DIGITALISATION OF THE DEVELOPMENT OF SUBJECTS OF REGIONAL AGRARIAN ECONOMY: EVIDENCE FROM UKRAINE

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Abstract
Under the conditions of contemporary economic transformations, the digitalisation of regional agrarian economic entities has emerged as a fundamental prerequisite for enhancing the efficiency, competitiveness, and sustainability of the agricultural sector. The purpose of the article is to study the role of digital technologies in the development of regional agrarian entities and to identify priority directions for their effective implementation. The study examines the main areas of digitalisation in the agrarian economy, paying particular attention to the impact of digital solutions on increasing productivity, optimising resource use, and improving managerial decision-making across diverse agribusiness categories. It is emphasised that digitalisation contributes to the integration of agrarian enterprises into regional markets, the development of value chains, and the strengthening of cooperation within territorial communities. At the same time, the article identifies key constraints to the digital transformation of the regional agrarian economy, experimentally evaluated through a sociological survey conducted across territorial communities in the Mykolaiv region, Ukraine. These limitations include insufficient infrastructure, limited investments, a shortage of qualified specialists, and critical digital divides among smallholders. The necessity of adapting digital tools, such as hardware automation and specialised software systems, to regional specialties and production scales is substantiated. The article concludes that a comprehensive and systematic approach to digitalisation, combining state support, human capital development, innovation activity, and public-private partnerships, is essential for ensuring the sustainable development of subjects of the regional agrarian economy.
Keywords: digitalisation, regional development, agrarian economy, agribusiness categories, hardware automation.

Introduction

In the context of the accelerating global digital transformation, the agricultural sector is undergoing a paradigm shift, increasingly integrating advanced digital technologies into core production and management frameworks. For the Mykolaiv region, which is traditionally one of the leaders in agricultural production, the issue of digitalisation has moved from the area of theoretical discussions to the area of practical survival. Given its geographical positioning within a high-risk farming zone, further exacerbated by critical security challenges, the region requires sophisticated, innovative approaches to resource management. Digitalisation of subjects of the regional agricultural economy provides not only the automation of individual processes, but also the creation of a holistic ecosystem, where data becomes the main asset for making management decisions. The use of information and communication technologies, automated production management systems, digital platforms, precision farming tools and analytical data processing systems allows to increase production efficiency, optimise the use of natural and financial resources, as well as improve the quality of management decisions in agriculture. At the same time, the digital transformation of the agricultural sector is accompanied by low challenges, in particular, an insufficient level of digital infrastructure, limited access to financial resources, a shortage of qualified specialists and an uneven level of digital literacy among the subjects of the agricultural economy.

The structural transformation of the agrarian sector is intrinsically linked to broader objectives of regional development. In high-risk environments, the systematic digitalisation of agricultural economic entities serves as a critical catalyst for the economic resilience of territorial communities by optimising resource allocation and streamlining supply chains. However, achieving systemic competitiveness requires transitioning from fragmented technology adoption to synchronised digital ecosystems.

Recent scholarship emphasises that agribusiness efficiency is determined by the analytical capacity of data frameworks rather than land bank scale. While global literature covers macro-level digital shifts, an acute research gap remains regarding how spatial and structural factors within localised clusters dictate the adoption velocity of hardware automation and farm management software (FMS). This study bridges this empirical divide, outlining pathways for enhanced regional competitiveness and corporate sustainability in Ukraine. Consequently, it is relevant to study the processes of digitalisation of the development of subjects of the regional agricultural economy and to determine the priority areas for the effective implementation of digital technologies in the activities of agricultural enterprises.

Key drivers and tools of digitalisation

Recent scientific studies indicate that the digitalisation of the agricultural sector is one of the key factors in increasing the efficiency of the regional economy and the competitiveness of agricultural enterprises.

Modern studies emphasize that digital agricultural technologies, in particular GPS navigation systems, sensor monitoring systems, unmanned aerial vehicles and farm management systems, can significantly increase production efficiency and contribute to a more rational use of resources. Such technologies allow for the use of precise application of fertilizers and plant protection products, which ensures increased yields and reduced negative impact on the environment.

