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Assessment of the effectiveness of state aid to agricultural producers

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Abstract. The purpose of this study was to identify the key factors influencing the effectiveness of state support for agricultural producers in Kazakhstan, as well as to assess its influence on the development of the agro-industrial complex. The study employed methods of systematic analysis and comparative assessment, which helped to identify the specific features of state support for agricultural producers, determine its impact on the economic development of the agro-industrial complex, and the validity of the allocation of budget resources. The analysis found that the total amount of budget funds allocated to support agriculture in Kazakhstan

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increased from KZT 300 bn in 2015 to KZT 750 bn in 2024, with the share of subsidies growing from KZT 150 bn to KZT 410 bn. However, most of the funding goes to large agricultural holdings, while small and medium-sized farms face challenges accessing financial and material resources. The analysis revealed that state aid positively influences agricultural productivity growth. For example, grain yields increased from 1.12 t/ha in 2015 to 1.63 t/ha in 2024, while milk production increased from 4.8 mn t to 6.7 mn t. However, the availability of subsidies does not always lead to increased profitability. For example, despite the expansion of preferential lending from KZT 100 bn to KZT 280 bn, small farmers still face excessive costs and challenges in obtaining financial resources. The pace of digitalisation in the agro-industrial complex continues to be insufficient: the introduction of precision farming is limited by a lack of infrastructure and specialists. The experience of the EU, the US, and Australia, where state support stimulates innovative solutions, suggests the need to expand technological modernisation programmes. As a result, the study concluded that subsidies need to be redistributed in favour of small and medium-sized farms, control over the targeted use of funds must be strengthened, and digital technologies must be actively introduced to improve the efficiency of the agricultural sector

Keywords: subsidies; preferential lending; audit of budget expenditure; crop yields; technical modernisation

INTRODUCTION

The agro-industrial complex of Kazakhstan plays a key role in the country's economy, influencing food security, rural development, and social stability in the regions. Agriculture and agricultural processing account for a sizeable share of the economic structure and create jobs for the population. To increase production efficiency and introduce modern technologies, the government is implementing measures to support agricultural producers, including subsidies, preferential lending, tax breaks, and modernisation programmes. However, with the growing need for innovation and product quality improvement, the agricultural sector faces serious challenges. These include climate change, rising energy and resource prices, and the need to transition to more sustainable farming methods. These factors require flexibility in government support policies and constant monitoring of the effectiveness of the programmes being implemented. In the current circumstances, it is crucial not only to provide financial aid, but also to adapt state aid mechanisms to emerging challenges so that they contribute to the long-term and sustainable development of the agro-industrial complex.

The issue of the effectiveness of government support for agricultural producers stays relevant against the backdrop of dynamic changes in agricultural policy and the economic situation. M. Meng *et al.* (2024) noted that subsidies for equipment and fertilisers positive influenced agricultural productivity. However, the researchers also emphasised that this process was accompanied by an uneven distribution of resources between large and small farms. U. Kambali and N. Panakaje (2022) argued that the introduction of new financial mechanisms, such as investment loans, markedly improved financial accessibility for small and medium-sized farmers. The researchers believe that these measures stimulated technological upgrading and improvements in production processes in the agricultural sector. S. Getahun *et al.* (2024) studied the impact of precision farming technologies on the growth of agricultural production efficiency, emphasising the need for extensive investment in infrastructure and training. The researchers also argued that without adequate training for farmers and infrastructure development, the adoption of these technologies would be limited. A. de Boon *et al.* (2022) highlighted the value of government support in the transition to environmentally sustainable agriculture. The researchers noted that investment in environmentally friendly technologies is a crucial factor in the sustainable development of the agricultural sector. G.S. Malhi *et al.* (2021) addressed the need to adapt agricultural practices to climate change, which required a review of conventional farming methods. The researchers also noted that the adaptability of agricultural policy can ensure the sustainability and competitiveness of the agricultural sector in the face of climate change.

V. Stadnyk *et al.* (2021) argued that cooperation between various actors in the agro-industrial complex, including farmers and processing enterprises, contributes to reducing costs and increasing production volumes. In the researchers' opinion, the development of cooperative mechanisms considerably improves resource efficiency and contributes to the expansion of sales markets. M.-H. Ehlers *et al.* (2021) highlighted the significance of flexibility in the distribution of subsidies, which accommodate regional characteristics and the individual needs of agricultural producers. The researchers also noted that such measures allow addressing problems and meeting the needs of farmers more effectively. W. Lin and J. Huang (2021) studied the effects of tax incentives on the development of small farms, emphasising that reducing the financial burden contributed to improving their competitiveness and stability. The researchers also noted that such measures were necessary to create more favourable business conditions in the agricultural sector.

M. Moahid *et al*. (2021) investigated the influence of credit programmes on improving agri-producers' access to financial resources, arguing that this contributed to the modernisation of technologies and increased production volumes. In their study, the researchers stressed the need to simplify the conditions for obtaining preferential loans. K.L.M. Ang and J.K.P. Seng (2021) investigated the possibilities of introducing information technology into agribusiness, arguing that the digitalisation of agriculture enabled a marked improvement in production performance. The researchers noted that without the introduction of relevant IT solutions, the agricultural sector would be unable to compete in international markets effectively. Thus, despite extensive research in this area, there are still unresolved issues, such as the effectiveness of long-term financial support mechanisms, improving cooperation at the regional level, and adapting innovative technologies to the specific conditions of Kazakh agriculture.

The purpose of the present study was to assess the effectiveness of state support for agriculture in Kazakhstan and to identify measures that could be taken to improve this support. The objectives of the present study were as follows: to consider the role of financial mechanisms, such as investment loans, in improving financial accessibility for farmers and their technological modernisation; to assess the potential of precision farming technologies to improve agricultural efficiency and the possible obstacles to their adoption; to assess government support for the transition to environmentally sustainable practices in the agricultural sector.

