



The role of digital platforms in regulating the cyclicity of agricultural markets in Kazakhstan

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Abstract. The purpose of this study was to substantiate the potential of using digital platforms to reduce the cyclicity of agricultural markets in Kazakhstan in the context of the modern transformation of agricultural production. The study used an applied analytical approach covering the period 2020-2024. The economic essence of the cyclical nature of agricultural markets was analysed, the regulatory framework for the management of the agro-industrial complex was investigated, and an empirical

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study of the East Kazakhstan and Akmola regions was conducted. In particular, in 2022, the gross volume of agricultural production in the Akmola region reached KZT 976.6 billion, which is 18.6% more than the previous year. In 2024, crop production dominated the region (up to 75% of production), while animal husbandry prevailed in East Kazakhstan (up to 60%). Investment programs were analysed, including the implementation of more than 670 projects with a total value of KZT 3.3 trillion by 2027, as well as the implementation of microcredit under the “Auyl Amanaty” program in the amount of KZT 100.5 billion. Particular attention was paid to the assessment of key digital platforms: Ger Inspector, Qoldau.kz, GeoPard, AgriSupp, which contributed to the reduction of information asymmetry, automation of subsidies, climate risk analysis, and production planning. The practical significance of the study lies in the possibility of using its results to develop regional strategies for the digital transformation of the agricultural sector in order to stabilise markets and strengthen food security

Keywords: sustainable development; technologies; farming; prices; market fluctuation

INTRODUCTION

In the current conditions of agricultural development in Kazakhstan, the search for effective mechanisms for stabilising agricultural markets prone to cyclical fluctuations is of particular importance. Price disparities, uneven production, and limited access to market information pose threats to the economic security of farms and the food system as a whole. At the same time, digitalisation opens up new opportunities for operational data analysis, forecasting supply and demand, and forming transparent product sales channels. Kazakhstan's agriculture remained vulnerable to seasonal and market fluctuations, which made it difficult to maintain stable production and income. R. Gabdualiyeva *et al.* (2024) investigated the potential of digital technologies – Global Positioning System (GPS) navigation, drones, online platforms, and monitoring systems – to increase the efficiency of agricultural production. The authors identified a number of barriers, including unstable internet coverage, a shortage of qualified personnel, a lack of standards, and a low level of digital literacy among farmers. At the same time, the study did not sufficiently reveal the role of digital platforms in smoothing fluctuations in agricultural markets, which required further study.

A low share of digital solutions in Kazakhstan's agriculture constrained its economic efficiency due to outdated technologies and uneven resource use. O. Ryskeldi *et al.* (2024) analysed the impact of six digital tools – including livestock monitoring, cow tracking, drones, parallel driving, telematics, and soil sensors – on over 130 farms. Their findings showed increased productivity, reduced costs, and high returns on investment (up to 400%). However, the study did not explore the influence of these technologies on regulating market fluctuations, stabilising farm incomes, or mitigating seasonal volatility. A low level of digital integration in Kazakhstan's agricultural machinery industry has limited its modernization and competitiveness. M. Sarsembayev *et al.* (2023) examined legal aspects of digitalisation, highlighting the need to update regulations on document management, cybersecurity, the Internet of Things, robotics, and smart systems. However, the study did not assess how such transformation could help

mitigate seasonal and market instability in agricultural production. The weak level of investment activity and technical modernization has long restrained the growth of the competitiveness of agricultural production in Kazakhstan.

Limited use of digital technologies, weak infrastructure, and low levels of digital literacy have hindered the development of agricultural production in Kazakhstan (Akhmet *et al.*, 2025). D. Kulanova *et al.* (2025) examined the institutional conditions for digitalisation, analysed state programs, and found that less than 10% of farmers use digital solutions, and support remains patchy. However, the impact of digital platforms on reducing market volatility was not considered, which requires further analysis. Insufficient integration of production participants, weak infrastructure, and limited access to financing have hindered the effective development of cluster models in agriculture in Kazakhstan. A. Tkacheva *et al.* (2024) investigated the potential of agroclusters using the example of the Pavlodar region, confirming the effectiveness of vertical integration and state support. The authors identified the prospects of grain, meat, and dairy clusters, emphasising the role of investment and training. At the same time, they did not consider how digital solutions can affect the reduction of market volatility, which requires further study.

The low level of digitalisation of irrigation systems and the deterioration of infrastructure have hindered the efficient use of water resources in agricultural production in Kazakhstan. Z. Imanbayeva *et al.* (2024) examined the role of state regulation in the implementation of digital technologies and substantiated the effectiveness of “smart irrigation” and agricultural notes, proving that increasing digitalisation by 75% can reduce water consumption by 18%. However, the authors did not consider the impact of digital platforms on mitigating market fluctuations, which requires further analysis. Limited use of financial technologies and low investment activity have hindered the innovative development of agricultural production in Kazakhstan. P. Buzaubayeva *et al.* (2023) analysed the possibilities of using FinTech tools, agricultural lending, and state

support to finance digitalisation. The authors noted their ability to increase the efficiency and attractiveness of the sector. However, the impact of these tools on smoothing market fluctuations was not considered, which requires further study.

