sciendo

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Gaukhar Siximbayeva[1], Kulshariya Shayakhmetova[2], Urkhiya Yernazarova[3], Rashid Ruzanov[4]

Efficiency of Agriculture Subsidies in Kazakhstan

ABSTRACT: *Agricultural subsidies are a vital instrument for fostering the development of Kazakhstan's agricultural sector. This study evaluates the effectiveness of government support in enhancing agricultural productivity and explores farmers' perceptions of subsidy programs. The research analyzes key economic indicators, including subsidies, loans, and investments in fixed assets, to understand their influence on labor productivity. Additionally, survey data from 323 farmers provide insights into the challenges and benefits associated with subsidy mechanisms.*

The results highlight that subsidies and loans positively impact productivity, while excessive employment growth and over-reliance on subsidies may reduce efficiency. Farmers view subsidies as essential for sustaining their activities but identify challenges such as insufficient funding, complex application processes, and technical issues with automated systems. Furthermore, regression analysis reveals that expanding acreage, increasing income, and improving access to credit significantly enhance productivity, whereas short-term investments require further optimization.

This study contributes to the existing literature by addressing the role of state support in transitional economies and providing policy recommendations to improve the efficiency and accessibility of agricultural subsidies. The findings emphasize the need for balanced resource allocation, enhanced financial literacy among farmers, and streamlined subsidy distribution processes to foster sustainable growth in Kazakhstan's agricultural sector.

KEYWORDS: subsidies, agriculture, policy, production, GDP, effectiveness

RECEIVED 28 August 2024; **ACCEPTED** 27 November 2024.

INTRODUCTION

The effectiveness of agricultural subsidies is a pivotal factor shaping the development of the agricultural sector in Kazakhstan. As the global economic landscape undergoes rapid transformation, government support has emerged as a critical instrument not only for enhancing production volumes but also for fostering sustainable agricultural development. The Food and Agriculture Organization (FAO) emphasizes that "government intervention is essential to ensure food security and stimulate rural development" (FAO, 2020, 2024). This highlights the vital role that state assistance plays within the agricultural framework.

Contemporary economic theory and practice underscore that various forms of governmental support, including subsidies, grants, and tax incentives, can significantly influence both farmers' production metrics and the overall health of the agricultural economy. According to the World Bank, "well-designed subsidy programs can align agricultural output with national food security goals and improve livelihoods" (World Bank, 2021). Despite the broad spectrum of government assistance mechanisms, the specific factors that drive agricultural production growth in Kazakhstan remain inadequately explored, pointing to a significant research gap in this field.

This study addresses three critical dimensions: first, the role of government support in stimulating agricultural production; second, farmers' perceptions regarding the efficacy of subsidies; and third, the prospects for future agricultural development in the context of government assistance. A comparative analysis of international experience reveals that subsidization approaches vary

1 Department of Economics and Entrepreneurship, L.N. Gumilyov Eurasian National University, Kazakhstan, siximbayeva.g@gmail.com ORCID 0000-0003-1430-4868

2 Department of Management, ESIL University, Kazakhstan, shayakhmetova.k@esil.edu.kz ORCID 0000-0002-8677-1767

3 Academic School of Business and Management, «Q» University (Qaynar), ernazarova.u@qainar-edu.kz ORCID 0000-0002-8827-7922

4 Institute of Economics of the National Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan, ruzanov.rashid@ieconom.kz ORCID 0000-0003-4913-3886

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

according to the unique characteristics of local agricultural sectors. For instance, the United Nations Development Program (UNDP) states that "successful subsidy programs are tailored to meet the specific needs of farmers, often incorporating sustainable practices" (UNDP, 2022).

Understanding the interplay between agricultural subsidies and production indicators is essential for all stakeholders—including policymakers, economists, and farmers. This insight can facilitate more efficient allocation of government resources and prompt adjustments to existing subsidy programs that reflect the evolving challenges within the agricultural sector.

The primary objective of this research is to clarify how government support enhances the effectiveness of agricultural production while also investigating farmers' views on the tangible impacts of subsidies on their operations.

LITERATURE REVIEW

The efficiency of subsidizing agriculture is explored by a large number of academic studies worldwide. The most frequent topics include economic efficiency of subsidies, the impact of subsidy policy on grain crop acreage, environmental efficiency, income and agricultural production, farm employment, etc. Studies analyzing the effectiveness of subsidies in agriculture often use various econometric methods to identify the impact of government support on productivity.

Fan et al. (2008) investigate the impact of government expenditure on the poverty level in rural areas of India. The primary methodological aspects of the study include correlation analysis and a multiple equation model. The research demonstrates that labor productivity, wage levels, and employment in the nonagricultural sector are negatively correlated with poverty levels, as indicated by a high level of statistical significance. Furthermore, agricultural productivity is positively related to agricultural wages, albeit with reduced statistical significance. The methodology of the study emphasizes the interconnections between government spending, economic growth, and poverty, employing a sophisticated econometric model and correlation analysis. These approaches provide extensive data to support policy recommendations aimed at improving the poverty situation in rural regions of India.

Vozarova and Kotulic (2016) focus on the quantitative assessment of the impact of subsidies on agricultural production in Slovakia. The primary objective of the study is to identify a statistically significant relationship between the volume of gross agricultural production and the amount of subsidies provided across various regions of the country. Correlation analysis was employed for this purpose, specifically utilizing the Pearson correlation coefficient, which allows for the evaluation of the direction and strength of the relationship between two variables. The analysis confirmed a strong correlation between the volume of gross agricultural production and the level of subsidies, indicating that subsidies have a significant influence on agricultural productivity. These subsidies may lead to both positive effects (increased production, lower prices) and negative consequences (disturbances in international markets, reduced economic efficiency). The authors emphasize the necessity of considering other factors that contribute to the successful operation of agriculture.

Kazukauskas et al. (2014) investigate the impact of subsidy withdrawal on agricultural productivity, utilizing data from Ireland, Denmark, and the Netherlands. The authors employ econometric techniques to analyze production functions, drawing on existing literature. They examine the complex relationships between farmers' resource choices and their productivity, using models that address issues arising from simultaneity in estimation. The study noted about the absence of significant connection between the change in product structure and specialization. The study supports the idea that farmers manage to adapt to the new policy gradually, increasing the production of more productive crops before moving on to more radical changes.

The primary focus is on how divided subsidies may influence production specialization, encouraging farmers to shift toward more profitable products and fostering innovation within agribusiness.

Nikola and Kehinde (2017) analyze the effectiveness of agricultural subsidies in the Republic of Macedonia, employing regression analysis and tests for causal relationships. The results indicate that subsidies do not contribute to significant increases in productivity or exports, suggesting a need for reforms in the distribution of subsidies and modernization of the sector.

Praveen (1994) examines the short-term trade relationship between food subsidies and subsidies for agricultural production in developing countries, with an emphasis on India. Using a multisector model, the authors analyze the impact of these subsidies on household well-being. The results show that production subsidies can be more effective for improving well-being than food subsidies, but a combination of different measures is needed to achieve sustainable growth.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Rizov (2005) employs comprehensive methods to investigate the impact of individualization on agricultural productivity in transition economies. Utilizing a neoclassical growth model, he demonstrates that the shift toward individual farming positively influences productivity, which is correlated with resource redistribution and enhanced efficiency. By calculating correlation coefficients and conducting regression analysis, he establishes the potential existence of a feedback mechanism, where past shocks in productivity are correlated with current policies and/or outcomes. If the regression is endogenous, it is essential to consider the correlation between the current value of this regression and present shocks to productivity, as well as the feedback from past productivity shocks.