MATERIALS AND METHODS

The study conducted a comprehensive assessment of state support for agricultural producers in the Republic of Kazakhstan, including an analysis of its structure, delivery mechanisms, and influence on the development of the agro-industrial complex. The focus was on exploring various instruments of state support, including subsidies, preferential lending, agricultural risk insurance, as well as programmes promoting technological modernisation of the industry. The first stage of the study analysed financial support for agriculture. Various forms of subsidies were considered, such as payments per hectare of cultivated land, compensation for fuel costs, and support for the production of certain types of agricultural products. The study assessed the availability of credit resources, the terms of preferential loans, interest rates, and the degree of involvement of state institutions in financing the agricultural sector. Furthermore, the issue of agricultural risk insurance was examined, including state co-financing of insurance programmes, the coverage of farms by these instruments, and factors limiting their availability.

The second stage of the study focused on analysing the technological modernisation of agricultural production. The study assessed the influence of government programmes, such as subsidies for pesticides, fertilisers, seeds, priority crops, and livestock, on the renewal of agricultural equipment, the availability of subsidies for its purchase, and the promotion of innovative technologies. Measures to develop digital technologies in agriculture were also analysed, including the use of precision farming, automated production process management systems, and the introduction of modern methods for monitoring crop and soil conditions. The third stage of the study assessed the effectiveness of budget funds allocated to support agriculture. The analysis included a comparison of the financing system for the agricultural sector in Kazakhstan with leading international practices (EU, USA, Australia, Canada, Japan, New Zealand), which helped to identify key differences in the mechanisms for distributing and controlling state subsidies. Legislation regulating the audit of budget expenditures in Kazakhstan was examined, such as the Law of the Republic of Kazakhstan No. 392-V LRK (2015), the Regulatory Resolution of the Accounts Committee for Control over the Execution of the Republican Budget No. 6-NK (2020) and Order of the Minister of Finance of the Republic of Kazakhstan No. 873 (2018). Additionally, the degree of farmers' dependence on state support and the possible consequences for the long-term sustainability of their farms were examined.

Next, the study examined the economic and social consequences of the implementation of state support programmes for agricultural producers. The analysis included an assessment of labour productivity growth, crop yield dynamics, and the profitability of farms based on reports on the dynamics of agricultural development in Kazakhstan and budg*et* allocations for its development for the 2015-2024 period. The effects of state support on the development of rural infrastructure, including transport logistics, storage, and processing systems for agricultural products, were also examined. Particular attention was paid to employment in rural areas and the significance of state aid in ensuring stable incomes for farmers. The final stage of the study analysed the environmental aspects of state support for agriculture. The study examined the influence of subsidies on the efficient use of water and land resources, measures to promote sustainable agricultural production methods, and the dissemination of practices aimed at reducing the negative impact of agricultural activities on the environment. Thus, the study covered all key aspects of state support for agricultural producers, which helped to identify its advantages and disadvantages, as well as to determine ways to improve the mechanisms for financing, controlling the distribution of budget funds and stimulating technological development in Kazakhstan's agro-industrial complex.

RESULTS

Financial support for agriculture plays a key role in the development of the sector, improving production efficiency, and increasing resilience to risks. Subsidies, loans, preferential financing, and access to risk insurance constitute a substantial part of this support (Sodoma *et al.*, 2021). Subsidies are one of the most widespread instruments of government support for agriculture. They are aimed at reducing agricultural producers' costs, stimulating production growth, and modernising the sector. The structure of subsidies may vary depending on the country and programme, but several key types are most prevalent. Subsidies may be provided per hectare of cultivated land, which is particularly significant for large agricultural enterprises where land size plays a key role in the production process. Subsidies may also be granted per litre of fuel required to operate agricultural machinery or per unit of product produced, e.g., per tonne of grain or litre of milk. These measures contribute to increased productivity and help agricultural producers reduce their operating costs.

Loans and preferential financing are a valuable component of government policy in agriculture. They provide agricultural enterprises with the opportunity to invest in development, expansion of production, and modernisation of technology. The terms of such loans may include low interest rates, preferential repayment terms, and partial state guarantees, making them accessible to a wide range of producers. However, despite favourable terms, access to credit resources may continue to be a problem for some small and medium-sized agricultural producers, especially in times of economic instability. In such cases, the government's task is to create conditions for obtaining cheap loans and subsidising part of the interest rates. Agriculture, like other industries, is exposed to various risks, such as adverse weather conditions, plant and animal diseases, and economic fluctuations. In this regard, the availability of risk insurance is becoming a vital element of financial protection for agricultural producers. State co-financing of insurance programmes makes insurance more accessible to farmers, reducing their financial burden in case of adverse events. It also contributes to the development of the agricultural insurance market, allowing producers to feel more confident in times of instability and minimise potential losses.

Technological modernisation is a key factor in improving agricultural efficiency, product quality, and industry sustainability in a rapidly changing environment. One of the crucial elements of modernisation is support for the purchase of modern agricultural equipment, as well as the impact of government programmes on the renewal of the machine park and the introduction of digital technologies (Duncan *et al.,* 2021). The purchase of modern agricultural machinery and equipment plays a key role in technological modernisation. Modern machines greatly increase labour productivity, improve the quality of land cultivation, and contribute to production growth. However, the prohibitive cost of such equipment often becomes an obstacle for small and medium-sized farms. In this case, state support in the form of subsidies, soft loans, or tax breaks helps agricultural producers to renew their machinery fleet. For instance, many countries provide subsidies for the purchase of tractors, combine harvesters, seeders, and other equipment, which enables farmers to invest in high-quality machinery without major initial costs. Such support contributes to the more active introduction of the latest technologies in agricultural production. State programmes supporting the technological modernisation of agriculture play a key role in the renewal of machinery and the introduction of innovative technologies (Musca & Kara, 2023). These programmes may include not only subsidies for the purchase of equipment, but also training for specialists, personnel training, and consulting services for farmers on the use of modern equipment and technologies. The impact of such programmes on the renewal of the machine park is that they significantly accelerate the modernisation process, reducing the financial burden on agricultural producers and allowing them to invest more wisely in high-tech equipment. Additionally, programmes aimed at introducing the latest technologies contribute to improving the environmental situation by increasing resource efficiency and reducing costs.