The purpose of this study was to substantiate the possibilities of using digital tools to reduce fluctuations in demand, supply, and prices for agricultural sector products in the context of modern transformations of the agricultural market of Kazakhstan.

MATERIALS AND METHODS

In the process of the study, an applied analytical approach was used involving qualitative methods of analysis, covering the time period 2020-2024. A theoretical review was conducted on agricultural markets' cyclical nature, its manifestations, and its impact on price stability and food security. Particular attention was paid to the analysis of theoretical approaches to the application of digital platforms in the agricultural sector, with a focus on institutional economics, transaction cost theory, and the paradigm of sustainable development. The research involved content analysis of academic and policy literature, as well as comparative analysis of economic theories relevant to digitalisation in agriculture. The methodology combined qualitative synthesis and structural analysis to identify the key conceptual foundations for the integration of digital platforms in agricultural market stabilisation.

At the empirical level, the agro-industrial complexes of East Kazakhstan – Aitas KZ (n.d.) and the Akmo-la-Atameken Agro regions – were studied. These companies were selected as the largest and most innovative agro-industrial complexes in their respective regions, which are actively implementing digital technologies and are of strategic importance for the development of the agro-industrial complex. Their socio-economic structure, specialisation in agricultural production, and export level were analysed. For spatial comparison, indicators of the estimated distribution of agricultural production in 2024 were used (Satubaldina, 2024; United States Department of Agriculture, 2025). The analysis revealed differences in the ratio of crop and livestock production, which made it possible to use regional parameters of digital transformation. The study also included an assessment of investment activity in the digital infrastructure of the agricultural sector, in particular within the framework of the implementation of the Agro-Industrial Complex Development Program for 2022-2026 (Food and Agriculture Organisation, 2023). As part of the methodological framework, the study involved an analytical review of six companies from the food industry sector listed on the Kazakhstan Stock Exchange (n.d.). These companies were selected based on official exchange data and examined for structural characteristics relevant to the overall dynamics of the sector. The analysis included a review of corporate

documentation, regional affiliation, and stock exchange performance. The selected enterprises included Rakhat JSC (n.d.), Bacchus JSC (n.d.), and Kostanay Flour Company (n.d.). In addition, Tsesna-Astyk Concern JSC (Kazakhstan Stock Exchange, n.d.), Kainar-AKB JSC (n.d.), and Aksaynan JSC (n.d.) were also examined.

Information was systematised on key digital platforms operating in the agricultural sector of Kazakhstan. These include the Unified State Subsidy Information System (Kazakhstan intensively introducing..., 2025) and e-Agriculture. Also analysed were Auyt Amanaty and the Crop Traceability Information System. Additional attention was given to the E-farming Platform and artificial intelligence-driven solutions. The data was collected on the basis of official statistical and analytical materials. Data analysis allowed us to determine the level of their integration into production processes, the impact on reducing information asymmetry, optimising management decisions, and stabilising the market. Based on the results obtained, recommendations were formulated to strengthen the investment attractiveness of digital solutions, and proposals were developed to enhance food security through the formation of regional digital policy.

RESULTS AND DISCUSSION

The cyclical nature of agricultural markets is one of the key characteristics that determines the behaviour of prices, production volumes, and incomes of agricultural producers in the medium and long term. Its essence lies in the periodic repetition of growth and recession phases that arise under the influence of a number of objective and subjective factors – from climatic conditions, seasonality of demand and supply, and fluctuations in resource costs to changes in public policy, prices on world markets, and the availability of technologies. Agricultural products are characterised by high sensitivity to external and internal disturbances, since most of their types have a limited shelf life, significant dependence on weather conditions, and a specific cost structure.

In practice, the cyclical nature of agricultural markets is manifested in price volatility, unevenness of farmers' incomes, and instability of food supply. In years of overproduction, a sharp decline in prices is observed, which reduces the profitability of agricultural production and discourages further investment. On the contrary, in years of deficit, prices increase, which exacerbates social tensions, especially in conditions of limited access to imports or underdeveloped logistics infrastructure. Such unevenness is especially dangerous for countries with a strong agricultural component of the economy, such as Kazakhstan, where the agro-industrial complex plays an important role in ensuring employment, foreign exchange earnings, and food security (Jumabayeva *et al.*, 2023). The economic significance of the cyclicity of agricultural markets lies not only in the impact on producers' profits but also in the

broader macroeconomic context. First, the instability of agricultural production complicates the formation of a strategy for the development of the sector, as financial risks increase and incentives for modernization decrease. Second, price volatility affects the availability of food for consumers, especially vulnerable social groups, which is directly related to the level of food security of the state. Thirdly, cyclicity makes it difficult to attract investment in the agribusiness sector, as private capital is focused on predictability and stability of income.

Another feature of agrarian markets is their tendency to so-called “price scissors,” when the growth rate of the cost of means of production (fuel, fertilisers, seeds) outpaces the growth of prices for agricultural products (Palamarchuk *et al.*, 2023). This exacerbates imbalances in the agribusiness sector and creates conditions for structural instability. In such conditions, it becomes necessary to find tools to smooth out cyclicity, among which digital platforms are playing an increasingly important role. Their ability to provide prompt access to market information, perform analytics, forecasting, and regional coordination of supply and demand makes it possible to increase the adaptability of market participants to fluctuations (Digital Platforms for Farmers..., 2025). Thus, the cyclicity of agrarian markets is a complex economic phenomenon that has multi-level consequences at both the micro and macro levels. Overcoming it requires not only improving state regulatory instruments but also actively implementing digital solutions that can increase market transparency, reduce risks, and support food security. These aspects are important in further analysing the effectiveness of digital platforms in a regional context.

