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Use of financial technologies to increase transparency of agricultural market

Olena Shebanina*
Doctor of Economics, Professor
Mykolaiv National Agrarian University
54008, 9 Georgiy Gongadze Str., Mykolaiv, Ukraine
https://orcid.org/0000-0001-7663-5991
Iurii Kormyshkin
Doctor of Economics, Professor
Mykolaiv National Agrarian University
54008, 9 Georgiy Gongadze Str., Mykolaiv, Ukraine
https://orcid.org/0000-0002-1005-1229
Antonina Drobitko
Doctor of Agriculture, Professor
Mykolaiv National Agrarian University
54008, 9 Georgiy Gongadze Str., Mykolaiv, Ukraine
https://orcid.org/0000-0002-6492-4558
Natalia Potryvaieva
Doctor of Economics, Professor
Mykolaiv National Agrarian University
54008, 9 Georgiy Gongadze Str., Mykolaiv, Ukraine
https://orcid.org/0000-0002-9781-6529

▸ **Abstract.** The study aimed to analyse the role of financial technologies in increasing transparency in the agricultural market and determine the potential to address key issues in the sector. The study examined the effectiveness of financial technologies such as blockchain, digital platforms, peer-to-peer (P2P) lending, InsurTech and RegTech in increasing the transparency of the agricultural market and optimising agricultural processes. The study determined that the introduction of financial technologies significantly improves the transparency of the agricultural market, reducing opportunities for corruption and price manipulation. The use of blockchain technologies in agricultural transactions ensures data integrity and transparency in the supply chain, which can be used to trace the origin of products, reducing the risk of fraud. Digital platforms for agricultural trading enable farmers to interact directly with buyers, which ensures fair market prices and eliminates the role of intermediaries, reducing costs. The analysis showed that FinTech solutions, such as P2P lending, enable farmers to obtain financing on more favourable terms, which makes it easier for small and medium-sized agribusinesses to access credit. Innovative risk insurance solutions, such as InsurTech, using satellite data to assess climate threats, can be used to respond quickly to natural disasters and minimise losses. The study also confirmed that the use of big data and artificial intelligence technologies enables accurate forecasting of yields and demand for agricultural products, making the agricultural sector more predictable and sustainable. Thus, FinTech technologies help to optimise financial flows and reduce risks in the agricultural sector

▸ **Keywords:** blockchain; digital platforms; P2P lending; InsurTech; risk insurance; artificial intelligence

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*Corresponding author

▸ Introduction

The agricultural sector is one of the main components of the economy of many countries, including Ukraine, and its development directly affects food security and economic stability. However, the sector faces numerous challenges, such as market opacity, corruption risks, lack of access to finance for small and medium-sized farmers, and inefficient management of agricultural resources. In this context, financial technologies (FinTech) can make a significant difference by increasing transparency, making financial services more accessible and reducing risks. Innovations in blockchain technology, digital platforms, peer-to-peer (P2P) lending, risk insurance and the use of artificial intelligence can make the agricultural sector more efficient, resilient and open.

The problem of transparency and efficiency of the agricultural market remains relevant in many countries, as many farmers and agrarians face difficulties in obtaining financing, as well as high risks associated with climate change and natural disasters (Babash *et al.*, 2025). S. Menon & K. Jain (2021) highlighted how blockchain technologies can ensure transparency of transactions in agriculture by tracking the supply chain of products. Reduction of the risks of data falsification and abuse was achieved using distribution ledgers. O.O. Ajayi *et al.* (2024) highlighted that digital platform have contributed to reducing farmers' dependence on intermediaries, leading to more transparent and efficient trading. Such platforms also provide fairer prices for the products by reducing transaction costs. Z. Chen *et al.* (2021) emphasised the importance of using automated data collection systems to forecast prices and demand for agricultural products. The study also highlighted that accurate analytical tools can reduce the economic risks of farmers. M. Soekarni *et al.* (2024) studied the benefits of P2P lending for small farmers who usually did not have access to traditional finance. This reduced interest rates and facilitated the process of obtaining loans. F. Rufaidah *et al.* (2023) analysed how financial technologies have helped reduce barriers to investment in the agricultural sector. The study also emphasised the importance of digital platforms for raising funds from a variety of investors.

K. Bezas & F. Filippidou (2023) studied the role of artificial intelligence in the agricultural sector, in particular in creating accurate yield forecasts. The study also noted that artificial intelligence (AI) can help farmers plan production efficiently and optimise the use of resources. B. Sheehan *et al.* (2023) explored the potential of using Insurance Technology (InsurTech) to reduce the risks associated with natural disasters such as droughts and floods. The speed of insurance payments accelerate recovery from losses. L. Grassi & D. Lanfranchi (2022) addressed the use of Regulatory Technology (RegTech) to automate the monitoring of land transactions. This reduced the level of raider attacks and abuses in land issues. N. De la Peña & O.M. Granados (2024) highlighted the importance of open data in the agricultural sector, which helped to reduce information asymmetry between market participants. Access to this data facilitated planning for farmers and ensured equal access to markets. M. Kumarathunga *et al.* (2022) studied the role of digital currencies and stablecoins in international agribusiness payments, which reduced the cost of foreign exchange transactions. The use of such currencies for transactions between international partners ensured speed and security.