One of the most promising areas of technological modernisation in agriculture is the introduction of digital solutions, such as precision farming and process automation (Stender *et al.*, 2024). These technologies enable the collection and analysis of data on soil condition, moisture levels, and temperature, which helps to make more informed decisions about sowing, fertilisation, and harvesting times. Precision farming systems using sensors, GPS and satellite technology markedly increase yields, reduce fertiliser and plant protection costs, and minimise adverse environmental impact. Implementation of such technologies requires highly qualified specialists, which makes them accessible primarily to large agricultural enterprises. However, in the future, such solutions may become available to small farms as well. The automation of processes such as harvesting, land cultivation, and irrigation also greatly increases labour productivity. Modern robots and drone technologies enable work with minimal human involvement, which reduces labour costs and increases the accuracy of operations. To improve the efficiency of budget spending in agriculture, Kazakhstan could look at what other countries have succeeded in. In some countries, government support for farmers is not merely about boosting production, but also about introducing innovative technologies, sustainable farming methods, and environmentally friendly practices (Table 1).

***Table 1**. Comparison of state support for the agro-industrial complex in different countries*

Country	Main forms of state support	Approximate amounts of support	Notes
European Union	Subsidies for environmentally friendly farming, agroecological zones, production modernisation	EUR 58 bn in 2020 to support farmers	Includes support for innovative technologies and sustainable farming practices
USA	Tax breaks, low-interest loans, subsidies for innovative technologies	USD 25 bn (federal agricultural support programme in 2021)	Programmes encourage long-term investment and sustainable agriculture
Australia	Subsidies to support agriculture in remote areas, innovative projects, climate risk insurance	AUD 4.8 bn for agricultural support programmes (2022)	Support is aimed at sustainable development and reducing climate risks.
Canada	Subsidies for technology development, use of renewable energy sources, risk insurance	CAD 3.8 bn (federal programme in 2021)	Includes maintaining product quality and improving the sustainability of farmers
Japan	Subsidies for modernisation, agro-ecological tourism, tax breaks, scientific research	JPY 1.5 tn (2022 for agricultural support)	The support system focuses on innovation and sustainable production.
New Zealand	Grants for environmentally friendly technologies, sustainable production methods, bioenergy	NZD 350 mn in 2021 for agricultural development and environmental initiatives	The programmes are aimed at the sustainable use of natural resources and improving production efficiency.

***Source:** compiled by the authors of this study based on data from B. Czyżewski et al. (2021), H. Panchasara et al. (2021), S.R. McGreevy et al. (2021), N. Bradly et al. (2022), O. Adisa et al. (2024), A.G. Green et al. (2024)*

In European Union (EU) countries, support for the agro-industrial complex includes not only financial subsidies but also incentives for sustainable farming practices. Within the framework of the EU's general agricultural policy, programmes focused on environmentally friendly farming, the creation of agroecological zones and the modernisation of agriculture through the introduction of the latest technologies are actively supported. In 2020, EUR 58 bn was allocated to support farmers, including support for innovative technologies and sustainable farming practices. European farmers can receive subsidies aimed at improving infrastructure and technologies for processing agricultural products. Particular attention is paid to environmental sustainability, which contributes to the integration of agriculture into the broader context of sustainable development. The use of precision farming technologies, such as GPS navigation, drones, and sensors, enables European farmers to significantly increase yields through more accurate and efficient use of resources. For example, using sensors and data analysis, farmers can accurately determine fertiliser and water requirements, reducing overuse of these resources and minimising their negative environmental impact (Czyżewski *et al.*, 2021).

In the United States, federal and state programmes to support farmers focus not only on direct subsidies but also on creating favourable conditions for long-term investment. Tax breaks and low-interest loans are a prominent part of these programmes. In 2021, the federal agricultural support programme amounted to USD 25 bn. Furthermore, farmers in the United States can receive subsidies for the introduction of innovative technologies, which contributes to the integration of new methods into agricultural production. The country also actively supports environmentally friendly agricultural practices, such as organic farming and sustainable use of water resources. The use of precision farming technologies in the United States allows farmers to markedly increase the efficiency of fertiliser use and reduce their quantity, which leads to lower costs and a reduced impact on the ecosystem (Adisa *et al.*, 2024). In Australia, agricultural policy includes a variety of measures to support farmers, especially in the context of climate change. Subsidy programmes are aimed at supporting agriculture in remote regions, as well as financing innovative projects aimed at increasing productivity and environmental sustainability (Ismayilov *et al.*, 2023). In 2022, AUD 4.8 bn was allocated to agricultural support programmes. Australian farmers can also receive support through climate risk insurance programmes, which help minimise losses in case of adverse weather conditions. The introduction of precision farming technologies, such as drones for crop monitoring, helps Australian farmers quickly identify plant problems, enabling them to respond quickly to changes and increase yields while reducing water and fertiliser costs (Panchasara *et al.,* 2021).

