



FUTURITY
OF SOCIAL SCIENCE

DOI: <https://doi.org/10.57125/FS.2023.06.20.03>

How to cite: Buzaubayeva, P., Gulzhan, A., Baimagambetova, Z., & Kenges, G. (2023). Financial Technologies to Support Agricultural Innovations in Kazakhstan: Prospects for Digital Development. *Futurity of Social Science*, 1(2), 30-44. <https://doi.org/10.57125/FS.2023.06.20.03>

Financial Technologies to Support Agricultural Innovations in Kazakhstan: Prospects for Digital Development

Perizat Buzaubayeva*

Postgraduate Student, L.N. Gumilyov Eurasian National University, Astana, Kazakhstan, <https://orcid.org/0000-0003-3726-482X>

Alina Gulzhan

PhD in Economics, Head of the Department of Finance, Finance and International Trade, Kazakh University of Economics, Astana, Kazakhstan, <https://orcid.org/0000-0002-7509-0894>

Zamzagul Baimagambetova

PhD in Economics, Head of the Department of Finance, S. Seifullin Kazakh Agro Technical University, Astana, Kazakhstan, <https://orcid.org/0000-0002-7509-0894>

Gulzhihan Kenges

Senior Lecturer of the Department of Finance, S. Seifullin Kazakh Agro Technical University, Astana, Kazakhstan, <https://orcid.org/0000-0001-8529-8923>

***Correspondence email:** Pika_b@mail.ru.

Received: March 19, 2023 | **Accepted:** May 29, 2023 | **Published:** June 20, 2023

Abstract: In modern conditions, there is a growing need to solve problems in one of the priority sectors of the country's economy - agriculture - by increasing the role and ensuring the availability of financial technologies for agricultural producers, improving credit conditions, increasing the efficiency of monetary institutions that provide loans to agricultural enterprises, as well as developing forms of their support. In Kazakhstan, the government pays great attention to supporting the agricultural sector by providing subsidies and loans. However, at present, the products manufactured in the sector are not competitive with their foreign counterparts; the level of labour productivity and the material and technical base of enterprises often do not meet modern requirements, which necessitates the improvement of state support for lending, the development of the credit market infrastructure, and the improvement of lending conditions. Accordingly, there is a need to find new ways to finance the innovative development of agricultural producers in Kazakhstan. In this context, the purpose of the study is to substantiate possible directions of the introduction of innovations in the field of agriculture in Kazakhstan and to identify opportunities for attracting modern financial technologies to finance its innovative development. The research objective was achieved using general scientific (analysis, synthesis, induction, deduction, generalisation, systematisation) and special methods (trend method, analysis of statistical materials in dynamics), which allowed to obtain a reasonable and objective result. In the course of the study, the following results were obtained: an assessment of the current state of agriculture in Kazakhstan and identification of promising areas of its development; substantiation of the directions of the introduction of innovations in the field of agriculture in Kazakhstan; specification of the main areas of financing and application of financial technologies for financing the innovative development of the agro-industrial complex. As a result of the study, it can be concluded that the stimulation of agricultural development should be carried out through the introduction of innovative financial technologies, which can become a source of financial resources for the introduction of modern digital technologies into the activities of agricultural enterprises.

Keywords: green bonds, innovative technologies, threats to environmental safety, renewable energy, investment.

Introduction

Research Problem

Agriculture is one of the key sectors for Kazakhstan, as it provides the state budget, makes up a significant part of the export potential, and forms the food security of the state. The analysis of the scientific literature conducted in the course of the study development indicates that researchers mostly focus on determining the dynamics of statistical indicators or analysing the areas of financial incentives or technical features of innovation, while the issue of financial incentives for the innovation activity of agricultural producers is not considered in a comprehensive manner. And in today's fast-paced world, the issue of introducing innovations in agriculture and finding ways to stimulate such development is becoming extremely relevant and can be considered as a component of the state's food security.

Research Focus

The research is focused on studying the specifics of the use of financial technologies in the development of modern agriculture in Kazakhstan and identifying the impact of the introduction of these technologies on the innovative activity of agricultural enterprises. The emphasis in the process of developing the topic is on the introduction of digital technologies and innovative developments

in the agricultural industry while comparing the possibilities of using various financial technologies to attract investment resources in the field of innovative agricultural development. For most agricultural enterprises, the use of innovative technologies can be a way to increase investment attractiveness and increase yields and production efficiency.

Research Aim and Research Questions

The analysis of the scientific literature on the selected topic has revealed that researchers today do not combine the issues of financing and innovative development of agriculture, they mostly consider these two processes in parallel, which does not correspond to the realities of the current state of agricultural development in Kazakhstan. In the modern scientific space, there is a demand for the formation of approaches to the development of an effective system of financial incentives for the innovative development of agricultural production.

Given the extreme relevance of the analysed topic and the justified importance of determining the directions of financing the introduction of innovations in the field of agriculture, the purpose of the article is to substantiate possible directions of the introduction of innovations in the field of agriculture in Kazakhstan and to identify opportunities for attracting modern financial technologies to finance its innovative development. To achieve this goal, it is necessary to solve a number of tasks:

- 1) assess the current state of agriculture in Kazakhstan and identify promising areas for its development;
- 2) to substantiate the directions of the introduction of innovations in the field of agriculture in Kazakhstan;
- 3) identify the main areas of financing and application of financial technologies to finance the innovative development of the agro-industrial complex.

Literature Review

The importance of agricultural development and technological modernisation necessitates a comprehensive qualitative and quantitative analysis of the subsidy system in this sector and the search for alternative sources of funding.

