending model creates particularly severe challenges for industries with a long payback period, such as livestock and horticulture. This is because growing perennial crops (orchards, vineyards) requires 5-7 years before reaching full yield, and the payback period of large livestock complexes (dairy farms, feedlots) takes at least 7-10 years. However, in conditions of a shortage of long-term financing, agrarians are forced to either attract expensive short-term loans or limit themselves to their personal resources, which decelerates the development of the sector. The lack of long-term loans also adversely affects the modernisation and technical re-equipment of the agro-industrial complex. For instance, the cost of modern grain harvesting equipment can reach KZT 200-300 mn, which makes its purchase impossible without borrowed funds. Therewith, a short-term loan with a high interest rate (15-20% per annum) increases the financial burden and reduces the profitability of the business. In developed countries, such capital expenditures are financed through 10-15-year loans with a grace period, which allows agrarians to invest in technological upgrades without major financial risks.

Another problem is the limited choice of financing instruments. In Kazakhstan, long-term loans are mainly provided by state development institutions, such as Agrarian Credit Corporation and the "Fund for Financial Support of Agriculture", but their programmes are insufficient to cover all the needs of the industry. Commercial banks, oriented towards faster capital turnover, are reluctant to lend to agriculture on a long-term basis for fear of high default risks. It is also worth noting significant factors that can lead to instability in the agro-industrial complex of Kazakhstan, including wide fluctuations in the prices of agricultural products, especially grain crops. Thus, according to the Ministry of Agriculture of the Republic of Kazakhstan (n.d.) and Bureau of National Statistics (n.d.), the price of wheat in Kazakhstan in 2020-2024 showed dramatic changes: in 2020 a tonne of grain cost about KZT 80,000, in 2021 the price increased to KZT 110,000, and by 2023 it reached KZT 135,000. In 2024, wheat prices in Kazakhstan also showed significant fluctuations. In September 2024, Prodkorporatsiya set purchase prices for Grade 3 wheat within KZT 85,000-110,000 per tonne, depending on gluten values (Zhazetova, 2024). Such fluctuations were driven by a series of factors, the key ones being changes in global market demand, climatic conditions, and logistical constraints.

At the global level, grain demand is determined by production volumes in the largest exporters (USA, EU), as well as by the geopolitical situation and trade sanctions (Liu *et al.,* 2023). For instance, wheat prices rose sharply in 2022 due to global supply disruptions caused by crises in the Black Sea region. In Kazakhstan, price increases were exacerbated by drought, which led to yield reductions of 15-20% in some regions, as well as by rising logistics costs. Specifically, a shortage of grain wagons and limited capacity of Kazakhstan's railway infrastructure hampered exports, leading to domestic price volatility. Strong price fluctuations adversely affect the financial sustainability of farmers. During periods of soaring prices, farmers can make considerable profits, but when prices fall sharply due to market saturation or reduced export demand, many farms face cash gaps and an inability to repay loan obligations. This situation increases the risk of loan defaults, making agricultural producers less attractive borrowers for banks.

Another critical factor of instability is the fluctuation of the tenge exchange rate, which directly affects the cost of agricultural production. Kazakhstan's agro-industrial complex is heavily dependent on imported goods – seeds, fertilisers, agricultural machinery, spare parts, and fuels and lubricants. All these components are purchased for foreign currency, and with the devaluation of the tenge, the cost of agricultural production automatically increases. Thus, according to the reports of the National Bank of Kazakhstan (n.d.b), in 2022 the dollar exchange rate increased from KZT 431 at the beginning of the year to KZT 470 at the end of the year, which led to an increase in the cost of imported agricultural technologies by an average of 9%. Therewith, the cost of mineral fertilisers, such as urea and ammonium nitrate, increased by 15-20%, which greatly increased farmers' production costs (KazAzot announces prices…, 2023). Thus, while in 2021 the price of a tonne of ammonium nitrate was around KZT 140,000, in 2023 the price exceeded KZT 180,000. In 2024, the price of ammonium nitrate in Kazakhstan also continued its growth. According to the data, as of mid-2024, the wholesale price of ammonium nitrate in Almaty was between KZT 235,000 and KZT 255,000 per tonne. Thus, compared to 2023, there was a marked increase in the cost of this crucial fertiliser in 2024 (Ammonium nitrate b…, n.d.).

Exchange rate fluctuations are particularly hurtful for farmers who have loans in foreign currency. In Kazakhstan, some agricultural holdings and large farms borrow in dollars or euros because international financial institutions offer lower interest rates. However, with

the sharp weakening of the tenge, servicing such loans becomes more challenging, increasing the debt burden and reducing business profitability. Furthermore, the devaluation of the tenge also affects the cost of diesel fuel, which is a key consumable in agriculture. Kazakhstan produces major volumes of petroleum products, but fuel prices depend on global conditions and domestic regulatory decisions. In 2023, the cost of diesel fuel increased from 230 KZT per litre to 295 KZT per litre, which increased farmers' costs for sowing and harvesting campaigns (Information and reference..., 2024). In 2024, the cost of diesel fuel in Kazakhstan continued to rise. From 17 May 2024, new retail price ceilings were set: for foreign citizens, diesel fuel (summer and off-season) cost 315 KZT per litre, while for Kazakh citizens with a driver's licence the price was 295 KZT per litre for up to 100 litres per day, which increased farmers' costs for sowing and harvesting campaigns.