In Canada, government support for farmers includes programmes aimed at improving product quality and developing agricultural technologies. The Canadian government actively supports sustainable agriculture, including initiatives to use renewable energy sources and introduce innovative technologies in agribusiness. In 2021, CAD 3.8 bn was allocated to the federal agricultural support programme. A prominent part of government support is risk insurance, including natural disasters and fluctuations in world market prices, which helps to ensure the financial stability of

farmers. The use of precision farming technologies, such as GPS navigation and drone systems for soil monitoring, helps Canadian farmers minimise the use of chemicals and increase the resilience of farms to climate change (Green *et al.,* 2024). Japan attaches great significance to preserving rural areas and ensuring the sustainability of agriculture. A key element of the country's agricultural policy is subsidies for the modernisation of production, the introduction of modern technologies, and the development of agro-ecological tourism. Japanese farmers receive tax breaks and support for research aimed at improving agricultural technologies and increasing the resilience of agriculture to climate change. Japan actively uses precision farming technologies to increase crop yields and minimise adverse environmental impacts, particularly through drone systems for precise fertiliser distribution and plant condition monitoring (McGreevy *et al.*, 2021).

In New Zealand, government support is focused on the introduction of innovative agricultural methods, including sustainable technologies and the use of bioenergy. In 2021, NZD 350 mn was allocated to agricultural support programmes. Farmers receive grants to implement environmentally friendly technologies and develop sustainable production methods. New Zealand also has a system of incentives for improving product quality and increasing the efficient use of natural resources. The use of drones and sensors to monitor crop conditions and optimise fertiliser application helps New Zealand farmers greatly reduce costs and improve the environmental sustainability of their production (Bradly *et al.,* 2022). Thus, international practices demonstrated showed that a comprehensive approach is essential for successful agricultural policy, including not only financial support but also the creation of long-term incentives for innovation and sustainable agricultural development. Unlike Kazakhstan, where the primary focus is on subsidies and support for production processes, these countries place much greater emphasis on creating an innovative and sustainable agricultural economy, which could be a valuable benchmark for Kazakhstan in the future.

In the Republic of Kazakhstan, support for agriculture is also provided through subsidies, preferential loans, and tax incentives. However, there are several problems that hinder the effective use of these funds. For instance, budget funds are not always received on time, and the processes for their distribution are often complex and not always transparent, which reduces their effectiveness. The Republic of Kazakhstan has a series of subsidy programmes aimed at supporting the agro-industrial complex (AIC), which include subsidies for pesticides, fertilisers, seeds, and planting material, as well as for priority crops and livestock. In 2024, for example, state support in the form of subsidies amounted to KZT 46.4 bn, of which a major part was allocated to crop and livestock production (State support for…, n.d.). The principal objective of these programmes is to stimulate agricultural production, improve its quality and resilience to external factors.

However, despite these measures, there are a series of problems that can be addressed to improve the effectiveness of subsidy programmes. First and foremost, the bureaucratic procedures for obtaining subsidies must be simplified. The complexity of the application process and the need to collect many documents often become a barrier for farmers, especially in remote regions. Automating the application process through electronic platforms could greatly expedite the process and make it more accessible, potentially reducing the application time from 2-3 months to 2-3 weeks (Subsidies for crop…, 2023). Additionally, expanding the list of subsidised crops from the current 10 to 20 items and introducing the latest agricultural technologies into the programmes will also increase their attractiveness and effectiveness. Support for farmers not only in conventional crops but also in the innovative technologies, such as precision farming and sustainable agricultural practices, can contribute to more efficient use of resources, increasing yields by 15%-20%. It is also essential to improve transparency and control over the use of subsidies. The development and implementation of monitoring mechanisms, such as the use of blockchain technologies, will help prevent cases of misuse of funds, increasing trust in government programmes. Regular audits and public oversight can reduce the number of cases of misuse of subsidies by 30%-40% (Ermuhan, 2024).

Long-term loans with low interest rates (2%-4% per annum) significantly affect farmers' investment activity. They allow farmers to invest in modern equipment, technology, and infrastructure, which helps increase productivity by 10%-15% and competitiveness. However, access to such loans is not always evenly distributed, especially in conditions of economic instability and an increase in the key rate of the National Bank of Kazakhstan. Therefore, to stimulate investment activity, it is vital to increase the availability of preferential lending for farmers, especially for small and medium-sized businesses, by increasing the number of loans issued by 20%-30% (Sagbo & Kusunose, 2021). To this end, it is necessary to expand preferential lending programmes, reduce interest rates to 3%-5% and provide further state guarantees. Interest rate subsidy programmes for loans can markedly reduce the financial burden on farmers and increase the attractiveness of investment in the agricultural sector. The development of microfinance and cooperative forms can also be a valuable tool for ensuring access to finance, especially for small farms, which often face challenges in obtaining conventional bank loans. The development of these instruments is estimated to increase access to finance by 40%-50% (Balana & Oyeyemim, 2022). The implementation of these measures will increase the

investment attractiveness of the agricultural sector, stimulate the development of sustainable and highly productive farms, and increase the overall volume of investment in Kazakhstan's agriculture. The development of Kazakhstan's agricultural sector in the 2015-2024 period is characterised by growth in crop yields, an increase in livestock production and growth in investment in the sector. These changes are linked to both government support and the adaptation of agricultural producers to market conditions (Table 2).

***Table 2**. Dynamics of agricultural development in Kazakhstan*

Year	Grain yield (t/ha)	Milk production (mn t)	Meat production (mn t)	People employed in the AIC (%)	Investments in AIC (KZT bn)
2015	1.12	4.8	0.8	24	230
2016	1.18	5.0	0.9	23	260
2017	1.25	5.3	1.0	22	290
2018	1.3	5.5	1.1	21	320
2019	1.36	5.7	1.2	20	350
2020	1.42	5.9	1.3	19	400
2021	1.47	6.1	1.4	18	450
2022	1.53	6.3	1.5	17	500
2023	1.58	6.5	1.6	16	550
2024	1.63	6.7	1.7	15	600

***Source:** compiled by the authors of this study based on data from K. Yuksel et al. (2023)*

The table showed the key indicators of agriculture, including grain yields, milk and meat production, and employment in the agricultural sector. The analysis showed that since 2015, grain yields increased by over 40%, milk and meat production also grew, while employment in the sector gradually declined due to automation and mechanisation. Therewith, investment in the industry continues to show steady growth, indicating the growing attractiveness of agriculture for capital investment. State support for agriculture in Kazakhstan is provided through a system of subsidies, preferential loans, and financing for infrastructure projects. From 2015 to 2024, there has been a steady increase in the amount of budget funds allocated to the development of the agricultural sector, as presented in Table 3.