Studies of the impact of agricultural subsidies on farmers' grain-growing initiatives show contradictory results. Fan et al. (2023) indicated that subsidy increases grain crop acreage. Yi et al. (2015) found that they have a minor stimulating effect and play a positive role for farmers who are not confident in participating in grain sowing, increasing farmers' enthusiasm for grain sowing and expanding the acreage. Ciaian and Swinnen (2009) indicated that the subsidy program did not contribute to grain production in terms of acreage and fertilizer use. Meanwhile, some studies, such as those by Hennessy (1998) and Yu et al. (2019), concluded that agricultural subsidies not only help stimulate farmers' enthusiasm for growing grain but also have a positive impact on grain production. The mechanism behind the subsidy's effect was also identified. Namely, the new program encourages operators to increase their grain crop acreage by renting more land and increasing the share of grain crops grown. Authors use regression analysis methods in their researches.

Subsidies are helping farmers achieve environmental sustainability; however, they are also leading to increased levels of economic inefficiency, and there are positive and significant spillovers from both the economic and environmental perspective (Bernini & Galli, 2024). The study by Bernini & Galli, (2024) examines the impact of subsidies on the economic and environmental efficiency of agricultural enterprises in Italy over a 10-year period. The results reveal that correlation coefficients between environmental and economic efficiency fluctuated, remaining negative; however, recent years indicate promising trends. Developing a spatial stochastic frontier model, the authors assessed both direct and indirect effects of subsidies, identifying that from a certain point onward, subsidies positively influenced environmental efficiency. Nevertheless, their economic impact has become insignificant and even negative in recent years.

The effect of subsidies (reduced distributional and technical efficiency) is likely to be negatively correlated with separation, while the positive effect (increased productivity due to investment) is likely to be positively correlated (Olson, 1982). Subsidies can also lead to technical inefficiency if farms perceive them as higher profits, leading to inaction, lack of effort, and reduced competitive pressure to seek methods to increase costs (Leibenstein, 1966).

Bollman et al. (2018) found that in practice, it is difficult to separate the impact of subsidy reforms from other factors affecting the performance of farms and rural areas, such as fluctuations in global grain prices and an overall decline in the rural population, the value of farm assets, the number of farms, and employment in the local nonagricultural economy. To assess the impact of the reform, the method of regression models was used, which considered the spatial variability in the impact of the abolition of the transport subsidy. This made it possible to highlight the impact of the reform on various indicators (value added, land value, number of farms and employment outside agriculture).

While continuing to optimize and adjust policies, work should be conducted in terms of optimizing the policy implementation environment, improving policy implementation methods, and strengthening the foundation of policy implementation to improve policy effectiveness (Liu & Xu, 2023).

Several scientists have also used grain productivity to measure the outcomes of agricultural subsidy policies in terms of increasing yields (Just et al., 2013; Garrone, et al., 2019; Zhang et al., 2021). Other scientists, such as Wang et al. (2014) and Huang et al. (2011), constructed various forms of econometric models based on data from various sources to assess the impact of agricultural subsidies on farmers' incomes.

Subsidies can significantly increase the acreage, grain production, and total income of farmers, which contributes to improving their grain production capabilities as well as their income. Agricultural subsidies increase farmers' willingness to grow grain, reduce land abandonment, and increase total acreage, total production, and total income from grain (Li, et al., 2022). The willingness to cultivate grain is an important mechanism influencing the effectiveness of agricultural subsidy policies.

Theoretical studies show that there are various channels through which subsidies affect productivity (De Long et al., 1991; Blomstrom et al., 1996; Rajan et al., 1996). At the same time, subsidies can either increase or decrease productivity, resulting in both positive and negative net effects (Rizov et al., 2013).

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

The positive connection between subsidies and productivity is an urgent subject of research of Huttel et al. (2010). By correlation methods, a positive relationship has been established between the income and the capital ratio for both regions. Auto-regression results show that income volatility affects the probability of investment, which confirms the theoretical model: subsidies can become an additional source of financing either directly by increasing the financial resources of farms or indirectly by improving access to official loans. In other words, for farms, subsidies can serve as a substitute for loans.

The impact of various types of marginal subsidies on farm employment segments has become an urgent area of research by Bojnec and Fertő (2022) who point out the emergence of understanding the importance of local land use and food production, according to the study, simultaneously contributes to the creation of jobs on farms and in rural areas.

A literature review provided on the effectiveness of agricultural subsidies emphasizes the complexity and diversity of the impact of subsidies on agriculture, including their economic, social, and environmental aspects. Methodologically, the reviewed research employs a range of econometric techniques, from correlation analysis to regression models, to identify the nuanced effects of subsidies on agricultural productivity and income effectively leverage correlation analysis to demonstrate significant relationships between subsidy levels and agricultural outputs. Other research adapts more sophisticated models to explore the feedback mechanisms and broader economic dynamics associated with subsidies.

Overall, while subsidies generally provide farms with incentives to enhance engagement in agriculture and adjust their capital–labor ratios, this is also risk, leading to resource misallocation and excessive investments in subsidized sectors. This duality accentuates the importance of refining subsidy policies to avert inefficiencies while maximizing benefits. Consequently, continued research is warranted to address these complexities and inform policy frameworks that can foster sustainable agricultural development.

METHODS

The goal of this paper is to estimate the efficiency of government subsidies for the agriculture in Kazakhstan. To achieve this goal, the authors define following research questions (RQs):

Which factors determine the increase of the agricultural production?

To address this question, key indicators characterizing the development of agriculture were selected. The dependent variable in this study is gross value added (GVA) per employee, which serves as a measure of labor productivity in the agricultural sector. This metric was chosen as it reflects the efficiency of resource use and is widely accepted as a key indicator of sectoral performance.

The independent variables, selected based on theoretical relevance (Table 1), include agriculture Gross Domestic Product (represents overall economic output and sector performance), investments in fixed assets (reflects capital development and infrastructure improvement), loans (captures access to financial resources necessary for production expansion), subsidies (indicates the level of government support and its potential influence on productivity), number of registered farmers (measures sector participation and entrepreneurship), number of employees in agriculture (assesses the scale of human resources available), payroll (proxy for labor costs and income distribution), taxes, and other payments to the budget (reflects fiscal contributions and economic activity).

These indicators were chosen for their direct and indirect influence on labor productivity, as supported by prior studies.

A regression model was employed to quantify these relationships, with the Pearson correlation coefficient used in a preliminary analysis to identify the most significant predictors. This approach ensures robustness and relevance in the analytical framework.

What is the role of government support in the form of subsidies in enhancing agricultural activities in Kazakhstan?

To analyze the role of the state in supporting agricultural productivity subsidies, loans and investments in fixed assets selected as key indicators reflect government interventions based on their relevance to policy frameworks:

- Representing the direct financial support provided by the government to agricultural producers
- Proxy for state-facilitated access to financial resources, enabling farmers to invest in critical inputs
- Reflecting capital funding, supported by government programs

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Tab. 1: Information for calculating Pearson correlation coefficient.