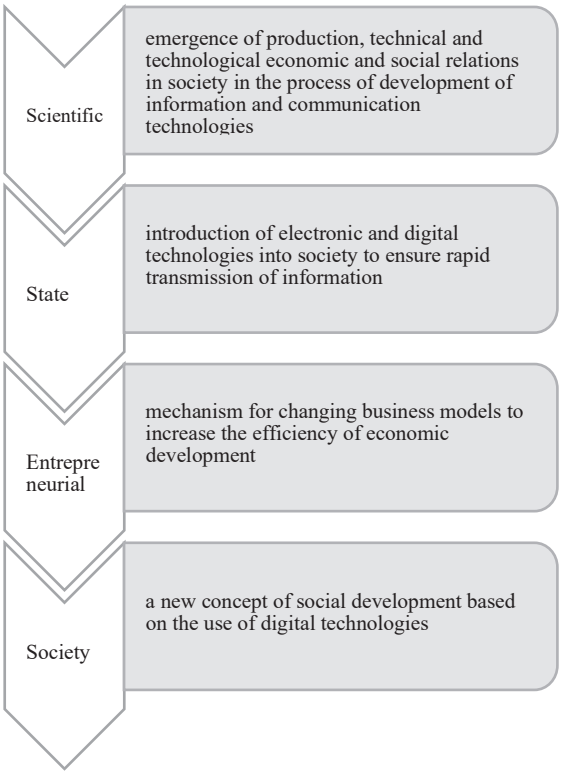
Researchers also emphasize the significant economic effect of the introduction of digital technologies in agriculture. Thus, the use of digital tools for

agricultural product management allows reducing production costs, improving product quality and increasing the level of economic efficiency of subjects of the regional agrarian economy.

Shabatura (2019) believes that digitalisation is a tool for obtaining the desired socio-economic effect, which becomes a platform for meeting the needs of society and surplus profits for owners of domestic businesses. The author emphasizes that business owners who seek to implement the principles of digitalisation in economic development should focus on automating production and management processes to increase the efficiency of functioning and taking into account that, depending on the scope of application, the concept of 'digitalisation' is noticeably modified, considers it necessary to differentiate it at four levels - the state, scientists, entrepreneurs, society (Figure 1).

Figure 1

Characteristics of the definition of 'digitalisation' from different perspectives



Source: Compiled by the authors based on Shabatura, 2019.

Ponomarenko & Mishchenko (2025) consider key innovations that allow agricultural production to adapt to climate change and the resource base – precision agriculture (GPS, drones, IoT sensors), artificial intelligence, biotechnology, vertical farms, robotics, questionnaires, digital twins, drones and automatic control systems; integrated application of modern tillage technologies (Full-till, Mini-till, Strip-till, Verti-till); use of GPS and precision agriculture to optimise crops, fertilizer application and plant protection; environmentally friendly technologies – erosion control, increasing humus content, reducing the use of chemical protection agents. Based on the conducted research of modern innovation-intensive technologies in the development of the agricultural sector, the authors note that this type of production allows to increase the yield by 15-30% compared to traditional systems, while simultaneously reducing energy and resource costs (Ponomarenko & Mishchenko, 2025).

Tytarchuk (2025) emphasizes that the implementation of online monitoring and telematics systems is a crucial factor in the competitiveness of agricultural enterprises, proposing a differentiated approach to their integration depending on the scale of the business entity. The author notes that one of the problems of the modern domestic agricultural sector is the extensive technical deterioration of equipment (average age over 15 years), and based on an analysis of the experience of the companies 'Kernel' and 'MHP' confirms the high economic return from predictive maintenance systems (payback 1.5-2.5 years) (Tytarchuk, 2025).