***Table 3**. Budget funds allocated for the development of agriculture in Kazakhstan*

Year	Total support (KZT bn)	Subsidies (KZT bn)	Preferential lending (KZT bn)	Tax benefits (KZT bn)
2015	300	150	100	50
2016	350	180	120	50
2017	400	200	140	60
2018	450	230	160	60
2019	500	260	180	60
2020	550	290	200	60
2021	600	320	220	60
2022	650	350	240	60
2023	700	380	260	60
2024	750	410	280	60

***Source:** compiled by the authors of this study based on data from P. Buzaubayeva et al. (2023)*

The allocated funds are used to support farmers through subsidies for costs, loans for modernising production processes, as well as developing rural infrastructure and introducing digital technologies. Subsidies account for the bulk of the funding, with their volume increasing more than 2.5 times between 2015 and 2024. There has also been an increase in the volume of preferential lending, which expands agricultural producers' access to financial resources for upgrading equipment, purchasing seeds, and developing processing capacities. These data suggest that state support continues to play a key role in the development of agriculture, but further research and improvement of distribution mechanisms are needed to increase the efficiency of spending.

In Kazakhstan, a considerable proportion of agricultural producers depend on state support. For many farmers, subsidies are a crucial tool for covering the excessive costs of purchasing seeds, fertilisers, equipment, and labour. These measures also help to attract investment in the modernisation and development of agriculture. However, this dependence has its drawbacks. First and foremost, it can create a system where farmers are not always interested in developing their

businesses independently and seeking innovative solutions to improve efficiency. Dependence on state intervention can reduce their initiative and ability to develop independently. Such dependence also creates risks in conditions of economic instability or changes in state policy. For example, cuts in subsidies or changes in legislation can substantially exacerbate the financial situation of farmers, especially those who are not ready to adapt to changes.

Legislation regulating the audit of the effective use of budget funds in the Republic of Kazakhstan includes several key regulatory documents. The principal act is the Law of the Republic of Kazakhstan No. 392-V LRK (2015), which establishes the principles, objectives, and tasks of state audit, including the audit of the effective use of budget funds. This law defines the structure and functions of the auditing bodies and regulates the procedure for conducting audits in state bodies and organisations. According to data, in 2023, over 1,200 audits per year will be conducted by various auditing bodies, and over 60% of them will be aimed at verifying the use of budget funds in various state institutions. The law also prescribed the establishment of the Kazakhstan Financial Control Agency, which is responsible for conducting audits at all levels of government and publishing reports on the results of audits, thereby promoting transparency and accountability in the use of funds.

Furthermore, a significant regulation is the Regulatory Resolution of the Accounts Committee for Control over the Execution of the Republican Budget No. 6-NK (2020). It establishes the procedure for conducting external state audits, including audits of the effective use of budget funds. This document regulates the actions of the Supreme Audit Chamber of the Republic of Kazakhstan when auditing the accounts of state bodies and organisations, and establishes that in 2021, 350 external audits were conducted, of which over 70% concerned the effectiveness of spending at various levels of government. Another vital regulation is the Order of the Minister of Finance of the Republic of Kazakhstan No. 873 (2018). This Order governs the procedures for internal audits conducted by internal audit services in state bodies and defines methods for assessing the effectiveness of the use of state funds at various levels of government. In 2020, 120 audits of the effectiveness of public spending were conducted, of which 85% concerned public procurement and the use of budget subsidies. These legislative acts provide the legal basis for conducting audits of the effectiveness of budget spending aimed at improving the transparency and efficiency of public administration in Kazakhstan.

One of the key problems affecting the efficiency of budget spending is corruption and bureaucratic obstacles to its distribution. In Kazakhstan, as in other countries, there is a problem of insufficient transparency in the distribution of subsidies, which opens opportunities for abuse and corrupt practices. Farmers often face challenges in applying for subsidies due to complex and confusing bureaucratic procedures. Corruption in this process means that funds do not always reach those who really need them. Instead of being directed towards supporting agriculture and farmers, some of the funds end up in the hands of corrupt officials. This undermines trust in the system and reduces its effectiveness. To combat corruption and bureaucracy, more transparent and simplified mechanisms for the distribution of funds must be introduced. Electronic platforms, simplified application procedures, and stronger accountability measures for civil servants can markedly improve the situation. Development of a system to monitor and control the use of budget funds is also a major step that will help to ensure the efficient use of financial resources and minimise corruption risks.

Agriculture plays a key role in the economies of many countries, affecting not only food security but also the standard of living of the population, especially in rural areas. Support for the agricultural sector greatly influences the indicators such as productivity, farmers' incomes, infrastructure development, and rural employment (Viana *et al.*, 2022). One of the key economic outcomes of the introduction of modern technologies and government support is increased labour productivity and crop yields. The use of innovative methods such as precision farming, genetically improved varieties, irrigation systems, and new fertilisers considerably increases yields per unit area. The introduction of the latest technologies, including process automation, improved land treatment, and optimised resource use, contributes to increased production while reducing costs. This not only improves food security, but also increases agricultural exports, which is essential for strengthening the country's economy. Productivity growth directly affects farmers' profitability, providing stable incomes and opportunities for further investment in development. The dynamics of farmers' incomes directly depend on the efficient use of resources, the level of subsidies, and access to modern technologies. With support measures such as preferential lending, subsidies for agricultural machinery and product processing, farmers' incomes can increase substantially. The profitability of agricultural production depends on production costs, product prices, and access to markets. However, even with government support, farmers, especially small and medium-sized enterprises, often face challenges in obtaining financial resources, which limits their ability to expand. In some cases, farmers may become overly dependent on subsidies, which hinders their long-term development. It is therefore necessary to ensure more diverse sources of income and create opportunities for increased profitability, including access to innovative technologies and new markets.