Period	GDP, million tenge	Acreage, thousand hectares	Gross harvest, thousand tons	Invest-ments, million tenge	Income, million tenge	Gross value added per employee	Loans to agro, million tenge	Number of registered farmers	Jobs, thousand people	Taxes, other pay-ments, million tenge	Subsidies, million tenge
PCC	PCC-1	PCC-2	PCC-3	PCC-4	PCC-5	PCC-6	PCC-7	PCC-8	PCC-9	PCC-10	PCC-11
2010	895 425	21 439	19 691	83 586	274 180	429	228 266	186 351	2 295	25 950	41 800
2011	1 654 429	21 083	35 914	109 424	358 261	642	220 313	200 076	2 196	28 780	54 869
2012	1 241 517	21 191	22 231	133 945	405 649	612	188 289	189 481	2 173	38 034	51 550
2013	1 683 851	21 271	28 665	139 627	399 963	782	181 743	189 168	2 074	36 964	55 996
2014	1 739 436	21 245	28 055	173 281	409 527	1 070	212 353	192 038	1 605	35 651	72 922
2015	1 825 237	21 023	30 102	163 907	377 562	1 242	328 500	189 038	1 363	39 517	180 800
2016	2 047 581	21 474	33 049	253 691	450 255	1 402	338 000	184 608	1 386	40 940	196 050
2017	2 249 167	21 840	33 746	348 481	524 512	1 736	384 900	185 754	1 319	46 163	228 580
2018	2 411 487	21 899	34 351	365 001	533 748	2 077	461 600	194 828	1 228	46 572	198 970
2019	2 817 661	22 136	31 986	494 976	607 251	2 466	537 800	203 037	1 184	54 914	206 300
2020	3 687 310	22 582	34 955	565 369	672 951	3 005	583 900	219 449	1 175	56 678	384 800
2021	4 387 237	22 926	31 749	772 475	758 737	3 351	704 700	225 030	1 176	67 841	372 500
2022	5 808 260	23 162	36 821	850 346	977 475	4 608	768 300	230 247	1 108	84 868	451 100

Source: Kazakhstan Bureau of National Statistics

These variables were also chosen because they align with Kazakhstan's State Program for the Development of the Agro-industrial Complex (2017–2021), which emphasizes increasing financial accessibility, implementing optimal tax regimes, and transitioning from commodity-specific measures to broader financial instruments.

The role of the state was analyzed using a regression model. This approach allowed for the quantification of the impact of each type of government intervention on agricultural productivity. By focusing on these indicators, the study provides insights into how government policies shape agricultural development and identifies areas where policy adjustments may further enhance sectoral performance.

How do farmers perceive the effectiveness of government subsidies in supporting their agricultural activities in Kazakhstan?

A survey-based approach was employed. The primary variable of interest—the perception of subsidy effectiveness—served as the dependent variable. This perception reflects the farmers' evaluation of how subsidies contribute to improving their agricultural productivity and overall operational sustainability.

The independent variables were selected based on their potential to influence farmers' perceptions, including:

- Participation in subsidy programs (receiving or not receiving subsidies)
- Farm size (measured by the land area in hectares)
- Farmers' age group (as a proxy for experience and potential openness to government programs)
- Level of education (categorical variable: primary, secondary, higher)
- Years of experience in agriculture (continuous variable) (Table 2)

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Tab.2: The structure of respondents provided.

Age	Number	%	Education	Number	%	Experience	Number	%
≤35	51	18%	Secondary	31	11%	Less 5 years	39	14%
36–50	115	41%	Technical	57	20%	5–10 years	66	24%
≤51	113	41%	Higher	191	68%	Over 10 years	174	62%
Total	**279**	**100%**	**Total**	**279**	**100%**	**Total**	**279**	**100%**

Tab.2: The structure of respondents provided (continuation).

Hectares	Number	%	Legal form	Number	%
≤ 100	30	11%	Farm	178	64%
101–1000	100	36%	Private person	17	6%
1001–5000	101	36%	LLP	82	29%
≤5 000	48	17%	Cooperatives	2	1%
Total	**279**	**100%**	**Total**	**279**	**100%**

Source: Farmers' survey results.

These independent variables were chosen to represent key demographic and operational characteristics of farmers as they are likely to shape attitudes toward the effectiveness of subsidies. Data were collected through a survey distributed to 323 farms, stratified by size and regional representation to ensure a diverse and representative sample. The survey instrument included both closed- and open-ended questions to capture quantitative and qualitative insights.

The results highlighted that the majority of farmers perceive subsidies as effective, with variations linked to farm size and education level, which were analyzed further in the discussion section.

What are the possible scenarios for predicting the agriculture production growth?

To address this research question, a forecasting approach was implemented using a linear regression model with multivariate analysis. The dependent variable in this analysis was agricultural production growth, chosen as the key outcome to be forecasted. Independent variables included indicators identified through prior correlation analysis as strongly associated with agricultural performance, such as the amount of subsidies, land area, and investments in fixed assets.

To enhance the robustness of the forecasts, a linear smoothing method was applied to develop three predictive scenarios:

- Pessimistic scenario on assuming minimal government support and adverse external conditions.
- Optimistic scenario based on maximum governmental investment and favorable conditions.
- Optimal scenario as a balanced projection considering realistic levels of support and average external factors.

The scenarios provide insights into how different levels of government support and external conditions could influence future agricultural growth. This method allows for a structured exploration of potential outcomes, helping policymakers and stakeholders to better understand the implications of their decisions.

BACKGROUND DATA: SUBSIDIZING AGRICULTURE IN KAZAKHSTAN

Access to financial resources remains one of the main problems for the development of agricultural producers. One of the stimulating factors for the agriculture and processing development remains the infusion of financial resources such as subsidies and preferential loans.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

The government of Kazakhstan is the largest stakeholder in the agro-industrial complex, acting as a subsidy regulator, strategist, landowner, and main financier. In 2019, subsidies reached a record of 324 billion tenge—in 2020, 294 billion tenge.[5] In terms of subsidies, Kazakhstan is inferior to the partner countries of the EAEU. For example, in 2015, the volume of subsidies under the so-called yellow basket in Kazakhstan amounted to about 960 million dollars, in Belarus—1.5 billion dollars, and in Russia—3.3 billion dollars (Kazakhstan Bureau of National Statistics).

During the analyzed period of 2019–2021, in almost all major indicators, an annual growth of more than 20–30% was observed. In the structure of the total agricultural enterprises' income, 55% is taken up by revenue from activities in crop production and 45% by animal husbandry.

Currently, subsidies in the Kazakhstan agriculture are carried out in 12 directions and 51 types. The procedure and conditions for subsidizing in Kazakhstan are regulated by the rules for subsidizing the increase in yield and quality of crop production. These rules determine the procedure for providing budget subsidies to increase crop yields and quality at the expense and within the limits of local budgets. The process of subsidizing crop production is fully automated and is carried out through the subsidy information system on the website kezekte.kz and gosagro.kz (previously qoldau.kz).

Since the crop production industry is the most profitable for Kazakhstani farmers, several types of government subsidies were selected as the basis for the analysis in this study:

1) Subsidies for the development of production of priority crops, including perennial plantations
2) Development of seed production by reimbursing up to 70% of farmers' costs
3) Reduction in the cost of fertilizers (except organic ones)
4) Cost of water supply services to farmers (up to 80% of the tariff with VAT)
5) Subsidizing the cost of pesticides, bioagents (entomophiles) intended for treatment against harmful organisms at full cost (100%) and at a reduced cost (50%)

During 2019–2021, 519 million US dollars (233,774 million tenge) were allocated to subsidize farmers' costs for fertilizers, pesticides, subsidies per 1 hectare (hectare subsidy), as well as subsidies for seed production. The total amount of disbursed budget funds for these types of subsidies amounted to 456 million US dollars (205,142 million tenge) or 88% (Digital platform archive qoldau.kz). Subsidizing the crop industry in Kazakhstan is not limited to reimbursing the standard costs of farmers. Since 2020, following the example of the experience of foreign countries, the government of Kazakhstan has been actively implementing a state support program for insurance in agriculture. The main task is to subsidize (compensate) up to 80% of the costs of farmers' insurance pay and increase the availability of debt and trade financing Kazakhstan agriculture.

