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MAIN TRENDS OF THE DEVELOPMENT OF AGRICULTURE IN THE CONDITIONS OF DIGITALIZATION

In an era where digitization influences every facet of our lives, the agribusiness sector stands at no exception. Cutting-edge technologies are developed almost daily. Entire agro-information is gradually digitized and analyzed. By simultaneously analyzing a vast array of indicators – from current and historical weather data from nearby weather stations to GPS logger technology data – an integrated crop management system outpaces the productivity of top managers in the agricultural market. The development of digitization in management among Ukrainian agroholdings demands the application of foreign countries' experience oriented toward business optimization, effective IT solutions, and assurance of product and service quality. The latest ideas, initiatives, and programs need integration into the company's business strategy, enhancing its innovative appeal.

The primary directions for developing management systems in terms of digitization should include: expediting innovative initiatives, predictive monitoring of the market environment, assessing factors impacting a company's competitiveness, devising roadmaps based on industry priorities and customer experience. Simultaneously, fostering human potential, comprehensive synchronization of all activities, fostering a culture and competencies for information exchange, IT system modernization, employing analytics, and Big Data must occur.

To ensure the stable development of agroholdings and bolster the industry's economic and technological security, it's imperative to adopt cutting-edge technologies. Utilizing innovations and technological advancements in the agricultural sector will boost operational efficiency. Through intensive technologies in domestic agricultural production, an increase in gross production, improved product quality, reduced resource costs can be achieved, ultimately enhancing production efficiency and profitability in agricultural production.

***Keywords*:** digitization; cutting-edge technologies; management; security; agricultural sector.

Formulation of the problem. Presently, Ukraine's agricultural management system requires substantial restructuring. There's a growing trend among agricultural producers to employ computers for data collection, enhancing the decision-making process in management to boost productivity within the sector.

The digitization of agriculture has emerged as a crucial component within large-scale rural digital transformation initiatives, integrating these areas into digital frameworks. Its primary objective is to bridge the digital gap and foster socio-economic rejuvenation in rural regions.

The agro-food sector significantly contributes to employment and livelihoods. Digitization is poised to revolutionize every aspect of the agro-food chain. Employing optimization principles, personalized approaches, and predictability will enable efficient resource management within the system.

Digital agriculture is set to establish high-productivity systems capable of adaptation and predictability, crucial in navigating changes, including those stemming from climate variations. Consequently, this can elevate food security, profitability, and sustainability at both national and regional enterprise levels.

Review of recent research and publications: Numerous scholars, including Dominique Mazzone, Charles-Edouard Buet, Stephan Scheible, Scott Brennen, Daniel Kreis, Thomas Ochs, Ute Riemann, Karl Dahlmann, and Donald Bowersox, have delved into various facets of digitalization. N. M. Horobets's work meticulously delineates the evolution stages of this concept.

The significance of digitalization in the Fourth Industrial Revolution is highlighted in the works of Hausemeier Y., Kagerman H., Lapin A., and Schwab K. Several researchers – E. Malyshka, L. Ligonenko, M. Lobas, O. Pyshchulina, V. Rossokha, A. Slobodianyk, and D. Sokolov – have expounded upon digitalization's implementation in management processes.

This article aims to scrutinize and synthesize global experiences in deploying cutting-edge technologies within the agricultural sector, stressing the imperative for local agricultural entities to embrace modern technologies and systems for more effective management. The study utilizes various scientific methods like analysis, synthesis, deduction, induction, comparison, and generalization. Additionally, a systematic approach establishes interconnections between phenomena and processes, while the monograph method is employed to scrutinize literary sources.

Presenting main material. In today's market landscape, the process of digitization stands as a pivotal element for the advancement of both businesses and society overall. The shifts in the external environment, such as technological advancements, amplified information flows, and evolving consumer needs, drive the global proliferation of digitization.

Digitization encompasses the adoption and integration of digital technologies to streamline and automate business operations, enhance consumer interactions, and elevate overall economic efficiency. The «Industry Development Strategy 4.0» formulated by the Association of Industrialists and Entrepreneurs of Ukraine defines digital transformation as encompassing social and technological shifts linked to the integration of digital technologies across all facets of human interaction.