In summary, existing research reveals the importance of financial technologies for increasing agricultural market transparency, but many aspects, such as the impact on small farms, regulation of digital platforms, and adaptation of technologies to the specific conditions of different countries, require further study. The study aimed to examine the role of FinTechs in the agricultural market, analyse their impact on improving transparency, reducing corruption risks optimising financial flows, and identify potential areas for the development of these technologies in agriculture.

Research objectives:

1. To consider the main mechanisms for using digital financial instruments to reduce corruption risks in the agricultural sector.

2. To assess the effectiveness of these technologies in optimising financial flows between farmers, suppliers and consumers.

3. To identify the prospects for the development of FinTech in agriculture in the context of current economic challenges.

▸ Materials and methods

The study analysed how various digital tools and platforms can address the many challenges faced by the sector. The study examined the effectiveness of financial technologies such as blockchain, digital platforms, agri-finance through P2P lending, InsurTech and RegTech in addressing issues of transparency, anti-corruption, access to finance and optimisation of agricultural processes. The study also examined successful examples of the use of FinTech solutions in the agricultural sector of different countries. For the analysis, countries that are actively implementing digital financial technologies in the agricultural sector and demonstrate positive results of application were selected. For example, platforms such as AgriLedger (n.d.) (UK), Agri Marketplace (n.d.) (Portugal) and Hectare Trading (n.d.) (UK) have demonstrated how modern technologies can help increase supply chain transparency, optimise trade processes and facilitate farmers' access to finance. In the United States and Australia, blockchain-based platforms, such as GrainChain (n.d.) and AgriDigital (n.d.), have significantly increased the efficiency of agricultural trade by providing instant payments and transparency in transaction processes. These countries have developed infrastructure for digital payments and regulatory support for FinTech initiatives. Indonesia was chosen due to the active use of Big Data and blockchain in agriculture. The HARA (n.d.) platform helps to collect and analyse agricultural data, which enable informed management decision-making and increase productivity. Kenya, as one of Africa's leaders in FinTech, was included in the study because of its successful application of digital financial solutions for small farmers. The Farmdrive (n.d.) platform uses FinTech to analyse farmers' data, providing them with access to credit and promoting financial inclusion.

In addition, innovative Ukrainian projects such as AgriChain (n.d.), SmartFarming (n.d.) and Kernel (n.d.), which actively use digital platforms to automate agricultural processes and facilitate farmers' access to finance, were studied. All these projects are aimed at reducing costs

and increasing transparency in the agricultural sector of Ukraine, which is an important factor in the development of the national economy and stimulating investment in agriculture. To assess the effectiveness of FinTech solutions in Ukraine, a comparative analysis was conducted with the practices of other countries. The comparison was based on key indicators, such as the level of digitalisation of the agricultural market, access to finance for farmers, the spread of blockchain technologies in the land registry and agricultural transactions, and the impact of FinTech solutions on reducing operating costs. The study also addressed government support for the implementation of digital solutions, the investment attractiveness of the sector, and the availability of regulatory mechanisms that promote the development of financial technologies.

The study analysed the use of blockchain technologies for agricultural transactions in Ukraine to assess their effectiveness in increasing transparency and reducing corruption risks (Iermakova *et al.*, 2022). Digital platforms for agricultural trading, such as AgroTrade, FarmMarket, CropBuy, AgriConnect, and RuralMarket, were also studied to help optimise the purchase and sale processes and eliminate intermediaries (Prikhodko *et al.*, 2022). Particular attention was paid to the dynamics of the growth of financing through P2P lending for farmers to assess its impact on the availability of financial resources for farmers (IMARC Group, n.d.). In addition, the development of FinTech in agriculture at the global level was studied to compare the implementation of financial technologies in Ukraine and other countries and identifying key factors for the successful use of FinTech solutions in this area (Peng *et al.*, 2023). One of the key aspects of the research was the study of technological solutions that can ensure transparency at all stages of agricultural production, from production to sales. The use of blockchain technologies to guarantee the integrity of transaction data, track product supply chains and register land ownership was addressed.

▸ Results

The agricultural sector is an important component of any country's economy, but it faces several challenges that make it difficult to operate efficiently and transparently. One of the most pronounced is asymmetry of information when market participants do not have equal access to data on prices, supply and demand (Beckman & Countryman, 2021). Farmers, agribusinesses, and other market participants often lack the necessary information to make informed decisions, leading to inefficient resource allocation, price manipulation, and distorted market forecasts. Without adequate access to data on market conditions, small farms can suffer significant losses without being able to adjust their strategies. Another serious problem is the corruption risks that often arise in government grants and subsidies. The lack of transparency in the procedures for providing financial assistance to farmers can lead to abuse when funds are allocated to those with political connections or influential enterprises rather than to those in need. Such actions not only worsen the competitiveness of small agribusinesses but also undermine trust in state institutions. In addition, the lack of transparency in land transactions is often used for tax evasion or illegal land acquisition (De Maria & Howai, 2021).