In modern economic science, digital platforms are considered as a tool capable of transforming the agricultural sector by creating new models of interaction between producers, consumers, government agencies, and investors (Makhazhanova *et al.*, 2024). Theoretical approaches to their application in agricultural production are based on a combination of institutional theory, transaction cost theory, innovative development, and digital economy. They are united by a common understanding that digital solutions are not just a technological update – they change the rules of market functioning, reduce information asymmetry, simplify access to resources, and increase the efficiency of management decisions. According to the theory of transaction costs, digital platforms reduce the costs of searching for information, concluding agreements, and monitoring the fulfilment of obligations. In agriculture, this is manifested through the rapid exchange of data on prices, product quality, weather conditions, logistics, the availability of subsidies, and insurance programs. Such platforms allow agricultural producers to act proactively, rather than reactively, which is especially important in conditions of market instability and climate risks (Rindfleisch, 2019). Examples of such solutions are the

AgriTech Farm Management Software, Cropio, and Climate FieldView. Other widely used systems include EO-SDA Crop Monitoring. In Kazakhstan, Digital Village also provides tailored technological support for farmers. They provide the opportunity to monitor soil conditions in real time, forecast yields, plan irrigation, optimise fertiliser use, and choose the best time for harvesting, taking into account market trends. Based on this concept, digitalisation reduces risks and increases the efficiency of resource use, allowing for prompt adjustment of production behaviour.

From the standpoint of an institutional approach, digital platforms act as a new type of infrastructure institution that provides conditions for transparent, open, and predictable interaction of all market participants (Matskiv *et al.*, 2025). They create a new ecosystem where transactions take place in the digital space, rather than through traditional chains of intermediaries, which reduces costs and reduces price volatility. These processes are of particular importance in the agro-industrial complex of Kazakhstan, where the territorial fragmentation of producers and the underdevelopment of logistics channels create high barriers to effective communication between market participants. The innovative paradigm considers digital platforms as drivers of technological development that integrate big data, cloud computing, remote monitoring, the Internet of Things, and decision-making systems based on artificial intelligence. In the context of the agricultural sector, this makes it possible to automate the processes of sowing, irrigation, harvesting, yield forecasting, and monitoring the condition of soil and plants. In addition, digital solutions allow the creation of financial support platforms – electronic lending systems, digital agricultural receipts, insurance, and grant support (Acs *et al.*, 2021).

Within the framework of the approach to sustainable development, digital platforms are considered as a tool not only for increasing economic efficiency but also for ensuring social justice and environmental balance. Through access to knowledge, government services, investment resources, and new markets, small farmers are able to compete on a par with large agricultural holdings. This helps reduce regional disparities and ensure food security (Robertson & Lapiņa, 2023). Thus, digital platforms in the agricultural sector act as a complex multifunctional system that embodies economic, organisational, and technological approaches to increasing the efficiency of agricultural production. Their implementation is not only applied but also strategic for stabilising agricultural markets, minimising cyclicity, and creating sustainable agro-economic models. This study and M.-H. Ehlers *et al.* (2021) started from the same position regarding the importance of digitalisation for the agricultural sector but differed in their emphases. In M.-H. Ehlers *et al.*'s work, digitalisation was considered as a factor in the transformation

of agricultural policy, with an analysis of nine policy dimensions, including spatial specificity, cost distribution, and flexibility over time. The authors emphasised the change in policy instruments under the influence of digital technologies. This study focused on the practical aspect of reducing the cyclicity of agricultural markets in Kazakhstan. Digital platforms were considered as a tool for stabilising prices, coordinating supply and demand, and supporting farmers' incomes. The work also took into account barriers to implementation: weak infrastructure, lack of investment, and low levels of digital literacy. While M.-H. Ehlers *et al.*'s study focused on policy transformation, this study focused on market stability.

The approach proposed by R. Abiri *et al.* (2023) was based on a systemic vision of digital agriculture as a set of interconnected technologies (Internet of Things, artificial intelligence, blockchain, and robotics) capable of ensuring productivity and sustainability of production. While the emphasis was on the technological framework and its potential for global application, this study paid more attention to a specific task – reducing price volatility and stabilising the agricultural market in Kazakhstan. Thus, these approaches complement each other: the first from a technological perspective, the second from the point of view of local market risk management. In J. MacPherson *et al.* (2022), digital agriculture was considered through the prism of global policy, legal regulation, and sustainable development goals. The authors structured the analysis in five areas: climate, biodiversity, soils, nutrition, and biomass, supplementing it with future development scenarios. The study had a comprehensive, multidisciplinary nature. In

contrast, this study was focused on solving a specific economic problem – stabilising price dynamics in the agricultural market in Kazakhstan. Thus, the work of J. MacPherson *et al.* served as an example of a global policy-analytical review, while this study presented an example of the local application of digital solutions for market adaptation.