The primary objective behind such transformations is to devise fresh management paradigms to tackle conventional business challenges. Ukraine hasn't reached the same level of digital economy development as more advanced Western nations. Nevertheless, even in these developed nations, companies confront significant hurdles in implementing digital transformation.

According to the Riverbed Technology company's global study, 95% of respondents across nine countries expressed their unpreparedness to implement a digital strategy in their companies at present. Studies highlight that in the agricultural sector, high-tech adoption stands at a modest level, roughly around 10–12%, significantly lower than leading countries like Australia, the USA, Israel, the Netherlands, and Canada.

These countries extensively employ information technologies in agriculture. For instance, about 80% of farmers in the US utilize information technology in their practices. Japan and South Korea utilize microclimate management and remote monitoring systems in greenhouses, enabling farmers to control parameters from afar. In Germany, leveraging information technologies resulted in a 30% yield increase, accompanied by a 30% reduction in fertilizer expenses and a 50% decrease in inhibitor costs.

Assessing the digitalization potential of the Ukrainian economy and particularly the agricultural sector reveals several issues:

Inadequate education within Ukrainian society regarding the benefits and implications of digitization.

Limited involvement of agrarian business, the banking sector, and the public sector in information technologies (ICT).

Unjustified disparities in digital technology usage among key Ukrainian stakeholders.

Digitization significantly contributes to enhancing agricultural management efficiency across various levels: state, regional, sectoral, local, and enterprise levels. At the state level, supported by economic and mathematical models, digitization aids in successfully fulfilling the tasks outlined in the Regulations on the Ministry of Agrarian Policy and Food of Ukraine, approved by Resolution No. 124 of the Cabinet of Ministers of Ukraine on February 17, 2021.

The digitization process begins with the following steps: digitization of information data; processing unstructured large volumes of data, which are known as Big Data; grouping and organizing large volumes of data. The process ends with digital transformation [4].

Digitization of agribusiness includes the following technological aspects:

1. The Internet of Things (IoT) is a network of physical objects equipped with built-in means of communication and perception. An example of the use of this technology is the Internet of Food&Farm 2020 project, which implements IoT in food and agriculture, covering such sectors as crop production, dairy products, fruits, vegetables, and meat (according to Ligonenko, 2021), [5].

2. Robotics is the automation of a system or process using robotic devices. Examples are automated greenhouse management systems that monitor climate conditions and perform robotic harvesting. Other projects include PANTHEON Precision Agriculture, Robotics for Micro Farms (ROMI) and projects based on cyber-physical systems such as DESIRA.

3. Artificial intelligence technologies associated with the use of systems based on fuzzy logic (according to Polianchykov, 2021), [6].

4. Big Data technologies are technologies that make it possible to increase the effectiveness of analytical solutions by exchanging large and complex data for traditional processing (Rudenko, 2019), [7].

5. Technologies of satellite monitoring of agriculture. An example is the CROPIO program, which includes modules for monitoring the condition of crops, work planning and monitoring (Slobodianyk, 2020), [8].

6. Fifth generation communication (5G), which allows to significantly speed up data transfer and remote control of agricultural machinery, industrial robots and unmanned vehicles (Pyschulina, 2020), [9].

For the development of international technical cooperation, it is necessary to develop and implement international standards, which will

ensure the effective administration of management decisions made at enterprises of various forms of ownership. The integration of digitization and new methods of cooperation between enterprises, institutions and the government is a radically new approach to solving management problems. This approach is implemented in Germany (Plattform Industrie 4.0), Sweden (Plattform Industrie 4.0), the Netherlands (Smart Industry), France (Nouvelle France Industrielle), the Czech Republic (Průmysl 4.0) and a number of other developed countries.

A key aspect of digitization in the management of the agrarian sphere is the creation and development of a single information space for the engineering and technical support of the agro-industrial complex. In order to integrate data into a single information space, standardization of the form of their submission is necessary, and this is one of the main tasks of digitization.

