SUSTAINABLE DEVELOPMENT OF THE AGRICULTURAL INDUSTRYIN THE ERA OF DIGITAL TRANSFORMATION: CHALLENGES AND OPPORTUNITIES FOR MANAGEMENT

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The strategic vision of sustainable development of Ukraine envisages a gradual movement towards the harmonious coexistence of economy, ecology and society. This path is divided into three key stages:

- First stage: Overcoming the crisis and stabilization. At this stage, the primary task is to overcome the ecological and economic crisis, which means overcoming negative trends in the economy and ecology. An important aspect is macroeconomic stabilization, which involves creating conditions for sustainable economic growth. At this stage, it is necessary to create the prerequisites for improving the standard of living of the population, ensuring access to basic needs and services. It is also important to balance production and consumption, reducing the negative impact on the environment. In fact, this is a transitional stage that lays the foundation for further development.
- Second stage: Structural changes and quality of life. At this stage, it is necessary to solve the task of structural restructuring of the economy, in particular, through the development of new industries and technologies, including digital ones. An important aspect at this stage is the solution of the fuel and energy problem, which involves the transition to cleaner and more efficient energy sources - it is necessary to ensure the democratization of society, guaranteeing the rights and freedoms of citizens. At the same time, it is important to ensure a high quality of life, which includes access to quality education, healthcare and social services, and it is also necessary to ensure the balanced use of natural resource potential, preserving biodiversity and ecosystems.
- Third stage: Sustainable development and the noosphere. At this stage, it is necessary to ensure sustainable development based on new sectors of the economy based on knowledge and innovation. A particularly urgent task is the creation of environmentally friendly industries that minimize the negative impact on the environment. It is necessary to create a global system of environmental safety that will ensure environmental protection at the international level. This stage lays the foundation for noosphere development, which involves the harmonious interaction of man and nature.

An analysis of the current economic situation in Ukraine, especially in agriculture, shows that the country is at the first stage of this path.

Today, in Ukraine, the need to form a digital economy and society is recognized at the state level, since digital technologies are considered one of the key drivers of sustainable development of all spheres of production activity. The development of the digital economy actualizes many issues of state policy, which must not only be clearly posed, but also systematically resolved. One of such issues is understanding the consequences of the transition to a digital format for the sustainable development of the agricultural sector and agricultural production. The phenomenon of spatial differences, which is among the priorities for solving acute problems of uneven development of agricultural production, deserves increasing attention.

The digital economy is an evolutionary stage of development where real-time data exchange replaces traditional methods of interaction, covering all sectors of the economy. This contributes to economic growth, improved quality of services and unlimited scalability of business models through the use of the latest technologies.

The analysis of scientific literature shows a variety of approaches to defining digital transformation, but in general it can be characterized as a process of changing the model of functioning of the system, its components and relationships through the active use of information and

communication technologies. The digital transformation of economic systems, in particular in agriculture, is closely related to the use of the potential of information and communication changes for their own modernization. This process was not instantaneous, but developed gradually, accumulating the potential for the widespread use of digital technologies.The digital transformation of the agro-industrial complex (AIC) is a key factor in ensuring its sustainable development. It opens up new opportunities for increasing production efficiency, reducing negative environmental impacts, and ensuring food security. At the same time, digitalization also creates new challenges that require effective management.

Digitalization covers all sectors of the economy, including agribusiness, through the introduction of digital technologies. This leads to radical changes in the organization of work of agricultural enterprises, opening up opportunities for faster, more efficient and better achievement of economic and social goals. In general, the development of digital infrastructure is aimed at ensuring equal access to digital technologies for all citizens of Ukraine, regardless of their place of residence, without technical, organizational or financial obstacles, in order to avoid "digital inequality".

Digital modernization of the agricultural sector opens up opportunities for increasing the predictability, productivity, and flexibility of agricultural production, which contributes to strengthening food security, stability, and profitability of agribusiness. However, for the successful implementation of digital technologies, it is necessary to create favorable conditions for stimulating innovation in agriculture, and the state must ensure a systematic approach to digitalization, including improving legislation and legalizing the concepts of "digital transformation of agrarian relations" and "digital agriculture", which is a necessary condition for the successful implementation of digital technologies.

The challenges of the digital transformation of the agricultural industry are primarily technological, when there isHigh cost of digital transformation: Small and medium-sized enterprises (SMEs) may face financial difficulties in purchasing and implementing modern equipment and software. The high cost of digital transformation is one of the key challenges faced by small and medium-sized enterprises (SMEs) in the agro-industrial complex (AIC). This is because the modern equipment and software required for digital transformation are often quite expensive.