The agro-industrial complexes of the East Kazakhstan and Akmola regions play a crucial role in Kazakhstan's agriculture, serving both the domestic market and exports. In 2022, the gross output of agriculture, forestry, and fisheries in the Akmola region reached KZT 976.6 billion (USD 2.09 billion), which marked an 18.6% increase compared to the previous year. Of this amount, 708.09 billion KZT came from crop production (mainly grains), while 264.2 billion KZT came from livestock production, representing 72.5% and 27% of agricultural output, respectively (Azernews, 2023). Akmola is part of Kazakhstan's "grain belt" and is one of the country's leading exporters of wheat, barley, and oilseeds, with up to 50% of production exported (Satubaldina, 2024). In contrast, East Kazakhstan has a more balanced agricultural structure, with a stronger focus on livestock production, especially cattle farming and dairy. Although exact figures for total output in recent years are not available, the region is among the leaders in livestock production and is home to major meat processing and vegetable oil facilities, with 88 active oilseed processing plants. Approximately 30-40% of the region's production is exported, while the rest is consumed domestically (APK-Inform, 2025). The structure of agricultural production in both regions in 2024 is presented in Table 1.

Table 1. Estimated distribution of agricultural output by region in 2024

Region	Crop production	Livestock production	Notes
Akmola Region	70-75%	25-30%	Dominated by grain and oilseed cultivation
East Kazakhstan Region	40-50%	50-60%	Leading in livestock production; well-developed oil industry

Source: created by the authors based on A. Satubaldina (2024), United States Department of Agriculture (2025)

Both regions are actively involved in state support programs, including machinery leasing at 5% annual interest, microcredits at 2.5%, subsidies for imported equipment, loan guarantees of up to 85%, and initiatives in partnership with the Food and Agriculture Organisation. These programs cover tens of thousands of farms, while hundreds of agricultural cooperatives benefit from better access to land and resources. Under the "Auyly Amanaty" program alone, 15,500 microcredits worth KZT 100.5 billion were issued, including to 442 cooperatives, many of which are located in Akmola and East Kazakhstan (Agroberichten Buitenland, 2025a). Thus, regional features of the agro-industrial complex demonstrate the dominance of grain farming in Akmola and livestock in East Kazakhstan. Both regions are deeply integrated into Kazakhstan's agricultural policy

and continue to develop through a combination of modernization, export orientation, and active state support.

One of the largest agro-industrial complexes of the East Kazakhstan region in 2020-2024 is the Aitas KZ holding, which includes Aitas Agro. The company is a national leader in poultry farming and occupies key positions in the region both in terms of production volumes and the scale of innovation implementation. The main production facilities are located in Ust-Kamenogorsk, where a large poultry farm operates with an annual capacity of up to 160 thousand tonnes of poultry meat, which provides more than a third of the country's domestic market. The subsidiary Aitas Agro specialises in crop production and cultivates more than 30 thousand hectares of arable land. The main crops are spring and winter wheat, sunflower, and

barley. The company is actively implementing digital technologies – in particular, precision farming systems based on yield mapping, modified fertiliser application rates, and GPS navigation. They use the Cropwise and OneSoil platforms to build a map of field productivity, which allows for differentiating approaches to sowing and improvement, taking into account the peculiarities of substantiation and relief. The initiative to introduce precision agriculture was launched by the company's management after completing international business education, which testifies to Aitas KZ's strategic orientation towards innovation (OneSoil, 2023). The company also participates in state programs for the digitalisation of the agricultural sector, in particular within the framework of the National Project for the Development of the Agro-Industrial Complex of Kazakhstan for 2021-2025 (Food and Agriculture Organisation, 2021), which includes subsidising innovations, research and development, and the introduction of "smart" farms. free activities in the field of animal husbandry and crop production, the company has its own meat processing infrastructure: the subsidiary Aytas-MP Limited Liability Partnership provides red meat processing with an annual capacity of 12 thousand tonnes, as well as a separate line for processing poultry meat (25 thousand tonnes/year) (Deloitte, 2021). Thus, Aitas KZ demonstrates an appropriate vertically integrated agribusiness structure with a high level of digitalisation, which to a large extent shapes the agricultural profile of Eastern Kazakhstan and increases the food security of the region and the country as a whole.

And one of the most powerful agro-industrial complexes of the Akmola region, which deserves special attention, is Atameken Agro (n.d.). The company is one of the largest agro-holdings in the region and plays a key role in the grain sector of Kazakhstan. The main production facilities are located within the Akmola and North Kazakhstan regions. The total land bank of Atameken Agro is about 321 thousand hectares of arable land, a significant part of which falls on the Akmola region. Atameken Agro specialises in growing grain and industrial crops, such as soft and durum wheat, barley, rapeseed, flax, mustard, peas, lentils, chickpeas, and buckwheat. Thanks to the introduction of modern agricultural technologies, the company managed to achieve high yield indicators; in particular, in 2024 an increase in barley yield was recorded to 17.3 quintals per hectare, which allowed reducing the cost of production to USD 90 per tonne, while previously this figure was USD 120. The company is actively implementing elements of precision agriculture, in particular variable crop rationing, automated fertiliser application, and the use of satellite monitoring to manage field productivity. To store the harvest, Atameken Agro uses modern elevator complexes and grain drying plants, which allow for effective organisation of storage and further logistics of grain (APK-Inform, 2023). This is especially

important, given the company's active export activities. Atameken Agro participates in state support programs, such as Ken Dala and initiatives of the Baiterek holding, receiving preferential financing for updating the technical park and implementing investment projects. The company also joins regional initiatives to modernise the agricultural industry, in particular in the field of implementing digital platforms for agricultural production.