Figure 1 shows information on the specific weight of crop subsidies by their types. As can be seen, subsidies for pesticides (about 40%) and fertilizers (about 30%) account for the largest share annually, while annual seed production subsidies and hectare subsidies do not exceed 17%. The lowest share falls on subsidizing water supply services (no more than 3% annually).

It can be seen from Figure 1 that the most common types of subsidies in the field of crop production in Kazakhstan (Kezekte.kz, 2019–2021) are subsidies for the cost of pesticides, bio agents (entomophiles) intended for processing against harmful organisms. This demand is explained by the fact that the state reimburses the farmers from 50% to 100% of the cost of pesticides, which is the main motivating factor for the latter. Similarly, fertilizer subsidies are important because this type of expenditureis a major component of the crop production cost.

Table 3 presents the main indicators of financial and economic activities of Kazakhstani agricultural enterprises.

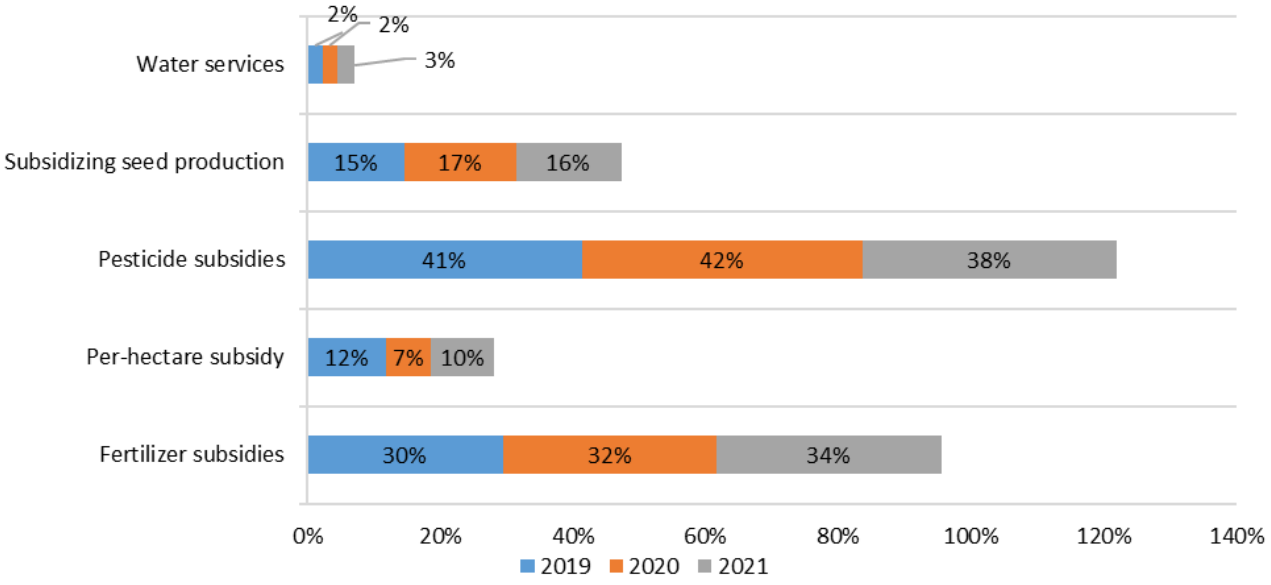
For three consecutive years, the share of crop production in gross value added in agriculture has been 54.7% and livestock production—54.0%. It is significant that with high costs, farmers make annual profits in excess of 100 billion tenge per year, the absolute growth of this indicator amounted to 34 billion tenge or 33% (Table 3).

In the structure of the "other" position, the share of income from subsidies received in crop production is on average 1%. This indicator shows the demand for subsidies in crop production. The overall profitability index ranged from 17% to 22%, with a relative deviation of +2% over the period under review. In addition, the total income of farmers received from government subsidies

5 1 USD is relevant to 475 tenge.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Fig. 1: Specific weight of subsidies for crop production by their types.



Source: Compiled by the author based on Digital platform archive qoldau.kz

Tab. 3: Main indicators of financial and economic activities of Kazakhstan farmers 2019–2021 billion tenge

Indicator	2019	2020	2021	Absolute deviation 2021/2019	Relative deviation 2021/2019
Income, including:	607 251	672 950	758 736	151 485	25%
Crop production	*332 163*	*391 713*	*442 922*	*110 759*	*33%*
Cost price	484 889	529 561	604 297	119 407	25%
Gross profit	**122 361**	**143 389**	**154 439**	**32 077**	**26%**
Income from financing	10 421	10 381	12 848	2 426	23%
Other income, including:	97 290	138 722	129 498	32 208	33%
*Subsidies**	*62 937*	*86 303*	*55 900*	-7 037	-11%
Product sales expenses	13 174	19 412	20 913	7 739	59%
Administrative expenses	45 977	46 932	54 092	8 115	18%
Financing expenses	22 020	21 623	26 639	4 618	21%
Other expenses, including:	43 383	58 021	54 729	11 346	26%
Maintenance of the subsidy portal	*371*	*443*	*510*	*138*	37%
Profit before taxation	**105 517**	**146 503**	**140 411**	**34 893**	**33%**
Income tax	4 081	5 652	6 650	2 569	63%
Profitability	**17%**	**22%**	**19%**		

Note: *Subsidies for certain types of crop production costs.
Source: Bureau of National Statistics of Kazakhstan.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

is subjected to reduction by the amount of return to the state in connection with the maintenance of the e-portal, which amounts to about 1% annually.

RESULTS

What factors determine the growth of agricultural production and the development of agriculture in Kazakhstan?

Calculating the Pearson correlation coefficient, the most interrelated indicators were found: GVA per employee has a strong positive correlation with most variables: especially high correlation with crop production GDP (r = 0.98), acreage (r = 0.95), income (r = 0.98), and taxes (r = 0.98). Negative correlation with employment in agriculture (r = -0.81). The independent variables also correlate with each other: the GDP of crop production strongly correlates with income (r = 0.98), which is logical, since the income of agricultural enterprises often depends on total production. Employment has negative correlations with most variables, which may indicate a decrease in productivity with an increase in the number of people employed.

Based on the high correlation of the selected indicators, a regression analysis was performed. Particularly, the multiregression analysis helps to assess the influence of several factors on a dependent variable. In this case, the impact of various indicators of agricultural activity on GVA per employee was analyzed (Table 4):

The multiregression analysis identifies several critical factors impacting labor productivity in agriculture in Kazakhstan:

1. Positive contributors:
- Acreage expansion (β = 0.598) significantly improves productivity, demonstrating the role of larger operational scales in enhancing efficiency.
- Income growth (β = 0.0029) and access to loans (β = 0.0025) also positively correlate with productivity, highlighting the importance of financial resources for operational improvements.
2. Negative contributors:
- Employment growth (β = -0.638) reduces productivity, likely due to insufficient mechanization or low efficiency in resource use.
- Subsidies (β = -0.00096) show a slight negative effect, potentially due to resource misallocation or dependency on government support.
3. Mixed findings: Investments in fixed assets (β = -0.0039) have a short-term negative impact, suggesting a lag before investments yield productivity gains.

