SCIENTIFIC HORIZONS

Journal homepage: https://sciencehorizon.com.ua
Scientific Horizons, 28(3), 160-174

UDC 338.43:330.322
DOI: 10.48077/scihor3.2025.160

Evaluating the impact of investments on the productivity of Kyrgyzstan's agro-industrial complex

Bekbolot Talgarbekov*
PhD Student, Doctoral Student
Kyrgyz Economic University named after M. Ryskulbekov
720033, 58 Togolok Moldo Str., Bishkek, Kyrgyz Republic
https://orcid.org/0009-0007-5743-2751
Asel Dzhailova
PhD Student, Doctoral Student
Kyrgyz Economic University named after M. Ryskulbekov
720033, 58 Togolok Moldo Str., Bishkek, Kyrgyz Republic
https://orcid.org/0000-0002-2006-4728
Ilqiz Abyshov
PhD Student, Doctoral Student
Kyrgyz Economic University named after M. Ryskulbekov
720033, 58 Togolok Moldo Str., Bishkek, Kyrgyz Republic
https://orcid.org/0009-0007-9346-3271
Zhamalgazy Zhumabaev
Doctor of Economics, Professor
Kyrgyz Economic University named after M. Ryskulbekov
720033, 58 Togolok Moldo Str., Bishkek, Kyrgyz Republic
https://orcid.org/0009-0003-6334-6543
Zhou MiaoLong
PhD Student
Jusup Balasagyn Kyrgyz National University
720033, 547 Frunze Str., Bishkek, Kyrgyz Republic
https://orcid.org/0009-0001-8707-1500

Article's History:
Received: 12.09.2024
Revised: 03.02.2025
Accepted: 26.02.2025

Abstract. Increasing the efficiency of the agro-industrial complex of Kyrgyzstan is a key task for ensuring the country's food security and economic stability. The purpose of this study was to assess the impact of investments on the productivity of Kyrgyzstan's agro-industrial complex, in particular by determining the efficiency of their allocation, identifying barriers to attracting capital, and outlining promising areas for industry development. The study analysed data for the period 2014-2024, including the

Suggested Citation:
Talgarbekov B., Dzhailova, A., Abyshov, I., Zhumabaev Zh., & MiaoLong, Zh. (2025). Evaluating the impact of investments on the productivity of Kyrgyzstan's agro-industrial complex. *Scientific Horizons*, 28(3), 160-174. doi: 10.48077/scihor3.2025.160.

*Corresponding author

regional distribution of investments, the level of mechanisation, production volumes, and the introduction of innovative technologies. It was found that the share of investments in agriculture averages 12.4% of total capital investments in the country; however, their distribution is uneven. Thus, in the Chui region, investments reached USD 492.9 thousand in 2020, whereas in the Naryn region, they amounted to only USD 0.2 thousand. At the same time, productivity increased most significantly in regions with developed infrastructure: in the Jalal-Abad region, production rose from 1,631.1 thousand tonnes in 2020 to 1,666.9 thousand tonnes in 2023. Investments in irrigation systems led to an 18.7% increase in yields, while the modernisation of technological equipment contributed to a 12.4% reduction in product losses. The analysis revealed that only 27.5% of farms have access to modern technologies, which significantly limits the potential for productivity growth. The SWOT analysis identified the main challenges as climate change, bureaucratic barriers, and weak coordination between the state and the private sector. The practical value of the study lies in developing recommendations for creating a favourable investment climate, enhancing the efficiency of financing, stimulating public-private partnerships, and implementing circular economy approaches. The proposed measures will contribute to the sustainable development of Kyrgyzstan's agro-industrial complex, increasing productivity and expanding the country's export potential

Keywords: economic development; agricultural production; yield increase; production cycle; innovative technologies

INTRODUCTION

Agriculture and product processing are essential for ensuring food security and supporting the country's economy. Effective investment in this sector contributes to the introduction of modern technologies, increased labour productivity, and improved product quality. At the same time, the development of the agro-industry leads to the creation of new jobs, particularly in rural areas, and contributes to improving living standards. In the context of Kyrgyzstan, the agro-industrial complex forms the backbone of the economy, as a significant portion of the population is employed in agriculture. However, this sector faces numerous challenges, including insufficient technical support, a lack of investment, and low production efficiency. Nevertheless, Kyrgyzstan possesses considerable potential for the development of its agro-industry, owing to favourable natural and climatic conditions, as well as advantageous opportunities for the export of agricultural products. Unlocking the potential of Kyrgyzstan's agro-industrial complex through active attraction of investments plays a crucial role not only in the country's economic development but also in ensuring its food security. This underscores the importance of an integrated approach to planning, implementing, and monitoring investment projects in this sector.

Studies on the impact of investments in the agro-industrial sector address various aspects, such as economic efficiency, innovative technologies, social impacts, and environmental sustainability. The influence of investments on productivity was examined by R. Ali and S. Stevano (2021), who focused on the social aspects of labour in agro-industrial sectors, highlighting issues such as unequal access to resources and low wages. In turn, C.R. Barbosa *et al.* (2024) analysed the efficiency of using agro-industrial by-products, emphasising their potential to enhance livestock productivity. Financial support for the agribusiness sector is regarded as a critical component of its development. T. Habanabakize and M.F. Zerihun (2023) have highlighted the importance of financial intermediation in stimulating productivity growth in the agricultural sector in South Africa, which may also be relevant for Central Asian countries. Other researchers, including A. Bowman and S. Chisoro (2024), have emphasised the role of investment in fostering innovation and the development of local agribusiness systems.

Investment is also considered a key factor in ensuring sustainable development. For example, A. Ehrensperger *et al.* (2023) studied the agrarian transition in the Mekong region, emphasising the need to integrate environmentally sustainable practices into the modernisation of the agricultural sector. In this context, J.R. Gallego-Bono and M.R. Tapia-Baranda (2021) have noted that the transformation of agribusiness clusters through the introduction of innovative environmental technologies is an important factor in enhancing competitiveness. S. Hamann (2020) examined the global agribusiness system, highlighting how the centralisation of investment in large corporations can create inequalities and constraints for smallholder farmers. Another critical aspect is the impact on long-term environmental sustainability, which remains an unresolved issue for many regions.

The use of agro-industrial waste in the production of fertilisers was examined by F. Marra *et al.* (2023), who concluded that this approach not only reduces environmental pressure but also significantly improves soil quality, thereby contributing to increased productivity. C. Henderson (2021) analysed the role of investments from the Arab Gulf countries in the agro-industry and noted that such investments contribute to technological modernisation but are often accompanied by social conflicts arising from changes in land use.

Thus, the analysis of the literature shows that, although many studies consider the impact of investments

on the productivity of the agro-industrial complex, the issues of integrating innovations adapted to local conditions and improving socio-economic outcomes for rural communities remain unresolved. The purpose of this study was to assess the impact of investments on the productivity of Kyrgyzstan's agro-industrial complex, taking into account international experience.

MATERIALS AND METHODS

The study is aimed at analysing the investment potential of Kyrgyzstan's agro-industrial complex and identifying ways to optimise it. To achieve this goal, data collected over the past ten years (2014-2024) were used, covering information on investment volumes, financing structure, sector productivity levels, and regional specificities. The analysis is based on statistical data from the National Statistical Committee of the Kyrgyz Republic (n.d.), reports of the Food and Agriculture Organization (n.d.). The analysis of international experience in attracting investments to the agro-industrial complex included an assessment of the effectiveness of various financing mechanisms and the adaptation of best practices to Kyrgyzstan's context. The study involved a comparative analysis of investment strategies in countries with different economic models, such as the EU, the USA, China, India, Brazil, Argentina, Australia, and South Africa, using official reports of the Food and Agriculture Organization. The sample was based on key indicators of investment activity and agro-industrial productivity, including the volumes of domestic and foreign investments, government subsidies, and grant programmes. The analysis of these data made it possible to assess the dynamics of changes in financing, identify the main sources of capital investment, and evaluate the effectiveness of state support for the sector.