The food industry of Kazakhstan is one of the basic industries that ensure food security, domestic demand, and export potential of the country (Tungyshbayeva *et al.*, 2021; Tleubayev *et al.*, 2024). In the context of economic instability in early 2020, caused by the global pandemic and devaluation fluctuations, this industry has maintained relative stability and demonstrated positive dynamics. Analytical data from the Kazakhstan Stock Exchange and state statistics allow us to assess the key economic indicators of food industry enterprises and outline the main trends in their development. In the first quarter of 2020, the index of physical volume of food industry production was 113.4%, which indicates a real growth in production. The largest increase was recorded in the production of flour (605 thousand tonnes, +7.8%), sunflower oil (66.1 thousand tonnes, +33.3%), and mineral water (104.7 million litres, +13.5%). The Kazakhstan Stock Exchange (2020) listed 6 companies from the food industry sector, with a total market capitalisation of KZT 67.8 billion, representing 0.31% of the total exchange market. The largest share belongs to Rakhat JSC (Almaty), a leading confectionery manufacturer, which accounts for over 91% of the sector's capitalisation and demonstrates strong financial sustainability.

Other listed companies include Bacchus JSC (Almaty), specialising in alcoholic beverages, and Kostanay Flour Mill JSC (Kostanay region), focused on grain processing and flour production. Tsesna-Astykh Concern JSC (Akmola region) (Kazakhstan Stock Exchange, n.d.) is one of the major players in grain storage and trading, while Kainar-AKB JSC (Pavlodar region) manufactures battery components with food industry applications. Another example is Aksaynan JSC (West Kazakhstan region), engaged in bakery and pasta production. However, all companies aside from Rakhat JSC exhibit low trading liquidity and limited capitalisation, which constrains their influence on the broader food industry stock segment. Other issuers, such as Bacchus and Kostanay Flour Mill, had limited liquidity. Financial results indicate stability: the average profitability on net profit is 11.5%. Profits grew due to increased demand for long-term storage products, in particular under quarantine restrictions. At the same time, costs for imported components increased due to the fall in the KZT exchange rate and logistical difficulties. Despite this, the industry maintained its development pace thanks to state support programs, access to financing, and active participation in modernization projects. The

food industry is expected to continue to be a stable sector with high demand and potential for export expansion, especially in the value-added processing and distribution segment.

Kazakhstan's agro-industrial sector is undergoing a dynamic transformation driven by the national strategy for digital modernization (Chykurkova *et al.*, 2025). As of 2024, the Ministry of Agriculture provides 93 public services, with 98% of them available online. More than 2.6 million electronic service transactions were completed in the agricultural sector in that year alone, reflecting a

high degree of digital integration among farms and agribusinesses (Agroberichten Buitenland, 2025b). A key component of this transformation is the development and implementation of digital platforms and systems that automate subsidy applications, monitor land use, manage livestock, and provide farmers with access to credit and decision-making tools. These systems are helping to reduce bureaucratic barriers, increase transparency, and improve production efficiency. Table 2 below presents the core platforms used in Kazakhstan's agricultural digital ecosystem.

Table 2. Key digital platforms in Kazakhstan's agricultural sector

Platform/system	Purpose/function
Unified State Subsidy Information System	Subsidy management and application automation
e-Agriculture	Integrated agro-industrial management system
Auyl Amanaty	Credit and microcredit services for farmers and cooperatives
Crop Traceability Information System	Crop production traceability (under development)
E-farming Platform	Unified digital ecosystem for agro-industrial complex (planned)
Artificial Intelligence-Driven Solutions	Automation and optimisation via artificial intelligence (chatbots, drones, soil analysis)

Source: created by the authors based on Kazakhstan intends to increase yields in agriculture by introducing digital technologies (2025), Agroberichten Buitenland (2025b)

Over 200 digital farms across Kazakhstan – including in Akmola and East Kazakhstan – are currently using artificial intelligence-powered drones, GPS-guided machinery, and soil analysis sensors to improve productivity. The government has also outlined ambitious plans for artificial intelligence integration between 2025 and 2026. Projects include chatbots for subsidy automation (reducing human error from 30% to 5%), intelligent soil diagnostics that cut manual labour by up to 80%, and drones capable of reducing crop losses by 25-30% through precision pest control (Kazakhstan intends to..., 2025). Despite this progress, key challenges remain. Limited internet access in rural areas, low levels of digital literacy, and insufficient localisation of digital tools slow adoption. However, the Digital Acceleration for an Inclusive Economy initiative, supported by the World Bank, aims to expand broadband coverage and increase digital access across rural Kazakhstan. Support from the private sector and start-up community is also growing. The Astana Hub start-up ecosystem has contributed around KZT 4.7 billion (~USD 9.3 million) in agri-tech innovations, driving digital development and job creation in rural areas (Agroberichten Buitenland, 2025b).