The geopolitical situation in the world also significantly affects Kazakhstan's economy, and the agro-industrial complex is no exception. In 2020-2022, external factors such as sanctions restrictions, changes in trade routes and rising logistics costs put considerable pressure on Kazakhstan's agricultural exports. The changes were particularly strong from 2022 onwards, when international sanctions against Russia and related transit transport restrictions led to changes in export routes. Prior to 2022, a sizeable portion of Kazakhstan's grain and flour exports travelled through Russian ports on the Black and Baltic Seas. However, the imposed sanctions made transit through Russia more cumbersome and caused disruptions in transport chains (Consequences of Russia's..., 2024). As a result, Kazakh exporters had to switch to alternative routes, including the Trans-Caspian International Transport Route (TCITR), which runs through the Caspian Sea, Azerbaijan, and Turkey. While this route enabled diversification of exports, it proved to be significantly more expensive. For instance, while grain delivery through Russian ports cost on average USD 30-40 per tonne, logistics costs through the TCITR rose to USD 70-80 per tonne. This led to a decrease in the competitiveness of Kazakh products on world markets, as their production costs increased. Analogous problems arose in the export of agricultural products to Central Asian countries, which are historically key consumers of Kazakh flour, wheat and oil. Sanctions restrictions and transit problems led to delays in deliveries and increased transport costs, resulting in a 15-20% increase in the cost of grain delivery to Uzbekistan compared to 2021 (Uzbekistan again became..., 2023).

Another factor worsening the situation was overloaded railway infrastructure. The disruption of usual export routes increased the load on Kazakhstan's railways, especially on the Trans-Caspian corridor. This caused many agro-exporters to face a shortage of grain cars in 2022-2023, which led to contract cancellations and delays in deliveries. This forced companies to look for alternative means of delivery, including road transport, which is more expensive, which also adversely affected the profitability of exports as the added transport costs reduce producers' margins (Fernandes *et al.,* 2023).

China is a strategically significant market for Kazakhstan, but challenges emerged there as well. Kazakhstan's grain, oil, and meat shipments to China increased in 2023-2024, but stringent phytosanitary requirements and periodic border crossing restrictions posed extra obstacles. In 2022-2023, due to changes in China's quarantine policy (related to COVID-19 and other sanitary risks), repeated delays in cargo clearance occurred at the border, resulting in rail car downtime and greater logistics costs. Furthermore, the capacity of railway border crossings between Kazakhstan and China is limited, creating bottlenecks in the transport system. Thus, geopolitical instability, sanctions restrictions, changes in logistics routes, and other factors discussed earlier have become serious challenges for Kazakhstan's agribusiness, increasing risks for agro-producers and forcing them to adapt to the new economic reality. These conditions challenge agro-producers to react quickly to changes in the market situation, prices for agricultural products, as well as external economic factors, such as currency fluctuations and changes in logistics conditions. In this environment, ensuring the sustainability of financial flows in the sector and access to necessary credit resources becomes one of the key factors for maintaining the normal operation of the agro-industrial complex.

Based on the above-mentioned factors, a methodology was developed to assess and optimise the sustainability of lending to the agro-industrial complex of Kazakhstan under conditions of market instability, which considers various economic and external economic factors, which will enable effective adaptation of credit strategies to changing conditions (Fig. 1).

The assessment of the current state of lending and economic sustainability of the agro-industrial complex in conditions of instability requires a comprehensive approach, which includes in-depth analysis of a variety of factors affecting the availability and efficiency of credit resources. First of all, the importance of assessing the risks associated with price volatility should be noted, as the agribusiness sector is traditionally subject to sharp fluctuations in the prices of key agricultural products. Unpredictable weather conditions, changes in international politics, and fluctuations in demand for agricultural products can cause sharp price volatility, which increases the financial burden on agricultural producers and increases the risk of loan defaults. For example, the price of wheat in Kazakhstan in 2020 was around KZT 80,000 per tonne, but in 2023 it reached KZT 135,000, which was 68% greater (Bureau of National Statistics, n.d.). Such price hikes pose serious challenges for long-term financial planning,

as seed, fertiliser, and fuel costs do not always change proportionately with income. Analogously, the cost of ammonium nitrate increased from KZT 140,000 to over KZT 235,000 per tonne between 2021 and 2024, while diesel fuel rose from KZT 230 to KZT 295 per litre over the same period, increasing the cost of agricultural production (KazAzot announces prices..., 2023; Information and reference..., 2024). Considering this, special mechanisms must be put in place to mitigate these risks, such as the use of futures contracts to hedge price risks. For example, farmers could enter into forward contracts for grain at a fixed price, which would enable them to fix their income level in advance and minimise the effects of market fluctuations. Furthermore, the development of state income insurance programmes and stabilisation funds will reduce the impact of sharp changes in market conditions. Together, these instruments can improve the financial sustainability of the agricultural sector, ensuring predictability of cash flows and reducing the probability of credit defaults.