Additionally, general indicators of agricultural production were examined, as they represent an important measure of the productivity of the agro-industrial complex. Particular attention was paid to analysing changes in production levels depending on the volume of investments, the introduction of new technologies, and improvements in infrastructure. This approach made it possible to assess the direct relationship between financing and production outcomes. The study also focused on regional differences in the development of Kyrgyzstan's agro-industrial complex, using data from the National Statistical Committee of the Kyrgyz Republic (n.d.), grouped by administrative regions. This enabled the identification of disparities in the distribution of investments, levels of mechanisation, and the availability of infrastructure – in particular, irrigation systems, logistics centres, warehouses, and processing enterprises. An analysis of the regions' investment potential revealed which areas receive greater financial support and which remain underdeveloped. Due to the absence of official data on agricultural investments at the regional level, a proportional distribution method was applied to assess their impact on production indicators. At the initial stage, the share of investments in agriculture within the total volume of capital investments in the country was determined (1):

$$P_{agr} = \frac{I_{agr}}{I_{gen}}, \quad (1)$$

where P_{agr} – share of investment in agriculture in total investment; I_{agr} – investments in agriculture throughout the country; I_{gen} – total investment across the country.

This share was then applied to the total investment in each region (2):

$$I_{agr.reg} = I_{gen.reg.} * P_{agr.}, \quad (2)$$

where $I_{agr.reg}$ – approximate investments in agriculture in a specific region; $I_{gen.reg.}$ – total investment in this region.

This approach made it possible to obtain indicative measures of agricultural sector financing at the local level and to assess regional disparities. An analysis of the ratio between investments and agricultural production volumes in the regions of Kyrgyzstan for the period 2020-2023 enabled an assessment of the impact of financing on agricultural sector productivity and the identification of regions with the highest and lowest investment efficiency. For comparative purposes, international experience in attracting investments was analysed, which helped to identify financial mechanisms potentially applicable in Kyrgyzstan. The main sources of data were official statistical materials provided by the National Statistical Committee of the Kyrgyz Republic (n.d.). To assess the investment climate of the agro-industrial sector, a SWOT analysis was conducted. This analysis made it possible to identify the strengths and weaknesses of the industry, as well as its opportunities and threats. It took into account the country's natural potential, the state of infrastructure, access to financing, and environmental challenges. The results of the SWOT analysis provided insights not only into the current state of the sector but also into priority areas for implementing reforms and developing practical recommendations.

The analysis of the problems facing Kyrgyzstan's agro-industrial complex was carried out using a comprehensive approach that combines both quantitative and qualitative research methods. Statistical analysis of macroeconomic indicators, levels of subsidies, credit rates, and the availability of financing was conducted, along with a comparative analysis of the effectiveness of agrarian reforms in neighbouring countries. Additionally, institutional barriers, environmental risks, the availability of environmentally sustainable technologies, and the extent of international financial support were assessed. The primary sources for the analysis were national and international reports, as outlined

above. Nevertheless, the study has certain limitations, including potential incompleteness of statistical data, political and economic factors, and insufficient transparency regarding private investments. Based on the analysis and identified challenges in attracting investments to Kyrgyzstan's agro-industrial complex, a set of practical measures was developed, aimed at overcoming key barriers and improving the efficiency of the sector. The proposed recommendations are directed at both the public sector and private businesses, as well as potential investors, thereby promoting a comprehensive approach to the development of the agricultural sector.

RESULTS

The agro-industrial complex of Kyrgyzstan is one of the key sectors of the national economy, providing a significant share of employment and playing an important role in ensuring food security. However, the current state of the sector is marked by numerous challenges that hinder its full development. Kyrgyzstan's agriculture is primarily focused on the production of grain crops, potatoes, fruits, and livestock products, particularly milk and meat. At the same time, its contribution to the country's gross domestic product amounts to approximately 20%, while more than 60% of the population is employed in this sector (National Statistical Committee of the Kyrgyz Republic, n.d.). The infrastructure of the agro-industrial complex faces a range of persistent problems, including outdated equipment, underdeveloped logistics, and limited access to water resources. The level of investment activity remains low, constraining the introduction of modern technologies, the modernisation of production processes, and the reduction of product losses. Although there has been some growth in investment volumes in recent years, the level of investment remains insufficient to achieve a significant breakthrough in the industry. The main sources of investment are international organisations and grant programmes, yet their impact is limited due to the low effectiveness of local governance structures.

The lack of significant breakthroughs in agricultural productivity is explained by technological backwardness, infrastructure constraints, low access to financial resources, and risks associated with climate change, such as droughts and water shortages. The majority of small and medium-sized farmers are unable to obtain loans due to high interest rates, which significantly limits their potential to modernise their production. An assessment of the current state of Kyrgyzstan's agricultural sector shows that to ensure sustainable development of the sector, it is necessary to focus on modernising production, building infrastructure and expanding access to financial resources. These factors play an important role in increasing productivity, improving the competitiveness of products in the Kyrgyz and global markets, and in the sustainable development of rural regions. Over the past ten years, the dynamics of investment in the Kyrgyz agricultural sector has demonstrated both positive trends and significant challenges. After a period of decline, there was a sharp increase in investment, but further dynamics remained unstable. In some years, there was an increase in investment, which contributed to the development of the industry, but these fluctuations did not allow for sustainable progress. Despite a slight recovery in recent years, the overall growth rate remains insufficient to ensure a significant technological breakthrough. The largest share of investment has been directed to support traditional activities such as crop and livestock production, while innovative areas have remained underdeveloped (National Statistical Committee of the Kyrgyz Republic, n.d.).

The absence of a significant breakthrough in the productivity of Kyrgyzstan's agro-industrial complex can be attributed to technological backwardness, infrastructure constraints, limited access to financial resources, and risks associated with climate change, including droughts and water shortages. Most small and medium-sized farmers are unable to obtain credit due to high interest rates, which significantly limits their capacity to modernise production processes. An assessment of the current state of Kyrgyzstan's agro-industrial complex indicates that, to ensure the sustainable development of the sector, it is essential to prioritise the modernisation of production, the development of infrastructure, and the expansion of access to financial resources. These factors play a crucial role in increasing productivity, enhancing the competitiveness of agricultural products in both domestic and global markets, and supporting the sustainable development of rural regions.

Over the past decade, investment dynamics in Kyrgyzstan's agro-industrial complex have shown both positive trends and significant challenges. Following a period of decline, there was a sharp increase in investments; however, subsequent dynamics remained unstable. In certain years, an increase in investment contributed to the sector's development, but these fluctuations hindered consistent and sustainable progress. Despite a modest recovery in recent years, the overall growth rate of investments remains insufficient to ensure a major technological breakthroug. The largest share of investments has been directed towards supporting traditional activities, such as crop and livestock production, while innovative areas have remained underdeveloped (National Statistical Committee of the Kyrgyz Republic, n.d.).

The main sources of investment have been state support programmes and international grants, which primarily focused on expanding production capacities and addressing urgent infrastructure issues. However, limited access to long-term loans and high interest rates have significantly constrained the ability of small and medium-sized farmers to attract investments for the modernisation of their production. This, in turn, has slowed the overall transformation of the agro-industrial

complex. Investments in innovative technologies – such as precision agriculture, the automation of production processes, and the use of modern irrigation systems – have remained at a low level due to insufficient awareness among farmers, as well as the absence of a targeted state policy to support innovation in the sector. At the same time, the growth in the industry's productivity has been achieved mainly through extensive production expansion, which has been accompanied by rising costs and increased pressure on natural resources.

A key challenge identified was the uneven distribution of investments across the regions of Kyrgyzstan. As official data on the regional allocation of investments in the agricultural sector are not available, an approximate calculation was carried out based on the share of agricultural investments within the total volume of capital investments in the country. Using this method, agricultural investments were proportionally distributed according to the total capital investments recorded in each region. This approach makes it possible to assess the level of financial support for the agricultural sector at the local level and to identify regions with the highest and lowest levels of investment. The results of these calculations are presented in Table 1.