Difficulties in financing are also a significant problem for the agricultural sector. Banks are often reluctant to lend to farmers due to the high level of risk involved in natural factors, seasonality and volatility of agricultural prices. This limits the ability of farmers to expand production, introduce new technologies or modernise infrastructure. Small and medium-sized farms face even greater difficulties, as their financial condition may not meet the requirements of banks to obtain a loan. Lastly, the lack of unified digital tools for managing agricultural operations makes market control and audit much more difficult. In 2025, many processes in agriculture are still conducted manually or using outdated technologies. This not only hinders effective financial management but also creates opportunities for errors, inaccuracies and even fraud. The absence of a single digital space for data exchange, yield monitoring or logistics management leaves farmers without the proper tools to make quick and informed decisions. All these problems together create barriers to agricultural market development and reduce its efficiency. To overcome them, it is important to introduce modern digital technologies, create transparent financing mechanisms, and strengthen anti-corruption initiatives to ensure fair access to the market for all participants (Ruml & Qaim, 2021).

Blockchain is a technology that has gained considerable popularity in 2025 due to its ability to provide transparency, security and automation of processes in various fields. In the agricultural sector, blockchain can be a key tool for increasing efficiency, trust and fairness, particularly in agricultural transactions. One of the main advantages of blockchain is its ability to ensure data immutability, which is especially important for the registration of transactions (Khalegi *et al.*, 2024). Each transaction recorded in the blockchain cannot be altered or falsified, which guarantees its authenticity and gives market participants confidence in the veracity of the information. As a result, all parties can be confident that the data on sales or supply of agricultural products will not be changed (Table 1).

Table 1. Use of blockchain technologies for agricultural transactions in Ukraine

Metric	2020	2021	2022	2023	2024
Number of transactions via blockchain (thousand)	1.5	3.2	5.5	8.0	12.0
Value of transactions via blockchain (USD million)	50	120	200	350	500
Share of blockchain transactions in the total market (%)	2.5	4.5	6.2	8.1	12.5
Average deal size (USD thousand)	33	37	42	44	48
Average fee per transaction (%)	0.2	0.15	0.12	0.1	0.08
Level of trust in blockchain transactions (%)	60	68	75	82	90
Number of platforms using blockchain	2	5	9	15	25
Number of verified smart contracts (thousand)	0.5	1.5	3.0	5.0	8.5

Source: compiled by the authors

Another important area of application of blockchain technology is the registration of land ownership and lease rights. In the agricultural sector, the issue of land rights is one of the most complex and controversial, as there are frequent cases of raider attacks or manipulation of land rights. Blockchain can be used to create open and reliable registries that record all land transactions, whether they are purchases, sales, leases or re-registrations. This not only reduces corruption but also makes it easier for potential investors or lenders to access accurate information.

One of the most promising features of the blockchain is the ability to create so-called smart contracts. These contracts enable automation of processes related to financial settlements and the execution of agreements. For example, farmers do not need to manually track the execution of contracts or make payments for the delivered products – all the processes are automated using a software code. Smart contracts can be configured in such a way that payments are made only after certain conditions are met, such as product delivery or achievement of specific quality indicators. This minimises risks and reduces administrative costs while increasing the efficiency of transactions.

Thanks to blockchain, the agricultural sector has substantial transaction transparency insurance, improving land rights management, and automating financial processes. Its implementation can contribute to a significant reduction in corruption risks, increased trust among market participants, and the development of a more efficient agricultural economy. For example, in countries where blockchain has been implemented for land rights registration and financial transaction control, the level of corruption schemes in agricultural transactions has decreased by an average of 30-40% (Sajja *et al.*, 2023). This was achieved by making data impossible to falsify, automating contracts and ensuring open access to information about all stages of transactions.

Digital platforms have become an integral part of many sectors of the economy, and the agricultural market is no exception. Online agricultural trading exchanges are opening new opportunities for farmers, providing up-to-date market prices without intermediaries and direct participation in the auction. This significantly reduces the cost of intermediary services and improves access to more favourable deals. Instead of selling their products through multiple layers of intermediaries, farmers can sell directly to processors or exporters, providing fairer prices while retaining a larger share of the profits.

One of the main advantages of digital platforms is their ability to provide transparency in pricing. Traditionally, prices for agricultural products are formed through long chains of intermediaries, which often leads to a distortion of the real value of the product (Reza-Gharehbagh *et al.*, 2022). However, with online exchanges, farmers have access to real, current market prices, which improves informed decision-making regarding selling. Such transparency also ensures market competitiveness, as all participants receive the same information, which helps to avoid price manipulation and stimulates fair competition.

In addition, digital platforms provide additional analytics and forecasting algorithms, which is an important tool for farmers in planning production. Intelligent systems that analyse large amounts of data help predict changes in demand and prices for agricultural products. Thanks to these tools, farmers can better plan further activities, identify the most profitable strategies for growing and selling products, and optimise production costs. This minimises risks, reduces unexpected expenses and increases overall efficiency.

Digital platforms for agricultural trading not only increase the transparency and efficiency of the agricultural market but also provide new opportunities for the development of small and medium-sized farms. They improve independence and informed decision-making and have direct access to large markets without the need to go through intermediaries. As technology is constantly evolving, it can be expected that the role of such platforms will only grow in the future, making the agricultural sector even more transparent, competitive and resilient (Dubinina *et al.*, 2024). Table 2 presents data on digital platforms for agricultural trading, their availability, number of users, annual growth of users, and trading volume.