Sirenko et al. (2025) examine how digital technologies, including artificial intelligence, blockchain, and cloud systems, improve financial management in the agricultural sector of Ukraine during wartime. The authors discuss how digital tools increase transparency, speed, and security while reducing financial risks in crisis settings (Sirenko et al., 2025).

The study of digitalisation within regional agrarian entities is of paramount importance, as the implementation of digital technologies enhances production efficiency, optimises resource allocation, and strengthens regional competitiveness.

The purpose of the article is to study the role of digital technologies in the development of subjects of the regional agrarian economy and determine the priority areas of their effective implementation to increase the efficiency, competitiveness and sustainability of the agricultural sector.

The objectives of the study are:

1. To investigate the main directions and tools of digitalisation (information and communication technologies, digital platforms, precision agriculture) and their role in the integration, formation of value chains and cooperation of subjects of the regional agrarian economy.
2. To assess the impact of digital solutions on increasing productivity, optimising the use of natural and financial resources, reducing transaction costs and improving the quality of management decisions at the regional level.
3. To identify key obstacles to the digital transformation of the agricultural sector (infrastructure, financial, personnel) and to justify a comprehensive approach to overcoming them, taking into account regional specifics, the scale of production, the development of human capital and public-private partnership.

Materials and Methods

The information base of the research comprises materials of the European Commission, the Government Portal, statistical and analytical data of the Ministry of Economy, Environment and Agriculture of Ukraine, resources of the analytical platforms YouControl and YC.Market, publications of AgroPortal, as well as official web resources of agricultural enterprises located in the Mykolaiv region.

To achieve the research objectives, the methodological framework integrates a complex of general scientific and special economic methods. A systematic approach is used to evaluate the digitalisation of the agrarian economy as a multi-component system covering technological, economic, organisational, and social dimensions. The methods of analysis and synthesis are applied to generalise contemporary theoretical perspectives and define the fundamental components of digital transformation. A comparative analysis is employed to assess the current adoption velocity of digital technologies among regional agricultural enterprises based on their corporate data. The sociological method is operationalised via a questionnaire survey to determine digitalisation maturity, evaluate digital tool utilization, and identify primary implementation barriers. Statistical analysis is used to process quantitative findings from the field survey, verify sample reliability, and execute stratified calculations. Finally, graphical and tabular methods are utilised for the systematic visualisation of empirical results through thematic tables and figures.

To ensure empirical replication and rigorous scientific validation, the field research design conceptualises digitalisation through a synchronised matrix of spatial, structural, and operational parameters within the Mykolaiv region, Ukraine. To achieve structural granularity, data collection was systematically executed across 12 distinct territorial communities representing diversified geographic and logistical zones. The targeted sampling framework incorporates a multi-strata design to capture the entire operational hierarchy of the regional agrarian economy, distinguishing between micro-scale private farmers (FOPs), small and medium agrarian enterprises, and large export-oriented corporations.

Out of the region's total institutional landscape, which comprises 10,508 active agricultural entities (including 8,757 enterprises and 1,751 individual entrepreneurs), a specialised population pool of approximately 4,800 consistently reporting, commercially active agrarian entities was identified as the baseline for this study. From this target framework, a representative sample size of N = 482 valid respondents was selected (Table 1). Evaluated using standard stratified sampling, algorithms, this framework operates at a 95% confidence level with a 4.2%, margin of error, confirming the regional dataset's statistical reliability.

The survey instrument was organised into three thematic digital dimensions, focusing on general profile and structural metrics, hardware automation and precision field technologies, and specialised software systems alongside administrative cloud infrastructure.