***Table 1**. Ratio of investment and agricultural production volumes by regions of Kyrgyzstan (2020-2023)*

	Region	Batken region	Jalal-Abad region	Issyk-Kul region	Naryn region	Osh region	Talas region	Chui region	Bishkek city	Osh city
2020	Investments (thousands of US dollars)	17.8	389.5	5,061.2	0.2	50.5	320.5	492.9	3,737.6	29.9
	Production (thousand tons)	564.5	1,631.1	1,365.7	379.2	1,594.6	634.5	3,679.8	2.7	36.2
2021	Investments (thousands of US dollars)	27.4	1,378.7	4,018.6	-	125.1	594.8	1,113.3	6,700.5	55.1
	Production (thousand tons)	505.2	1,611.4	1,188.3	378.8	1,604.4	599.3	2,725.3	2.5	37.9
2022	Investments (thousands of US dollars)	71.5	1,316.1	4,073	0.2	110.9	895.3	815.6	7,306.4	36.5
	Production (thousand tons)	549.3	1,667.8	1,331.4	399.8	1,666.2	652.4	3,669.5	2.5	34.4
2023	Investments (thousands of US dollars)	20.8	352	882	49.7	41.8	137.7	225	2,825.1	39.1
	Production (thousand tons)	500	1,666.9	1,247.7	349.7	1,649.6	613.4	3,500.9	2.3	33.6

***Source:** created by the authors based on data from the National Statistical Committee of the Kyrgyz Republic (n.d.)*

The ratio of investment to output across different regions of Kyrgyzstan reveals significant disparities. Some regions, such as Bishkek, receive substantial investments, yet the volume of agricultural output remains almost unchanged, indicating low investment efficiency. Conversely, regions such as Chui and Jalal-Abad demonstrate considerably higher levels of productivity per unit of invested funds, reflecting more effective use of financial resources. Low investment efficiency is also observed in Naryn region, where capital investment increased sharply in 2023, but agricultural output actually declined. A similar situation is evident in Osh, where considerable fluctuations in investment volumes have not resulted in growth in production. In contrast, Chui region stands out as one of the most efficient, consistently demonstrating high productivity even with relatively modest levels of investment. Overall, investments do not always correlate directly with increases in agricultural output. This discrepancy may be explained by factors such as climatic conditions, the degree of mechanisation, the extent of government support, and the adoption of technological innovations in each region. Therefore, it is essential to recognise that not only the volume of investments but also the efficiency of their utilisation determines the development and performance of the agro-industrial complex.

The ratio of investment to output in the regions of Kyrgyzstan is a relative indicator, as it is calculated based on the proportional distribution of total agricultural investment. Initially, the share of agricultural financing within the total volume of national capital investments was determined, after which this coefficient was applied to each region. The analysis shows that Chui and Jalal-Abad regions demonstrate high productivity relative to relatively modest investment levels, whereas in the cities of Bishkek and Osh, substantial investments do not translate into significant increases in agricultural production. In Naryn region, a sharp increase in financing was observed in 2023; however, agricultural output actually declined, which may be attributed to natural conditions or specific issues related to the utilisation of capital. Since the distribution of investments was estimated using an approximate method, the results obtained reflect general trends. Nonetheless, for a more accurate and detailed assessment, region-specific data on the actual volume of agricultural sector financing are necessary. The analysis

of data from the National Statistical Committee of the Kyrgyz Republic (n.d.) also highlighted that the largest sources of investment are international organisations and financial institutions, which primarily fund projects with a focus on environmental sustainability and social impact. However, domestic sources of investment remain weak, largely due to the limited financial capacity of local farmers and restricted access to credit. High interest rates and complex administrative procedures are among the main barriers to attracting additional capital to the agricultural sector.

Particular attention is drawn to the dependence of the sector's productivity on state support. The results of the study demonstrate that regions where subsidy programmes, preferential lending schemes, and tax incentives for farmers have been implemented show higher rates of yield and profitability growth. Conversely, in areas lacking such programmes, there is a decline in productivity and a low level of private investor engagement. Overall, the analysis confirmed that achieving stable growth of the agro-industrial complex requires not only an increase in the total volume of investments but also a revision of their structure. Priority should be given to the introduction of innovative technologies, the development of export-oriented sectors, and improving the efficiency of financial resource use through greater transparency in management decisions. Such an approach would foster more balanced regional development and enhance the competitiveness of Kyrgyzstan's agro-industrial complex in international markets. To identify the key strengths, weaknesses, opportunities, and threats of Kyrgyzstan's agro-industrial complex, a SWOT analysis was conducted, serving as a tool to assess the sector's investment potential (Table 2).

***Table 2**. SWOT analysis of the investment climate of the agro-industrial complex of Kyrgyzstan*

Strengths	Weaknesses
▪ significant natural potential, including fertile land and water resources; ▪ a large proportion of the population employed in agriculture, which provides an available workforce; ▪ orientation towards the production of environmentally friendly products that are in demand on the international market.	▪ low level of mechanisation and outdated equipment; ▪ limited access to financing for small and medium-sized farmers; ▪ imperfect infrastructure: problems with logistics, storage and processing of products; ▪ high level of bureaucracy and corruption, which complicate investment processes.
Opportunities	**Threats**
▪ attracting international investors through tax breaks and the creation of special agricultural zones; ▪ introducing innovative technologies to increase productivity; ▪ expanding the export of agricultural products to international markets; ▪ using grants and programs of international organisations to develop the industry.	▪climate change, which negatively affects crop yields and water supply; ▪ instability of the economic and political situation in the country; ▪ high competition from neighbouring countries, which have better infrastructure capabilities; ▪ lack of a long-term state strategy for the development of the agro-industrial sector.

***Source:** created by the authors*

The strengths of Kyrgyzstan's agro-industrial complex provide a foundation for further development, while its weaknesses significantly constrain investment potential. Successful exploitation of available opportunities, particularly through the introduction of modern technologies and the expansion of cooperation with international partners, could contribute to overcoming existing threats. At the same time, it is essential to consider environmental challenges, which remain among the key risks to the stability and long-term sustainability of the agro-industrial sector. Kyrgyzstan's agro-industrial complex accounts for approximately 20% of the country's gross domestic product and provides over 40% of jobs in rural areas (National Statistical Committee of the Kyrgyz Republic, n.d.). Despite its considerable potential, the sector faces serious challenges that hinder investment attraction. These challenges are multifaceted and encompass technological, financial, institutional, and environmental dimensions.

One of the key problems facing the sector is its technological backwardness. The majority of agro-industrial enterprises continue to rely on outdated equipment, with only approximately 27% utilising modern machinery. This significantly undermines production efficiency, increases operational costs, and complicates the processes of product processing and storage. As a result, product losses due to inefficient storage reached 35% of the total harvest in 2024. The insufficient adoption of modern agricultural technologies – such as precision agriculture, automated farm management systems, digital field monitoring, and the use of biotechnologies – further reduces the competitiveness of Kyrgyz agricultural products in international markets. This issue is particularly critical in the context of increasing global integration, where international product quality standards are becoming stricter and consumers increasingly demand environmentally friendly and certified products.

This technological lag also limits the potential for expanding Kyrgyzstan's export capacity. Due to the low quality and limited processing of agricultural produce, local farmers are often forced to sell their products at reduced prices, thereby lowering the overall profitability of the sector. Furthermore, the lack of access to

modern equipment and advanced technologies diminishes the resilience of agricultural enterprises to climate change impacts, such as droughts and sudden frosts, which result in substantial crop losses. Technological backwardness also negatively affects the investment climate: international investors are reluctant to invest in enterprises that are unable to ensure high production standards and effective management practices. To address this issue, it is essential to develop a clear strategy for the modernisation of the agro-industrial complex, focusing on improving access to modern technologies, supporting scientific research in agriculture, and creating favourable conditions for both foreign and domestic investment. For example, in Uzbekistan, the government introduced a programme to subsidise farmers for equipment modernisation, which led to a 40% increase in agricultural productivity over five years. Kyrgyzstan should consider adopting a similar approach.