Factors influencing the high cost are:

- cost of equipment: modern tractors, combines, drones, sensors and other devices necessary for precision agriculture and other digital technologies have a high cost;
- software cost: software for farm management, data analysis, crop forecasting, and other tasks can also be expensive, especially for small businesses;
- Implementation and training costs: in addition to purchasing equipment and software, businesses also need to consider the costs of their implementation, staff training, and technical support.

The consequences of high costs for SMEs include negative aspects, such as: limited access to technology, where many SMEs cannot afford to purchase and implement modern digital technologies, which puts them at a disadvantage compared to large agri-holdings; slow digital transformation, where high costs can slow down the process of digital transformation of the agri-industrial complex as a whole, since SMEs are an important part of this sector; reduced competitiveness: SMEs that do not have access to modern technologies may lose their competitiveness in the market.

Solutions are being developed on an ongoing basis through government support: governments can provide financial support to SMEs to purchase and implement digital technologies, for example in the form of grants, subsidies or soft loans; leasing and rental: SMEs can consider leasing or renting equipment and software, which will reduce initial costs; resource sharing: several SMEs can join forces to share digital technologies, which will reduce the costs for each participant; development of affordable technologies: the development and promotion of more affordable digital technologies, specifically designed for the needs of SMEs, can help to solve the problem of high cost.

Addressing the high cost of digital technologies for SMEs is an important task that requires a comprehensive approach and cooperation between the state, business, and scientific organizations.

Cities may experience an insufficient level of digital literacy - agricultural workers need training and retraining to work with new technologies.

Digital literacy is a pressing issue today because it requireseffective use of technology, data analysis and interpretation, and adaptation to change.

Agriculture is undergoing a transformation thanks to the introduction of digital technologies. Smart agriculture, based on the Internet of Things (IoT), allows farmers to collect data on climate, biological processes and ecology, which helps to make informed decisions and optimize all aspects of production.

Digital agriculture, also known as precision agriculture, combines data communication with geospatial and satellite technologies to effectively manage resources. According to the Dalberg/CTA report, digital solutions contribute to the development of smallholder farming and the achievement of sustainable food development goals.

Modern technologies in agriculture, such as precision farming, drones, sensors and software, require workers to be able to use them. Without the appropriate knowledge and skills, workers will not be able to fully use these tools, which will reduce the effectiveness of their implementation. Digital technologies generate large amounts of data that need to be analyzed and interpreted to make informed decisions. Workers must be able to work with this data to obtain useful information and use it to optimize production. Digital technologies are also constantly evolving, so workers must be ready to train and retrain. Without the ability to adapt to change, they may find themselves behind the scientific and technological progress.

Digital literacy should be increased by working onlight programs.It is important to develop and implement special educational programs for agribusiness workers that would cover various aspects of digital literacy, from basic computer skills to the use of specialized software.

A necessary measure is to conducttraining courses and seminars**,** because regular training courses and seminars will help employees improve their digital literacy and familiarize themselves with new technologies. Practical sessions are mandatory: it is important that the training is practical in nature, so that employees can gain real experience using digital technologies in their work. Online resources are now coming to the fore. There are many online resources that can help employees improve their digital literacy, such as video tutorials, online courses and interactive platforms. Mentoring and sharing of experience is also important: creating opportunities for sharing experience between employees, as well as attracting mentors who have a high level of digital literacy, can help increase the level of knowledge and skills of the entire team.

The state should create conditions for the development of digital literacy in the agri-industrial complex, develop relevant programs and support educational initiatives. Educational institutions that train specialists for the agri-industrial complex should include digital literacy courses in their programs. Agri-industrial enterprises should invest in training their employees and create conditions for improving their digital literacy. Every agri-industrial complex employee should realize the importance of digital literacy and strive for continuous training and development in this area.

But there are still infrastructure constraints: insufficient internet coverage and weak IT infrastructure in rural areas can slow down digital transformationagro-industrial complex (AIC). The infrastructure of rural areas is extremely important. To use modern digital technologies in AIC, such as precision agriculture, drones, sensors and software, a stable and fast Internet connection is necessary. Without it, the possibilities of using these technologies will be limited or nullified. Digital technologies in AIC generate large amounts of data that need to be transmitted and processed. This requires a developed IT infrastructure, which includes not only the Internet, but also servers, network equipment and other components. Many digital technologies in AIC involve remote access to data and equipment management. Without a reliable Internet connection, remote management capabilities will be limited, which can lead to a decrease in production efficiency.