According to the latest statistics, the total area of agricultural land in Kazakhstan is 24 million hectares, with the share of cereals and legumes at 17.3 million hectares (Denissova et al., 2021). The country's agro-industrial complex involves more than 149,000 tractors and 38,000 combines used for harvesting. These figures confirm that agriculture plays an extremely important role for Kazakhstan and creates the preconditions for the development of many related industries. The scientific literature (Ashraf et al., 2020; Ghulam et al., 2018; Ponomarenko et al., 2018) suggests that agriculture can develop much more efficiently in conditions where agro-industrial producers do not finance their activities on their own but use various financial instruments to stimulate production development and introduce innovations in agriculture. Until now, the main financial incentive for farmers in Kazakhstan has been government subsidies, but this type of financial incentive is not very effective. Subsidies that are not tied to production are not paid in Kazakhstan, although they are believed to have less impact on producers' economic decisions, as they do not require farmers to meet any criteria (Filipenko et al., 2020; Hrynychyshyn, 2021; Petrescu et al., 2021). Therefore, there is a need to develop and implement innovative financial instruments to stimulate the introduction of new technologies in the development of agricultural production.

At the same time, the government is working on other ways to stimulate agricultural development (Monetary policy strategy until 2030, 2023; Taishykov et al., 2023; Sousa et al., 2021). For example, additional measures were proposed at the government meeting, including the

extension of loans through financial institutions and procortifications, without penalties, to ensure that farmers have access to finance without being restricted by their credit history. However, these instruments have not yet yielded the expected results.

Despite active measures taken by the state, Kazakhstan's agriculture, despite its significant potential, faces serious risks associated with natural anomalies (Rui Dinis Sousa et al., 2021). However, active support measures and the willingness of the authorities to deal with these challenges can help minimise losses and restore the agricultural sector as early as next year. In this context, it is also necessary to consider the possibility of attracting financial instruments to stimulate the innovation activity of agricultural producers and the introduction of various means of digitalising production.

Financing for innovative agricultural development can become a driver for the development of new types of production in Kazakhstan (Hamed et al., 2020; Khaldi et al., 2020; Nassar et al., 2019), including the cultivation of new types of crops or the saving of resources involved in production (fuel and lubricants, water, human labour). Measures aimed at developing Kazakhstan's agricultural sector and minimising the impact of natural anomalies on its sustainability and productivity should be promoted as actively as possible in the area of investment financing. It is also important to note that export potential remains an important component of the strategy for developing agriculture and strengthening the economy of Kazakhstan, and therefore financing its development may also become an attractive investment area for potential investors.

Research Methodology

Kazakhstan's agriculture is of strategic importance for the state, so most farmers are constantly looking for financial resources to finance their development and introduce innovative technologies in the field of agricultural production. Given this, farmers need effective tools to financially stimulate innovative development. Therefore, the topic of the study is aimed at substantiating possible directions for introducing innovations in the field of agriculture in Kazakhstan and identifying opportunities for attracting modern financial technologies to finance its innovative development.

The study will be conducted on the basis of analysis of both qualitative and quantitative data, which will allow to obtain an objective generalised result and develop specific directions for attracting modern financial technologies to finance innovative agricultural development in Kazakhstan.

The research was based on official statistics and scientific literature, which ensured the objectivity and versatility of the results.

Results

Agriculture is one of the most promising sectors of the economy that Kazakhstan has high hopes for. Today, it accounts for about 4.5% of Kazakhstan's GDP. Approximately 75% of the country's territory is suitable for agricultural use, but only about 30% of the land is suitable for farming. In Kazakhstan, agriculture is based on two main areas: livestock and crop production. A large share of farming is devoted to sheep and cattle breeding, as well as the sale of dairy products, leather, meat, and wool. In terms of crop production, the dominant crops are wheat, barley, cotton, and rice, with wheat exports being the main source of foreign exchange earnings. Kazakhstan is one of the ten largest grain exporters in the world.

Obviously, the development of agriculture has a positive impact on the domestic economy. The total area under cultivation is 19 million hectares, including 14.5 million hectares of grain, 2.7

million hectares of oilseeds, 458.3 thousand hectares of vegetables, melon, and potatoes, 1.2 million hectares of fodder crops, and 144,000 hectares of industrial crops (sugar beet, cotton, tobacco). The volume of agricultural inputs was about 2.5 million tonnes of seeds and 471,400 tonnes of fertilisers. Around 90% of all the machinery currently in use is of an older model, which is why it regularly breaks down and therefore needs to be replaced. For example, tractors that have been in operation for more than 10 years account for 85% of the total fleet, and harvesters in similar condition account for 68% (Statistics of agriculture, forestry, hunting, and fishing, 2023).

As of 2022, the entire agricultural machinery sector was valued at USD 500 million, of which USD 300 million was for imported equipment. The production line from Russia is in particular demand, with a market share of 40%. Other major suppliers include Germany, Canada, the Netherlands, Belarus, Turkey and China.

However, the instruments used to attract financial resources to agriculture are dominated by government subsidies and concessional loans, while investment in agricultural producers is not sufficiently developed. The agricultural sector is one of Kazakhstan's key industries. The volume of agricultural output in Kazakhstan is growing annually. In 2022, the gross agricultural output of Kazakhstan totalled 5.4 trillion tenge (an increase of 22.5% compared to the previous year) (Statistics of agriculture, forestry, hunting, and fishing, 2023). Kazakhstan's agricultural products are in demand not only in the domestic market but also on the foreign market. The main buyers of Kazakhstan's agricultural products are the EAEU countries, China and Iran. Investment activity in the agricultural sector is also showing growth. In 2022, the growth of investments in fixed assets reached 6.7%, totalling 853.5 billion tenge (Statistics of agriculture, forestry, hunting, and fishing, 2023). The state at the republican and local executive levels is creating conditions for the development of this industry by creating favourable conditions for doing business in the country. Investors are offered favourable lending terms, customs duties, tax breaks, and in-kind grants. However, state support alone is not enough; innovative development and building of a modern agro-industrial complex can be achieved through the introduction of modern financial instruments and the use of financial technologies to finance qualitative transformations in agriculture.