Financial barriers also play a significant role in constraining the investment process. Small and medium-sized farmers face substantial difficulties in accessing credit due to high interest rates and stringent banking requirements. The lack of long-term financing options and the prevalence of high credit rates (ranging from 10% to 24% per annum) severely limit opportunities for modernising production facilities and adopting innovations (Pomerlyan & Belitski, 2023). State subsidies currently reach less than 15% of farmers, and the absence of grant programmes aimed at agricultural development further exacerbates this problem. Institutional barriers, such as bureaucracy, corruption, and weak legal frameworks, significantly hinder the attraction of both domestic and foreign investment. According to the Doing Business 2020 ease of doing business ranking, Kyrgyzstan is ranked 80th, whereas Uzbekistan holds the 69th position and Azerbaijan ranks 34th. This suggests that the regulatory environment for entrepreneurship in Azerbaijan is more favourable compared to Uzbekistan and Kyrgyzstan. Higher rankings typically indicate more streamlined procedures for starting a business, obtaining permits, and conducting commercial activities. Kyrgyzstan should consider implementing reforms aimed at improving its business climate, drawing on the experiences of neighbouring countries. The unsatisfactory level of legal regulation creates unstable investment conditions, which deter potential investors, particularly from the international community. Furthermore, insufficient transparency in the management of investment projects increases risks for investors, as the absence of clear rules and effective control mechanisms heightens the likelihood of fund misappropriation and delays in project implementation.

The underdevelopment of market infrastructure, including logistics, storage, and processing facilities, also limits the full realisation of investment projects. The uneven distribution of infrastructure across regions means that in some areas the essential conditions for the efficient transportation and storage of agricultural products are lacking. This situation leads to an increase in transportation costs by 15-20%. Additionally, the lack of a developed network of processing enterprises reduces the added value of agricultural products, thereby lowering farmers' profits by an average of 25%. Additionally, institutional barriers limit small and medium-sized farmers' access to government support programmes and financial instruments, such as loans and subsidies. In many cases, the application process for such programmes is overly complex, which reduces their effectiveness and limits the participation of potential beneficiaries. The absence of a unified database and a transparent system for monitoring investment flows also creates significant obstacles to evaluating the effectiveness of already implemented projects.

An example of a government initiative aimed at financing the agro-industrial complex is the "Agricultural Financing-13" project, approved for 2025. This programme provides loans at an annual interest rate of 10%, with a total allocated amount of 4,092,769,440 soms. The implementation period is set at 36 months for enterprises engaged in livestock, crop production, and water-saving irrigation technologies, and 84 months for farmers requiring financing through the leasing of agricultural machinery. This programme has been in operation for over ten years, and although there were initial plans to terminate it in 2025, a decision was made to extend its duration, which underscores its significance for the development of the agricultural sector. Nevertheless, despite substantial allocated funds, small farmers continue to face difficulties in accessing these resources due to persistent administrative and procedural barriers. Environmental challenges also play a crucial role in shaping the investment climate. Climate change is already exerting a significant impact on the agricultural sector: over the past decade, the average annual temperature in Kyrgyzstan has increased by 1.2°C, and the number of dry periods has risen by 30%. This has resulted in a 15% reduction in water resources and a marked decline in wheat and barley yields in several regions. For instance, in Batken region, a 20% decrease in grain yields was recorded in 2022 compared to 2015 (National Statistical Committee of the Kyrgyz Republic, n.d.).

These factors not only reduce overall agricultural output but also complicate long-term investment planning due to the high degree of uncertainty regarding natural conditions. Moreover, the increasing frequency of extreme weather events – such as heavy rainfall, frosts, and hail – causes substantial production losses. For example, in 2021 alone, hail damage in Chui region was estimated at over 250 million soms, significantly undermining the financial stability of local farms. The low level of adaptation to these changes increases the vulnerability of Kyrgyzstan's agro-industrial complex to external factors, making it less attractive to potential investors. Currently, only 18% of agricultural land in the

country has access to modern irrigation systems, and more than 40% of irrigation canals require repair or reconstruction. This significantly limits farmers' capacity to cope with climate-related challenges. For instance, within the framework of the "Rehabilitation of Irrigation Systems in the Fergana Valley" project, supported by the World Bank during 2021-2023, more than 200 km of irrigation canals were repaired, enabling increased productivity on approximately 15,000 hectares of agricultural land. Nevertheless, the scale of such initiatives remains insufficient to ensure the long-term sustainability of the agricultural sector.

Furthermore, investments in environmentally sustainable technologies remain at a low level. For example, the share of land under drip irrigation does not exceed 3% of the total agricultural area, whereas in neighbouring Kazakhstan this figure reaches 12% (Food and Agriculture Organization, n.d.). Programmes to support the cultivation of drought-resistant crops, the development of agroforestry, and the use of agro-industrial waste for fertiliser production are also still limited. In addition, the absence of comprehensive government programmes for climate change adaptation and the insufficient involvement of international organisations further exacerbates existing problems. For instance, in 2022, Kyrgyzstan received only USD 4 million in international financial assistance for environmental projects, whereas neighbouring Uzbekistan attracted over USD 50 million from the World Bank and the Asian Development Bank. This disparity is particularly critical in light of the growing global demand for environmentally friendly products, which require adherence to stringent standards of sustainable production.

Coordination problems between government agencies, the private sector, and international organisations also remain significant. For example, the "Green Economy for Sustainable Development" project, which aimed to finance the modernisation of irrigation systems, faced serious implementation challenges: due to bureaucratic obstacles and the absence of a unified coordination centre, only 35% of the allocated funds were utilised during the first year of implementation. Such a lack of coordination leads to the duplication of efforts, inefficient use of resources, and a lack of synergy in addressing key challenges within the agro-industrial complex. Moreover, uncertainty for potential investors is aggravated by conflicting regulations and inconsistent government policies. For instance, in 2023, the Kyrgyz government introduced changes to the tax regime for agribusiness, which compelled more than 15% of farm enterprises to revise their business models or temporarily suspend operations. In addition, international organisations – which could serve as important sources of funding and expert support – currently lack a clear platform for interaction with the government and the private sector, limiting their participation in strategic initiatives. To improve this situation, it is necessary to establish transparent mechanisms for monitoring and evaluating the implementation of investment projects, enabling the timely identification of problems and the adoption of corrective measures.

All these issues create additional risks for investors, thereby reducing overall trust in the country's institutional system. Addressing these challenges requires a comprehensive approach, including the improvement of legislation, increased public investment in sustainable agricultural practices, and more active engagement with international donors. Thus, the main barriers to attracting investment in Kyrgyzstan's agro-industrial complex are technological backwardness, limited access to financial resources, institutional shortcomings, and environmental challenges. The following section will present recommendations for overcoming these barriers and creating a favourable investment climate. Based on the analysis conducted and the identified problems and barriers to attracting investment in Kyrgyzstan's agro-industrial complex, a set of practical recommendations has been developed to address these issues and enhance the sector's overall efficiency. These recommendations are aimed at both the public sector and private businesses, including potential domestic and foreign investors, and are designed to promote a comprehensive and coordinated approach to the development of the agricultural sector.

The primary task for the state is to create a favourable institutional environment, which includes simplifying administrative procedures for investors, increasing transparency of processes, and reducing the level of corruption. It is crucial to develop a national programme for the modernisation of the agro-industrial complex, which should incorporate subsidies for the purchase of modern equipment, preferential loans for farmers, and financing of innovative projects within the sector. Another key priority is infrastructure development. Investments are required to create and modernise irrigation systems, logistics centres, storage facilities, and processing plants. Such improvements would significantly reduce crop losses, enhance product quality, and expand export opportunities. To raise the technological level of the agro-industrial complex, it is recommended to establish specialised training programmes for farmers and agro-industry workers, focusing on the application of modern agricultural technologies. In addition, the creation of state or public-private research centres dedicated to the development of innovations specifically adapted to Kyrgyzstan's climatic conditions is essential.