Problems may arise when implementing digital technologies in the daily lives of rural residents. Due to insufficient Internet coverage, rural areas may find themselves in a digital vacuum, which will lead to uneven access to modern technologies and an increase in the digital divide between cities and villages. Without a developed IT infrastructure, the possibilities of using digital technologies in the agricultural sector will be limited, which may lead to a decrease in the competitiveness of agricultural enterprises. Insufficient infrastructure may complicate the process of implementing digital technologies in the agricultural sector, as enterprises will have to spend additional funds and time on solving infrastructure problems.

Given the significant amount of institutional changes required, close cooperation between representatives of the executive and legislative branches, the expert community, scientists, civil society, local authorities and united territorial communities is key. This will help align the interests of all stakeholders within a single strategic vision with further consolidation at the legislative level. It is important to realize that changing the institutional environment is accompanied by both certain risks and opens up new opportunities for stakeholders in rural areas (Table 1).

To address the above problems and challenges, we propose the following measures:

- **infrastructure development**: the state should invest in infrastructure development in rural areas, providing access to high-speed Internet and creating the necessary IT infrastructure;
- **attracting investments**: for infrastructure development, investments can be attracted from various sources, including the private sector, international organizations and others;
- **joint projects**: the implementation of joint projects between the state, business, and local communities can contribute to more effective infrastructure development;
- **use of alternative technologies**: in some cases, alternative technologies, such as satellite Internet or wireless networks, may be used to provide Internet access in rural areas.

Addressing infrastructure constraints will be an important step towards a successful digital transformation of the agricultural sector and ensuring its sustainable development. Addressing economic issues will reduce the risk of dependence on technology companies: agricultural enterprises may become dependent on digital technology suppliers, which can lead to higher prices and limited choice. Of course, the risk of dependence on technology companies is a serious problem that agricultural enterprises may face in the context of digital transformation.

Table 1. *Risks and opportunities of institutional changes in the regulation of the digital environment for different groups of stakeholders*

Stakeholders	Opportunities	Risks
Local community (rural areas	1. Expanding the possibilities of receiving administrative services online; 2. Increasing the number of high-tech jobs and wages; 3. Expanding opportunities for marketing your own farm products	1. Disappearance of traditional jobs; 2. The need to spend time studying digital legislation
Agricultural producers	1. Expansion of sales markets 2. Increasing opportunities for joint procurement of essential products and services 3. The opportunity to invest in “digital cooperation” 4. Reducing business administration costs in accordance with legislative requirements	1. Enforcing monopolies on the use of digital platforms in the interests of certain business structures through “digital legislation” 2. Inability to quickly reengineer classic, industrial-era business processes to meet digital standards
State and local authorities	1. Reducing administrative costs at the state and regional levels while ensuring a higher level of transparency of activities 2. Expanding the range of services provided online	1. Lack of personnel suitable for modern digital technologies
Together	1. Defining general rules of communication between agricultural producers, consumers, local population and authorities	1. Delays in digitalization processes and underutilization of their potential

But such a dependence has certain tendencies when:

- **specialized equipment and software are used**. Often, agricultural enterprises use specialized equipment and software developed by specific technology companies. Switching to different equipment or software can be difficult and costly;
- **established ecosystem**Some companies create entire ecosystems that include hardware, software, services, and support. Agribusinesses that enter such an ecosystem can become dependent on a single supplier;
- **data collection is taking place.**Digital technologies in agriculture generate large amounts of data that can be stored and processed by technology companies. Agribusinesses that do not have access to or control over their data can find themselves dependent on a supplier.

Such dependencies will have certain dependencies, namely:

- **price increase**: technology companies that have significant market power can abuse their position and raise prices for their products and services;
- **choice restriction**: dependence on a single supplier can limit an agricultural enterprise's choice and force it to use technologies that are not optimal for its needs;
- **lack of control**: an agribusiness that depends on a technology company may lose control over its data and processes, which could negatively impact its business;
- **bankruptcy risk**: if a technology company goes bankrupt or ceases operations, an agribusiness may find itself without support and access to the necessary technologies, which can lead to serious problems.