Table 1

Empirical research matrix, sampling framework, and survey dimensions

Survey Cluster / Agricultural Scale	Main Target Respondents	Sample Size (n = 482)	Core Analytical Focus & Addressed Survey Themes
Micro-scale & Private Farmers (FOPs) *(Land bank: < 100 ha)*	Individual producers, family farm owners, rural entrepreneurs	n_1 = 312 *(Representative pool; approx. 10.3% of regional stratum)*	Focus: Baseline digital literacy, affordability barriers, and state digital platform integration. Themes: Mobile banking, state registry utility, and basic GPS indicators.
Small & Medium Agrarian Enterprises *(Land bank: 100 – 2,000 ha)*	Agricultural directors, chief agronomists, farm managers	n_2 = 130 *(Random sampling; approx. 10.1% of regional stratum)*	Focus: Cost-efficiency transitions, mechanical automation, and operational blockages. Themes: Parallel driving systems, fuel telemetry, and crop monitoring software.
Export-Oriented Entities *(Land bank: > 2,000 ha / Logistics)*	Agribusiness owners, corporate logistics executives, IT directors	n_3 = 40 *(Targeted census; approx. 8.9% of regional stratum)*	Focus: High-tier corporate competitiveness, AI integration, and international supply chain certification. Themes: Autonomous autopilot machinery, enterprise ERPs, and cloud FMS platforms.

Results and Discussion

Digitalising regional agrarian economic entities has shifted from an optional extra to a strategic necessity, opening key avenues for regional economic growth:

1. Institutional digitalisation and transparency of management (State Agrarian Register – SAR and eFishing)

SAR has become the only digital opportunity for access to state and donor support, which allows farmers to transparently receive assistance, identify land plots and apply for available programs. According to statistics, as of 2025, SAR united over 210 thousand registered users, and over 80% of public funds to support the domestic agricultural sector were distributed through the platform. The transfer of SAR to full state ownership creates the basis for its further

scaling and transformation into a basic digital channel for interaction between agricultural producers and the state. The main emphasis is on small agricultural producers, for whom access to support programs was previously difficult. Submitting an application through SAR takes a few minutes, which is paramount in a full-scale war, when small farmers need quick solutions and minimising bureaucratic barriers.

Therefore, the main goal of SAR is to digitalise the agricultural sector to ensure transparent distribution of state support and minimise the bureaucratic burden on farmers. As part of the systemic reform of the industry, the 'eFishing' system was introduced as a digital solution that minimizes corruption risks, increasing the economic efficiency of managing state resources on the ground and has already provided about UAH 170 million in additional revenues to the state budget.

2. Formation of a digital scientific and innovative environment (Agricultural Knowledge and Innovation System - AKIS)

Integration into the European space requires new approaches to information exchange. With the support of the EU, the Ministry of Economy, Environment and Agriculture of Ukraine is implementing the Agricultural Knowledge and Innovation System (AKIS) with a corresponding web portal integrated with the State Agrarian Register to provide farmers with convenient access to professional knowledge, advice and European standards. In the EU, AKIS serves as an end-to-end mechanism for achieving the strategic objectives of the Common Agricultural Policy (CAP).

For Ukraine, its development is aligned with the National Strategy for the Development of Agriculture and Rural Areas until 2030, which provides for priorities in terms of competitiveness, innovation, digitalisation and effective knowledge exchange (Cabinet of Ministers of Ukraine, 2024). At the regional level, AKIS is a practical mechanism for bridging the gap between science and practice by providing farmers and rural communities with access to knowledge and innovation needed to increase competitiveness and comply with European standards. The integration of professional knowledge and European requirements into digital platforms allows Ukrainian producers to adapt to the competitive conditions of the EU market and ensure the sustainable development of rural areas.

3. Digital technologies, digital monitoring and resource control

According to the Digital Agenda of Ukraine (2016), in the next 50 years, the level of development of the agricultural sector of Ukraine and its ability to compete in global markets will be determined by precision (3.0) and digital (4.0) agriculture, that is, in fact, by digital technologies. From a financial perspective, precision agriculture involves the use of modern technologies to maintain or increase yields and allows plants to receive the necessary amount of resources. Technologies help in making strategic decisions at the field level, as well as in operational actions at the processing stage, which makes it possible to optimise the costs of agricultural production without losing yield. In the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period up to 2030, namely, within the framework of strategic goal 6. 'Modernization of the agricultural sector: development of processing, innovation, digitalisation and knowledge exchange', among the tasks it is worth highlighting 'Task 3. Digitalisation', the implementation of which is provided for in the areas: digitalisation of agriculture and digital agricultural advisory services' (Cabinet of Ministers of Ukraine, 2024). The introduction of digital technologies opens up additional potential for growth, increasing the accuracy of operations, ensuring environmental sustainability and profitability of agricultural enterprises. An example of a digital economy in the agricultural sector is presented in Figure 2.