From the private sector perspective, it is important to promote cooperation among small and medium-sized farmers, which would enable more efficient use of resources, knowledge sharing, and improved access to financing. Investors, in turn, should focus on long-term projects that consider not only economic benefits, but also social and environmental impacts. This approach

would help to foster a positive perception of investors within local communities and support the sustainability of investments. International organisations can play a significant role in the development of the agro-industrial complex by providing grants, technical assistance, and facilitating Kyrgyzstan's integration into global agricultural markets. An important avenue for development is also the attraction of international expertise and the adaptation of successful practices from other countries to the local context. Table 3 systematises practical recommendations for the development of Kyrgyzstan's agro-industrial complex.

***Table 3**. Comparison of international practices for attracting investment in agro-industry*

Sector	Recommendations	Expected results
Public policy	Simplification of administrative procedures and reduction of corruption	Improving the investment climate and increasing transparency
	Development of a state programme for the modernisation of the agricultural sector: subsidies, preferential loans, financing of innovative projects	Increasing investments, modernising equipment, and enhancing productivity
	Investments in infrastructure: irrigation systems, logistics centres, warehouses, facilities for product processing	Reducing crop losses, improving product quality, and expanding exports
	Introduction of incentives for investors: tax breaks, support for public-private partnerships	Attracting international and domestic investors
Financing	Expanding access to credit resources for small and medium-sized farmers	Increasing investment in production modernisation
	Introduction of preferential financial instruments, such as long-term loans and grants	Expanding the availability of investments for farmers
Cooperation	Development of farmers' cooperatives to share resources and obtain more favourable financing conditions	Enhancing the efficiency of resource use and reducing costs
	Establishment of cooperation between the state, the private sector, and international organisations	Developing a coordinated industry strategy and incorporating international experience
Ecology	Introduction of sustainable agricultural practices to preserve natural resources	Reducing the impact of climate change on yields and promoting environmental sustainability
	Use of agro-industrial waste for the production of fertilisers or energy	Reducing costs and increasing production efficiency

***Source:** created by the authors*

Table 3 summarises the main areas of reform and specific measures that can be implemented to overcome existing barriers and ensure the sustainable development of Kyrgyzstan's agro-industrial complex. In conclusion, the implementation of these recommendations will enhance the efficiency of Kyrgyzstan's agro-industrial complex, increase its attractiveness to investors, ensure sustainable economic growth, and contribute to improving the living standards of the rural population. These measures will lay the foundation for the development of an agricultural sector that is adapted to modern challenges and opportunities, fostering long-term resilience and competitiveness.

DISCUSSION

The agro-industrial complex of Kyrgyzstan is a strategically important sector of the economy; however, low investment levels, outdated infrastructure, and insufficient implementation of modern technologies remain key challenges to its development. Similar conclusions are drawn in the work of J.G. Djokoto (2021), who argues that although foreign investment holds significant potential for transforming the agricultural sector, it may crowd out domestic investment if there is insufficient integration and coordination. Effective attraction of investments into Kyrgyzstan's agricultural sector is critical for increasing productivity, modernising infrastructure, and adopting innovative approaches. This conclusion is consistent with the research of T. Joltreau (2024), who highlights the positive impact of state grants and subsidies on the development of precision agriculture in European Union countries. The adoption of similar approaches in Kyrgyzstan could contribute to enhancing the competitiveness of its agricultural products.

Furthermore, the integration of circular economy principles into the agro-industrial complex demonstrates significant potential (Golub *et al.*, 2020). As examples from the Netherlands and Denmark show, the use of agricultural waste for energy and fertiliser production increases the efficiency of production processes and reduces the environmental impact. Similar concepts are explored by A. Vastolo *et al.* (2022), who highlight the substantial benefits of using agro-industrial waste for feed production. Such practices could be adapted to Kyrgyzstan's specific conditions, taking into account local environmental and economic characteristics. At the same time, the study by X. Xu and Y. Yan (2014) demonstrates that public investment, if not accompanied by proper planning and coordination, can crowd out private investment. This issue is particularly relevant for Kyrgyzstan, where the attraction of

private capital should play a key role in transforming the agro-industrial complex.

The introduction of circular economy principles in the agro-industrial sector represents a crucial element for increasing production efficiency and reducing environmental impact. Research confirms that integrating circular practices, such as the use of biogas plants for processing agricultural waste, contributes to diversifying farmers' income sources and provides additional opportunities for economic growth. For instance, in Germany, a significant proportion of farms generate income from the sale of biogas and processed organic fertilisers, which allows for more efficient resource use. Similar conclusions are presented in the works of A. Vastolo *et al*. (2022), who emphasise that the use of agro-industrial waste for feed purposes and energy production enhances the economic profitability of farms. Beyond economic benefits, the circular economy also addresses key environmental issues, including the reduction of greenhouse gas emissions, prevention of soil degradation, and preservation of water resources (Khryk *et al.*, 2024). These aspects are particularly critical for regions facing severe natural challenges, such as Kyrgyzstan, where water scarcity and soil quality issues limit agricultural productivity. In this context, the experience of the Netherlands and Denmark can serve as an important model for adaptation, as confirmed by the studies of B.I. Koura *et al*. (2024).

It has been identified that different countries apply unique approaches to the development of their agro-industrial sectors, depending on their natural, economic, and social conditions. For example, in EU countries, as noted by T. Joltreau (2024), government subsidies and grants are directed towards supporting innovations such as precision agriculture, which significantly enhances the competitiveness of the agricultural sector. In the USA and Canada, public-private partnerships facilitate the rapid integration of new technologies, aligning with the findings of M. Böhme (2020), who emphasises the importance of strategic cooperation between government and business in implementing large-scale agricultural projects.

For Kyrgyzstan, adapting such approaches requires careful consideration of local specificities, including infrastructure constraints, low levels of mechanisation, and insufficient government support. As highlighted by N.U. Wani *et al*. (2024), it is essential to take into account the potential for regional integration and diversification of investment sources to support the agro-industrial complex under the specific conditions of Central Asia. Kyrgyzstan's agro-industrial sector plays a crucial role in employment and food security, but its development is hindered by numerous structural challenges. The analysis confirms that low levels of mechanisation, limited infrastructure, and insufficient adoption of modern technologies represent the main barriers to increasing productivity in the sector. These conclusions are consistent with the study by V. Yarashevich (2020), who notes that countries of the Eurasian Economic Union, to which Kyrgyzstan belongs, are marked by significant disparities in agricultural development due to uneven investment distribution and infrastructure limitations.

At the same time, despite the low level of investment activity, international organisations and grant programmes play an important role in providing financing for Kyrgyzstan's agro-industrial complex (Sakkaraeva & Kumashev, 2024). As noted by J. Rodenbiker (2022), infrastructure projects, such as initiatives under the framework of the "Green Silk Road", can serve as significant stimuli for regional economic development. However, as the experience of other countries demonstrates, the effectiveness of such initiatives depends largely on the state's ability to create transparent mechanisms for resource management and adapt them to local conditions. A comparison with neighbouring countries, such as Kazakhstan and Uzbekistan, reveals that the level of mechanisation in Kyrgyzstan's agricultural sector remains considerably lower. For instance, in Kazakhstan, due to substantial investments in technology and strong state support, agricultural productivity is significantly higher (Manatovna *et al.*, 2023). This comparison underscores that for Kyrgyzstan, the modernisation of production processes must be a priority task to ensure the competitiveness of the sector at the regional level.

Particular attention should also be given to access to financial resources, as high interest rates and insufficient financial support severely limit farmers' capacity to modernise their production. As evidenced by V. Yarashevich (2020), overcoming these constraints requires the development of low-interest credit programmes and the promotion of cooperation between the state and the private sector. An analysis of the dynamics of investment in the agro-industrial complex of Kyrgyzstan over the past ten years has shown that although the volume of investments is gradually increasing, their overall level remains insufficient to achieve a technological breakthrough. The findings confirm that priority is still given to supporting traditional sectors, such as crop production and livestock, while innovative areas are developing slowly. This trend aligns with the conclusions of A. MacMillan (1991), who emphasises that limitations in the design of investment programmes and a focus on short-term goals significantly hinder progress in the agricultural sector.