Directions will be developed to reduce the risk of addiction. For this purpose,Supplier diversification: it is important to work with several technology suppliers to avoid becoming locked into one. Open standards play a significant role, using hardware and software that complies with open standards and allows agribusinesses to more easily switch to other technologies if necessary. There is a need for ongoing data control. Agribusinesses must have access to and control over their data. It is important to enter into contracts with technology companies that ensure confidentiality and data protection. Agribusinesses should strive to develop their own competencies - they can invest in developing their own digital competencies to reduce dependence on external suppliers.

Agribusinesses can join together in cooperatives or other organizations to share digital technologies and reduce dependence on technology companies.

Reducing the risk of dependence on technology companies is an important task that requires a comprehensive approach and cooperation between all participants in the agro-industrial complex. To do this, it is necessary to attract investments: the digital transformation of the agro-industrial complex requires significant investments that may be inaccessible to many enterprises. Yes, of course, the need to attract significant investments is one of the key problems that agro-industrial complex (AIC) enterprises face during digital transformation. AIC enterprises need to purchase equipment and software: modern technologies in the agro-industrial complex, such as precision agriculture, drones, sensors, robotic systems and farm management software, require significant financial investments. The implementation of digital technologies often involves not only the purchase of equipment, but also its integration with existing systems, personnel training and adaptation of business processes. In many cases, digital transformation requires the modernization of existing infrastructure, such as irrigation systems, logistics and storage.

To maintain competitiveness, businesses need to invest in research and development of new digital technologies.

Many agribusinesses, especially small and medium-sized ones, may struggle to obtain the necessary financing for digital transformation. Modern digital technologies can be quite expensive, making them inaccessible to many businesses. Businesses may also be unaware of existing government support programs or other sources of financing.

To solve the problems of digital transformation, it is necessary to:

- **government support**: the state can provide financial support to agribusiness enterprises for digital transformation, for example, in the form of grants, subsidies, soft loans, or tax breaks;
- **attracting investments**: businesses can attract investment from various sources, such as venture funds, private investors or banks;
- **leasing and rental**: using leasing or renting equipment and software can reduce the initial costs of digital transformation;
- **joint projects**: participation in joint projects with other enterprises or scientific organizations can allow sharing the costs of digital transformation;
- **crowdfunding**: in some cases, businesses can use crowdfunding to raise funds for digital transformation.

Attracting investment is an important factor in the successful digital transformation of the agribusiness sector. The state, business and other stakeholders must cooperate to create favorable conditions for attracting investment and ensuring access to necessary financing for enterprises.

Digital technologiesmay lead to increased competition in the market, which may create additional difficulties for small and medium-sized enterprises (SMEs) in the agro-industrial complex (AIC). Digital technologies allow enterprises to enter new markets and attract customers from all over the world. This may lead to increased competition, as SMEs will have to compete not only with local, but also with foreign players.

Digital technologies allow businesses to improve production efficiency, reduce costs and offer more competitive prices. This can create additional difficulties for SMEs that do not have sufficient resources to implement modern technologies.

Digital technologies provide access to a vast amount of information about the market, competitors and consumers. This can allow large companies to gain an advantage over SMEs that have limited access to information.

But certain difficulties may arise in SMEs:

- **financial difficulties**: the implementation of digital technologies requires significant investments that may be unaffordable for many SMEs;
- **insufficient qualifications**: SME employees may not have sufficient qualifications to work with modern digital technologies;
- **lack of access to infrastructure**: In some regions, SMEs may have limited access to necessary infrastructure, such as internet and IT equipment.

We offer ways for SMEs to overcome these difficulties:

- **cooperation**: SMEs can join together in cooperatives or other organizations to share digital technologies and reduce costs;
- **specialization**: SMEs can specialize in certain market segments to reduce competition from large companies;
- **innovations**: SMEs can develop their own digital technologies or adapt existing ones to their needs;
- **government support**: the state can provide financial and consulting support to SMEs for the implementation of digital technologies.

Increasing competition in the market is an integral part of the digital transformation of the agricultural sector. However, SMEs can overcome these difficulties if they actively adapt to the new conditions and use all available opportunities.

There are social ones, such as unemployment, where automation and robotization could lead to job losses in agriculture.Automation and robotics in agriculture is an inevitable process that brings both benefits and certain challenges, one of which is the potential reduction of jobs.