The government of Kazakhstan pays special attention to attracting new technologies and promoting innovation in agriculture. In 2020, the World Bank approved a \$500 million loan to Kazakhstan for the Sustainable Agriculture Programme. So, in general, today there is a demand for the introduction of innovations in the field of agricultural production, and, accordingly, for financing the introduction of such innovations. Innovative machinery in agriculture will not only help to maximise the efficiency of energy use but will also allow for better yields. IoT can also bring Kazakhstan's agriculture to a new level of development. The Internet of Things (IoT), an innovative area where various objects and mechanisms are connected to each other in a network and perform certain tasks in an automated manner, is currently actively developing in many areas of human life, including agriculture. Many people are already familiar with the concept of a smart home, where a single controller or app can control household appliances, heating, ventilation and air conditioning systems, lighting, security systems, etc. Similar innovations are already being implemented in the agricultural sector, where modern controllers are used to automate the management of greenhouses or livestock farms.

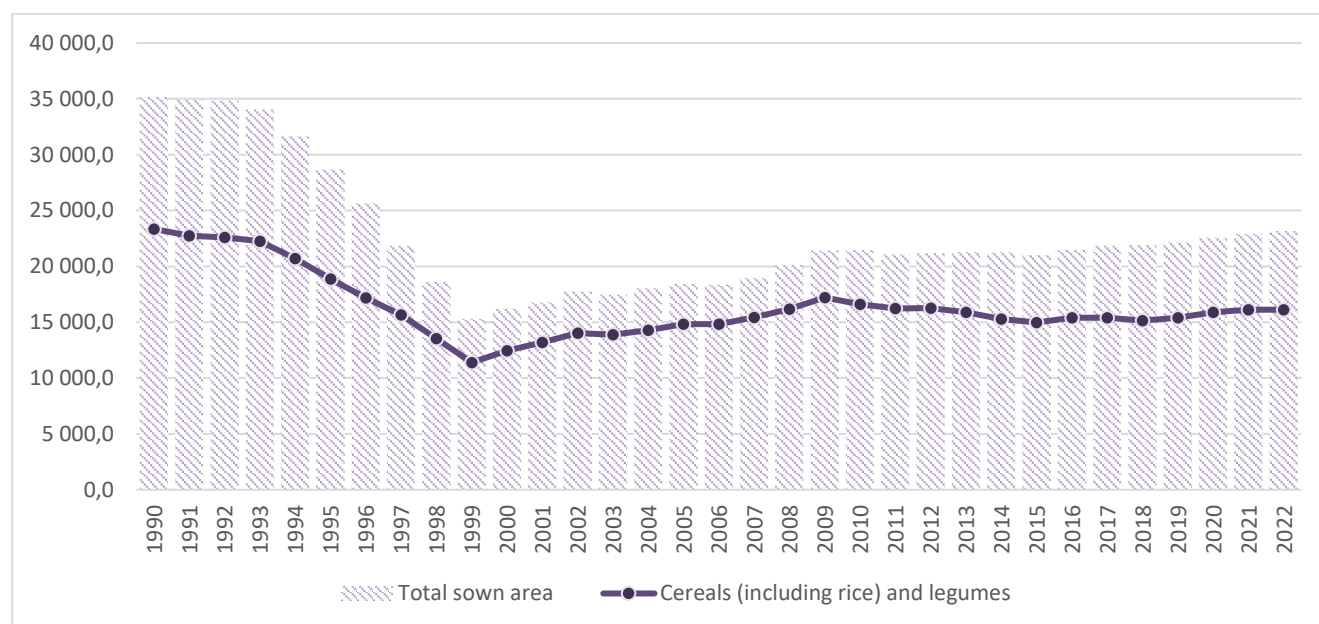
According to the Ministry of Agriculture of the Republic of Kazakhstan, in the period from 2015 to 2022, the average annual grain production is 19.1 million tonnes, of which 8 million tonnes are exported annually to more than 70 countries.

In January-December 2022, the volume of gross agricultural output decreased by 2.4% to 7.4 trillion tenge. The reason for the decline is the abnormal drought last year, which resulted in a 6.7% (4.2 trillion tenge) decline in crop production, although livestock production grew by 3.6% (3.1 trillion tenge). Food production increased by 1.9% to 2.2 trillion triggers over the same period (Statistics of agriculture, forestry, hunting, and fishing, 2023).

The total area of sown land in Kazakhstan is shown in Figure 1.