Although state programmes and international grants continue to play an important role in supporting Kyrgyzstan's agro-industrial sector, their impact is limited by the weak effectiveness of management structures and insufficient integration of private investment. As highlighted by A. Vilas-Franquesa *et al*. (2023), the introduction of innovations, particularly in the field of agro-industrial by-product utilisation, is a key avenue for enhancing the sectors efficiency while also addressing environmental challenges. However, in Kyrgyzstan,

such technologies remain in the early stages of limited implementation, due to low levels of awareness and insufficient state support. Furthermore, the uneven distribution of investments across regions remains a serious challenge, exacerbating socio-economic inequalities (Krylova *et al.*, 2023). This finding is consistent with the study of V. Zubok *et al.* (2021), which emphasises that structural disparities in regional development significantly reduce the overall effectiveness of state policy. In Kyrgyzstan, regions with better-developed infrastructure receive a disproportionately higher share of investments, while less developed areas remain largely neglected.

The direct relationship between investment volumes and agricultural productivity is clearly evident in regions where access to modern technologies and irrigation systems enables significant increases in yields. At the same time, stagnation is observed in areas with limited access to financing and low levels of mechanisation, confirming the critical importance of integrating innovative approaches. As A. MacMillan (1991) highlights, investments in infrastructure modernisation are essential for ensuring the sustainable development of the agro-industrial sector. The results of this study also underline the need to develop a comprehensive strategy that considers not only the total volume of investments, but also their structure and targeted allocation. Furthermore, the SWOT analysis conducted in this study identified key aspects of the investment climate within Kyrgyzstan's agro-industrial complex. While substantial natural potential and an available labour force create favourable conditions for industry development, low levels of mechanisation, inadequate infrastructure, and restricted access to finance remain serious constraints. As observed by S.K. Wegren and F. Nilssen (2021), such challenges are characteristic of economies in transition, where structural barriers significantly hinder the attraction of investment.

The direct relationship between investment volumes and agricultural productivity is clearly evident in regions where access to modern technologies and irrigation systems enables significant increases in yields. At the same time, stagnation is observed in areas with limited access to financing and low levels of mechanisation, confirming the critical importance of integrating innovative approaches. As A. MacMillan (1991) highlights, investments in infrastructure modernisation are essential for ensuring the sustainable development of the agro-industrial sector. The results of this study also underline the need to develop a comprehensive strategy that considers not only the total volume of investments, but also their structure and targeted allocation. Drawing on international experience, particularly in the field of agro-industrial waste processing innovations, as noted by A. Vilas-Franquesa *et al.* (2023), could significantly enhance both the efficiency and profitability of the sector. Furthermore, the SWOT analysis conducted in this study identified key aspects of the investment climate within Kyrgyzstan's agro-industrial complex. While substantial natural potential and an available labour force create favourable conditions for industry development, low levels of mechanisation, inadequate infrastructure, and restricted access to finance remain serious constraints (Kerimkulova *et al.*, 2023). As observed by S.K. Wegren and F. Nilssen (2021), such challenges are characteristic of economies in transition, where structural barriers significantly hinder the attraction of investment.

Institutional barriers and environmental challenges continue to pose significant obstacles to the development of Kyrgyzstan's agro-industrial complex. Complex procedures for applying for state support and the absence of a transparent system for monitoring investment projects limit small and medium-sized farmers' access to financial resources, including loans and subsidies. Similar issues are identified by J.G. Díaz-Cueva and R. Guevara-Moncada (2023), who emphasise that ineffective management and lack of coordination in supporting small businesses in the agro-industrial sector led to reduced competitiveness and financial sustainability of the sector. Environmental challenges, including climate change, water scarcity, and frequent extreme weather events, introduce additional risks for agriculture (Oliynyk *et al.*, 2021). The lack of modern water management and irrigation systems, along with ongoing soil degradation, severely constrains farmers' capacity to adapt to these changes. As T. Salerno (2014) notes, effective natural resource management and the implementation of adaptation practices are crucial for ensuring sustainable agricultural development, especially in the context of growing global demand for environmentally friendly products. Investment in innovative, environmentally sustainable technologies, such as drip irrigation, cultivation of drought-resistant crops, and the use of agro-industrial waste for fertiliser production, remains at a low level. The absence of incentives to attract investments in these areas creates a vicious cycle, limiting the sector's capacity to address climate risks and enhance productivity. A similar situation is observed in other countries, where, according to T. Salerno, imperfect investment regulation and insufficient state support hinder the development of the agro-industrial sector.

Coordination between government agencies, the private sector, and international organisations remains weak, leading to the inefficient use of resources and duplication of efforts. This is supported by the findings of J.G. Díaz-Cueva and R. Guevara-Moncada (2023), who argue that the absence of an integrated development strategy creates uncertainty for investors and significantly complicates the implementation of long-term projects. Creating a favourable institutional environment is a key condition for attracting investment. As T. Joltreau (2024) notes, the introduction of transparent

governance mechanisms and support for investors through tax incentives significantly increase investment activity. In Kyrgyzstan, the implementation of measures such as simplifying administrative procedures and developing state support programs for farmers can provide the necessary basis for attracting both domestic and international investors.

Infrastructure modernisation is another important area of reform. Investments in irrigation systems, logistics centres and processing facilities will reduce crop losses and improve product quality, which, in turn, will contribute to expanding export potential. Similar examples of effective infrastructure solutions are given in the study by M. Benegiamo (2020), which emphasises the importance of integrating logistics chains in the development of the agro-industry. The creation of training programs and research centres is recommended to introduce modern technologies and improve the skills of agricultural workers. Creating a favourable institutional environment is a key condition for attracting investment. As J.R. Caradus (2022) highlights, the introduction of transparent governance mechanisms and support for investors through tax incentives significantly increase investment activity. In the context of Kyrgyzstan, the implementation of measures such as simplifying administrative procedures and developing state support programmes for farmers can establish a necessary foundation for attracting both domestic and international investors.

Infrastructure modernisation represents another critical area of reform. Investments in irrigation systems, logistics centres, and processing facilities will help to reduce crop losses and improve product quality, thereby enhancing the country's export potential. Similar examples of effective infrastructure development are provided in the study by M. Spies (2021), which emphasises the importance of integrating logistics chains for the successful development of the agro-industrial sector. Furthermore, the creation of specialised training programmes and research centres is recommended to facilitate the adoption of modern technologies and to improve the skills of agricultural workers. As noted by A. Mahmoud *et al*. (2024), the development of technologies adapted to local conditions significantly enhances resource efficiency and ensures environmental sustainability. In Kyrgyzstan, such initiatives should focus on addressing specific challenges related to climate change and soil degradation, thereby supporting the long-term resilience and productivity of the agro-industrial complex.

CONCLUSIONS

Kyrgyzstan's agro-industrial complex plays a key role in the national economy, accounting for approximately 20% of gross domestic product and providing over 40% of rural employment. However, its development is constrained by technological backwardness, limited access to finance, institutional barriers, and environmental challenges. Although overall investment in the sector has increased in recent years, both the structure and efficiency of these investments remain problematic. In 2023, total investment in the agro-industrial sector amounted to USD 7.3 million, but its distribution was uneven. For instance, USD 2.8 million was invested in Bishkek, while the Chui region, despite demonstrating high productivity indicators, received only USD 225,000.

Technological backwardness continues to be one of the most pressing issues, resulting in high product losses, which reach up to 35% of the harvest. The lack of access to modern technologies also reduces the resilience of the agricultural sector to climate change, which is already having a marked impact on yields. Over the past decade, Kyrgyzstan's average annual temperature has increased by 1.2°C, while the frequency of droughts has risen by 30%. These changes have led to a 15% reduction in water resources and a decline in the yields of key crops, such as wheat and barley. Furthermore, financial barriers significantly constrain farmers' capacity to invest in modernisation. High credit rates, ranging from 10% to 24% per annum, make production modernisation unaffordable for most small and medium-sized agricultural enterprises. In addition, state subsidies currently reach less than 15% of farmers, which is substantially lower than the level of support provided in neighbouring countries.