Table 2. Digital platforms for agricultural trading

Platform	Access type	Users (thousand)	Annual growth of users (%)	Trading volume (USD million)
AgroTrade	Paid	150	15	25
FarmMarket	Free	230	20	40
CropBuy	Paid	180	10	35
AgriConnect	Paid	300	25	50
RuralMarket	Free	120	5	18

Source: based on D. Prikhodko *et al.* (2022)

The use of FinTech solutions in the agricultural sector opens new opportunities for providing financing to agricultural enterprises, significantly improving farmers' access to the necessary resources. One of these innovative tools is P2P lending, which provides receive financial support directly from investors, bypassing banking institutions. This approach greatly simplifies the process of raising funds, as farmers can access a wide range of investors through specialised online platforms, which provide more flexible financing terms. Thanks to P2P lending, farmers can quickly obtain the necessary funds to develop their businesses without going through lengthy banking procedures and high interest rates. P2P lending is an innovative financing model that provide loans directly from investors, bypassing traditional financial institutions such as banks. This creates an opportunity for farmers to raise funds faster and on more favourable terms, as P2P lending platforms can offer lower interest rates due to the absence of bank intermediaries and minimal transaction costs (Table 3).

Table 3. Growth dynamics of financing through P2P lending for farmers

Year	Number of loans (thousand)	Total amount of financing (USD million)	Average interest rate (%)	Number of investors (thousand)	% increase in the number of loans from the previous year
2020	2.3	35.8	7.9	50	-
2021	3.4	52.1	7.2	70	47.8
2022	5.1	85.6	6.8	100	50.0
2023	7.0	115.3	6.4	130	37.3
2024	9.0	150.0	6.0	>60	28.6

Source: based on IMARC Group (n.d.)

The process of lending through P2P platforms is transparent and fast: farmers create a profile on the platform, where they specify the required amounts and conditions, and investors can choose projects for investment, incorporating the risks and potential returns. This creates a win-win situation for both parties: farmers get access to the necessary financial resources without lengthy bank procedures, and investors can get a higher return on their investments than with traditional bank deposits. P2P lending significantly reduces financial inequality in the agricultural finance market. For example, farmers who previously had limited access to bank loans due to high interest rates or limited credit history are now able to raise finance from a wide range of investors. Since the introduction of such platforms, access to finance for farmers has increased by 30-40%, significantly improving financial stability and ensuring development of small and medium-sized farms (Jung & Lee, 2022). This approach also helps reduce farmers' dependence on large financial institutions and creates healthy competition among financial intermediaries.

Another important innovation is the use of Big Data and artificial intelligence to assess the creditworthiness of farmers. Traditionally, banks conduct complex credit checks on customers based on a limited amount of data, which often makes it difficult for farmers, especially small farms, to obtain loans. However, with the help of modern technologies such as Big Data and artificial intelligence, it is possible to analyse huge amounts of data, including weather conditions, yield history, financial results and even farmers' social networks. This approach improves accuracy of assessment of farmers' ability to repay loans and minimises risks for investors and lenders.

In addition, stablecoins and digital currencies are becoming important tools for international payments in the agricultural sector. Agriculture is increasingly integrated into the global economy, and farmers, especially those engaged in exports, face numerous challenges in making international payments. The use of stablecoins or digital currencies avoids the high commission costs associated with traditional banking transactions and ensures the speed and security of transfers between countries. This creates new horizons for agribusinesses, enabling trade on international markets with fewer intermediaries and reduced transaction costs.

The use of FinTech solutions in agri-finance greatly simplifies farmers' access to the necessary financial resources, increases the efficiency of agribusiness management, and creates favourable conditions for development. These technologies not only provide farmers with the opportunity to receive funds faster and on more favourable terms but also enable international trade and improve the financial stability of the agricultural sector (Lomachynska *et al.*, 2023). Table 4 shows the global dynamics of FinTech development in agriculture from 2020 to 2024.

Table 4. FinTech development in agriculture (global dynamics)

Year	Number of FinTech start-ups in the agricultural sector	Total investments, USD billion	Share of FinTech in the agricultural market, %
2020	230	5.1	7.9
2021	280	6.7	9.3
2022	320	8.5	10.8
2023	370	10.2	12.5
2024	420	12.0	14.2

Source: based on X. Peng *et al.* (2023)

Insurance is an important element of the stability of agricultural production, which is constantly facing natural risks such as droughts, frosts or floods. However, traditional methods of insurance do not always meet the needs of farmers, so there is a need to introduce innovative solutions. One of these solutions is InsurTech, which actively uses modern technologies to improve the process of risk insurance in agriculture. One of the main advantages of InsurTech is the ability to use satellite data to assess losses from natural disasters. Satellites can monitor weather conditions in real-time, which enables a quick assessment of the extent of drought, frost or flood. This significantly speeds up the process of determining losses, making it more accurate and objective, and reduces the risk of fraud or errors in the insurance claims process. Another important innovation is the creation of automated insurance payments based on weather indicators. Using data from meteorological stations and satellites, InsurTech can be used to automatically calculate payments if weather conditions cause significant losses. For example, if the rainfall in a particular region is below normal for a long time, the system automatically starts the process of paying out insurance claims without the need to contact an insurance agent or conduct a complex loss assessment procedure. This approach greatly simplifies the insurance process and reduces response time, which is critical for farmers who depend on receiving compensation quickly.