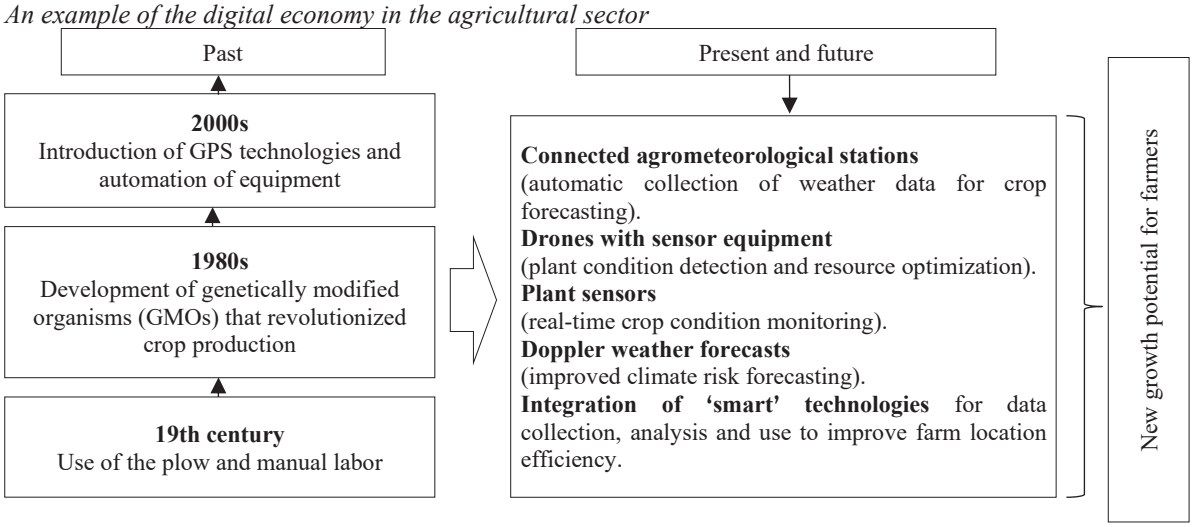
One example of the digitalisation of the agricultural sector in Ukraine is the DigitalAgriBusiness digital transformation project of agribusiness, which was launched in early 2016 at Kernel-Trade LLC.

The goal of the project was to ensure growth and efficiency through the digitalisation of agricultural production based on Big Data.

For the purpose of remote control of agricultural lands, the Cropwise Operations digital platform was developed, which includes operational monitoring of the state of sown areas, auto-documentation, forecasting and planning of agricultural operations. The system helps to increase the efficiency of agriculture and reduce the cost of agricultural operations through early identification of problem areas in the fields and rational use of resources.

The implementation of GPS navigation systems, drones for field monitoring, IoT sensors and data management platforms (AgriChain – a comprehensive system for agribusiness management, GeoPard – an unbiased cloud-based analytical platform for precision agriculture) allows for the optimisation of resource use, which allows for an increase in yield by 15-25% and a reduction in costs by 10-20%. Production digitalisation covers not only crop production (through precision agriculture systems, IoT sensors and platforms such as AgriChain or GeoPard), but also the sphere of natural resource protection. The implementation of the pilot project 'eInspector' is aimed at transforming fish protection activities through digital accountability. This allows for the optimisation of the use of bioresources, where automated control and monitoring become safeguards against abuse, which, together with agricultural technologies, ensures an increase in the productivity of the industry by 15-25 percent.