Weak infrastructure remains another critical factor holding back the development of Kyrgyzstan's agro-industrial sector. Currently, only 18% of agricultural land has access to modern irrigation systems, while over 40% of irrigation canals are in critical condition and require reconstruction. For example, the Fergana Valley Irrigation Rehabilitation Project successfully modernised 200 km of irrigation canals, leading to increased productivity on 15,000 hectares of agricultural land. However, such measures remain insufficient to ensure the sustainable development of the sector on a national scale. Institutional barriers, including high levels of bureaucracy and corruption, pose additional challenges for attracting investment. According to the Doing Business 2020 ranking, Kyrgyzstan is ranked 80th, while Uzbekistan and Azerbaijan are ranked 69th and 34th, respectively. This reflects a less favourable business climate in Kyrgyzstan, which significantly reduces its attractiveness to potential investors. Moreover, the inconsistency of state policy and frequent changes in tax legislation compel agricultural enterprises to repeatedly revise their business strategies, thereby slowing down the sector's overall development.

An analysis of the regional distribution of investments further reveals significant disparities in the efficiency of their utilisation. For instance, in Naryn region, investments rose from USD 0.2 thousand to USD 49.7 thousand in 2023, yet agricultural production

declined, indicating inefficient resource management. In contrast, the Chui region, despite receiving relatively modest investment volumes, continues to demonstrate stable productivity growth, confirming its higher investment efficiency. To ensure the sustainable development of Kyrgyzstan's agro-industrial complex, the implementation of comprehensive reforms is essential. Improving access to financing, reducing credit rates to 5-7% per annum, expanding state subsidies for modernisation from 15% to 30% of farms, and simplifying administrative procedures will contribute significantly to attracting both domestic and foreign investors. Investments in technological innovations, including precision agriculture, automated farm management systems, and drip irrigation, should be increased from the current 3% to 15% of total capital investments in the sector. A critical priority remains the modernisation of infrastructure, particularly the reconstruction of at least 500 km of irrigation canals over the next five years, which is expected to substantially improve agricultural yields. Overall, the implementation of these proposed measures will enhance the efficiency of Kyrgyzstan's agro-industrial complex, increase its attractiveness to investors, boost the competitiveness of agricultural products in international markets, and contribute to the sustainable economic development of the country.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Ali, R., & Stevano, S. (2021). Work in agro-industry and the social reproduction of labour in Mozambique: Contradictions in the current accumulation system. *Review of African Political Economy,* 49(171), 67-86. doi: 10.1080/03056244.2022.1990624.

[2] Barbosa, C.R., de Nazaré Santos Torres, R., de Lima Meirelles, P.R., Baldassini, W.A., Machado Neto, O.R., & Costa, C. (2024). The effect of including agro-industrial by-products on the fermentation pattern of grass silage and the performance of sheep: A meta-analysis. *New Zealand Journal of Agricultural Research*. doi: 10.1080/00288233.2024.2427732.

[3] Benegiamo, M. (2020). Extractivism, exclusion and conflicts in Senegal's agro-industrial transformation. *Review of African Political Economy*, 47(166), 522-544. doi: 10.1080/03056244.2020.1794661.

[4] Böhme, M. (2020). Shared interest or strategic threat? A critical investigation of political debates and regulatory responses to Chinese agricultural investment in Australia. *Globalizations*, 18(3), 441-460. doi: 10.1080/14747731.2020.1769414.

[5] Bowman, A., & Chisoro, S. (2024). Inclusive agro-industrial development and sectoral systems of innovation: Insights from South Africa. *Innovation and Development*. doi: 10.1080/2157930X.2024.2312311.

[6] Caradus, J.R. (2022). Intended and unintended consequences of genetically modified crops – myth, fact and/or manageable outcomes? *New Zealand Journal of Agricultural Research*, 66(6), 519-619. doi: 10.1080/00288233.2022.2141273.

[7] Díaz-Cueva, J.G., & Guevara-Moncada, R. (2023). Management of coopetitive tensions in SMEs of the Ecuadorian agro-industrial sector: Conflicts, rivalries, and interests. *Cogent Business & Management*, 10(3), article number 2287270. doi: 10.1080/23311975.2023.2287270.

[8] Djokoto, J.G. (2021). Foreign direct investment into agriculture: Does it crowd-out domestic investment? *Agrekon*, 60(2), 176-191. doi: 10.1080/03031853.2021.1920437.

[9] Ehrensperger, A., Nanhthavong, V., Beban, A., Gironde, C., Diepart, J.-C., Scurrah, N., Nguyen, A.-T., Cole, R., Hett, C., & Ingalls, M. (2023). The agrarian transition in the Mekong Region: Pathways towards sustainable land systems. *Journal of Land Use Science*, 19(1), 1-23. doi: 10.1080/1747423X.2024.2288728.

[10] Food and Agriculture Organization. (n.d.). Retrieved from https://www.fao.org/countryprofiles/index/en/?iso3=KAZ.

[11] Gallego-Bono, J.R., & Tapia-Baranda, M.R. (2021). Industrial ecology and sustainable change: Inertia and transformation in Mexican agro-industrial sugarcane clusters. *European Planning Studies*, 30(7), 1271-1291. doi: 10.1080/09654313.2020.1869186.

[12] Golub, G., Skydan, O., Kukharets, V., Yarosh, Y., & Kukharets, S. (2020). The estimation of energetically self-sufficient agroecosystem's model. *Journal of Central European Agriculture*, 21(1), 168-175. doi: 10.5513/JCEA01/21.1.2482.

[13] Habanabakize, T., & Zerihun, M.F. (2023). The criticality of financial intermediation on the South African Agro-Industrialization. *Cogent Economics & Finance*, 11(2), article number 2223416. doi: 10.1080/23322039.2023.2223416.

[14] Hamann, S. (2020). The global food system, agro-industrialization and governance: Alternative conceptions for sub-Saharan Africa. *Globalizations*, 17(8), 1405-1420. doi: 10.1080/14747731.2020.1730050.

[15] Henderson, C. (2021). The rise of Arab Gulf agro-capital: Continuity and change in the corporate food regime. *Journal of Peasant Studies*, 49(5), 1079-1100. doi: 10.1080/03066150.2021.1888723.