Automated systems and robots can perform many tasks that previously required manual labor, such as harvesting, tilling the soil, caring for animals, etc. It allows for a significant increase in labor productivity, which means that fewer workers can do more work; optimize production processes, reduce costs, and increase efficiency, which can lead to a reduction in the number of employees.

Job losses may lead to increased unemployment in rural areas, especially among low-skilled workers. Unemployment may lead to social tension, rural-urban migration, and a deterioration in the economic situation in the region. Automation may lead to a change in the employment structure in agriculture, reducing the number of low-skilled jobs and increasing the number of highly skilled jobs that require specialized knowledge and skills.

But there are ways to mitigate the negative consequences. It is important to provide workers with the opportunity to retrain and train to acquire new skills that will be in demand in the labor market. It is necessary to create new jobs in other sectors of the economy that will be available to workers who have lost their jobs in agriculture. It is important to provide social support for the unemployed, including unemployment benefits, retraining programs, and assistance in finding a job.The state can regulate the process of automation to minimize negative consequences for workers. Automation and robotization are important factors in the development of agriculture, but it is important to consider their potential social consequences and take measures to mitigate the negative impact on rural residents.

The digital divide is a phenomenon that describes the unequal access to digital technologies and the internet among different groups of the population. This gap can exist between different social groups, such as rich and poor, urban and rural residents, young and old, educated and uneducated, etc.

The digital divide exacerbates social inequality through:

1. **limited access to information and opportunities:**people who do not have access to the Internet are limited in their access to information, education, work, government services, and other opportunities that are available online;
2. **increasing economic inequality:**Digital technologies are playing an increasingly important role in the economy. People who do not have access to them may find themselves at a disadvantage in the labor market and lose opportunities for economic development;
3. **social isolation:**The internet and social media are important tools for communication and social interaction. People who do not have access to them can feel isolated from society;
4. **increasing inequality in education:**Digital technologies are playing an increasingly important role in education. Children who do not have access to them may be at a disadvantage compared to their peers who do.

But steps are possible to overcome the digital divide. To do this, it is necessary to**to provide access to the Internet:**The state should invest in infrastructure development to ensure access to the Internet for all citizens, regardless of their place of residence and social status. Increasing digital literacy of different groups of the population leads to the fact that people can effectively use digital technologies. The state can regulate prices for equipment and services to make them more accessible to the general population. It is also important to create high-quality and accessible content that will be interesting and useful for different groups of the population.

Bridging the digital divide is an important task for ensuring social justice and equality of opportunity for all citizens.

- Data protection: the collection and use of large amounts of data in the agricultural sector requires ensuring their confidentiality and protection from unauthorized access.

The collection and use of large amounts of data in the agribusiness sector (Agriculture) is an integral part of digital transformation. However, it also poses serious risks to data privacy and security.

In today's environment, data protection is important. Data collected in the agricultural sector may contain sensitive information about businesses, their operations, financial status, and other aspects. The security of this data is critical to protecting trade secrets and preventing misuse. Unauthorized access to data can lead to its loss, damage, or distortion, which can have serious consequences for the business. Data leaks can damage the business's reputation and lead to a loss of trust from customers and partners. There are laws that regulate the collection and use of personal data. Violation of these laws can lead to legal liability.

Data protection should be ensured through the following measures:

- **security policy development**: each agro-industrial complex enterprise must have a clearly developed data security policy that defines the rules for collecting, storing, using and transferring data;
- **use of modern technologies**: to protect data, it is necessary to use modern technologies such as encryption, authentication, access control, and others;
- **staff training**: personnel who have access to data must be trained in security rules and responsibility for their preservation;
- **regular audit**: it is necessary to regularly audit the data security system to identify and eliminate possible vulnerabilities;
- **cooperation with experts**: To ensure proper data protection, businesses can seek help from cybersecurity experts.

Data protection is a critical aspect of the digital transformation of the agribusiness sector. Businesses that do not pay sufficient attention to this issue can suffer serious losses.

In striving to achieve sustainable development of the agricultural sector in the context of digitalization, it is necessary to take into account environmental factors, such as energy consumption: digital technologies require significant amounts of energy, which can lead to increased greenhouse gas emissions.

Digital technologies in the agro-industrial complex (AIC) are an important tool for increasing the efficiency and productivity of agriculture. However, their use requires significant amounts of energy, which can lead to increased greenhouse gas emissions that contribute to climate change. Digital technologies require a lot of energy: computing power - modern digital technologies, such as artificial intelligence, machine learning and big data analysis, require powerful computers and servers that consume a lot of energy; equipment - the use of drones, sensors, robots and other equipment in the AIC also requires significant energy costs; data transmission - the transmission of large amounts of data generated by digital technologies also requires energy.