Figure 2
An example of the digital economy in the agricultural sector



4. Financial instruments and investment attractiveness

In modern conditions, the state is activating the formation of new financial mechanisms to support the agricultural sector, in particular through grant programs, cost compensation, specialised funds to support agricultural producers and war risk insurance systems. The war risk insurance mechanism for businesses is particularly important. It covers losses from hostilities - including property, equipment, and infrastructure damage - while providing partial state reimbursement for insurance premiums. The program is administered by the Export Credit Agency (ECA), and in 2026 the government expanded its capabilities by increasing the maximum amount of compensation for damaged or destroyed property from UAH 10 million to UAH 30 million and compensation for insurance premiums to UAH 3 million. At the same time, the digitalisation of financial and management processes plays an important role in increasing the investment attractiveness of the agricultural sector. The use of digital services, in particular the State Agrarian Register (SAR), electronic verification and automated management systems, contributes to reducing the administrative burden, increasing the transparency of financial flows and creating a more predictable investment environment for domestic and foreign investors. Transparency, ensured by the integration of financial instruments into digital services, together with the development of risk guarantee mechanisms through international financial institutions and partnership programs with the World Bank and European insurance agencies, creates the basis for the formation of a stable investment environment and stimulates the inflow of capital into regional agro-industrial projects.

5. Digital certification and simplification of access to international markets

Digital solutions that automate the collection and systematisation of data for international certification, in particular Global G.A.P., which is an essential condition for exporting products to the markets of the European Union, are becoming increasingly important for small and medium-sized agricultural producers. The use of digital platforms allows for electronic accounting of agro-technological operations, control of the use of fertilizers, plant protection products and water resources, as well as ensuring product traceability in accordance with international safety and quality standards. This significantly simplifies the audit process, reduces the administrative burden and reduces the time spent on preparing documentation for certification. At the same time, the digitalisation of certification processes contributes to increasing the export potential of agricultural enterprises, building the trust of international partners and integrating Ukrainian producers into global supply chains. The use of digital verification systems and electronic product identification in accordance with the requirements of Global G.A.P. allows agricultural producers to increase the competitiveness of their products and simplify access to European markets.

The agricultural sector of Mykolaiv region is characterized by a significant concentration of business entities and a high level of competition, which increases the need to implement modern digital and management solutions to ensure the efficiency of enterprises. As of 2026, there were 10,508 active agricultural entities in the region, of which 8,757 were enterprises and 1,751 were individual entrepreneurs. A significant role in shaping the competitive environment of the region is played by large agricultural companies, in particular, LLC SP 'NIBULON' (Mykolaiv city territorial community), LLC 'Euromet-Mykolaiv' (Mykolaiv city territorial community), LLC 'Agritek' (Mykolaiv city territorial community), STOV 'Promin' (Blagodatne rural territorial community), LLC 'PAEK-Pivden' (Shyrokove rural territorial community), PSP Agrofirma 'Rodnichok' (Shevchenkove rural territorial community), LLC 'Prodinvest Service' (Mykolaiv city territorial community), LLC 'PAEK-Agro' (Yelanets settlement territorial community), LLC 'Zolota Nyva' (Vesnyane rural territorial

community) and PE agrarian enterprise ʻBlagodatnenskyi ptahoprom' (Blagodatne rural territorial community), which form the basis of regional agribusiness and contribute to the introduction of modern technologies and digital solutions in the agriculture of the region. An analysis of leading enterprises in the Mykolaiv region - home to over 10,000 agribusiness entities - highlights how digital technologies are actively deployed to maintain efficiency under martial law (Table 2).