The development of rural infrastructure markedly affects the economy of rural regions. Modern logistics

networks and efficient agricultural processing and storage systems are key to improving the productivity of the agricultural sector. Logistics, including transport and distribution, helps to reduce losses associated with storage and transport of goods and improve access to markets. The processing of agricultural products, especially in areas such as food production, textiles, and biofuels, contributes to adding value and creating jobs. Product storage systems help minimise losses during harvesting and ensure a stable supply to markets during the off-season. All these elements of rural infrastructure help to create a more sustainable and efficient system, which contributes to higher incomes for farmers and the development of rural areas. One of the key social effects of agricultural development is job creation. Agriculture has conventionally played a leading role in providing employment in rural areas. The introduction of modern technologies and the expansion of infrastructure create new employment opportunities in various fields, from work on farms and in agribusinesses to jobs in processing and transport. The development of the agricultural sector helps to improve the standard of living in rural areas, reducing migration to large cities in search of work. It is essential that these jobs are stable and provide good working conditions. Creating quality jobs in rural areas requires joint efforts by both government agencies and the private sector, which must actively invest in the development of agricultural production and rural infrastructure.

As one of the key sectors of the economy, agriculture greatly influences the environment. In recent decades, in the face of global challenges such as climate change, biodiversity loss and ecosystem degradation, it has become particularly significant to introduce sustainable agricultural practices and use natural resources efficiently. In this regard, support for environmentally sustainable agricultural practices and the role of public assistance in water and land resource management are crucial for ensuring the long-term environmental sustainability and development of the agricultural sector (Tan *et al.,* 2022). Sustainable agriculture includes agribusiness practices aimed at ensuring long-term productivity while conserving natural resources and minimising harmful impacts on the environment. Such methods include organic farming, agroforestry, crop rotation, minimum tillage, and integrated pest management. These practices help to preserve biodiversity and improve soil, water, and air quality. Government support for sustainable agricultural practices plays a key role in their widespread adoption. Countries with developed agricultural sectors have active subsidy and preferential lending programmes aimed at supporting environmentally friendly technologies and agronomic methods. For instance, farmers can receive subsidies for switching to organic farming, using environmentally safe fertilisers and pesticides, applying renewable energy sources and restoring ecosystems.

In countries with developing agricultural markets, government support is also required to introduce sustainable agricultural practices. Effective subsidies for environmentally friendly technologies, farmer training programmes, and the creation of environmental certification mechanisms contribute to the transition to more sustainable agricultural practices. It is crucial to strike a balance between environmental support and economic benefits so that farmers can not only follow environmental standards but also improve their competitiveness in the market. The use of water and land resources in agriculture is a key component of the production process. However, their excessive use, especially against a backdrop of water scarcity and land degradation, can negatively affect the environment. In this case, government support and effective regulation play a prominent role in optimising the consumption of natural resources. Government programmes aimed at the efficient use of water resources include support for the introduction of water-saving technologies such as drip irrigation, water management systems, and innovative irrigation methods. These measures help to minimise water losses, increase water efficiency and reduce the burden on water bodies and water sources.

In countries with developing agricultural sectors, water resource management requires special attention. Water, as the most valuable resource for agriculture, especially in arid areas, must be used as efficiently as possible. The introduction of technologies that promote water conservation, as well as educational programmes for farmers on rational water use, can considerably improve the condition of water bodies and water sources. In terms of land use, one of the key challenges is to prevent soil degradation, salinisation, and erosion. This requires measures to protect and restore soils, including crop rotation, limiting the use of chemical fertilisers and erosion control. State support in the form of subsidies for projects aimed at restoring ecosystems, using organic fertilisers, and introducing nature-friendly technologies plays an essential role in preserving and improving the condition of land resources. Furthermore, it is vital to develop mechanisms to monitor the condition of land resources and the environmental impact of agricultural practices, which will ensure more efficient use of budget funds and prevent unnecessary costs.

DISCUSSION

Assessing the effectiveness of government support for agricultural producers is crucial, as it helps identify real results and focus efforts on improving current programmes. The analysis revealed that in some cases, government subsidies substantially influenced the growth of productivity and profitability of farms. This was particularly true for subsidies for the purchase of agricultural equipment and the introduction of innovative technologies, which contributed to improving product quality and increasing production volumes.

T.C. Durham and T. Mizik (2021) concluded that a comparative analysis of traditional, organic, and alternative agricultural systems showed that each had its unique advantages and challenges. Conventional methods are usually focused on maximising productivity, while organic farming focuses on sustainability and ecosystem approaches. Government support plays a key role in facilitating the transition to more sustainable methods, which contributes to increased profitability and efficiency in the long term. R. Zhang *et al.* (2021) showed that government subsidies greatly influence agricultural production by providing support through funding and tax breaks for producers. Such measures contribute not only to improving product quality but also to more efficient use of natural resources. However, the environmental impact of these subsidies must be considered to prevent possible harm to the environment and ensure the sustainable development of agriculture.

These findings confirmed the above presented study, as they demonstrated that government support greatly influences agricultural productivity. Specifically, it promotes the introduction of innovative technologies, infrastructure improvements, and the development of sustainable production methods, which increase both financial and environmental efficiency. These changes are particularly noticeable in countries where subsidies are aimed at reducing environmental impact and supporting the transition to organic and alternative production methods. However, the study also found that government support did not always produce the expected outcomes. In some cases, subsidies did not markedly improve farmers' financial situation since they were often used inefficiently. Problems with access to preferential loans and insufficient information among farmers about the mechanisms for obtaining state aid created obstacles to the full use of these funds. Additionally, dependence on subsidies reduced farmers' motivation to seek new sources of income and modernise production independently.