Figure 1

Dynamics of Sown Area in Kazakhstan



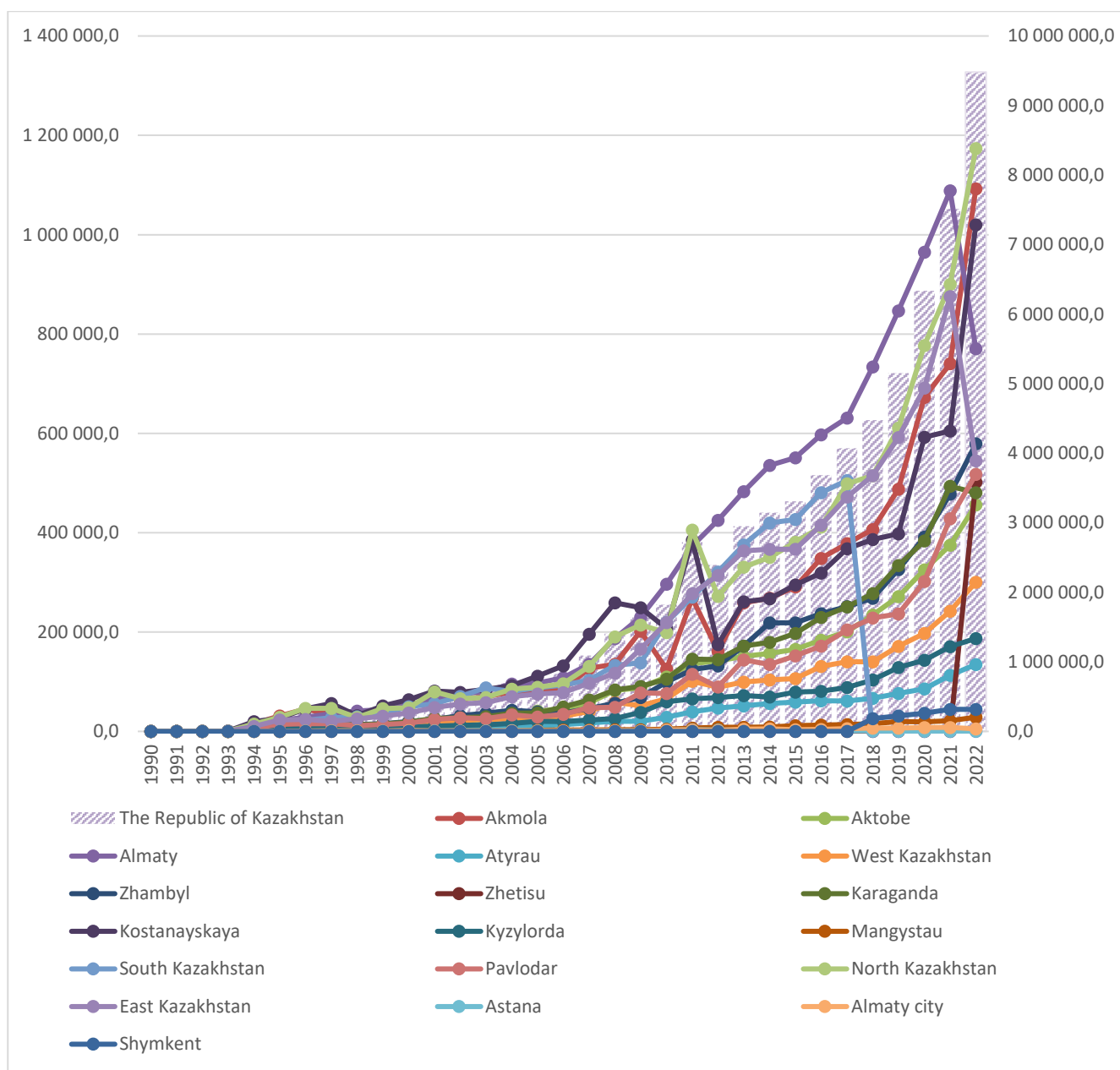
Source: Statistics of agriculture, forestry, hunting and fishing (2023).

Figure 1 shows that the total area of sown land in Kazakhstan has remained virtually unchanged in recent years, which means that the extensive way of agricultural development is not available, and therefore it is necessary to develop the existing potential and increase the efficiency of available land resources.

Figure 2 shows the dynamics of gross agricultural output in Kazakhstan as a whole and by regions.

Figure 2

Dynamics of Gross Agricultural Output in Kazakhstan in General and by Regions (in Million Tenge)



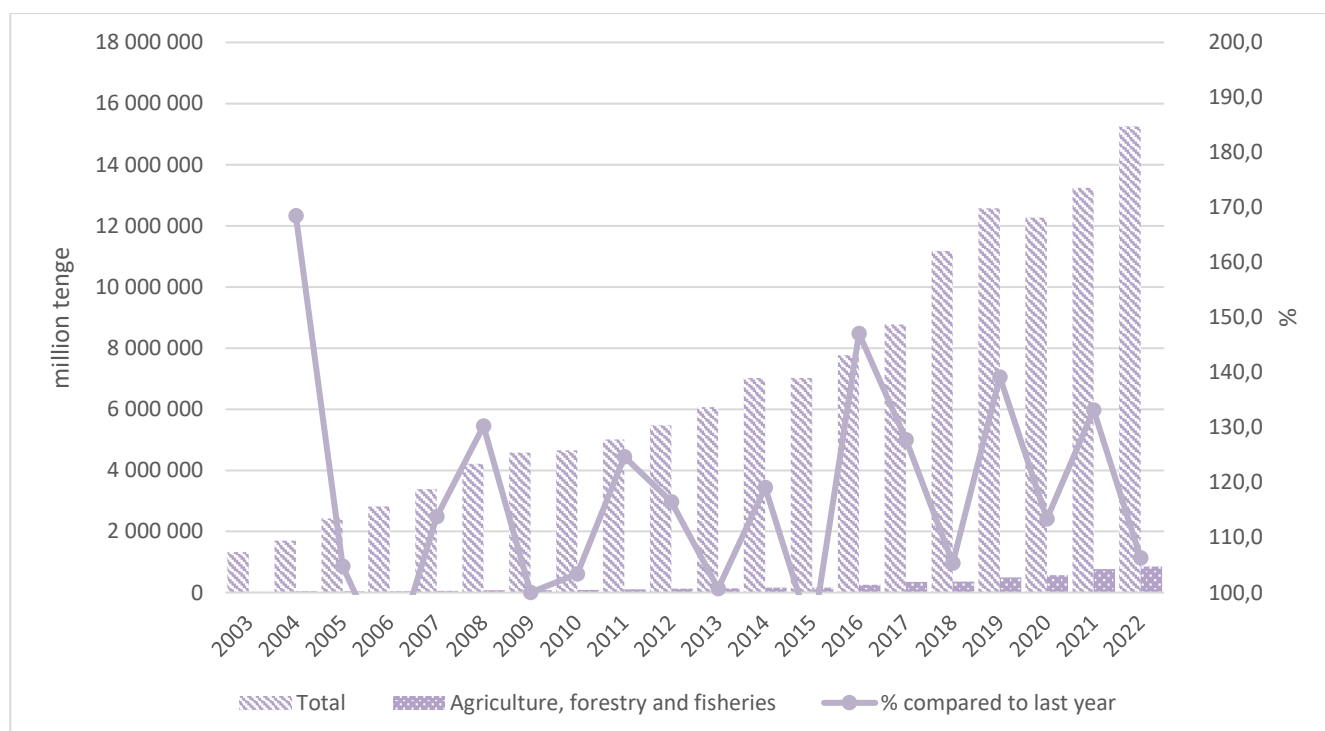
Source: Statistics of agriculture, forestry, hunting and fishing (2023).