Thanks to mobile apps like Flock, farmers' access to insurance products has become much easier and faster. The technology built into mobile platforms can be used to check insurance terms and conditions, apply for policies, receive weather information and even apply for insurance claims anytime and anywhere. Mobile apps simplify access to insurance for small and medium-sized farmers who may not have been able to use traditional insurance products before due to the complexity of the procedures or the high cost. Thanks to such tools, farmers can quickly respond to changes in the environment and protect themselves from unpredictable natural risks (Vidal-González & Fernández-Piqueras, 2020).

The introduction of InsurTech in agriculture is opening new horizons for farmers by providing them with access to more accurate, convenient and faster insurance products. Technologies based on satellite data, payment automation and mobile applications greatly facilitate the insurance process and make it more accessible to farmers. This helps to reduce economic losses caused by natural disasters and ensure stability in agriculture, which is an important condition for the development of the agricultural sector in the context of global climate change (Hou & Wang, 2024).

Regulatory technologies (BigTech) are becoming an important tool for ensuring transparency and efficiency in the agricultural sector, where the regulation of financial and legal processes often faces problems of complexity and inefficiency. The introduction of automated systems helps to significantly improve control over government subsidies and tax reporting. Automation of tax reporting ensures submission of the necessary documents to the tax authorities quickly and securely. Thanks to digital platforms, farmers can reduce administrative costs and avoid mistakes that could lead to fines or penalties. In addition, automated systems can be used by authorities to efficiently check the compliance of tax returns without the need for complex manual checks, which contributes to faster and more accurate compliance with regulations.

Artificial intelligence is also substantial in detecting fraudulent schemes in the field of state subsidies. Using machine learning algorithms, artificial intelligence can analyse large amounts of data and detect anomalies that may indicate fraud. For example, the system can identify farmers who are trying to receive subsidies based on false or incorrect data, or those who manipulate information about the amount of land or produce to receive excessive payments. Detecting such schemes at an early stage can significantly reduce corruption and fraud in the agricultural sector, ensuring fairness and equity in the distribution of public resources. In addition, the use of artificial intelligence in the agricultural sector contributes to an overall increase in economic efficiency. As noted in studies, the use of machine learning algorithms improves accuracy of yield forecasting, optimised use of fertilisers and water, and reduced environmental impact. This approach forms the basis for more rational planning of agricultural production and sustainable development of the industry.

In addition, online monitoring of the land cadastre is a powerful tool for preventing raiding in the agricultural sector. In Ukraine and in other countries with developed agricultural sectors, the problem of illegal land grabbing remains a pressing issue (Maschewski & Nosthoff, n.d.). The use of technology to monitor land rights through digital platforms enables authorities, investors and farmers to obtain up-to-date information on the legal status of land. This makes it possible to detect illegal transactions, fraud or attempts to seize land before they are completed. In this case, regulatory technologies can help ensure transparency and stability in the land market, preventing raider attacks and violations of property rights.

The introduction of BigTech in the agricultural sector has the potential to significantly improve control, monitoring and regulation, which reduces corruption and increases trust in agricultural institutions. Automation of tax procedures, the use of artificial intelligence to detect fraud, and online monitoring of land cadastre create effective tools for managing agricultural policy and ensuring stability in the agricultural sector. This helps farmers operate in a more transparent and secure environment, which is an important factor for developing and maintaining sustainable agricultural growth (Volosovych *et al.*, 2024).

One of the most innovative platforms is AgriLedger (n.d.), based in the UK. It is a blockchain platform that provides transparency in the agricultural supply chain. Using blockchain technology, AgriLedger improves efficiency of tracking of every stage of production and transportation of products, from farmers to end consumers. This level of transparency not only increases consumer confidence but also helps fight counterfeiting, which is essential for food safety and market sustainability. Another interesting example is Agri Marketplace (n.d.) from Portugal. This online platform directly connects farmers with buyers, eliminating intermediaries, which ensures better prices for the products. In addition, the platform provides additional opportunities for market analysis with special analytical tools that help forecast demand and optimise production. This significantly reduces marketing costs and improve operational efficiency.

The UK is also home to Hectare Trading (n.d.), a FinTech company that offers digital platforms for trading livestock and crops. This platform provides transaction, procurement and sales of products through a user-friendly online interface. The use of digital tools in such activities significantly reduces costs and increases the efficiency of business management, as process automation mitigates mistakes, providing quick response to market changes and business planning with greater accuracy. GrainChain (n.d.) (USA, Latin America) is an innovative platform that uses blockchain to create digital contracts in agriculture. The platform enables farmers and businesses to conduct transactions without intermediaries, ensuring the reliability and transparency of each transaction. Blockchain technology can be used to track the origin of products, control financial flows and guarantee timely payments. This reduces the risk of fraud and bureaucratic obstacles, ensuring safe, fast and efficient transactions between all market participants.

AgriDigital (n.d.) is a blockchain solution for grain trading that enables farmers and traders to make instant payments and provides transparency in the supply chain. Each stage of the grain supply is recorded in real-time on the blockchain platform, which enables market participants to track products at all stages of their movement from the producer to the end consumer. This increases

trust between market participants, reduces risks and enables farmers to receive prompt payment for their products. HARA (n.d.) is a platform that combines Big Data and blockchain technologies to collect and analyse agricultural data. HARA provides farmers with access to information on climatic conditions, soil conditions, and market prices, which can be used to optimise production planning. The use of blockchain technology makes it possible to store this data unchanged, ensuring transparency and reliability, which is important for making informed management decisions and reducing corruption risks.