Overall, R^2 of 99.99% confirms the robustness of the model, indicating that the selected variables almost entirely explain variations in agricultural productivity. These results emphasize the need to balance resource allocation strategies, such as expanding acreage and improving credit access, while avoiding over-reliance on subsidies and addressing inefficiencies in labor utilization.

Based on the analysis, it is possible to point out which factors have the greatest impact on labor productivity in agriculture in Kazakhstan. The positive factors are the expansion of acreage, income growth, and access to credit. At the same time, excessive increases in employment and subsidies may have a negative impact on labor productivity.

The results confirm that loans play an important role in agricultural development. Farmers can obtain the necessary financial resources for the purchase of seeds, fertilizers, equipment, and other materials and increase the area of crops and production efficiency. In turn, loans contribute to an increase in agricultural production and farmers' incomes. At the same time, subsidies in Kazakhstan act as a grant to concessional loans (subsidizing the remuneration rate), as well as a part of GDP (for fertilizers, for seed production, etc.).

Identifying the role of government support in the form of subsidies in enhancing agricultural activities in Kazakhstan

Kazakhstan's government plays a pivotal role in supporting the agricultural sector, particularly through the provision of financial instruments and subsidies. Over the past 5 years, the state has implemented a comprehensive support framework as part of the State Program for the Development of the Agro-industrial Complex (2017–2021), allocating 1.71 trillion tenge in subsidies over 5 years.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Tab.4: Multiregression analysis.

Regression statistic					
Multiple R	0,9999				
R-square	0,9999				
Norm. R-square	0,9992				
Standard error	34,6577				
Observations	13				
Analysis of variance					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	18935533,97	1893553,397	1576,44	0,0006341
Remains	2	2402,315668	1201,157834		
Total	12	18937936,28			

	Coefficients	Standard error	*t-statistic*	*P- Meaning*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Y	- 13 318,03	4112,355095	-3,238540458	0,083568	-31012,0642	4376,008	-31012,06	4376,008
X 1	0,000396749	7,45194E-05	5,324108546	0,033515	7,6118E-05	0,000717	7,612E-05	0,000717
X 2	0,598541574	0,176372321	3,393625318	0,076943	-0,16032727	1,35741	-0,160327	1,35741
X 3	-0,008687662	0,006647951	-1,306817982	0,32133	-0,03729149	0,019916	-0,037291	0,019916
X 4	-0,003868786	0,000579461	-6,676523742	0,021706	-0,00636201	-0,00138	-0,006362	-0,00138
X 5	0,002930681	0,001104753	2,652792914	0,117563	-0,00182269	0,007684	-0,001823	0,007684
X 6	0,002518243	0,000440601	5,715474046	0,029275	0,00062249	0,004414	0,0006225	0,004414
X 7	0,00562555	0,003129979	1,79731234	0,214115	-0,00784166	0,019093	-0,007842	0,019093
X 8	-0,638121689	0,07840068	-8,139236632	0,014762	-0,97545259	-0,30079	-0,975453	-0,30079
X 9	0,004794798	0,013465634	0,356076639	0,755836	-0,05314315	0,062733	-0,053143	0,062733
X 10	-0,000955655	0,000357012	-2,676816961	0,115813	-0,00249175	0,00058	-0,002492	0,00058

These measures aim to enhance the accessibility of financing for agribusiness entities, promote optimal tax regimes, and shift from commodity-specific subsidies to broader financial support tools to foster sustainable development.

Provided analysis highlights the dual nature of these support mechanisms:

Positive impact in increased subsidies and greater access to financing have supported the growth of crop and livestock production, contributing to income generation and expansion of operational acreage. For example, loans and subsidies were found to significantly enhance productivity by enabling investments in seeds, fertilizers, and advanced equipment.

Challenges also reveal potential inefficiencies associated with over-reliance on subsidies. The regression results suggest that while subsidies can provide critical short-term support, excessive allocations may reduce labor productivity, indicating a need for a balanced approach to resource distribution.

This duality reflects the evolving nature of Kazakhstan's subsidy policies. The ongoing transition from commodity-specific measures to financial instruments seeks to optimize resource allocation and address challenges such as import substitution in the dairy sector and the expansion of meat cattle exports.

Perceived opinion of farmers related to the efficiency of the state subsidies

To find out the effectiveness of implementing the program of subsidizing crop production in Kazakhstan, authors have conducted a survey among agribusiness entities to get their opinion on the following topic: Are subsidies an effective tool for the development of the agro industry?

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Tab. 5: The authors' survey results.

General perception	1)	A vast majority of farmers (87%) view subsidies as an effective tool for supporting the agricultural industry
	2)	86.4% of respondents are direct recipients of subsidies, highlighting the program's extensive reach
Demographic factors influencing perception	1)	Farmers over the age of 36 with over 10 years of experience in agriculture expressed greater satisfaction with subsidies
	2)	Larger farms (operating over 100 hectares) reported higher perceived benefits, likely due to better economies of scale and resource allocation
Key challenges	1)	Complexity of processes: 74% of respondents reported difficulties with automated systems (kezekte.kz, gosagro.kz)*
	2)	Insufficient budget: Nearly half of farmers (48%) expressed dissatisfaction with the limited subsidy funds
	3)	Corruption and bureaucracy: 13% of farmers identified these issues as barriers to equitable access
Demanded subsidies	1)	The most popular subsidies include those for loan interest reimbursement and agricultural machinery leasing, with 222 respondents favoring these
	2)	Investment subsidies (50% cost reimbursement) and subsidies for fertilizers and pesticides were also highly demanded, cited by 166 and 155 farmers, respectively
	3)	Subsidies for water supply services and insurance are less prioritized, with only 29 farmers viewing these as critical, possibly due to reliance on natural irrigation systems
Moderate impact on profitability	1)	Despite widespread use, only 21% of farmers rate subsidies as having a "very high" or "high" impact on profitability
	2)	42% perceive the impact as moderate, while 37% view it as low
	This suggests that while subsidies are appreciated, their actual financial effectiveness may require optimization	
Level of satisfaction	1)	Only 12% of respondents are highly satisfied with the volume of subsidies
	2)	43% are moderately satisfied, and 45% express dissatisfaction, indicating room for improvement in allocation and coverage

***** This situation is due to the fact that the Kazakhstan process of obtaining subsidies is fully automated and is carried out on the kezekte.kz and gosagro.kz websites (previously qoldau.kz).

The survey results indicated following results (Table 5)

Survey results from 323 farms revealed that the majority of farmers (86.4%) perceived subsidies as a critical factor in sustaining their agricultural activities. Age and experience were positively correlated with a higher perception of subsidy effectiveness: farmers over 36 years old with over 10 years of experience expressed greater satisfaction with the programs. Farm size also played a role, with larger farms (over 100 hectares) reporting greater benefits from subsidies, likely due to better resource utilization and economies of scale.

However, qualitative responses highlighted challenges, including delays in subsidy distribution, insufficient amounts for smaller farms, and the complexity of application processes. These findings suggest a need for improved accessibility and equity in subsidy implementation.