Figure 2 shows a steady increase in the cost of lost production in the agricultural sector, but it should also be borne in mind that this rapid growth is partly inflationary, which negatively affects the economic situation not only in the industry but also in the country as a whole.

Of course, an important indicator for assessing the state of agriculture is the dynamics of investment in the sector. For example, after 2019, during the pandemic, the intensity of investment flows into agriculture declined significantly (Fig. 3. At the same time, it is worth noting the already low interest of investors in agricultural producers.

Figure 3

Dynamics of Indicators of Investments in Fixed Assets of Agricultural Enterprises in Comparison with the General Indicators in the Country



Source: Statistics of agriculture, forestry, hunting and fishing (2023).

Despite the consequences of the pandemic and the difficult economic aspects of development in 2022, a steady trend of investment in fixed assets in agriculture remains. Thus, the volume of investment in fixed assets in agriculture increased by 33.3% to 773.2 billion tenge (Statistics of agriculture, forestry, hunting and fishing, 2023), and the volume of investment in food production increased by 3.1% to 114.4 billion tenge. In 2022.

The state is one of the main investors in Kazakhstan's agriculture. In 2021, 104.4 billion tenge was allocated for the investment subsidy programme (local execution amounted to 104.3 billion tenge), which allowed for the subsidisation of 24,189 investment projects in the agro-industrial complex and the creation of 20,183 jobs (Statistics of agriculture, forestry, hunting, and fishing, 2023). Investment subsidies cover 34 priority areas of the agro-industrial complex. The annual practice of implementing the investment subsidy programme shows that the bulk of the budgetary funds on average consists of funds for the renewal of the agricultural machinery fleet by 50%.

By the end of 2022, the bulk of budgetary funds, over 67.7 billion tenge, or 65%, was spent on subsidising the purchase of agricultural machinery. The subsidy covers equipment purchased in 2019-2022.

About 13.3 billion tenge, or 13%, was allocated to subsidise investment projects in the livestock sector, while 23 billion tenge, or 22%, was allocated to support crop production projects (Statistics of agriculture, forestry, hunting, and fishing, 2023).

The analysis of the statistical material shows that there are positive trends in Kazakhstan's agriculture, which, however, should be developed and measures should be taken to improve the financial condition of agricultural producers. It is worth noting that producers need not only

investments in the renewal of machinery and cheap loans but also investments in innovative technologies that will develop modern agriculture.

As one of the key sectors of the global economy, agriculture can also demonstrate a dynamic pace of adoption of IoT, artificial intelligence, and innovative biological technologies. The industry has good reasons to innovate: according to experts, the world's population will reach 10 billion people by 2050, and all these people need to be provided with quality food. Given these prospects, the importance of ensuring a steady flow of financial resources in agriculture cannot be overstated. Obviously, those companies that manage to meet the growing demand for organic food through the use of innovative systems will have a clear competitive advantage.

Experts at IBM believe that the use of innovative technologies will allow farmers to increase production by 70% by the end of 2050 (Akter et al., 2020). One way or another, modern machinery has a lot to offer in terms of facilitating the daily tasks faced by farmers: regular maintenance of equipment, assessing water requirements, estimating the right time for planting, measuring soil temperature and moisture, and pest control. All these technologies require funding both at the development and implementation stages.

Table 1 shows the main potential technologies for active innovative development of agriculture in Kazakhstan.

Table 1

The Main Potential Technologies for Active Innovative Development of Agriculture in Kazakhstan

Project	Specifics of its implementation
Projects in the field of crop production	
Corn with efficient nitrogen uptake	To achieve stable yields, farmers need hybrids that absorb nitrogen efficiently, even with limited fertiliser application. Therefore, there is a demand for hybrids that remain highly productive even with low soil nitrogen. However, such hybrids must not only develop well with insufficient nitrogen but also produce high yields regardless of the form of fertiliser applied
Hybrid potato seeds	Since 2011, intensive research has been carried out as part of a project to develop a diploid hybrid potato that can be cultivated and propagated by seed. Until now, potato breeding has been a very slow process. The switch to seed potatoes means that it is no longer necessary to cool seed potatoes during storage and especially during long transport. However, a lot of experimentation is still needed before the first competitive varieties are available on the market
Detecting features from the air	The interaction between plant genotype and environmental factors can only be observed in the field. Therefore, field trials can be used to determine exactly whether a variety actually has the desired trait. The aim is, for example, to use aerial photographs to quickly and accurately determine characteristics such as plant development or a possible disease outbreak
Maximising the efficiency of maize photosynthesis	Maize is a plant known as a C4. It uses a special method of photosynthesis characterised by increased water use efficiency. As such, C4 plants can grow more biomass in a shorter period of time with increasing light exposure and temperature. However, even corn does not use the maximum light efficiency. The aim is to gain new scientific knowledge that can be used to improve photosynthetic efficiency in breeding
Cultures of the future	Crops of the Future is designed to promote crop breeding through an innovative public-private model. The aim is to select crops with special traits to better adapt to different environmental conditions. For example, improved nutritional quality or resistance to drought, heat, or floods
Projects in the field of attracting modern technologies and IoT to agriculture	