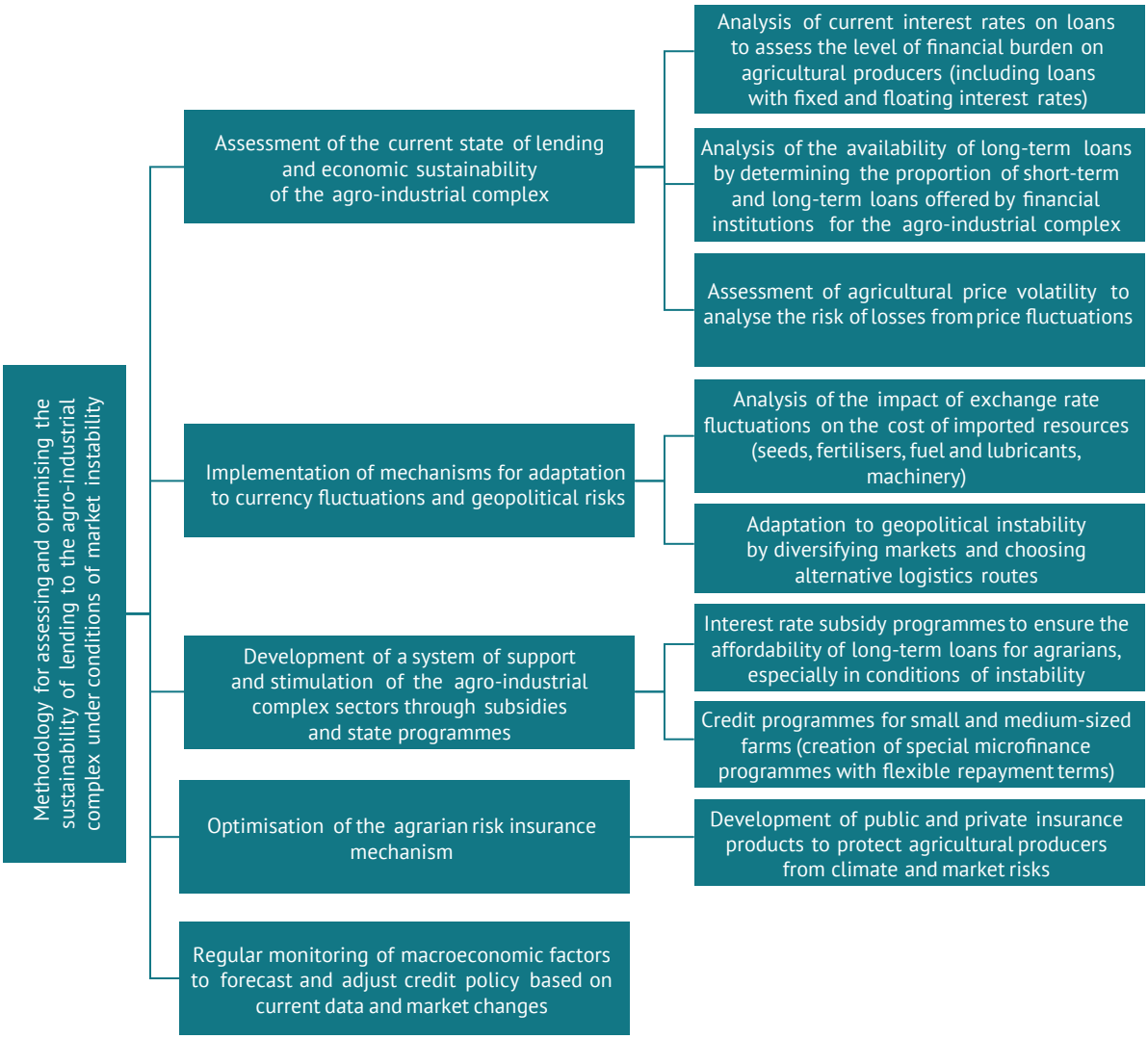

Figure 1. *Developed methodology of assessment and optimisation of sustainability of lending to the agro-industrial complex of Kazakhstan under conditions of market instability*
Source: *compiled by the authors*

For agricultural producers, the creation of stabilisation funds that would provide a financial safety cushion in case of sharp drops in product prices is also an essential tool. For example, the creation of a fund to compensate for losses from falling grain or meat prices could play a key role in supporting agribusiness in times of crisis. In 2022, when wheat prices in Kazakhstan fell by 15% year-on-year, a stabilisation fund could compensate for some of the agrarians' losses, preventing financial distress and loan defaults. Moreover, in conditions of currency volatility, attention should be paid to currency risks. For the agro-industrial complex of Kazakhstan, where a significant part of resources (seeds, fertilisers, machinery) is imported, exchange rate fluctuations play a key role in the formation of production costs. For example, in 2022, a 10% devaluation

of the Kazakh tenge against the US dollar led to a 12% increase in the cost of fertilisers and an 8% increase in the cost of agricultural machinery, which greatly increased the prime cost of agricultural products (Bureau of National Statistics, n.d.).