This study and that of M.J. Bustamante (2023) are similar in recognising the importance of digital platforms for the agricultural sector but differ in focus. M.J. Bustamante's emphasis was on the process of forming the "value" of the platform in its initial phase – how economic and social orientations are aligned between participants. The study showed how economic arguments dominate in attracting investors. In contrast, this study focused on the practical use of platforms to reduce market volatility in Kazakhstan. The first is about

assessing the potential, and the second is about actual impact. The publication by M.T. Morepje *et al.* (2024) examined e-commerce as a mechanism for increasing the sustainability of agriculture in sub-Saharan Africa. It was about access to markets, financial inclusion, and reducing losses. The research was structured around the socio-ecological dimension. Instead, the focus of this study was economic stabilisation – digital platforms here act as a means of regulating supply and demand in the agricultural market of Kazakhstan. A comparison of these two works demonstrates a shift in emphasis from inclusion to regulatory efficiency.

M. Vahdanjoo *et al.* (2025) described how the digitalisation of agriculture emerged as a strategic transformation at the macro level – the integration of technologies along the entire chain "from field to fork" with an emphasis on circularity, sustainable development, and system interoperability. The authors proposed a systemic, interdisciplinary view. In contrast, this study is based on a regional analysis and demonstrates how digital platforms can be used to address a specific problem – the instability of the agricultural market in a particular country. In the work of R. Birner *et al.* (2021), the research interest focused on digital solution providers, their business models, potential market concentration, and challenges for small farmers. The authors applied a theoretical framework, in particular the concept of club goods. This study operates at a different level of analysis – considering the platform as a practical tool for reducing price volatility and levelling the agricultural situation in Kazakhstan. This study and the study by A.S. Suali *et al.* (2024) agreed in recognising digital platforms as a tool for increasing the resilience of agricultural systems but differed in context. In A.S. Suali *et*

al., digital solutions were analysed in the context of the COVID-19 pandemic in the United Kingdom as a means of logistical adaptation. This study focused on the long-term stabilisation of agricultural markets in Kazakhstan through the reduction of seasonal and price volatility. The first study is about crisis flexibility; the second is about market stability.

The work of A. Cimino *et al.* (2024) addressed the behavioural factors of the adoption of digital technologies – the authors studied the intentions of farmers even before the implementation of the platform, taking into account the impact of environmental uncertainty and the role of social ties. This study is predictive in nature. In turn, this work captures the already realised effect: digital tools integrated into the agricultural sector have reduced volatility and improved access to information. A.K. Sanders (2022) approached the topic from the legal perspective – the main attention was paid to the risks of monopolisation, data control, intellectual property, and the need to update the regulatory framework. This study, on the other hand, appeals to the economic mechanisms of the influence of platforms – market transparency, access to forecasts, and price stabilisation. If A.K. Sanders's key issues are the regulatory challenges of the digital age, then in this case, practical solutions for agricultural stability. The analysis demonstrates that the cyclical instability of Kazakhstan's agricultural markets remains a significant challenge, influencing both food security and producer sustainability. While regulatory frameworks and strategic programs have aimed to strengthen self-sufficiency since 2014, dependency on imports for key food groups has persisted. The increasing integration of digital platforms – such as subsidy systems, satellite land monitoring, and artificial intelligence-based solutions – has shown clear potential to reduce volatility and enhance transparency in agricultural management (Wrzecińska *et al.*, 2023). Therefore, the expansion of digital tools, particularly in regions like Akmola and East Kazakhstan, is a critical step toward long-term market stabilisation and improved food system resilience.

In the current conditions of market instability in the agricultural sector of Kazakhstan, digital platforms with price forecasting and agricultural analytics functions are becoming one of the key stabilisation tools. They provide agricultural producers with operational data, demand forecasts, climate risks, and price dynamics, which allows reducing the impact of seasonal fluctuations, information asymmetry, and financial losses. One of the most functional platforms in this direction is AgriSupp – an analytical system developed by UkrAgroConsult. It covers grain and oilseed markets, including Kazakhstan, and provides daily operational information, analytical reports, historical databases, trend visualisation, and integration via Application Programming Interface. Thus, farmers, traders, and agricultural companies are able to make informed decisions, relying

not only on current prices but also on a forecast model. Another important platform is APK-Inform (n.d.), which provides up-to-date market prices, expert reviews, and analytical materials, which are especially valuable for market participants in the Commonwealth of Independent States countries, in particular Kazakhstan. It acts as a source of timely information for agricultural producers and traders focused on domestic and foreign demand.

Among precision agriculture solutions, the GeoPard Agriculture platform stands out, which, in partnership with Eurasia Group Kazakhstan, provides comprehensive analytics based on satellite images, agrochemical soil analysis, and vegetation indices. It allows you to create task maps for differentiated fertiliser and seed application, which optimises costs and increases yields. Another example is EOSDA Crop Monitoring, a system with artificial intelligence elements that provides analytics on the condition of fields, soil moisture, and weather risks. The platform supports Application Programming Interface integration with other agricultural programs and is aimed at both farmers and traders. It is worth noting the national platform of Kazakhstan – Qoldau.kz, which carries out digital satellite monitoring of 116 million hectares of agricultural land, contributing to land use control, restoration of uncultivated lands, and justification of credit decisions.