Monitoring of soil conditions	Soil condition is an important indicator that helps farmers decide on the best time to plant and harvest. With the help of monitoring IoT sensors, you can instantly receive signals about soil moisture or salinity. Other indicators include soil and air temperature: their correct assessment allows you to plan watering times and know when to expect pests
Weather monitoring	Weather monitoring in agriculture is one of the main applications of IoT. In crop production, yields are largely dependent on the environment, which is inherently unstable. Sensors for weather monitoring, located directly in the field, warn of changes in weather conditions such as temperature, precipitation, humidity, solar radiation, and wind speed
Greenhouse automation systems	The fragile and sensitive greenhouse ecosystem requires constant maintenance and monitoring. Intelligent greenhouse automation solutions such as Growlink, Farmapp, and GreenIQ help to maintain an optimal microclimate by controlling lighting, humidity, CO ₂ , and temperature
Plant monitoring systems	As crops grow and mature, a lot can go wrong: diseases, pest infestations, or unfavourable environmental conditions can cause irreparable damage before farmers even notice. The smart sensing technology used in crop monitoring collects data on the condition of crops (temperature, humidity, health indicators), which allows for timely action in case something goes wrong
Digital pest control	Finding out about pests and pinpointing their activity and location is usually impossible without frequent field visits. Smart agricultural monitoring systems solve these problems. Moreover, they help to determine the exact amount of chemicals to kill pests in each case
Livestock monitoring systems	By combining sophisticated hardware with modern software, IoT agri-tech solutions help protect livestock. For example, the use of special collars to track the health, location and activity of cows
Integrated farm management systems	Intelligent agricultural sensors can be installed throughout the farm, from greenhouses to pastures, as data collection points. The information received flows into a single management system, which must integrate with accounting and procurement databases to fully unlock its analytical potential

Source: Compiled by the author based on (Qadi et al., 2018; Arora et al., 2022; Ihnatenko, 2022; Li et al., 2022; Reyes, 2022; Sotnyk et al., 2022).

Financing of innovative projects in Kazakhstan's agriculture can be carried out using various financial technologies and instruments. Financial technologies (FinTech) can include various innovative approaches and instruments for financing innovative projects in Kazakhstan's agriculture. Table 2 shows several possible options for using financial technologies to finance innovative agricultural development.

Table 2

Options for Applying Financial Technologies to Finance Innovative Agricultural Development

Project	Specifics of its implementation
Agricultural loans	Agricultural enterprises can apply to banks and credit institutions for loans to develop innovative projects. There are specialised banks and credit institutions in Kazakhstan that provide loans for agriculture
Venture capital	Investors can invest in innovative agricultural projects through venture capital funds or private equity. This may include start-ups that develop new technologies for agriculture
FinTech platforms	Financial technologies (FinTech) can provide new ways of financing agriculture, such as crowdfunding, microcredit, and other online platforms. They allow raising funds from investors and micro-lenders

Government programmes and grants	The government of Kazakhstan can provide financial support to agriculture through various programmes and grants for innovative projects
International financial institutions	Kazakhstan can receive financial support for innovative agricultural projects through international organisations such as the World Bank, the European Bank for Reconstruction and Development, and others

Source: Compiled by the author based on (Afonasova et al., 2019; Aleksieienko et al., 2020; Dey et al., 2019; Fernández et al., 2019; Gobble, 2018; Korol, 2020).

To successfully finance innovative projects, it is important to carefully select the financial instrument that best suits your project's needs and have a clear business plan to attract investors or obtain loans. These technologies can be used individually or in combination to improve financial management and innovation in Kazakhstan's agriculture. It is important to choose the ones that best suit the specific needs of your project.

Discussion

The generalisation of approaches to the use of financial technologies to stimulate the introduction of innovative technologies in agriculture has proved that in today's conditions, it is advisable to introduce innovations in the agro-industrial complex with the help of modern financing technologies.

The analysis of statistical material on the state of development of agriculture in Kazakhstan proved the importance of this sector for the country's economy and stressed the importance of its further development.

The results obtained indicate that for the successful development of an agricultural enterprise, it is necessary to ensure stable sources of financing, which can only be achieved if

The analysis of financial technologies that can be introduced into the agricultural sector has shown that there is no single universal instrument for financing the development of agricultural producers, but rather a set of them and combine them with each other.

The results obtained regarding the feasibility of introducing innovative technologies in agricultural financing contradict the views of researchers (Denissova et al., 2021; Taishykov et al., 2023; Sousa et al., 2021), who consider the state as the main actor in financing the development of farmers. This conclusion is based on a comparison of the views of scientists on the research problem and the analytical findings of the study.

The results of the study showed that innovative agricultural development is possible with the constant introduction of innovative technologies and adaptation of the latest developments of scientists to the realities of agricultural producers' development, which was confirmed in the works of researchers (Hamed et al., 2020; Taishykov et al., 2023).