Currency devaluation, as a rule, leads to an increase in the cost of imported goods and services, which increases the financial burden on agricultural producers and complicates debt servicing for them. In such a situation, one solution is to use currency hedging mechanisms, e.g., through currency futures contracts or currency risk insurance. For example, farmers could contract with banks for a fixed exchange rate for a fixed period, which would allow them to reduce uncertainty and plan costs more accurately. It is also possible to provide credit resources in a currency that is linked to Kazakhstan's key trading partners, such as the Russian rouble or the Chinese yuan. This will allow agro-producers to avoid increased costs in case of tenge devaluation. Assessing the sustainability of lending in the face of geopolitical instability is also a crucial aspect. In 2023-2024, amid sanctions and changes in the external political situation, Kazakhstan faced a drop in foreign trade with Europe and the US, which adversely affected the export-oriented agricultural sector. The projected adaptation of credit mechanisms should include the creation of conditions for diversification of foreign trade, for example, through the development of new trade routes and improved logistics. This would allow agro-producers to compensate for losses caused by external shocks and reduce dependence on a single source of income. Furthermore, improving internal infrastructure and developing alternative markets would greatly mitigate the effects of geopolitical instability on agricultural sustainability.

To achieve sustainable development of the agro-industrial complex, a prominent aspect is the development of an effective system of support and incentives for agricultural sectors through subsidies and government programmes. In conditions of economic instability, when market conditions can change rapidly, increasing the availability of credit resources and reducing the cost of lending become key factors for agrarians, contributing to the modernisation and development of agriculture. One notable method is the implementation of interest rate subsidy programmes. These programmes ensure the affordability of long-term loans for agro-producers, especially in an environment of increased inflation and economic uncertainty. In 2023, Kazakhstan allocated KZT 580 bn for concessional loans in the agro-industrial complex, which demonstrated positive changes in support for the agro-sector (Olzhas Bektenov on support..., 2024). This step has become a crucial tool in ensuring the sustainability of agribusinesses, especially for those interested in expanding production or introducing the latest technologies. A foreseeable future need includes the creation of specialised programmes focused on modernising agro-production and improving the financial performance of enterprises. This would not only improve financial conditions, but also stimulate investment in the latest technologies, productivity and competitiveness of the sector.

Credit programmes for small and medium-sized farms are an equally significant element in the AIC support system. Small farmers, as a rule, face great challenges in obtaining loans, as they cannot provide sufficient collateral to secure the loan. In such cases, support in the form of microfinance programmes with flexible repayment terms is particularly valuable. These programmes provide access to finance for farmers struggling to access conventional credit markets and improve their production capacity. An example of a successful programme is the interest rate subsidy in 2023, which provided smallholder farmers with access to finance, helping to increase their production capacity and improve their financial performance. The programme has provided loans worth over KZT 10 billion, allowing 3,500 small farms to increase production by 15-20% (Bureau of National Statistics, n.d.). In the future, it is worth developing these programmes to include not only small but also medium-sized farms to stimulate growth and development of the sector at all levels. A major step could also be to expand access to concessional loans for modernisation of equipment and introduction of innovative technologies, which would help to increase the competitiveness of the agricultural sector in international markets.

One of the key measures to optimise the sustainability of Kazakhstan's agricultural sector in conditions of instability is the development and introduction of an effective mechanism for insurance of agricultural risks. The development of comprehensive insurance products covering both climatic and market risks is critical for improving the sustainability of agribusiness and ensuring its financial stability. The primary method of optimising the insurance mechanism is to create public and private insurance products that would protect agricultural producers from risks associated with adverse weather conditions (droughts, floods, frosts, and other climatic anomalies) and market instability (fluctuations in product prices). An example of a successful government programme is "Agroinsurance", which was launched to support farmers in case of damage caused by adverse weather conditions (About 3.3 billion..., 2021). This programme provides subsidised insurance policies, making them affordable to most agricultural enterprises. In 2023, thousands of hectares of agricultural land were insured under the programme, demonstrating a positive effect in reducing agro-producer losses and increasing confidence in insurance (Voluntary insurance in..., n.d.). The forecast for further development of agrarian risk insurance assumes expansion of existing programmes considering changes in the external economic environment. It is essential

that insurance products not only protect against natural catastrophes, but also consider risks associated with external economic instability, such as exchange rate fluctuations and changes in external demand for products. These changes can greatly affect the financial stability of agro-producers, and therefore the development of programmes that could compensate for such risks would contribute to improving the overall situation in the agro-industrial complex.

It should be emphasised that forecasting and adapting credit policies require constant monitoring of macroeconomic factors such as changes in interest rates, currency fluctuations, and fluctuations in agricultural prices. These factors significantly affect the financial sustainability of agrarians and may require a prompt response from financial institutions and the government. Regular monitoring of macroeconomic indicators allows for prompt adjustment of lending terms in response to changes in the external economic environment. Changes in interest rates on world markets or currency fluctuations may require a revision of lending rates in the national economy. In 2022 in Kazakhstan, the rise in the dollar led to higher prices for imported inputs and increased costs of agricultural production (Bureau of National Statistics, n.d.). Under such conditions, it is vital to adjust credit conditions in time to reduce the financial burden on agricultural producers.