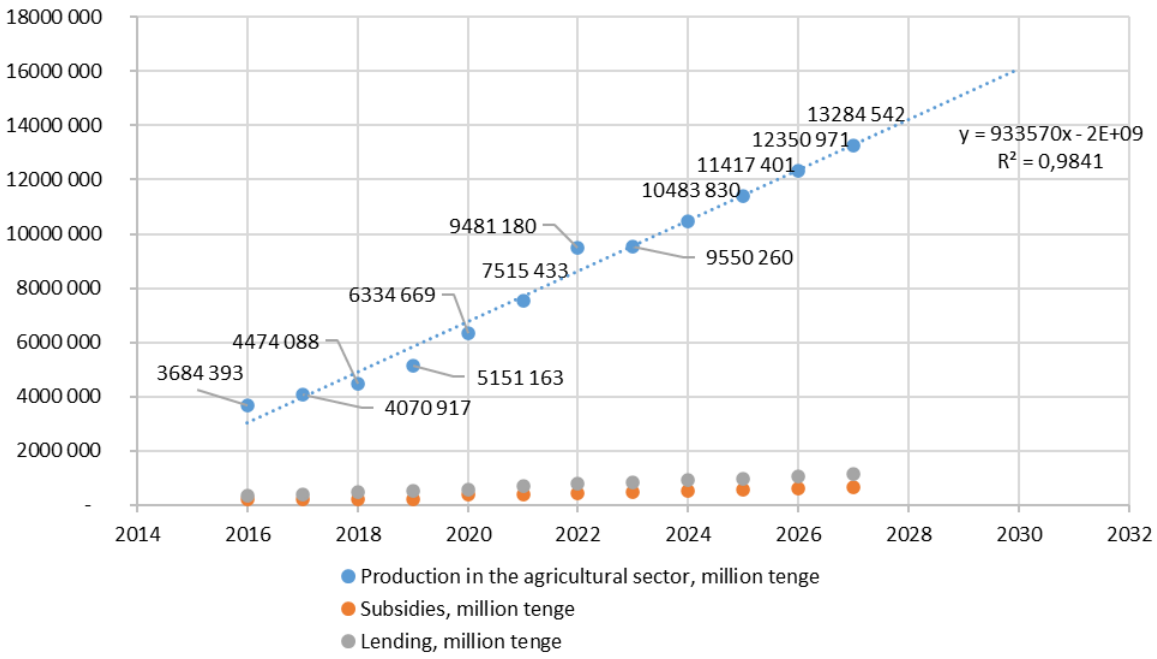
The possible scenarios for predicting the agriculture production growth?

Based on the correlation established, the projected growth trends in Kazakhstan agriculture production under the condition of stable financing and subsidizing for 2023–2028 are presented. The main point is the availability of constant concessional lending to crop production, livestock, and the allocation of subsidies (Figure 2). The forecast data are built using graphical forecasting tools by extrapolation, performed by a trend line in Figure 2.

At the same time, in the 3-year perspective, the increase in subsidies is symmetrical to the financial investment's growth (loans). In the case studied (Figure 3), the confidence value of R2 is 0.98. It is known that the higher coefficient signifies higher reliability of the line. It is generally assumed that with a coefficient above 0.85, the trend line is reliable.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Fig.2: Forecast trends in the growth of crop production in Kazakhstan with stable financing and subsidies for the 2023–2028 period.



Source: Authors' calculations on JSC ACC Annual report and Bureau of National Statistics Kazakhstan

To predict the socioeconomic effect, the forecast of the government financing (loans and subsidies) influence to the agriculture production growth was modeled. Being constructed based on the obtained calculations using the forecasting method by linear smoothing, several scenarios for forecasting the growth of agricultural sector production (Figure 4) were implemented (provided that state support for farmers is maintained within the framework of subsidy and preferential lending programs).

Generalized models are suitable for both short-term and long-term forecasting of GVA, but they are rarely used in works on this topic. Forecasting GVA can help improve the accuracy of the GDP forecast, as GVA reflects the real performance of the sector.

Figure 3 shows forecasting model based on linear smoothing and regression analysis, where three scenarios were developed:

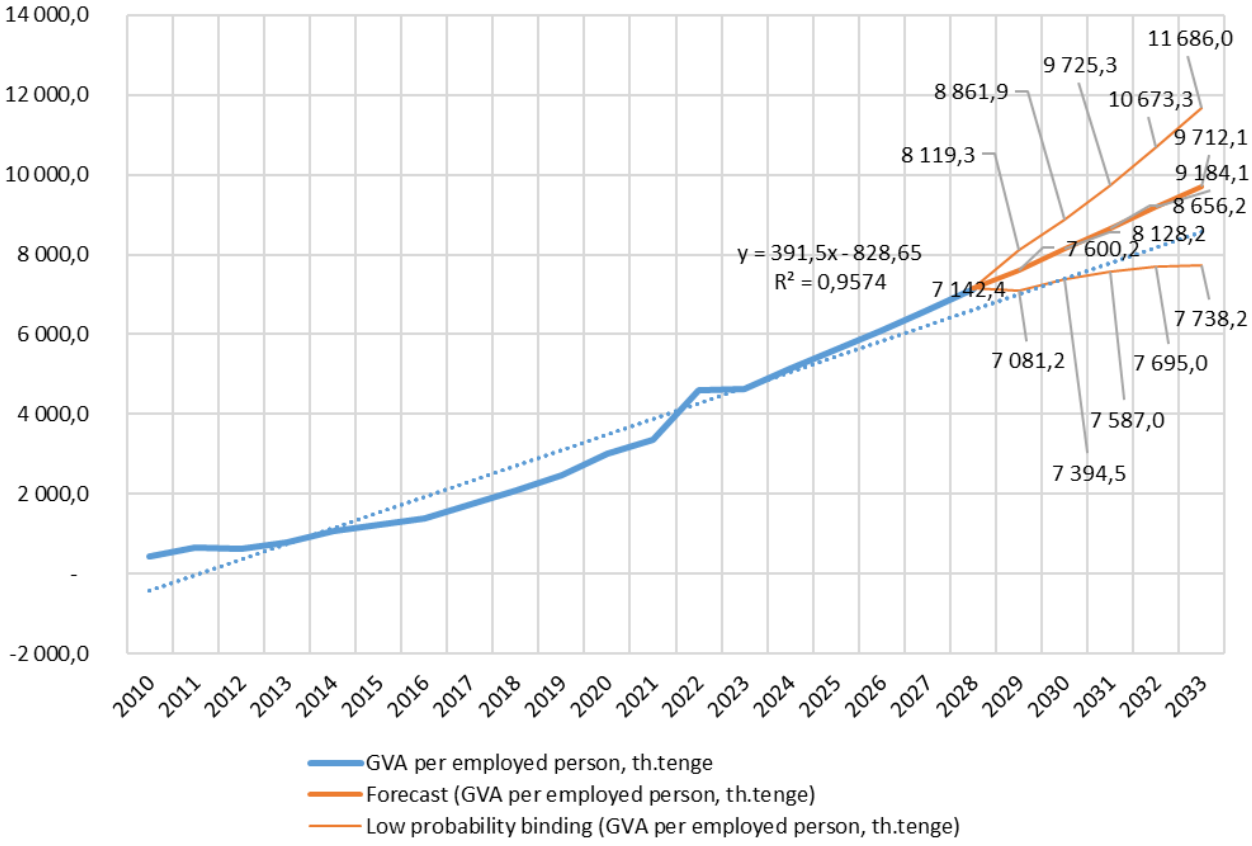
1. Pessimistic: Agricultural productivity declines by 5–10% annually due to reduced government support and unfavorable market conditions.
2. Optimistic: Productivity increases by up to 15% annually, assuming enhanced subsidy allocation, improved infrastructure, and favorable export conditions.
3. Optimal: Balanced growth of 8–10% annually, achieved through strategic government interventions, improved farmer education, and better access to credit.