The article also establishes that the current state of innovation activity in the agro-industrial complex of Kazakhstan is characterised by instability and contradictions, lack of an effective mechanism for implementing innovations, which allows enterprises to ensure expanded reproduction. Low innovation attractiveness of the agricultural sector due to high risks and insufficient investment, as well as excessively high-interest rates on loans, deprive enterprises of the sector of the opportunity to search for innovations, their development, and implementation. These conclusions are also supported by the work of scientists (Taishykov et al., 2023) who have focused on attracting investment in agricultural production

Conclusions and Implications

Traditionally, agriculture has not been an interesting business for investors due to its long production cycle and high risks. The non-automated industry was heavily dependent on the vagaries of nature and the human factor. IT technologies in the agricultural sector were limited to personal computers and accounting software. However, the gradual development of digitalisation technologies significantly reduces risks and increases the attractiveness of the agricultural sector for investors. Agriculture is developing and synthesising a powerful data stream for digitisation and analysis. Combining data from all parts of the production chain allows us to generate information important for the development of the industry, find patterns, and make the right decisions based on them, which minimise risks.

In summary, it is worth noting that investment in agriculture in Kazakhstan may be subject to different trends depending on the economic, political, and technological context. Some possible trends that can be observed in the field of agricultural investment in Kazakhstan have been outlined in the study.

In general, the growing interest in agricultural innovation is typical of the global situation, and in Kazakhstan, these areas should be supported. Investors may be more likely to value innovative agricultural projects that use new technologies such as the Internet of Things, artificial intelligence, and data analytics. Increased attention to sustainable production and environmental issues could lead to more investment in environmentally friendly agriculture. In addition, the government could provide financial support and incentives for investment in agriculture to support the development of the sector. Kazakhstan's participation in international trade agreements could create new opportunities for investment in agriculture and increase foreign trade.

Suggestions for Future Research

To date, the share of Kazakhstani agricultural enterprises using digital technologies is insignificant. This has a negative impact on the development of the agricultural sector in the country and reduces the margins of agribusiness (Khatib et al., 2019). In order to stimulate the development of all branches of the agricultural sector, Kazakhstan needs to automate the monitoring of agricultural land and create a digital platform that unites administrative agencies at all levels to control the quality and safety of agricultural products. These measures will be a significant stimulus for the development of agricultural digitalisation.

Therefore, one of the areas for further research may be the assessment and analysis of potential opportunities and risks from the introduction of advanced digital technologies in the development of agriculture in Kazakhstan.

The risks associated with each of the levels of digitalisation of agriculture in Kazakhstan may also become a separate area of scientific research. In general, depending on the elements of precision agriculture used, three levels of digitalisation of the agricultural sector in Kazakhstan have been identified:

Basic. This is practically an ordinary farm with a traditional approach to management. The technology of a basic farm is limited to electronic field maps and soil analysis. The main risk for such farms is that they are unable to compete with innovative farms, where most processes are automated and subject to innovative trends;

Advanced. These are partially automated farms. To get into this category, it is already necessary to use sensors, indicators, GPS trackers, weather stations, an electronic weed map, and software products for managing business processes. Such producers are competitive, but they spend a lot of

money on implementing innovative technologies, so they need to constantly analyse the payback and financial feasibility of implementing such technologies; digital farms, which operate with the help of new tools and technologies, with little or no human intervention. For such producers, an ethical aspect is also added, as they need to lay off workers and lose jobs where manual labour was previously used.

References

- Afonasova MA, Panfilova EE, Galichkina MA, Lusarczyk B. (2019). Digitalization in economy and innovation: the effect on social and economic processes. *Polish J Manag Stud.* 19, 22-32. doi: 10.17512/pjms.2019.19.2.02
- Akter, M., & Sultana, N. (2020). Digital Marketing Communication and Consumer Buying Decision Process in Pandemic Standpoint (COVID-19): An Empirical Study of Bangladeshi Customers' in Branded Cosmetics Perspective. *Open Journal of Business and Management*, 8(06), 26-96. doi: 10.4236/ojbm.2020.86167
- Aleksieienko, I., Poltinina O., Leliuk S. 2020. Information and communication support of project management processes and enterprise value. *Development Management* 3(18): 1-13. https://www.hneu.edu.ua/wp-content/uploads/2022/02/1-13-DM_2020_03_Aleksieienko.pdf
- Al Qadi, S., Sodagar, B., & Elnokaly, A. (2018). Estimating the heating energy consumption of the residential buildings in Hebron, Palestine. *Journal of Cleaner Production*, 196, 1292-1305. <https://doi.org/10.1016/j.jclepro.2018.06.059>
- Arora, D., Waiters, B. A., & Goel, L. (2022). Accelerated Digital Transformation: A Framework for Leading Digital Innovation and Change. *Leadership Strategies for the Hybrid Workforce: Best Practices for Fostering Employee Safety and Significance*, 18, 119-131. doi: 10.4018/978-1-6684-3453-6.ch009
- Ashraf, M., Ahmad, J., Sharif, W., Raza, A. A., Shabbir, M. S., Abbas, M., & Thurasamy, R. (2020). The role of continuous trust in usage of online product recommendations. *Online Information Review*, 44(4), 745-766. <https://doi.org/10.1108/oir-05-2018-0156>
- Dey, B. L., Yen, D., & Samuel, L. (2019). Digital consumer culture and digital acculturation. *International Journal of Information Management*, July, 102-157. <https://doi.org/10.1016/j.ijinfomgt.2019.102057>
- Fernández, X. L., Paz-Saavedra, D., & Coto-Millán, P. (2020). The impact of Brexit on bank efficiency: Evidence from UK and Ireland. *Finance Research Letters*, Elsevier, 36(c). <https://doi.org/10.1016/j.frl.2019.101338>.
- Filipenko, A., Bazhenova, O., Korol, M., & Stehnei, M. (2020). Dynamics and structure of main indicators of the American banking system. *Financial and credit activity: problems of theory and practice*, 4 (35), 44-58. <https://doi.org/10.18371/fcaptp.v4i35.221762>.
- Ghulam, Y., & Doering, J. (2018). Spillover effects among financial institutions within Germany and the United Kingdom. *Research in International Business and Finance*, 44, 49-63. <https://doi.org/10.1016/j.ribaf.2017.03.004>.
- Gobble, M. M. (2018). Digital Strategy and Digital Transformation. *Research-Technology Management*, 61(5), 66-71. doi:10.1080/08956308.2018.1495969
- Hamed, T. A., & Peric, K. (2020). The role of renewable energy resources in alleviating energy poverty in Palestine. *Renewable Energy Focus*, 35, 97-107. <https://doi.org/10.1016/j.ref.2020.09.006>