Furthermore, monitoring the prices of agricultural products, including major export commodities such as wheat and barley, allows forecasting future fluctuations in the profitability of agrarians and, accordingly, adjusting credit policy. For example, in 2023-2024, rising wheat prices on the world market could reduce risks for Kazakhstan's agro-producers, but at the same time, price volatility also carries risks associated with possible price drops. This requires the introduction of flexible lending models that can adapt to the market situation. Looking ahead, it is essential to introduce digital platforms to monitor macroeconomic data in real time. Such platforms provide up-to-the-minute information on the current state of the economy, enabling financial institutions and agro-producers to better manage credit risks and adjust strategies in response to changes in the external and internal environment. The use of digital technologies for data collection and analysis can optimise credit strategies and increase predictability in volatile market conditions, which helps to reduce financial risks and improve the resilience of agribusinesses. Table 2 presents the assessment steps, parameters, methods, and tools for optimising the sustainability of agribusiness lending.

***Table 2**. Assessment stages, parameters, methods, and tools for optimising the sustainability of agribusiness lending*

Assessment stage	Assessment parameters	Methods and tools	Goal and outcomes
1. Analysis of macroeconomic conditions	GDP, inflation, exchange rates, interest rates	Analysis of economic reports, monitoring of statistics	Assessing economic stability and forecasting the effects of macroeconomic changes on the agribusiness sector
2. Agribusiness risk assessment	Price volatility, weather conditions, market fluctuations, currency risks	Statistical forecasting models, scenario analysis, futures contracts	Determination of the effect of external risks on profitability and ability to repay loans
3. Analysis of public policy and regulation	Government subsidies, support programmes, tax incentives, export restrictions	Analysis of political and economic regulations, consultations with government agencies	Assessment of the impact of government initiatives on the availability of funding and subsidies provided
4. Assessment of credit resources	Credit terms, interest rates, availability of long-term loans, guarantees	Analysis of bank offers, comparison of interest rates	Determination of credit availability for agrarians and assessment of conditions for obtaining financing
5. Assessment of financial sustainability of agricultural enterprises	Liquidity, solvency, profitability ratios	Financial analysis, analysis of company statements	Assessment of the ability of enterprises to perform their loan obligations promptly
6.	Insurance products, risk coverage, insurance subsidies	Analysis of existing insurance programmes, examination of international practices	Assessment of the effectiveness of insurance mechanisms to protect against price and climate risks
7. Assessment of market-based lending mechanisms	Financing conditions, access to long-term investments, flexibility of credit mechanisms	Modelling of market situations, comparison of credit offers	Optimisation of credit conditions, facilitation of access to flexible credit mechanisms for agribusinesses
8. Assessment of the impact of geopolitical and external factors	Trade restrictions, currency fluctuations, geopolitical situation	Foreign policy analysis, economic and political situation in partner countries	Assessment of the effects of external factors on the financial stability of the agribusiness sector

***Source:** compiled by the authors*

The table above serves as the basis for a detailed methodology for assessing and optimising the sustainability of lending to the agro-industrial complex, which will enable an accurate assessment of the effects of various internal and external factors on the financial situation in the agricultural sector and identification of strategies to improve its sustainability. Optimisation of the sustainability of agribusiness lending through the implementation of the proposed methodology contributes to the solution of a series of critical tasks for the development of agriculture in conditions of market instability. Creating conditions for obtaining long-term and affordable loans will reduce dependence on short-term borrowed capital, which, as a rule, is associated with high interest rates and major risks for agricultural producers. When agricultural producers are forced to turn to short-term loans, their financial sustainability becomes vulnerable, especially when the market situation or weather conditions change. The introduction of long-term lending mechanisms with optimum conditions will help to significantly reduce the burden on agribusiness, ensuring its stability and long-term sustainability.

The use of price risk hedging and insurance instruments will allow agro-producers to protect themselves from unexpected market fluctuations, which will increase the financial sustainability of the entire agribusiness. Agro-insurance programmes that cover losses from adverse weather conditions will help minimise losses associated with natural disasters such as droughts or floods, as well as fluctuations in the prices of key agricultural commodities. Diversifying risks and reducing dependence on external fluctuations helps to ensure that agribusinesses stay profitable and viable even in volatile environments. Furthermore, optimising the sustainability of lending in the agribusiness sector will greatly increase investment in the sector. Subsidising interest rates and creating incentive programmes for investment in the modernisation of agricultural production will help attract further capital investment. Investment in the latest technologies, agricultural machinery and infrastructure helps to increase the productivity and efficiency of agribusinesses. This is particularly significant in the context of global change when agriculture needs to adapt to emerging economic and climatic conditions. Support for investment programmes and financial accessibility will help to significantly increase the innovation potential of the agro-industrial complex and accelerate the process of its modernisation.