A feature of the listed solutions is the availability of application programming interfaces – AgriSupp, GeoPard, and EOSDA provide the ability to connect market and satellite data to farm management systems or regional platforms. State services of the Ministry of Agriculture also cover key areas – subsidies, land registration, and animal identification – but there is less specific information about public integration via Application Programming Interface. Platforms such as the Unified Subsidy System, Qoldau.kz, and Ger Inspector contribute to transparent resource management, reduce administrative burden, and stabilise financial flows. In the B2B solutions market, the most active are UkrAgroConsult, GeoPard, EOS Data Analytics, and national digital operators. In addition to them, start-ups in the field of agro-innovation are developing within the Astana Hub ecosystem, in particular in the areas of blockchain logistics, digital exchanges, and electronic contracts. Although the exact names are not detailed, their presence is confirmed in reports on venture financing. An example of the effective action of digital solutions is the result of the work of Qoldau.kz, which contributed to the return to cultivation of millions of hectares of land, reducing disputes between farms and ensuring predictability in financing. Also, thanks to the Unified Subsidy System, in 2023 the level of abuse in the provision of subsidies was significantly reduced, and the management of funds became more transparent (Arystanbek, 2021).

Regarding investments, in 2025 the volume of financing for the agricultural sector of Kazakhstan

amounted to USD 880 million, which is many times higher than the figures for 2024 (USD 262 million). The plan for 2025–2027 provides for the implementation of 677 projects with a total value of KZT 3.3 trillion (~USD 7.1 billion), most of which involve the use of digital technologies. International organisations are also involved in this process (Kazakhstan steps up..., 2025). The Food and Agriculture Organisation supports the implementation of digital solutions through the 2022–2026 Agro-Industrial Complex Development Program. The United States Agency for International Development (USAID) finances projects to increase productivity and inclusion that contain digital components. The European Bank for Reconstruction and Development has traditionally supported the digitalisation of logistics and the modernization of food chains. Together, these tools form an ecosystem of partnerships between the state, business, and international institutions (Food and Agriculture Organisation, 2023).

Official statistics also confirm the dynamism of the digital transition. In the first four months of 2025, KZT 213 billion (~USD 440 million) was invested in the agro-industrial complex, which is 118% more than in 2024 (Temirgaliyeva, 2025). Of the 93 services of the Ministry of Agriculture, 98% are already provided online, and the number of electronic applications in 2024 exceeded 2.6 million (Agroberichten Buitenland, 2025a). This indicates a deep digital integration of the agricultural environment. In addition, the total amount of venture investments in start-ups in 2024 amounted to USD 157 million, part of which was directed at agrotechnology (Omarova, 2025). It is also worth noting the tax and customs incentives that the state provides to accelerate the introduction of modern agricultural equipment. These include leasing at 5% per annum, subsidies from 15 to 40% for the purchase of imported equipment (including drones and robotic complexes), privileges for importing equipment, and participation in special economic zones (Agroberichten Buitenland, 2025b). Astana Hub, as an innovation centre, offers tax benefits to agrotechnology start-ups, including zero Value Added Tax and income tax. At the regional level, initiatives to introduce digital tools are being implemented in the North Kazakhstan, Akmola, Kostanay, and Karaganda regions (Farmonaut, n.d.). Given all of the above, authors can conclude that Kazakhstan is gradually forming an effective digital infrastructure for the agricultural sector. Platforms with analytics, monitoring, and price forecasting functions not only increase production efficiency but also serve as levers of market stabilisation. Thanks to state support, the involvement of international partners, and the development of private initiatives, agricultural digitalisation is becoming the basis of a new model of sustainable agricultural development.

In the work of E.N. Sadjadi and R. Fernández (2023), the digitalisation of the agricultural sector appeared through the prism of systemic challenges in Spain –

infrastructural inequality, low digital literacy, and legal restrictions became the main barriers. The authors focused on the need for political will and long-term reforms. Instead, this study demonstrated how digital solutions are already functioning in Kazakhstan as a practical tool for market stabilisation – based on the provided analytics, monitoring, and forecasting. That is, while the first work describes the prerequisites for changes, the second – their implementation in action. In the publication of V. Nianko *et al.* (2021), the classical vision of state support for the agricultural sector prevails – through subsidies, infrastructure projects, and direct participation in regulation. The authors rely on traditional intervention mechanisms. The study under consideration demonstrates a departure from such approaches – through the integration of digital platforms that independently ensure a balance between demand and supply. This shows a shift from administrative to technological support tools.