- Hrynchyshyn, Y. (2021). The infrastructure of the Internet services market of the future: analysis of the problems of formation. *Futurity Economics&Law*, 1(2), 12-16. <https://doi.org/10.57125/FEL.2021.06.25.2>
- Ihnatenko, R. (2022). Technologies of targeted advertising: essence and effectiveness. *Financial and Credit Activity Problems of Theory and Practice*, 1(42), 428-435. <https://doi.org/10.55643/fcaptp.1.42.2022.3715>
- Khalidi, Y. M., & Sunikka-Blank, M. (2020). Governing renewable energy transition in conflict contexts: Investigating the institutional context in Palestine. *Energy Transitions*, 4(1), 69-90. <https://doi.org/10.1007/s41825-020-00024-z>
- Khatib, T., Bazyan, A., Assi, H., & Malhis, S. (2021). Palestine Energy Policy for Photo-voltaic Generation: Current Status and What Should Be Next? *Sustainability Energy Technologies and Assessments*, 13(5), 29-96. <https://doi.org/10.3390/su13052996>
- Korol, M. (2020). Dynamics of main indicators of the Canadian banking system. *Baltic Journal of Economic Studies*, 6 (3), 136-142. <https://doi.org/10.30525/2256-0742/2020-6-3-136-142>.
- Li, R., Xin, Y., Sotnyk, I., Kubatko, O., Almashaqbeh, I., Fedyna, S., & Prokopenko, O. (2022). Energy poverty and energy efficiency in emerging economies. *International Journal of Environment and Pollution*, 69(1-2), 1-21. <https://doi.org/10.1504/IJEP.2021.125188>
- Monetary policy strategy until 2030. (2023). Official website of the National Bank of Kazakhstan. <https://www.nationalbank.kz/ru/page/osnovnye-napravleniya-dkp> (accessed 20 January 2023)
- Nassar, Y. F., & Yassin Alsadi, S. (2019). Assessment of solar energy potential in Gaza Strip-Palestine. *Sustainable Energy Technologies and Assessments*, 31, 318-328. <https://doi.org/10.1016/j.seta.2018.12.010>
- Petrescu, M., and A.S. Krishen. (2021). Focusing on the quality and performance implications of marketing analytics. *Journal of Marketing Analytics*, 9 (3), 155-156. doi:10.1057/s41270-021-00129-4
- Ponomarenko, T., Prokopenko, O., Kuzmenko, H., Kaminska, T., & Luchyk, M. (2018). Banking security of Ukraine: current state and ways to improve. *Banks and Bank Systems*, 13(2), 77-88. [http://dx.doi.org/10.21511/bbs.13\(2\).2018.07](http://dx.doi.org/10.21511/bbs.13(2).2018.07)
- Reyes, J.A.L. (2022). Willingness to share information for energy efficiency: exploring differences and drivers across the Nordic countries. *Energ Sustain Soc*, 12, 38-56 <https://doi.org/10.1186/s13705-022-00363-3>
- Sotnyk, I., Kurbatova, T., Romaniuk, Y., Prokopenko, O., Gonchar, V., Sayenko, Y., Prause, G., & Sapiński, A. (2022). Determining the Optimal Directions of Investment in Regional Renewable Energy Development. *Energies*, 15(10), 3646. <https://doi.org/10.3390/en15103646>
- Statistics of agriculture, forestry, hunting and fishing. (2023). Bureau of National Statistics Agency for strategic planning and reforms of the Republic of Kazakhstan. <https://stat.gov.kz/ru/industries/business-statistics/stat-forrest-village-hunt-fish/> (accessed 20 January 2023)
- Denissova, N., & Born, R. (2021). Prospects of innovative development of agricultural production on the example of the Republic of Kazakhstan. *НАУКОВИЙ ВІСНИК*, 8(3), 38. <https://economics->

msu.com.ua/web/uploads/journals_pdf/Scientific%20Bulletin%20of%20MSU.%20Series%20Economics_2021_Vol.%208,%20No.%203.pdf#page=38

Taishykov, Z., Tolysbayev, B., Kuantkan, B., Koichubayev, A., & Baigabulova, K. (2023). Innovation management in agricultural production in Kazakhstan. CABI Reviews, (2023). <https://doi.org/10.1079/cabireviews.2023.0022>

Rui Dinis Sousa, Ainur Boranbayeva, Zaira Satpayeva and Amina Gassanova (2021). Management of successful technology transfer in agriculture: The case of Kazakhstan. Problems and Perspectives in Management, 19(3), 488-501. doi:10.21511/ppm.19(3).2021.40

Sousa, R. D., Boranbayeva, A., Satpayeva, Z., & Gassanova, A. (2021). Management of successful technology transfer in agriculture: The case of Kazakhstan. Problems and Perspectives in Management, 19(3), 488. doi:10.21511/ppm.19(3).2021.40