DISCUSSION

The findings of the present study provided a deeper understanding of the complexity and multifaceted nature of the problems faced by the agro-industrial complex of Kazakhstan in accessing credit resources. The identified problems indicated the presence of structural and systemic gaps that hinder the effective functioning of the financial system aimed at supporting agriculture. The observed challenges in ensuring the sustainability of lending, despite the existing state support programmes, highlighted the need for fundamental changes in approaches to financing the agricultural sector. These findings also pointed to weaknesses in the organisation of credit mechanisms, which may negatively affect the long-term financial stability and investment attractiveness of agricultural producers. Still, the analysis of the situation opened prospects for the development of more flexible and adapted models of financial support, which could increase the sustainability and independence of agrarians from external economic factors. K. Brockova *et al.* (2021) also highlighted the significance of adapting government programmes to changing market conditions, noting major advancement in the flexibility of approaches to support agrarians, but the drawback of this study was the limited consideration without accounting for the specifics of Kazakhstan's regions, which may affect the outcomes.

E.J. Kane (2021) examined approaches to agricultural subsidies and support, exploring useful methods to improve existing programmes, but at the same time, not paying due attention to the possible effects of international economic factors on the internal market, which limited its practical value for the specific situation of Kazakhstan. B.B. Balana and M.A. Oyeyemi (2022) focused on credit systems in developing countries using Nigeria as an example, emphasising the potential for transferability to other countries, but its findings were not fully applicable due to differences in economic structures and the level of development of the agricultural sector, which was a major limitation. Y. Xia *et al.* (2022) examined the potential of new financial instruments for the agribusiness sector, but did not explore in sufficient detail the risks associated with the instability of the global financial system, making the findings of the study somewhat incomplete. A. Ullah *et al.* (2020) highlighted the effects of socio-economic factors on farmers' access to credit and sources of finance in Pakistan, emphasising the significance of farm size as key determinants, but without considering regional differences in infrastructure and climatic conditions, which limits the generalisability of the findings. Thus, the findings of this study largely complemented and extended the findings of the above-mentioned works, providing a detailed picture of current credit problems in Kazakhstan, as well as offering concrete recommendations to improve the financial sustainability of the agro-industrial complex.

The problems identified in this study demonstrated the complexity of the financial environment where Kazakhstan's agro-industrial complex operates. Limited access to long-term loans constrains the investment activity of enterprises, reducing their opportunities for expansion and modernisation. High interest rates increase the debt burden on agrarians, which hampers their

ability to effectively manage their finances and adapt to market fluctuations (Manatovna *et al.*, 2023). Volatility in agricultural commodity prices creates further risks for borrowers and lenders, complicating the forecasting o f financial flows. External factors, including exchange rate movements and geopolitical instability, significantly affect the availability of financial resources, making the credit system vulnerable to macroeconomic changes (Musca & Kara, 2023). These aspects emphasise the existence of structural problems in the industry's financing mechanisms, which require a detailed review and adaptation to the current economic conditions.

T. Havemann *et al.* (2022) noted the significance of diversification of financial instruments in lending to the agricultural sector, which allows expanding the range of available sources of financing and reduce dependence on bank loans, but the lack of detailed analysis of the effects of macroeconomic factors on the effectiveness of these instruments limited the results obtained. A.A. Yadgarov *et al.* (2023) noted the positive impact of risk insurance mechanisms on reducing the financial burden on agrarians, showing their potential in stabilising the incomes of agricultural producers, but the study did not address the impact of global economic trends, which limited its applicability in conditions of high market volatility. A.D. Kehinde and A.A. Ogundeji (2022) highlighted the role of agricultural cooperatives in improving access to credit resources, confirming their effectiveness in increasing farmers' financial sustainability, but the paper did not sufficiently address the obstacles associated with institutional constraints and the complexities of managing such associations.

A.R. Khanal and O. Omobitan (2020) highlighted the value of credit sources affecting the demand for credit among small farms and enterprises, emphasising the relevance of credit availability for agricultural improvement, but without considering the effect of macroeconomic factors, which limited the comprehensiveness of the findings. A.A. Chandio *et al.* (2021) examined the factors influencing credit demand among small farmers in Pakistan, identifying key aspects such as farm size, but the study was limited to analysing only at the farm level without considering the broader economic and social contexts. Thus, the present study offered a more comprehensive approach to analysing agribusiness credit problems in Kazakhstan, considering not only individual financial instruments, but also their interplay with market and institutional factors. Unlike the above-mentioned studies, the presented analysis covered a wide range of aspects affecting the availability of credit resources, which offered a more nuanced understanding of systemic constraints and possible areas for their elimination.

The comprehensive methodology for optimising the sustainability of agribusiness lending proposed in the study reflects the need for a systemic approach to solving existing financing problems. The development of interest rate subsidy mechanisms is an effective tool to reduce the debt burden, allowing farmers to obtain more affordable loans and minimise the effects of high interest rates on their financial performance. The creation of long-term credit programmes with flexible conditions meets the needs of farmers for stable and predictable sources of financing, which is especially significant in conditions of market volatility. The development of agricultural risk insurance systems strengthens the financial stability of the sector, reducing the vulnerability of producers to unforeseen economic and market shocks (Cheremisina & Tomashuk, 2023). Together, these measures allow facilitating access to credit resources and to create a more sustainable financial environment conducive to the long-term development of the sector. Therewith, the key aspect of successful implementation of the proposed methodology continues to be the necessity of complex interaction between state structures, financial institutions, and agrarian business, which requires further study and adaptation of lending instruments to the specifics of the agrarian sector of Kazakhstan.