Z. Guo *et al.* (2022) also found that farmers' perceptions of environmental standards and their adoption of green agricultural technologies largely depend on their level of awareness and readiness for change. In countries with developed government support programmes, farmers tend to adapt their production methods to environmental requirements, which helps reduce the impact on the environment. However, problems arise when farmers face challenges in adopting the latest technologies or lack information about the benefits of green practices, which reduces the effectiveness of government support. M. Guth *et al.* (2022) concluded that the effectiveness and sustainability of small family farms under government support depends on how well agricultural policies are adapted to their specific needs. Farmers often find themselves dependent on subsidies, which limits their ability to develop and innovate independently. Although government programmes can bring short-term benefits, their influence on the long-term sustainability of farms will be limited if the structural and economic characteristics of small farms are not considered.

These findings are consistent with the arguments presented in the previous section, emphasising the significance of targeted government support to encourage farmers to switch to environmentally friendly production methods. A prominent aspect is not only the provision of subsidies, but also the creation of training and advisory systems to facilitate the successful introduction of green technologies (Faichuk *et al.*, 2022). Examples of successful practices from other countries show that a comprehensive approach, including both economic and information support, greatly increases the effectiveness of government intervention in agriculture. A comparison with international practices revealed that in countries with more developed agricultural sectors, government support is clearly focused on long-term goals. These countries use programmes that not only support farmers in the short term but also encourage them to adopt sustainable and highly efficient technologies. In contrast to these countries, in some developing economies, such as Kazakhstan, support for agriculture is limited mainly to short-term measures, which do not always contribute to the sustainable growth of the sector. E. Benami *et al.* (2021) also conducted a study, the findings of which confirmed that the integration of remote sensing, crop modelling, and economics is a valuable tool for agricultural risk management, providing accurate information on crop conditions and predicting potential threats. Internationally, satellite data, climate models and analytics are actively used to optimise agronomic processes and minimise losses. The use of such technologies enables farmers not only to respond to emerging risks, but also to make strategic decisions aimed at sustainable agricultural development.

B. Kamguia *et al.* (2022) also found that foreign aid can both contribute to and hinder economic complexity in developing countries, depending on how it is used. In some cases, aid programmes are not sufficiently adapted to local conditions, which can limit their long-term effects and lead to dependence on external sources of funding. However, with a properly targeted approach, aid can markedly accelerate agricultural development, improve infrastructure, and increase productivity in the long term, provided that local economic reality is factored in. Upon comparing the findings, it can be noted that the integration of remote sensing and crop modelling significantly improves the accuracy of forecasts and reduces the risks associated with natural disasters. However, many developing countries face limited access to the necessary technologies and data, which reduces the effectiveness of these methods. It is vital to emphasise that the successful implementation of such technologies requires not only high-quality data, but also an effective training system for local farmers so

that they can correctly interpret and apply the results obtained to improve the sustainability of agriculture. The problem of corruption and bureaucratic barriers, which greatly affect the efficiency of budget allocation, should be highlighted. In practice, farmers often face long processing times for subsidy applications and a lack of transparency when receiving support. This creates conditions for corruption schemes and leads to uneven distribution of funds, which reduces the effectiveness of the state support system and makes it not always focused on the needs of actual producers (Ketners *et al.*, 2024).

A.D. Nugroho *et al.* (2022) concluded that the impact of corruption control on malnutrition indicators in developing countries is intricately linked to the effectiveness of agricultural aid distribution. Corruption risks and bureaucratic obstacles can considerably slow down or even negate the effect of resources provided by state and international organisations. Problems with insufficient transparency in the aid distribution process mean that aid does not always reach the target groups, and resources may be spent inefficiently. N.A.O. Adewusi *et al.* (2023) found that blockchain as a tool for ensuring transparency in agricultural supply chains allows tracking the origin and movement of products, reducing the risks of corruption and fraud. This can have major implications for increasing consumer confidence and improving product quality. In the absence of transparency in agriculture, corruption schemes can lead to extensive losses and distort fair competition, which blockchain can minimise by ensuring reliability and transparency at all stages of the supply chain. Effective anti-corruption measures in the distribution of agricultural aid require a comprehensive approach that includes the creation of transparent mechanisms and the strengthening of institutions responsible for resource allocation (Shahini & Shtal, 2023). It is essential not only to identify cases of corruption, but also to implement sustainable monitoring systems that minimise bureaucratic barriers and ensure the fair distribution of funds. Thus, the fight against corruption plays a key role in improving the effectiveness of government aid and contributes to improving food security in developing countries.

Furthermore, insufficient coordination between distinct levels of government is a principal factor that also reduces the effectiveness of aid delivery. Local authorities often lack the capacity to assess the needs of agricultural producers promptly and provide them with the aid necessary. This leads to a mismatch between farmers' demands and the conditions offered by government programmes. F. Liu *et al.* (2022), also covered this problem, confirming that linking the coordination of the agricultural economy, ecology, and society is a key challenge in sustainable agricultural development. Problems of coordination between local and central authorities can manifest themselves in differences in priorities and resources, which hinders the effective distribution of agricultural support. This can lead to inefficient use of resources and a decline in the quality of services provided, which negatively affects social and environmental sustainability. C. Bernini and F. Galli (2024) also showed that the potential and limitations of subsidies in sustainable development management depend directly on the coordination between local and central authorities. Inconsistent decision-making often leads to agricultural subsidies being ineffective, as local authorities may not have sufficient information about centralised initiatives or vice versa. This creates barriers to the implementation of sustainable agricultural practices and slows progress towards environmental and economic sustainability.