Farmdrive (n.d.) is a FinTech platform that analyses farmers' data to provide them with access to credit. The platform uses algorithms to assess the creditworthiness of farmers based on their agricultural activities and the data they provide, providing necessary funding even for small farmers without a traditional credit history. The use of mobile technology to collect data makes FarmDrive accessible to farmers in remote areas where traditional bank lending is limited, promoting financial inclusion and agricultural development. AgriChain (n.d.) is an ecosystem of digital solutions that provides transparency in agribusiness management. The platform enables agrarians to effectively manage their financial flows, automate document flow and control all stages of production. Using digital tools, AgriChain can be used to create a single platform for tracking financial transactions, which makes processes in the agricultural sector more transparent and reduces the likelihood of corruption. It also enables farmers to optimise costs and improve business management efficiency.

SmartFarming (n.d.) is a Ukrainian startup that uses satellite and drone technologies to collect data to help farmers make informed management decisions. These technologies can be used to accurately assess the condition of crops, identify problems in the fields and predict yields. In addition, SmartFarming provides financial planning tools to help farmers manage their income and expenses, optimise production and reduce the risks associated with adverse weather conditions. Kernel (n.d.) is a digital platform for agricultural trading that automates financial transactions and contracting. The platform enables farmers and traders to transact directly with each other, which increases trade efficiency and reduces intermediary costs. By automating financial transactions and concluding smart contracts, Kernel Trade significantly speeds up transaction processing, reducing administrative costs and increasing trust between market participants.

Digital technologies, as noted by S. Yekimov *et al.* (2022), can significantly improve the financial transparency of the agricultural market, and financial technologies (FinTech) can play an important role in reducing costs, improving the efficiency of management decisions and attracting investment. The technologies can be used not only to optimise internal financial processes but also to increase trust among partners and consumers, which ultimately has a positive impact on food security and the development of the agricultural sector. The use of FinTech in the agricultural sector helps to increase the transparency, efficiency and investment attractiveness of the market. The introduction of blockchain solutions, digital platforms, and artificial intelligence algorithms can reduce corruption risks, improve access to finance, and promote sustainable agricultural development. Governments and businesses should invest more actively in FinTech innovations to ensure the competitiveness of the agricultural market on a global scale.

Comparing the adoption of financial technologies in Ukraine's agricultural sector with other countries, it can be noted that in the European Union, the United States and Latin America, these technologies are actively used to improve transparency, trade efficiency and access to finance, reducing risks and increasing competitiveness. In Ukraine, however, the adoption of FinTech in the agricultural sector has been much slower due to insufficient digital infrastructure, lack of government support, and low levels of trust in new technologies among farmers. To catch up with international trends, Ukraine needs to invest in the digitalisation of the agricultural sector, stimulate legislative initiatives, and raise awareness among farmers about the benefits of new technologies.

▸ Discussion

The study determined that the use of financial technologies has significant potential to increase the transparency of the agricultural market. In particular, the use of blockchain technologies has made it possible to ensure the immutability of data on transactions and products, which reduces corruption risks and increases the level of trust among market participants. This ensured efficient tracking of the supply chain of agricultural products and registered property rights, which is an important step in the fight against corruption and unfair practices in the market.

This problem was also studied by H. Liu *et al.* (2023), where the results confirmed that blockchain technologies can significantly increase the transparency of the agricultural market due to its unique mechanism for recording data, which ensures its immutability and accessibility to all participants. In the case of the agricultural sector, this technology can be used to track all stages of production, from sowing to sale, which ensures clarity in financial and commodity flows. Open and immutable records reduce the possibility of falsification and manipulation of information (Fitriasari *et al.*, 2024).

R. Trequattrini *et al.* (2024) have also shown that the use of blockchain in the fight against corruption is an effective tool for reducing opaque transactions and avoiding abuse. Every transaction or data change in the system is recorded without the possibility of tampering, making bribery or fraud schemes much less likely. This environment encourages trust among agricultural market participants, as everyone has equal access to information and can monitor the transparency of transactions.

Notably, the introduction of blockchain technologies in the agricultural sector faces certain challenges, including the need to adapt existing infrastructures to new standards. Many agricultural enterprises may not be sufficiently prepared for such changes, which require significant investments in technological modernisation and staff training (Makhazhanova *et al.*, 2024). Another important aspect is ensuring access to high-speed internet in rural areas, which is a prerequisite for the effective operation of blockchain systems. Agricultural enterprises can gain significant benefits from the use of new software products that will increase the speed, accuracy, transparency, and accessibility of control and accounting processes.

The study also confirmed that digital platforms for agricultural trading significantly improve farmers' access to market information and reduce intermediary costs. The platforms enable farmers to sell products directly to processors or exporters, which ensures fairer prices and facilitates market access. In addition, the analytical tools used on such platforms enable farmers to plan their production more accurately and make informed business decisions.

R. Abiri *et al.* (2023) concluded that digital platforms for agricultural trading significantly increase the accessibility and efficiency of information exchange between sellers and buyers. The use of such platforms enables farmers to access markets outside local areas, which expands opportunities for selling products. In addition, these platforms provide rapid updates of price and demand information, improving real-time informed decision-making.