C. Csosz *et al.* (2021) also stressed the significance of an integrated approach to ensuring the financial sustainability of the agro-industrial complex, highlighting the prominent role of state support programmes in the formation of affordable lending mechanisms, but focusing mainly on the analysis of existing instruments without a detailed consideration of their adaptation to the specifics of the agrarian sector of Kazakhstan. I. Tetteh *et al.* (2022) focused on the need for long-term lending to increase the investment activity of agricultural enterprises, suggesting the improvement of financing mechanisms considering the seasonality of agricultural production, however, without considering the potential macroeconomic risks associated with the expansion of credit programmes, which may affect their sustainability in conditions of market instability. M.A. Bhuiyan *et al.* (2022) analysed the impact of agrarian risk insurance on the sustainability of agricultural business, proving that effective insurance programmes can greatly reduce financial losses of agrarians, but without paying sufficient attention to the possible mechanisms of integration of insurance instruments into the existing credit system, which limited the practical application of the findings.

O.C. Okunlola and O.A. Ayetigbo (2024) examined the effects of agrarian finance on the sustainability of agricultural growth in Nigeria, revealing the positive influence of credit programmes on the growth and development of the sector, but without addressing regional differences in the availability of finance, which limited the generalisability of the findings. D. Kirechev (2021) examined improved access to finance for agricultural enterprises in Bulgaria as a factor in the sustainability of agricultural finance, showing that improved credit availability favours agricultural development, but

without considering the impact of external economic factors, which limited the accuracy of the findings. In contrast to the mentioned studies, the present study proposed a comprehensive approach combining interest rate subsidies, the establishment of long-term credit programmes, and the development of insurance systems. This comprehensive view allowed considering the existing financial support mechanisms and adapting them to the concrete needs of the agro-industrial complex of Kazakhstan, which made the proposed methodology more flexible and applicable in a dynamic economic environment.

The measures proposed in the present study are aimed at creating a more stable and predictable financial environment for the agro-industrial complex, which is crucial in conditions of high dependence of the industry on external factors. Expansion of insurance programmes focused on compensation for losses from natural disasters and market fluctuations helps diversify risks and reduce the probability of financial shocks for agrarians. The development of specialised insurance products adapted to the specifics of agricultural production allows increasing the protection of enterprises, minimising their losses in case of unfavourable economic or climatic changes (Pushak *et al.*, 2021). The creation of an effective system for monitoring the economic situation plays a key role in ensuring prompt adjustment of credit policy, which increases the resilience of credit mechanisms to market fluctuations. The introduction of digital platforms for monitoring and managing credit risks opens new opportunities for automating analysis and forecasting processes, which reduces uncertainty and expedites decision-making in the financial sector. Together, these measures ensure a greater level of adaptability of financial institutions and allow creating a balanced system of support for the agricultural sector, considering the specifics of its functioning in a changing economic environment.

E. Nshakira-Rukundo *et al.* (2021) also emphasised the value of insurance mechanisms in reducing risks for agrarians, noting successful examples of their implementation in international practice, but the lack of detailed analysis of the effectiveness of such mechanisms in the conditions of other countries limited the applicability of the findings obtained. A.O. Scott *et al.* (2024) examined the impact of digital technologies on credit risk management, considering modern approaches to automated monitoring of borrowers, but without factoring in the specifics of the agro-industrial sector, which limited the applicability of the proposed solutions. H.R.B.C. Tanaka (2023) analysed the effects of macroeconomic instability on credit availability for agrarians, detailing the external factors, but without any proposals for adapting credit instruments to these conditions. F.O. Odhiambo and R. Upadhyaya (2021) focused on the design of flexible credit programmes for agricultural enterprises, considering different financing models, but without addressing the integration of insurance mechanisms, which reduced the comprehensiveness of the proposed approach. In contrast to the mentioned studies, the present study offered a more comprehensive approach, an integrated solution that factors in the specifics of the agro-industrial sector of Kazakhstan and is aimed at creating a balanced system that can effectively respond to changes in the external environment and risks.

Thus, the findings of all the reviewed studies emphasised the significance of an integrated approach to solving the problems faced by the agro-industrial complex in the context of lending and financial sustainability. Each of the studied areas contributes to strengthening the financial stability and adaptability of the agricultural sector. However, despite the existing achievements, there is still a need to further improve the mechanisms and adapt them to the specifics of Kazakh agriculture. Ultimately, only the integration of all these solutions into a single system, as well as consideration of external factors that can affect financial flows, will allow creating a sustainable and long-term basis for the development of the agro-industrial complex of Kazakhstan.