The experience presented in the work of K. Kosić and P. Młodawska (2024) focuses on building trust in agri-food chains through digital food passports in Poland. The main emphasis is on transparency, data exchange, and product traceability. This study also illustrates the use of platforms in Kazakhstan for the purpose of economic stability – through volatility management and forecasting. That is, platforms act in different roles: in one case, as a communication tool; in the other, as an anti-crisis response mechanism. In the work of V. Borsellino *et al.* (2020), agri-food markets are considered in the context of global megatrends: from trade liberalisation to urbanisation. The authors analyse the impact of global structures, transnational corporations, and political strategies on the transformation of the sector. Against this background, this study looks like an example of a local solution within one country, where transformation is carried out not through macroeconomic reforms, but through the implementation of digital tools in everyday agricultural practice. Summarising the results, it can be stated that Kazakhstan is confidently moving towards creating a sustainable digital infrastructure in the agricultural sector. Digital platforms with analytics, monitoring, and price forecasting functions have become an important tool for stabilising the market and reducing its volatility. The synergy of state support, international financing, and business activity creates a favourable environment for technological change. It is digitalisation, as the study showed, that is becoming the basis of a new model of agricultural development with a long-term effect.

CONCLUSIONS

The study found that digital platforms play a key role in stabilising Kazakhstan's agricultural markets, reducing price and seasonal volatility, increasing the efficiency of agricultural production, and ensuring food security. Empirical analysis, in particular on the example of the East

Kazakhstan and Akmola regions, showed significant regional shifts, accompanied by an increase in production and exports. Thus, in 2022, gross agricultural output in the Akmola region amounted to KZT 976.6 billion (over USD 2 billion), which is 18.6% more than in the previous year. Of this amount, 72.5% was accounted for by crop production, which indicates the leading role of the region in grain production. At the same time, East Kazakhstan is distinguished by developed livestock farming and a significant export share (30-40%), which determines the need for digital solutions for coordinating logistics and pricing. In general, in the first quarter of 2020, the physical volume index of Kazakhstan's food industry production amounted to 113.4%, and in 2025, investments in the agro-industrial complex reached KZT 213 billion, which is 118% more than in 2024. This increase is associated with the implementation of more than 670 projects worth KZT 3.3 trillion by 2027, most of which have a digital component. At the same time, more than 98% of 93 state services in agriculture are already provided online, and the number of electronic applications has exceeded 2.6 million, which indicates a deep digital integration of the agricultural environment.

Digital platforms such as AgriSupp, EOSDA Crop Monitoring, GeoPard, and Qoldau.kz have demonstrated the ability to reduce information asymmetry, predict fluctuations in demand and supply, and increase the accuracy of agronomic decisions. For example, Qoldau.kz provides satellite monitoring of 116 million hectares, facilitating control over land use and financial decision-making. The GER Inspector system helps prevent subsidy abuse, which increases transparency and

reduces financial risks. Despite progress, there are barriers – limited internet coverage, low digital literacy, and lack of localized solutions. However, initiatives such as the Auyl Amanaty program (KZT 100.5 billion of microloans for 15,500 applicants) and the activities of the Astana Hub (KZT 4.7 billion of investments in agro-tech start-ups) are creating a favourable innovation climate. The involvement of international partners – the Food and Agriculture Organisation, USAID, and the European Bank for Reconstruction and Development – has strengthened the investment and institutional base for digitalisation. Thus, the results obtained indicate that digital platforms in the agricultural sector of Kazakhstan not only contribute to increasing productivity but also play a stabilising role in counteracting market cyclicity. Their implementation ensures a balance between state regulation and market mechanisms of self-regulation, strengthens food security, and creates the foundation for the long-term sustainability of the country's agri-food system. Prospects for further research include expanding the geography of analysis and conducting a quantitative assessment of the effectiveness of digital platforms using econometric models.

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Роль цифрових платформ у регулюванні циклічності аграрних ринків в Казахстані

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Анотація. Метою даного дослідження було обґрунтування потенціалу використання цифрових платформ для зменшення циклічності сільськогосподарських ринків Казахстану в контексті сучасних трансформацій сільськогосподарського виробництва. У дослідженні використовувався прикладний аналітичний підхід, що охоплював період 2020-2024 років. Було проаналізовано економічну суть циклічності сільськогосподарських ринків, досліджено нормативно-правову базу управління агропромисловим комплексом та проведено емпіричне дослідження Східно-Казахстанської та Акмолинської областей. Зокрема, у 2022 році валовий обсяг сільськогосподарського виробництва в Акмолинській області досяг 976,6 млрд тенге, що на 18,6 % більше, ніж у попередньому році. У 2024 році в регіоні переважало рослинництво (до 75 % виробництва), тоді як у Східному Казахстані переважало тваринництво (до 60 %). Було проаналізовано інвестиційні програми, включаючи реалізацію понад 670 проектів загальною вартістю 3,3 трлн тенге до 2027 року, а також реалізацію мікрокредитування в рамках програми «Ауыл Аманата» на суму 100,5 млрд тенге. Особлива увага приділялася оцінці ключових цифрових платформ: Ger Inspector, Qoldau.kz, GeoPard, AgriSupp, які сприяли зменшенню інформаційної асиметрії, автоматизації субсидій, аналізу кліматичних ризиків та плануванню виробництва. Практичне значення дослідження полягає в можливості використання його результатів для розробки регіональних стратегій цифрової трансформації сільськогосподарського сектору з метою стабілізації ринків та зміцнення продовольчої безпеки

Ключові слова: сталий розвиток; технології; сільське господарство; ціни; ринкові коливання