Presumably, the same trend is observed separately in animal husbandry. Siximbayeva (2022) found that the growth trend GDP in livestock production in Kazakhstan is symmetrical to the growth of financial investments by the state over the same period. The author suggests that further financing of the industry will have a positive impact on the growth of livestock production. As a rule, when supporting agriculture with loans, it is expected that such loans or financial policies will increase agricultural production by ensuring greater mechanization of agriculture or intensifying the use of modern means of production.

These scenarios highlight the critical role of policy frameworks and external factors in shaping the future of agriculture in Kazakhstan. The optimal scenario underscores the importance of aligning financial support with educational and structural reforms to maximize productivity while minimizing dependency on subsidies.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

Fig.3: Scenarios for forecasting the growth of gross value added (GVA) per employee until 2033.



Source: Authors' calculations on Kazakhstan Bureau of National Statistics

CONCLUSIONS

This study aligns with existing literature regarding the impact of government subsidies on agricultural productivity, particularly in the context of Kazakhstan. While drawing from international studies, our findings add to the understanding of how specific factors influence agricultural growth through targeted assistance programs.

For instance, the works of Vozarova and Kotulic (2016) and Fan et al. (2008) highlight strong correlations between subsidies and agricultural production. Similar to our findings, these studies emphasize that increased financial support positively impacts productivity, albeit with the caveat that excessive reliance on subsidies can lead to inefficiencies. This resonates with our observations regarding the potential adverse effects of surging employment and subsidies on labor productivity. Moreover, our study corroborates Kazukauskas et al. (2014) regarding the adaptability of farmers to policy changes. We found that the expansion of acreage, increased income, and enhanced access to credit significantly contributed to productivity, aligning with the suggestion that farmers adapt to revised subsidy frameworks by reallocating resources more efficiently.

However, our findings also echo the concerns raised by Nikola and Kehinde (2017), who noted that inadequate design and distribution of subsidies may hamper their effectiveness. The farmers surveyed in our research acknowledged subsidies as vital for development, yet there remains a consensus on the need for reform. This calls for a critical reassessment of how subsidies are implemented and adjusted to better meet evolving agricultural challenges. Furthermore, our analysis supports the arguments presented by Bernini and Galli (2024), which assert that while subsidies can foster environmental sustainability, they may also yield economic inefficiencies if not appropriately managed. Our study suggests that increasing allocations without robust regulatory frameworks risks creating dependencies that undermine productivity enhancements.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

In line with Rizov (2005), we argue for a multifaceted approach to improve productivity that combines subsidies with education on financial literacy. Educating farmers can mitigate dependency on assistance while also fostering innovation among smaller enterprises. This proactive strategy could catalyze new small and medium enterprise (SME) projects, ultimately leading to a more resilient agricultural sector.

Our analysis further identified key factors positively influencing labor productivity, notably the expansion of acreage, income growth, and access to credit. While the results indicate a generally supportive policy environment, significant limitations in the research must be acknowledged. The restricted availability of up-to-date information on subsidies due to the closure of the Qoldau.kz portal and the transition to the new resource gosagro.kz hampers comprehensive analysis beyond 2021. Therefore, further research is necessary to explore the impact of recent government policies and changes in agricultural dynamics post-2021.

RECOMMENDATIONS

Based on the findings, several recommendations are proposed to enhance the effectiveness of agricultural subsidies:

- Collect systematic feedback from grantees to ensure that their perspectives and needs are addressed in the development of new subsidy programs.
- Strengthen the regulatory framework to improve subsidy planning and monitoring systems, ensuring transparency and accountability.
- Simplify automated procedures for accessing subsidies by providing accessible video tutorials and step-by-step instructions in a 24/7 format through brochures, manuals, online platforms, and other communication channels.
- Cultivate a proactive attitude among farmers by improving financial literacy and exploring ways to optimize production in small, high-quality SME projects to reduce dependency on subsidies.

Moreover, there is a pressing need for comparative studies assessing the effectiveness of subsidy programs across different regions and contexts. Future research could benefit from examining how varying approaches to subsidy distribution—such as those implemented in European countries showcased in our literature review—might influence agricultural outcomes in Kazakhstan.

In summary, our findings not only enhance the understanding of agricultural support mechanisms but also serve as a stepping stone for future studies aimed at optimizing subsidy strategies within transitional economies.

REFERENCES

Atallah, G. (2019). Subsidizing Innovation and Production. *ECONOMÍA*, 42 (84), 9-35, Available at SSRN: https://ssrn.com/abstract=3488136

JSC Agrarian Credit Corporation. Annual report, 2022, 54, Available at https://agrocredit.kz/upload/iblock/c87/oy0485pax9gufsrobbrpwuvnd-v36p4sj.pdf

Bernini, C., & Galli, F. (2024) Economic and Environmental Efficiency, Subsidies and Spatio-Temporal Effects in Agriculture. *Ecological Economics*, 218 (108120), 2-12, https://doi.org/10.1016/j.ecolecon.2024.108120

Bojnec, Š., & Fertő, I. (2022). Do different types of Common Agricultural Policy subsidies promote farm employment? *Land Use Policy,* 112, 105823, https://doi.org/10.1016/j.landusepol.2021.105823

Bureau of National Statistics of the Republic of Kazakhstan (electronic resource) https://www.stat.gov.kz/official/industry/27/statistic/5 [Accessed 14.6.2024]

Bureau of National Statistics of the Republic of Kazakhstan (electronic resource) https://www.stat.gov.kz/official/industry/14/statistic/8 [Accessed 14.6.2024]

Blomstrom, M., Lipsey, R. E., & Zejan, M. (1996). Is Fixed Investment the Key to Economic Growth? *The Quarterly Journal of Economics*, 111(1), 269–276, http://dx.doi.org/10.2307/2946665

Bollman, R. D., & Ferguson, S. M. (2018). The Local Impacts of Agricultural Subsidies: Evidence from the Canadian Prairies. *Journal of Agricultural Economics*, 70(2), 507-528, https://doi.org/10.1111/1477-9552.12309

Ciaian, P., & Swinnen, J. F. M. (2009). Credit Market Imperfections and the Distribution of Policy Rents. *American Journal of Agricultural Economics*, 91(4), 1124-1139, http://www.jstor.org/stable/20616266

Common agricultural policy for 2023-2027. 28 cap strategic plans at a glance available at: https://agriculture.ec.europa.eu/system/files/2022-12/csp-at-a-glance-eu-countries_en.pdf

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

De Long, J. B. & Summers, L. H. (1991). Equipment investment and economic growth. *Quarterly Journal of Economics*, 106, 445–502, https://faculty.econ.ucdavis.edu/faculty/gclark/210a/readings/Delong-Summers.pdf [Accessed 11.7.2024]

Digital platform for the public and business https://subsidies-archive.kezekte.kz/en/ [Accessed 07.1.2024]

Fan, P. Mishra, A., Feng, Sh., Su, M., & Hirsch, S. (2023) The impact of China's new agricultural subsidy policy on grain crop acreage, *Food Policy*, 118 (102472), https://doi.org/10.1016/j.foodpol.2023.102472

Fan, P., Mishra, A.K., Feng, S., Su, M., Hirsch, S. (2023) The effect of agricultural subsidies on chemical fertilizer use: Evidence from a new policy in China, *Journal of Environmental Management,* 344 (118423), https://doi.org/10.1016/j.jenvman.2023.118423