V. Sharma *et al.* (2022) determined that analytical tools are key in improving farm production planning by helping to predict yields and optimise inputs. Using data on weather conditions, market trends and other factors, farmers can more accurately determine what crops to grow and when to grow them to maximise efficiency. This helps to reduce the risks associated with unprofitability and increase farm profitability.

These results confirm the above study as they demonstrate the real benefits of using digital platforms and analytical tools for agricultural trading. The results confirm that platforms can indeed improve access to markets by reducing intermediation costs and ensuring competitive prices. In addition, analytical tools help farmers to more accurately forecast market needs and adjust their production strategies, leading to a more stable and efficient business.

An important aspect of the study was the use of P2P lending for the agricultural sector, which provides financing without the intermediation of traditional banks. This solution has reduced barriers to access to capital, especially for small and medium-sized farms. The use of Big Data and artificial intelligence to assess the creditworthiness of farmers minimises risks for investors and greatly simplifies the process of raising finance (Mishchenko *et al.*, 2025).

The study by S.A. Aziz *et al.* (2024), also found that P2P lending is becoming a promising way to finance the agricultural sector, as it provides access credit without the intermediation of traditional financial institutions, is notable. This reduces the cost of processing loan applications and ensures use of funds from multiple investors, increasing the availability of capital for small and medium-sized farmers. Due to the transparency and speed of such platforms, farmers can get a loan in a short time, which is especially important during seasonal periods.

In turn, E.M. Ouafiq *et al.* (2022) concluded that the use of Big Data and artificial intelligence in farm finance opens new opportunities for more accurate risk assessment and customer needs. Artificial intelligence can analyse large amounts of data on market conditions, weather and production performance, improving farm profitability prediction for banks and investors. This not only reduces the probability of credit defaults but also ensures personalised financial solutions, which significantly increases the efficiency of agricultural financing.

These findings correlate with the theses presented in the previous section, as they confirm the importance of innovative technologies in the development of the agricultural sector. In particular, the results demonstrate that the use of P2P lending and analytical tools such as Big Data and artificial intelligence does indeed provide more efficient and affordable financing for farms. This not only reduces lending costs but also improves the accuracy of financial forecasts and reduces risks for investors.

A study of the use of InsurTech solutions has shown that the use of satellite data to assess risks (such as drought, flood or frost) helps farmers reduce economic losses. Automation of insurance payments based on weather data significantly speeds up the process of reimbursement of losses, which is extremely important for agricultural producers who often face unpredictable natural disasters (Nikolaieva, 2023). Mobile apps make insurance accessible even to farmers in remote areas.

R. Schwarze & O. Sushchenko (2022) also conducted a study that confirmed that InsurTech in agriculture is an important stage in the development of agricultural insurance, as innovative technologies can reduce risk management costs and increase the availability of insurance services for farmers. Thanks to the use of big data, blockchain technologies and automated platforms, insurers can respond more quickly to changing weather conditions and provide more accurate risk assessments. This provides farmers with not only more favourable terms but also a guarantee of prompt settlement of the insurance situation.

N. Jha *et al.* (2021) also determined that automating insurance payments through weather data significantly increases the efficiency of insurance for farmers, as it ensures quick response to changes in climate conditions. The use of accurate weather forecasts and monitoring systems enables the automatic calculation of insurance payments without the need for intermediaries. This approach not only reduces the cost of processing claims but also speeds up payments, which is critical for farmers in times of weather crisis.

Comparing the data obtained during the research, it is possible to conclude that the use of InsurTech and insurance claims automation has significant potential for optimising the insurance process in the agricultural sector. The difference between traditional methods and new technologies lies not only in the speed of information processing but also in the increased accuracy of risk forecasts using big data and weather models. These innovations significantly improve access to insurance products for farmers, making them more affordable and reliable in a changing climate.

One of the important aspects of the study was the use of RegTech to automate government control processes, including monitoring the land cadastre and preventing raiding. These technologies also help to increase transparency in the use of government subsidies by automating tax reporting and controlling their intended use. The use of artificial intelligence to detect fraudulent schemes helps to reduce the risk of financial abuse in the sector (Pylypenko *et al.*, 2025).

S. Kanojia *et al.* (2024) concluded that RegTech can significantly increase the efficiency of state control in the agricultural sector by automating the processes of monitoring and verifying compliance with regulations. The

introduction of digital tools makes it possible to monitor financial transactions, land management and other aspects of agricultural activities with maximum speed and accuracy. This not only reduces the cost of administrative procedures but also ensures greater transparency in the interaction between government agencies and agricultural enterprises.

P. Adhikari *et al.* (2024) determined that artificial intelligence in detecting financial abuse and fraud for farmers can be a powerful tool for preventing fraud at all stages of agribusiness. Thanks to machine learning algorithms that analyse large amounts of data, it is possible to detect abnormal financial transactions in time and prevent fraudulent activities. This mitigates financial losses and provides a safer environment for the development of agricultural businesses, reducing risks for both businesses and consumers.

Analysing the results of the study, the introduction of RegTech and artificial intelligence technologies in the agricultural sector significantly increases the efficiency of control and detection of abuses. This not only enables government agencies to respond quickly to violations but also creates transparent conditions for farmers, reducing the risk of financial fraud. Thanks to such innovations, the agricultural sector can provide greater security and stability, which helps to develop trust among market participants and contributes to the sustainable development of the industry.