Table 2
Digital technologies and results of their implementation in the activities of agricultural enterprises of Mykolaiv region

Name of the enterprise and field of activity	Implemented digital technologies and solutions	Key technological and economic effects
LLC SP ʻNIBULON' *(Integrated management, logistics and export)*	New general IT architecture (strategy together with KPMG); ERP system for elevators (ʻdigital twin', investments 1 million USD); Modernization of ACS TP (sensors and automation, 2 million USD); Application for logistics 'Driver's cabin'; Digital HR systems.	Adaptation of business processes to work in war conditions; Payback of the ʻdigital twin' is less than 1 year, reduction of grain losses to 1%; Precise control of grain and resource quality; Elimination of truck queues at terminals (elimination of downtime); Acceleration of management decision-making.
LLC ʻPAEK-Pivden', LLC ʻPAEK-Agro' *(Agricultural production)*	Automated irrigation systems (IoT) with soil moisture control; remote control of equipment and AgriTech solutions for demining agricultural lands.	Optimisation of water resources use and automation of irrigation processes; possibility of safe return of mined lands to agricultural circulation; reduction of personnel risks and increase of safety of field work.
LLC ʻZolota Nyva' *(Agricultural production and precision farming)*	A comprehensive system of precision farming: digitisation of the land bank and accounting of fields; satellite monitoring (NDVI) and the use of agrodrones; GPS-control of equipment and autopilot systems; creation of task maps and differentiated fertilizer application; digital technological and financial planning systems.	Full digital control of the production cycle; reduction of resource costs (in particular, fuel and fertilizer by eliminating overlaps); increased yield; ensuring a transparent economy of each hectare; making management decisions based on data (Data-driven) with integration into the company's logistics.
STOV ʻPromin', PSP Agrofirma ʻRodnichok' *(Agricultural production)*	GPS-monitoring of equipment, satellite analysis of crops (Cropio/EOS), field mapping, differentiated fertilizer application.	Reduction of costs for fuel and lubricants (FMM), precise control of technological operations, increased yield.

In order to map the broader adoption context across the territory, the structural parameters of the surveyed enterprises-categorized by urban, settlement, and rural community zones-reveal key operational trends. While large companies are actively implementing ERP/FMS systems, IoT solutions, and automation of production processes, most small and medium-sized agribusiness entities use only individual digital tools. The use of digital technologies allows agricultural enterprises to receive timely information about the state of soils, crops, climatic conditions and market trends, which helps to increase productivity and reduce production risks. In addition, digitalisation contributes to the formation of new business models in agriculture, the development of innovative activities and the integration of agricultural enterprises into regional and global markets. Despite the active development of digital services, the transformation is accompanied by a number of obstacles, in particular, low digital readiness of some farmers, the high cost of technologies, destruction due to war and personnel shortages (Table 3).

The empirical data reveals a profound, structurally determined digital asymmetry across agribusiness categories. Large export-oriented entities and corporate holdings (such as LLC SP Nibulon, LLC PAEK-Agro, LLC Agrytek, and STOV Promin) display advanced, integrated deployments of field hardware and enterprise software, with investments in digital twins reaching up to $1.000,000.

Table 3
Challenges of digital transformation of the agricultural sector and strategic vectors for overcoming them

Sphere	Key challenges and regional gaps	Strategic vectors for overcoming
Infrastructure and digital readiness	Low digital readiness; deep regional disparity in access to technologies.	European integration and standardization: development of regional IT infrastructure.
Financing and investments	High cost of technologies; cyclicality of small farmers' incomes; large-scale destruction of logistics due to the war.	Stimulating innovation: financial support for small farms and cooperatives to create regional test hubs of AgTech solutions on their basis.
Human and socio-cultural potential	Insufficient level of digital literacy; weak traditions of cooperation in the triangle 'business - science - state'.	Human capital development: implementation of targeted educational programmes; advanced training for working with Big Data and intelligent systems.
Ecology and resources	Climate change; irrational use of water and land resources; high carbon footprint.	Eco-orientation: using digital solutions to develop a circular economy, minimize waste and increase climate resilience.

Empirical Results and Structural Analysis of Agribusiness Digitalisation

In the hardware segment, large-scale crop producers (> 2,000 ha) utilise high-precision autonomous autopilot steering systems (2 cm accuracy) paired with variable rate application (VRA) tools like GeoPard and John Deere Operations Center. Telemetry data synchronises via CAN-bus readers and fuel monitoring systems, closing the 'field-to-elevator' visibility chain. On the software side, these entities exhibit near-total penetration of automated warehouse management (reducing inventory buffers by 66%), electronic document management (60-80% paperless workflow), and AI-driven crop telemetry.