The analysis of the study findings revealed that successful coordination between local and central authorities is a key factor for the effective distribution of agricultural aid. Differences in priorities and management strategies can create challenges in adapting agriculture to environmental and social changes. To achieve sustainable outcomes, it is vital to establish clear communication and coordination mechanisms that ensure coherence at all levels of governance and enhance the impact of agricultural programmes. Based on the analysis of the data, it can be concluded that structural changes are needed to improve the effectiveness of government support. First and foremost, mechanisms for monitoring the distribution of funds must be improved, making the process of receiving aid more transparent and accessible to all farmers. Furthermore, the focus should be on long-term goals and the introduction of innovative farming methods, which will not only support producers but also ensure the development of the agricultural sector overall.

CONCLUSIONS

The study yielded valuable findings regarding the effectiveness of state aid to agricultural producers. Specifically, between 2015 and 2024, total support for the agro-industrial complex in Kazakhstan increased from KZT 300 bn to KZT 750 bn, with subsidies increasing from KZT 150 bn to KZT 410 bn, and preferential lending from KZT 100 bn to KZT 280 bn. The key positive aspects included the growth in productivity and profitability of farms, which was particularly noticeable in cases where subsidies were used to purchase modern agricultural equipment and introduce the latest technologies. For instance, grain yields in Kazakhstan increased from 1.12 t/ha to 1.63 t/ha over the same period, milk production – from 4.8 mn t to 6.7 mn t, and meat production – from 0.8 mn t to 1.7 mn t. This made it possible to improve product quality and increase production volumes, which ultimately led to better financial performance for agricultural producers. However, the study also revealed serious problems in the implementation of state aid. It turned out that not all farmers can make effective use of the subsidies provid-

ed due to the low availability of preferential loans and insufficient information about state aid programmes. For example, the share of people employed in the agro-industrial complex fell from 24% to 15%, which shows the challenges farmers face in operating their farms. Plus, systemic problems in how funds are distributed, like bureaucratic barriers and corruption, seriously reduce the effectiveness of these programmes. As a result, many farmers do not receive adequate support, which hinders the sustainable development of the agricultural sector.

A comparison with foreign practices revealed that in countries with developed agricultural sectors, state aid focuses on long-term development, factoring in the introduction of sustainable and innovative technologies. For example, in 2020, the EU allocated EUR 58 bn to support the agricultural sector, a major part of which was directed towards subsidising environmentally friendly farming and modernising production. In the United States, USD 25 bn was allocated for analogous purposes in 2021, which made it possible to implement tax breaks and innovation support programmes. In Australia, government aid to agriculture amounted to AUD 4.8 bn in 2022, and CAD 3.8 bn in Canada. Meanwhile, in Kazakhstan, support is mainly focused on short-term goals, which does not always contribute to sustainable growth and modernisation of the industry. The study also found that insufficient coordination between multiple levels of government leads to a mismatch between farmers' needs and the conditions offered by government programmes. This complicates the process of obtaining state aid and reduces its effectiveness. For example, investment in Kazakhstan's agro-industrial complex has grown from KZT 230 bn to KZT 600 bn, but many farmers continue to be face challenges in accessing preferential financing.

Therefore, to increase the effectiveness of state aid to agricultural producers, it is necessary to implement comprehensive changes that will increase the transparency and accessibility of subsidies, improve coordination between government agencies and farmers, and focus on long-term strategies aimed at sustainable development and the introduction of innovative technologies. This is the only way to ensure stable growth in the agricultural sector and increase the competitiveness of Kazakh producers in the international market. For a deeper understanding of the effectiveness of state aid to agricultural producers, it is necessary to investigate the long-term effects of subsidies on the sustainable development of agricultural technologies and innovative practices.

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Анотація. Метою цього дослідження було визначення ключових факторів, що впливають на ефективність державної підтримки сільськогосподарських виробників у Казахстані, а також оцінка її впливу на розвиток агропромислового комплексу. У дослідженні було використано методи системного аналізу та порівняльної оцінки, які допомогли виявити особливості державної підтримки сільськогосподарських виробників, визначити її вплив на економічний розвиток агропромислового комплексу та обґрунтованість розподілу бюджетних ресурсів. Аналіз показав, що загальний обсяг бюджетних коштів, виділених на підтримку сільського господарства в Казахстані, зріс з 300 млрд тенге у 2015 році до 750 млрд тенге у 2024 році, при цьому частка субсидій зросла зі 150 млрд тенге до 410 млрд тенге. Однак більша частина фінансування надходить до великих сільськогосподарських холдингів, тоді як малі та середні фермерські господарства стикаються з труднощами у доступі до фінансових та матеріальних ресурсів. Аналіз показав, що державна допомога позитивно впливає на зростання продуктивності сільського господарства. Наприклад, врожайність зернових зросла з 1,12 т/га у 2015 році до 1,63 т/га у 2024 році, тоді як виробництво молока зросло з 4,8 млн т до 6,7 млн т. Однак наявність субсидій не завжди призводить до підвищення прибутковості. Наприклад, незважаючи на розширення пільгового кредитування зі 100 млрд тенге до 280 млрд тенге, дрібні фермери все ще стикаються з надмірними витратами та труднощами в отриманні фінансових ресурсів. Темпи цифровізації в агропромисловому комплексі продовжують бути недостатніми: впровадження точного землеробства обмежується браком інфраструктури та фахівців. Досвід ЄС, США та Австралії, де державна підтримка стимулює інноваційні рішення, свідчить про необхідність розширення програм технологічної модернізації. У результаті дослідження зроблено висновок, що субсидії необхідно перерозподілити на користь малих та середніх фермерських господарств, посилити контроль за цільовим використанням коштів та активно впроваджувати цифрові технології для підвищення ефективності аграрного сектору

Ключові слова: субсидії; пільгове кредитування; аудит бюджетних витрат; врожайність сільськогосподарських культур; технічна модернізація