During the development and implementation of measures to increase export potential in agro-industrial production, restoration of traditional and development of new markets for the sale of agricultural products, it makes sense to use methods of computer simulation modeling of real economic processes. This makes it possible to assess the effectiveness of various activities in this field. The use of simulation modeling ensures high accuracy of the display of real business processes in the created models, a high level of detail in the description of complex systems.

Taking into account all of the above, it is advisable to pay attention to the following tasks regarding digitalization in the field of agricultural management:

1. Digital transformation of indicators used in management decision-making.
2. Implementation of methods of working with large volumes of data (Big Data).
3. Wide use of economic and mathematical models to substantiate scientific management decisions.
4. Creation of software products that allow working with large volumes of data in combination with the use of economic and mathematical models and have an intuitive interface.
5. Training and retraining of management personnel to work with these software products.
6. Increasing the level of awareness of various layers of society regarding the benefits of digitalization by popularizing information and communication technologies (ICT) at the national level through holding conferences, symposia, and workshops with the participation of Ukrainian and foreign experts.

7. Consideration of the possibility of expanding the available targeted grants for the development of ICT due to the cooperation of the state with commercial banks and non-bank financial institutions to support ICT.

8. Facilitating the cooperation of representatives of business, the public sector, banks and education to achieve a balanced level of digitization among the leading stakeholders in the Ukrainian markets.

Conclusions and prospects for further research. Therefore, digitalization in the field of management of the agrarian industry involves the combination of digital data processing with the use of economic and mathematical models to support the process of management decision-making. These models include trend and factor forecasting, complex integral evaluation, multi-criteria optimization, management decision support under conditions of risk and uncertainty, as well as simulation modeling.

Digitalization opens up new opportunities for the use of economic and mathematical models combined into a single system, which will significantly increase the efficiency, objectivity and scientific validity of management decisions. The development and research of digital equivalents of real management decisions will allow real-time assessment of the consequences of these decisions, the risks associated with them, and the selection of the best option for management actions.

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ОСНОВНІ ТРЕНДИ РОЗВИТКУ СІЛЬСЬКОГО ГОСПОДАРСТВА В УМОВАХ ДІДЖИТАЛІЗАЦІЇ

У час, коли цифровізація впливає на всі сфери нашого життя, агробізнес не став винятком. Новітні технології розробляються практично щодня. Вся агроінформація поступово оцифровується та аналізується. Завдяки одночасному аналізу великої кількості показників – від поточних та історичних даних про температуру повітря та кількість опадів з найближчих метеостанцій до даних про поточні результати технології GPS logger, інтегрована система управління культурами випереджає продуктивність. топ-менеджерів аграрного ринку. Розвиток цифровізації управління серед українських агрохолдингів потребує застосування досвіду зарубіжних країн, орієнтованих на оптимізацію бізнесу, ефективні

IT-рішення, гарантію якості товарів і послуг. Останні ідеї, ініціативи та програми мають бути інтегровані в бізнес-стратегію компанії та підвищувати інноваційну привабливість бізнесу.

Основними напрямами розвитку систем управління в частині цифровізації управління мають стати: сприяння прискоренню інноваційних ініціатив, прогнозний моніторинг ринкового середовища, оцінка факторів, що впливають на конкурентоспроможність компанії, розробка дорожніх карт на основі пріоритетів галузі та клієнтського досвіду. При цьому має відбуватися формування кадрового потенціалу, комплексна синхронізація всіх видів діяльності, розвиток культури та компетенцій обміну інформацією, модернізація IT-систем, застосування аналітики та Big Data.

Для забезпечення стабільного розвитку агрохолдингу, зміцнення економічної та технологічної безпеки галузі необхідно впроваджувати новітні передові технології. Використання інновацій та технологічних розробок в аграрному секторі дозволить підвищити ефективність його діяльності. Завдяки інтенсивним технологіям вітчизняного сільськогосподарського виробництва можна досягти збільшення виробництва валової продукції, покращити її якість, знизити витрати ресурсів, що, у свою чергу, сприятиме підвищенню ефективності та рентабельності виробництва. сільськогосподарське виробництво.

Ключові слова: діджиталізація; новітні технології; управління; безпека; аграрна сфера.

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