Conversely, medium and small agribusiness scales operate under constrained models. Medium-sized entities focus primarily on isolated cost-control hardware (GPS fleet trackers and fuel sensors) to protect thin margins, omitting advanced VRA or IoT networks. The micro-scale sector (FOPs) is largely decoupled from hardware innovations due to prohibitive capital expenditures, relying exclusively on basic digital tools like smartphone apps, state registries, or commercial trading platforms.

Scientific Discussion: Digital Transformation vs. Corporate Sustainability

These empirical findings correlate directly with contemporary scientific literature regarding the mechanisms of digital corporate efficiency. As established by global agrarian economic models, digital adoption directly enhances competitiveness by shifting management from retrospective reporting to real-time proactive mitigation. For instance, the deployment of continuous satellite crop monitoring (NDVI) integrated into specialised Farm Management Systems (FMS), as heavily observed in the Mykolaiv regional cluster, delivers an average resource savings of 15-20% in fertiliser and fuel utilisation.

However, our study highlights that the 'digital divide' poses a severe threat to balanced regional development. While high-tier agribusinesses use Big Data and cloud-based financial controllers to secure international trade agreements and maximize supply chain efficiency, smallholders face structural stagnation. This uneven distribution of digital literacy and technological access impedes the aggregate resilience of territorial communities. Without localized institutional intervention and targeted financial support for shared digital services, digitalisation risks accelerating land consolidation - marginalizing small-scale family farms that are vital to rural demographic stability.

Thus, effective digital transformation of the agricultural economy is impossible without a combination of four vectors: infrastructural European integration, financial support for innovations, training of specialists, and environmental responsibility. The implementation of these strategic directions will allow not only to level the consequences of the war, but also to overcome regional disparities, ensuring the transition to a sustainable model of agricultural production.

Conclusions

Under the conditions of a full-scale war and global economic transformations, digitalising regional agricultural entities in the Mykolaiv region has shifted from an optional technological advantage to a strategic imperative for survival, resilience, and competitiveness. The practice of leading regional enterprises, such as LLC SP 'NIBULON', LLC 'PAEK-Agro', and LLC 'Zolota Nyva', demonstrates that the integration of digital tools, precision farming platforms like Cropwise, and automated management systems delivers significant technological and economic effects. These solutions streamline logistics, reduce production costs, and serve as an essential guarantee for the economic viability of agribusiness under high-risk environments.

Based on the study conducted, the following main

conclusions can be drawn:

1. Digitalisation as a driver of integration and transparency. Digital tools, particularly the State Agrarian Register (SAR), facilitate the integration of different agribusiness layers into regional and national markets, streamline supply chains, and foster cooperation within territorial communities. The automation of administrative and certification workflows, including compliance with international standards like Global G.A.P., reduces transaction costs, lowers corruption risks, and significantly improves the quality of managerial decision-making at the regional level.
2. The structural digital divide and regional constraints. Despite the clear benefits of innovative technologies, a profound digital divide persists across the region's 10,508 active agricultural entities.
3. Strategic vectors for sustainable transformation. Overcoming regional technological disparities and ensuring balanced agrarian development requires a comprehensive, systematic approach based on public-private partnerships and state support, structured around four essential vectors:

Infrastructural European integration – expanding regional IT networks and standardising state digital channels;

Financial support for innovations – introducing risk insurance mechanisms and target funding to make technologies affordable for small-scale producers;

Human capital development – implementing specialised training programmes to improve digital literacy and data processing skills among rural entities;

Eco-orientation – utilizing precision farming tools and IoT monitoring to build circular, climate-resilient agricultural models.

Ultimately, synchronising these strategic directions will mitigate the consequences of wartime destruction and ensure the long-term, sustainable development of subjects within the regional agrarian economy of Ukraine.

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