FAO. 2020. *The State of Food and Agriculture 2020. Overcoming water challenges in agriculture*. Rome. // https://doi.org/10.4060/cb1447en

FAO, IFAD, UNICEF, WFP and WHO. 2024. *The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms*. Rome.// https://doi.org/10.4060/cd1254en

Garrone, M., Emmers, D., Lee, H., Olper, A., & Swinnen, J. (2019). Subsidies and agricultural productivity in the EU. *Agricultural Economics*. 50(6), 803-817, https://doi.org/10.1111/agec.12526

Hennessy, D. A. (1998). The Production Effects of Agricultural Income Support Policies under Uncertainty. *American Journal of Agricultural Economics*, 80(1), 46–57, https://doi.org/10.2307/3180267

Huang, J., Wang, X., Zhi, H., Huang, Z., & Rozelle, S. (2011). Subsidies and distortions in China's agriculture: evidence from producer-level data. *Australian Journal of Agricultural and Resource Economics*, 55(1), 53–71. https://onlinelibrary.wiley.com/doi/10.1111/j.1467-8489.2010.00527.x

Huttel, S., Musshoff, O., & Odening, M. (2010). Investment reluctance: irreversibility or imperfect capital markets? *European Review of Agricultural Economics*, 37(1), 51–76, DOI:10.1093/erae/jbp046

Just, D. R., & Kropp, J. D. (2013). Production Incentives from Static Decoupling: Land Use Exclusion Restrictions. *American Journal of Agricultural Economics*, 95(5), 1049–1067. https://onlinelibrary.wiley.com/doi/abs/10.1093/ajae/aat060

Leibenstein, H. (1966). Allocative Efficiency vs. "X-Efficiency." *The American Economic Review*, 56(3), 392–415. http://www.jstor.org/stable/1823775 [Accessed 22.5.2024]

Liu, T., Xu, H. (2023) Post-assessment in policy-based strategic environmental assessment: Taking China's agricultural support and protection subsidy policy as an example, *Environmental Impact Assessment Review,* 100 (107047), https://doi.org/10.1016/j.eiar.2023.107047.

Ministry of Agriculture of Kazakhstan web site https://www.gov.kz/memleket/entities/moa/press/news/details/471818?lang=ru

Olson, M. (1982). *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*. Yale University Press. http://www.jstor.org/stable/j.ctt1nprdd [Accessed 17.6.2024]

Order of the Minister of Agriculture of the Republic of Kazakhstan, 2020 No. 107 On the approval of the Rules for subsidizing the increase in yield and quality of crop production https://adilet.zan.kz/rus/docs/V2000020209#z19 [Accessed 11.7.2024]

Order of the Kazakhstan Minister of Agriculture, 2020, No. 172. On approval of the Rules for subsidizing insurance premiums// https://adilet.zan.kz/rus/docs/V2000020673[Accessed 15.5.2024]

Raghuram, R.,G. &, Luigi, Z. (1996). Financial Dependence and Growth. *NBER Working Paper*, w5758, Available at: https://ssrn.com/abstract=7872

Resolution of the Kazakhstan Government dated December 30, 2021 No. 960. On approval of the Concept of development of the agro–industrial complex for 2021-2030 https://adilet.zan.kz/rus/docs/P2100000960 [Accessed 03.12.2023]

Resolution of the Kazakhstan Government dated July 12, 2018 No. 423 On Approval of the State Program for the Development of the Agro–industrial complex for 2017-2021// https://adilet.zan.kz/rus/docs/P1800000423 [Accessed 03.12.2023]

Rizov, M., Pokrivcak, J., & Ciaian, P. (2013). CAP Subsidies and Productivity of the EU Farms. *Journal of Agricultural Economics*, 64(3), 537–557, https://doi.org/10.1111/1477-9552.12030

Rules for subsidizing the cost of water supply services to agricultural producers https://adilet.zan.kz/rus/docs/V1500012714 [Accessed 11.7.2024]

Siximbayeva, G., Shayakhmetova, K., & Azatbek, T. (2022). The impact of credit financial investments on the growth of livestock production (meat farming) The Republic of Kazakhstan. *Economic series Bulletin of the Eurasian National University*, 141(4). https://bulecon.enu.kz/index.php/main/article/view/274

State subsidies information system https://gosagro.kz, [Accessed 22.1.2024]

The World Bank Annual Report 2021: *From Crisis to Green, Resilient, and Inclusive Recovery.* Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/120541633011500775/The-World-Bank-Annual-Report-2021-From-Crisis-to-Green-Resilient-and-Inclusive-Recovery

UNDP (United Nations Development Programme). 2022. Human Development Report 2021-22: Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World. New York.// https://hdr.

Cent. Eur. J. Public Policy 2025; 19(1): 22-37
DOI: 10.2478/cejpp-2025-0003

undp.org/system/files/documents/global-report-document/hdr2021-22overviewen.pdf

Wang, X., & Shen, Y. (2014) The Effect of China's Agricultural Tax Abolition on Rural Families' Incomes and Production. *China Economic Review*, 29, 185–199. https://doi.org/10.1016/j.chieco.2014.04.010

Yi, F., Sun, D., & Zhou, Y. (2015). Grain subsidy, liquidity constraints and food security—Impact of the grain subsidy program on the grain-sown areas in China. *Food Policy*, 50, 114–124, https://doi.org/10.1016/j.foodpol.2014.10.009

Yu, X., Sun, J. X., Sun, S. K., Yang, F., Lu, Y. J., Wang, Y. B., & Liu, P. (2019). A comprehensive analysis of regional grain production characteristics in China from the scale and efficiency perspectives. *Journal of Cleaner Production*, 212, 610–621. https://doi.org/10.1016/j.jclepro.2018.12.063

Zhang, W., & Lou, S. (2021). Research on grain production efficiency in China's main grain-producing areas from the perspective of grain subsidy. *Environmental Technology & Innovation*, 16(3), e0247610. https://doi.org/10.1371/journal.pone.0247610

Zhang, R., Ma, W., Liu, J. (2021), Impact of government subsidy on agricultural production and pollution: A game-theoretic approach, *Journal of Cleaner Production*, 285 (124806), https://doi.org/10.1016/j.jclepro.2020.124806

Fan, S., Gulati, A., & Thorat, S. (2008). Investment, subsidies, and pro-poor growth in rural India. Agricultural Economics, 39(2), 163-170.

Vozarova, I. K., & Kotulic, R. (2016). Quantification of the Effect of Subsidies on the Production Performance of the Slovak Agriculture. *Procedia Economics and Finance*, 39, 298-304.

Kazukauskas, A., Newman, C., & Sauer, J. (2014). The impact of decoupled subsidies on productivity in agriculture: a cross-country analysis using microdata. *Agricultural economics*, 45(3), 327-336.

Nikola, T. M., Kehinde, Mile, P. (2017). Are agricultural subsidies efficient tool for agricultural sector of the Republic of Macedonia. *Bulgarian Journal of Agricultural Science*, 23(3), 363-369

Praveen, J. (1994). The short-run trade-off between food subsidies and agricultural production subsidies in developing countries. *The Journal of Development Studies*, 31(2), 265-278.

Rizov, M. (2005). Does individualization help productivity of transition agriculture? Agricultural Economics, 33(2), 215–227. https://doi.org/10.1111/j.1574-0862.2005.00408.x