CONCLUSIONS

This study analysed the current problems of lending to Kazakhstan's agro-industrial complex and developed proposals to improve the sustainability of lending under conditions of market instability. The study found that despite the promising potential of the agro-industrial complex, the industry faces a series of major challenges, including high interest rates, limited availability of long-term loans, volatility in agricultural commodity prices, and the impact of external factors such as exchange rate changes and geopolitical instability. The study found that the primary challenge is the high financial burden on agro-producers caused by high interest rates and insufficient availability of long-term credit. For example, in 2024, the interest rate on long-term loans was 6% for concessional loans, and could be as high as 25-27% for commercial loans, well above the level needed to stimulate investment in agriculture. These factors substantially limit opportunities for long-term investment and modernisation of agro-production, which is critical for the sustainable development of the industry. Moreover, fluctuations in agricultural commodity prices (in 2020, a tonne of grain cost about KZT 80,000, and by 2023-2024 it reached KZT 135,000) and currency risks make agribusiness vulnerable to external economic shocks (in 2022, a 10% devaluation of the KZT led to a 12% increase in the cost of mineral fertilisers).

A prominent part of the study was the proposal of a comprehensive methodology aimed at optimising the sustainability of lending. It was stressed that the introduction of interest rate subsidy mechanisms (in 2023, KZT 580 billion was allocated for soft loans for

agribusiness), the creation of long-term credit programmes with flexible terms, and the development of agricultural risk insurance systems can greatly reduce the financial burden on agricultural producers and increase their financial sustainability. It was also proposed to expand insurance programmes aimed at compensating losses from natural disasters and market fluctuations, which allows diversifying risks and protecting agribusiness from external instability. Furthermore, the study proposed to develop specialised public and private insurance products that will provide agrarians against climatic and market risks, as well as to create an effective system for monitoring the economic situation for prompt adjustment of credit policy. The introduction of digital platforms for monitoring and managing credit risks will increase the efficiency of decision-making and reduce market uncertainty. Thus, an integrated approach to solving the problems of lending in the agro-industrial complex and implementation of the proposed methodology will increase the availability of credit resources, reduce the financial burden on agrarians, improve the financial sustainability of agribusiness, and stimulate investment in the modernisation of agricultural production.

Notably, this study had a limitation in the form of its restriction to the territorial context of Kazakhstan, which limited the universality of conclusions for other countries. In the future, it would be advisable to conduct studies that would confirm the findings in real conditions and adapt the proposed measures to the specific features of the agro-industrial complex of other countries, as well as to investigate the effects of various economic factors on the financial sustainability of agrarians.

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CONFLICT OF INTEREST

None.

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Оптимізація кредитних стратегій в агропромисловому комплексі в умовах ринкової нестабільності

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Анотація. Метою цього дослідження був аналіз проблем кредитування агропромислового комплексу Казахстану та розробка методології його сталого фінансування. Дослідження базувалося на системному підході, що включає теоретичний аналіз економічних та фінансових факторів, порівняльний аналіз міжнародної практики, а також розробку методів субсидування, страхування та моніторингу для оптимізації сталості кредитування агропромислового комплексу. Результати дослідження показали, що забезпечення сталості кредитування агропромислового комплексу вимагає комплексного підходу, що включає інтеграцію механізмів державного регулювання, ринкових інструментів та методів управління ризиками. Аналіз існуючої практики фінансування агропромислового комплексу в Казахстані показав, що ключовими проблемами продовжують залишатися висока вартість позикових коштів (у 2024 році кредитна ставка становила 6 % для пільгових кредитів та сягала 25-27 % у випадку комерційних кредитів), обмежений доступ малих та середніх фермерських господарств до кредитних ресурсів, а також нерозвиненість механізмів страхування сільськогосподарських ризиків. У цьому контексті дослідження підтвердило ефективність таких інструментів, як субсидії на процентні ставки, державні кредитні гарантії та розширення програм пільгового кредитування сільськогосподарських виробників. Згідно з висновками, це дозволило дрібним фермерам отримати доступ до фінансування в розмірі 10 мільярдів тенге та збільшити виробничі потужності на 15-20 %. Крім того, дослідження показало, що в нестабільному макроекономічному середовищі регулярний моніторинг макроекономічних факторів та адаптація кредитної політики до змін на фінансових ринках є важливими, оскільки тонна зерна коштувала близько 80,000 тенге у 2020 році та може досягти 135,000 тенге до 2024 року. Використання цифрових платформ та аналітичних інструментів для оцінки ризиків та прогнозування ринкових тенденцій може значно підвищити ефективність управління кредитами в агробізнесі. Крім того, міжнародна практика у сфері фінансування сільського господарства, зокрема моделі кредитної підтримки, що використовуються в розвинених та перехідних економіках, може бути адаптована до умов Казахстану, враховуючи специфічні особливості його сільськогосподарського сектору та фінансової системи. Отримані результати стали основою для вдосконалення механізмів кредитування агропромислового комплексу, підвищення доступності фінансових ресурсів для сільськогосподарських виробників та мінімізації кредитних ризиків в умовах економічної нестабільності

Ключові слова: макроекономічні фактори; субсидії; страхування; сільськогосподарська продукція; коливання валютних курсів; фінансування; процентні ставки