[16] Joltreau, T. (2024). The politics of agro-industrial greening: Policy processes, market institutions and local power relations in the sugarcane sector of French overseas departments. *Journal of Environmental Policy & Planning*, 26(5), 487-501. doi: 10.1080/1523908X.2024.2345086.
[17] Kerimkulova, M., Shakirova, K., Esenalieva, B., Makeeva, S., & Omurova, S. (2023). Manufacturing industry potential of the Kyrgyz Republic in Eurasian economic integration. *Sustainable Engineering and Innovation*, 5(2), 315-330. doi: 10.37868/sei.v5i2.id252.
[18] Khryk, V., Mazepa, V., Sytnyk, O., Levandovska, S., & Kimeichuk, I. (2024). Evaluation of the effectiveness of implementing measures to preserve natural resources in the context of sustainable development. *Scientific Reports of the National University of Life and Environmental Sciences of Ukraine*, 20(4), 106-118. doi: 10.31548/dopovidi/3.2024.106.
[19] Koura, B.I., Yassegoungbe, F.P., & Dossa, L.H. (2024). Production systems and strategies of peri-urban goat and sheep farmers for dry season feeding: A case study from Benin (West-Africa). *Cogent Food & Agriculture*, 10(1), article number 2356934. doi: 10.1080/23311932.2024.2356934.
[20] Krylova, I., Khrystenko, O., & Tabatskova, G. (2023). Unbalanced distribution of income in the conditions of a socio-oriented economy. *Ukrainian Black Sea Region Agrarian Science*, 27(2), 41-50. doi: 10.56407/bs.agrarian/2.2023.41.
[21] MacMillan, A. (1991). Agricultural investment projects: Design problems and possible cures. *Project Appraisal*, 6(2), 75-83. doi: 10.1080/02688867.1991.9726798.
[22] Mahmoud, A.M., Mohamed, Y., El-Helaly, M.A., Afifi, M.M., & El-Tawashy, M.K. (2024). Potential of producing organic lettuce seedlings without peat using agricultural and agro-industrial compost. *Journal of Plant Nutrition*, 47(19), 3316-3342. doi: 10.1080/01904167.2024.2378927.
[23] Manatovna, T.A., Dabyltayeva, N.E., Ruziyeva, E.A., Sakhanova, G., & Yelubayeva, Z.M. (2023). Unlocking intersectoral integration in Kazakhstan's agro-industrial complex: Technological innovations, knowledge transfer, and value chain governance as predictors. *Economies*, 11(8), article number 211. doi: 10.3390/economies11080211.
[24] Marra, F., Maffia, A., Canino, F., Greco, C., Mallamaci, C., & Adele, M. (2023). Effects of fertilizer produced from agro-industrial wastes on the quality of two different soils. *Archives of Agronomy and Soil Science*, 69(15), 3600-3618. doi: 10.1080/03650340.2023.2266218.
[25] National Statistical Committee of the Kyrgyz Republic. (n.d.). *Investments.* Retrieved from https://stat.gov.kg/ru/statistics/investicii/.
[26] Oliynyk, O., Skoromna, O., Gorokh, O., Mishchenko, V., & Yevdokimova, M. (2021). New approach to risk assessment of certain agricultural products. *Agricultural and Resource Economics*, 7(1), 44-57. doi: 10.51599/are.2021.07.01.03.
[27] Pomerlyan, E., & Belitski, M. (2023). Regional integration and economic performance: Evidence from the Eurasian Economic Union. *Eurasian Geography and Economics*, 65(5), 627-655. doi: 10.1080/15387216.2022.2163414.
[28] Rodenbiker, J. (2022). Green silk roads, partner state development, and environmental governance: Belt and road infrastructure on the Sino-East African frontier. *Critical Asian Studies*, 55(2), 169-192. doi: 10.1080/14672715.2022.2150249.
[29] Sakkaraeva, D., & Kumashev, M. (2024). Analysis of the agro-industrial sector of the Kyrgyz Republic. *Ekonomika APK*, 31(2), 41-50. doi: 10.32317/2221-1055.202402041.
[30] Salerno, T. (2014). Capitalising on the financialisation of agriculture: Cargill's land investment techniques in the Philippines. *Third World Quarterly*, 35(9), 1709-1727. doi: 10.1080/01436597.2014.971567.
[31] Spies, M. (2021). Promises and perils of the China-Pakistan Economic Corridor: Agriculture and export prospects in northern Pakistan. *Eurasian Geography and Economics*, 64(7-8), 869-895. doi: 10.1080/15387216.2021.2016456.
[32] Vastolo, A., Calabrò, S., & Cutrignelli, M.I. (2022). A review on the use of agro-industrial CO-products in animals' diets. *Italian Journal of Animal Science*, 21(1), 577-594. doi: 10.1080/1828051X.2022.2039562.
[33] Vilas-Franquesa, A., Casertano, M., Tresserra-Rimbau, A., Vallverdú-Queralt, A., & Torres-León, C. (2023). Recent advances in bio-based extraction processes for the recovery of bound phenolics from agro-industrial by-products and their biological activity. *Critical Reviews in Food Science and Nutrition*, 64(29), 10643-10667. doi: 10.1080/10408398.2023.2227261.
[34] Wani, N.U., Rahman, A., Grover, V., Mirzakhidova, S., & Mirwais Rasa, M. (2024). Regional trade expansion opportunities in Central and South Asia: Exploring trade complementarity, diversification and similarity. *Cogent Economics & Finance*, 12(1), article number 2363461. doi:10.1080/23322039.2024.2363461.
[35] Wegren, S.K., & Nilssen, F. (2021). Russia's changing role in the international agri-food system and why it matters. *Post-Communist Economies*, 33(8), 939-968. doi: 10.1080/14631377.2021.1943914.
[36] Xu, X., & Yan, Y. (2014). Does government investment crowd out private investment in China? *Journal of Economic Policy Reform*, 17(1), 1-12. doi: 10.1080/17487870.2013.866897.

[37] Yarashevich, V. (2020). The Eurasian Economic Union as a regional development project: Expectations and realities. *Area Development and P*olicy, 6(1), 82-105. doi: 10.1080/23792949.2020.1756362.
[38] Zubok, V., Cox, M., Pechatnov, V.O., Braithwaite, R., Spohr, K., Radchenko, S., Zhuravlev, S., Scarborough, I., Savranskaya, S., & Sarotte, M.E. (2021). A Cold War endgame or an opportunity missed? Analysing the Soviet collapse Thirty years later. *Cold War History*, 21(4), 541-599. doi: 10.1080/14682745.2021.1987871.

Оцінка впливу інвестицій на продуктивність агропромислового комплексу Киргизстану

Бекболот Талгарбеков
Аспірант, докторант
Киргизький економічний університет імені М. Рискулбекова
720033, вул. Тоголок Молдо, 58, м. Бішкек, Киргизька Республіка
https://orcid.org/0009-0007-5743-2751
Асель Джаілова
Аспірант, докторант
Науково-дослідний інститут інноваційної економіки ім. Ш. Мусакожоєва
720033, вул. Тоголок Молдо, 58, м. Бішкек, Киргизька Республіка
https://orcid.org/0000-0002-2006-4728
Ількіз Абишов
Аспірант, докторант
Киргизький економічний університет імені М. Рискулбекова
720033, вул. Тоголок Молдо, 58, м. Бішкек, Киргизька Республіка
https://orcid.org/0009-0007-9346-3271
Жамалгази Жумабаєв
Доктор економічних наук, професор
Киргизький економічний університет імені М. Рискулбекова
720033, вул. Тоголок Молдо, 58, м. Бішкек, Киргизька Республіка
https://orcid.org/0009-0003-6334-6543
Чжоу Мяолун
Аспірант
Киргизький національний університет імені Жусупа Баласагина
720033, вул. Фрунзе, 547, м. Бішкек, Киргизька Республіка
https://orcid.org/0009-0001-8707-1500

Анотація. Підвищення ефективності агропромислового комплексу Киргизстану є ключовим завданням для забезпечення продовольчої безпеки та економічної стабільності країни. Метою даного дослідження була оцінка впливу інвестицій на продуктивність агропромислового комплексу Киргизстану, зокрема шляхом визначення ефективності їх розподілу, виявлення бар'єрів для залучення капіталу та окреслення перспективних напрямів розвитку галузі. У дослідженні проаналізовано дані за період 2014-2024 рр., зокрема регіональний розподіл інвестицій, рівень механізації, обсяги виробництва та впровадження інноваційних технологій. Виявлено, що частка інвестицій у сільське господарство в середньому становить 12,4 % від загального обсягу капітальних інвестицій в країні, проте їх розподіл нерівномірний. Так, у Чуйській області інвестиції досягли 492,9 тис. доларів США у 2020 році, тоді як у Наринській області вони склали лише 0,2 тис. доларів США. У той же час, продуктивність зросла найбільш суттєво в регіонах з розвиненою інфраструктурою: в Джалал-Абадській області виробництво зросло з 1631,1 тис. тон у 2020 році до 1666,9 тис. тон у 2023 році. Інвестиції в зрошувальні системи призвели до зростання врожайності на 18,7 %, а модернізація технологічного обладнання сприяла зниженню втрат продукції на 12,4 %. Аналіз показав, що лише 27,5 % господарств мають доступ до сучасних технологій, що значно обмежує потенціал зростання продуктивності. SWOT-аналіз визначив основні виклики: зміна клімату, бюрократичні бар'єри та слабка координація між державою та приватним сектором. Практична цінність дослідження полягає у розробці рекомендацій щодо створення сприятливого інвестиційного клімату, підвищення ефективності фінансування, стимулювання державно-приватного партнерства та впровадження підходів циркулярної економіки. Запропоновані заходи сприятимуть сталому розвитку агропромислового комплексу Киргизстану, підвищенню продуктивності та розширенню експортного потенціалу країни

Ключові слова: економічний розвиток; сільськогосподарське виробництво; підвищення врожайності; виробничий цикл; інноваційні технології