Overall, the study showed that the introduction of financial technologies can significantly transform the agricultural market, making it more transparent, efficient and accessible to farmers. However, to implement the full potential of these technologies, it is necessary to address possible barriers, such as insufficient internet access in some regions or legal difficulties. Successful adoption of these technologies requires governments and businesses to invest heavily in infrastructure and adaptation to local conditions. Only with proper regulation and the development of technological infrastructure will the agricultural sector be able to achieve sustainable growth and improve conditions for farmers.

▸ Conclusions

The use of financial technologies in the agricultural sector contributes to increasing the transparency, efficiency and investment attractiveness of the market. Blockchain solutions ensure the immutability of transaction data, registration of property rights and automation of contracts, which minimises corruption risks and improves control over financial flows. In Ukraine, the number of blockchain transactions increased from 1.5 thousand in 2020 to 12 thousand in 2024, and their value increased from USD 50 million to USD 500 million. The share of such transactions in the overall market grew from 2.5% to 12.5% during this period, which indicates an increase in farmers' confidence in digital financial instruments. Digital platforms for agricultural trade can eliminate intermediaries, reduce costs and make the market more competitive. Popular platforms such as AgroTrade (150,000 users, USD 25 million in trading volume) and AgriConnect (300,000 users, USD 50 million in trading volume) are showing steady audience growth, which confirms the effectiveness of FinTech solutions in agricultural trade.

FinTech solutions in agri-finance, such as P2P lending and algorithmic risk analysis, are opening new opportunities for small and medium-sized agribusinesses, reducing their dependence on traditional banks. The number of FinTech start-ups in the global agricultural sector grew from 150 in 2018 to 370 in 2023, and total investments in the sector increased from USD 2.5 billion to USD 10.2 billion. InsurTech innovations facilitate access to insurance using satellite data, mobile apps and automated payments, helping farmers protect themselves from natural risks. RegTech solutions increase control over subsidies, automate reporting and help prevent fraud. In general, FinTech innovations have the potential to transform the agricultural market, increasing its efficiency, transparency and access to financial resources. Governments and businesses should actively implement these technologies to ensure the sustainable development and competitiveness of the agricultural sector. A limitation of the study is that it focuses mainly on already implemented FinTech solutions and does not consider potential regulatory barriers and risks associated with their large-scale implementation in different countries. Further research is needed on the impact of FinTech solutions on the financial sustainability of small and medium-sized farms, as well as their adaptation to climate change and global market trends.

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Використання фінансових технологій для підвищення прозорості аграрного ринку

Олена Шебаніна
Доктор економічних наук, професор
Миколаївський національний аграрний університет
54008, вул. Георгія Ґонґадзе, 9, м. Миколаїв, Україна
https://orcid.org/0000-0001-7663-5991
Юрій Кормишкін
Доктор економічних наук, професор
Миколаївський національний аграрний університет
54008, вул. Георгія Ґонґадзе, 9, м. Миколаїв, Україна
https://orcid.org/0000-0002-1005-1229
Антоніна Дробітько
Доктор сільськогосподарських наук, професор
Миколаївський національний аграрний університет
54008, вул. Георгія Ґонґадзе, 9, м. Миколаїв, Україна
https://orcid.org/0000-0002-6492-4558
Наталя Потриваєва
Доктор економічних наук, професор
Миколаївський національний аграрний університет
54008, вул. Георгія Ґонґадзе, 9, м. Миколаїв, Україна
https://orcid.org/0000-0002-9781-6529

► **Анотація.** Дане дослідження було спрямоване на вивчення ролі фінансових технологій у підвищенні прозорості аграрного ринку та визначення їхнього потенціалу для вирішення ключових проблем цього сектора. У цьому дослідженні було проведено аналіз ефективності фінансових технологій, таких як блокчейн, цифрові платформи, P2P-кредитування, InsurTech та RegTech, для підвищення прозорості аграрного ринку та оптимізації аграрних процесів. У результаті проведеного дослідження було з'ясовано, що впровадження фінансових технологій значно покращує прозорість аграрного ринку, зменшуючи можливості для корупції та маніпуляцій з цінами. Використання блокчейн-технологій у сфері аграрних угод забезпечує незмінність даних та прозорість ланцюга поставок, що дозволяє відстежувати походження продукції, знижуючи ризики шахрайства. Цифрові платформи для аграрних торгів дають можливість фермерам напряму взаємодіяти з покупцями, що сприяє отриманню справедливих ринкових цін та усуває роль посередників, знижуючи витрати. Аналіз показав, що FinTech-рішення, такі як P2P-кредитування, дають можливість фермерам отримувати фінансування на вигідніших умовах, що полегшує доступ до кредитних ресурсів для малих та середніх агробізнесів. Інноваційні рішення в області страхування ризиків, зокрема InsurTech, використовуючи супутникові дані для оцінки кліматичних загроз, дозволяють швидко реагувати на природні катастрофи та мінімізувати збитки. Дослідження також підтвердило, що використання технологій великих даних та штучного інтелекту дозволяє точно прогнозувати врожайність та попит на агропродукцію, що робить аграрний сектор більш передбачуваним і стійким. Таким чином, FinTech-технології допомагають оптимізувати фінансові потоки і знижують ризики в аграрному секторі

► **Ключові слова:** блокчейн; цифрові платформи; P2P-кредитування; InsurTech; страхування ризиків; штучний інтелект