But we need to work on reducing energy consumption and greenhouse gas emissions by applying:

1. **energy-efficient technologies**: the use of energy-efficient equipment and software can significantly reduce the energy consumption of digital technologies;
2. **renewable energy sources**: the use of renewable energy sources, such as solar, wind or biogas energy, can help reduce greenhouse gas emissions associated with the use of digital technologies;
3. **process optimization**: optimizing data collection, processing and analysis processes can help reduce energy consumption and greenhouse gas emissions;
4. **cloud technologies**: using cloud technologies can help reduce the need for local servers and equipment, which can also reduce energy consumption;
5. **heat recovery**: The heat generated by servers and other equipment can be used for space heating or other needs, which will reduce overall energy consumption.

A comprehensive approach that addresses the reduction of energy consumption and greenhouse gas emissions associated with the use of digital technologies in agriculture is important. A comprehensive approach requires collaboration between various stakeholders, including scientists, technology developers, agricultural enterprises, and government.

Ensuring the sustainable development of the agricultural sector in the context of digital transformation is an important task that requires a balanced approach to the use of digital technologies and taking into account their impact on the environment. Disposal of obsolete digital equipment can create environmental problems. Of course, the disposal of obsolete digital equipment is an important problem that needs to be addressed in the context of the digital transformation of the agro-industrial complex (AIC). Such disposal leads to environmental pollution: digital equipment contains harmful substances, such as heavy metals, plastic and other components that can pollute the soil, water and

air if the equipment is not disposed of properly. There is also a health hazard: some components of digital equipment can be dangerous to human health, especially if they enter the body through the respiratory tract or skin. Disposal of digital equipment can require significant financial costs, especially if special rules and standards must be followed.

But the problem of equipment disposal can be solved:

1. **recycling and reuse**: it is important to recycle and reuse digital equipment components as much as possible to reduce waste and conserve natural resources;
2. **safe disposal**: if recycling is not possible, the equipment must be disposed of in a safe manner, following all necessary regulations and standards;
3. **development of environmentally friendly equipment**: digital equipment manufacturers should develop environmentally friendly equipment that can be easily recycled and disposed of;
4. **information and training**: it is important to inform and train agricultural workers about the rules for disposing of digital equipment and their responsibility for preserving the environment;
5. **government regulation**: the state must develop and implement an effective regulatory system for the disposal of digital equipment to ensure its safe and environmentally friendly use.

Disposal of obsolete digital equipment is an important issue that needs to be addressed comprehensively and responsibly. Only in this way can we ensure the sustainable development of the agricultural sector and preserve the environment for future generations.

The use of digital technologies in agriculture can have both positive and negative impacts on biodiversity.

Positive impact:

- **precision agriculture**: the use of drones, satellites and sensors allows for detailed information on the condition of the soil and crops, which allows for the optimization of fertilizer application, irrigation and other agrotechnical measures. This can reduce the negative impact on the environment and preserve biodiversity;
- **environmental monitoring**: digital technologies allow monitoring the state of soil, water and air, which allows for timely detection and prevention of pollution;
- **development of organic production**: digital technologies can help in the development of organic agriculture by ensuring product quality control and certification.

Negative impact:

- **reduction of natural land area**: the expansion of agricultural land for the use of digital technologies can lead to a reduction in the area of natural ecosystems and a decrease in biodiversity;
- **use of pesticides and herbicides**: some digital technologies may contribute to increased use of pesticides and herbicides, which may negatively impact biodiversity;
- **environmental pollution**: the production and use of digital equipment can lead to environmental pollution with harmful substances.

In order to reduce the negative impact on biodiversity, it is advisable to usebalanced approach: use digital technologies in agriculture in a balanced way, taking into account their potential impact on biodiversity;develop environmentally friendly technologies: it is necessary to develop and implement environmentally friendly digital technologies that do not harm the environment. It is important to preserve and protect natural areas to ensure the preservation of biodiversity. It is necessary to monitor and control the use of digital technologies in agriculture in order to timely detect and prevent negative impacts on biodiversity.

Biodiversity conservation is an important task that requires an integrated approach and cooperation between different stakeholders. The use of digital technologies in agriculture can contribute to solving this problem if they are used in a balanced and responsible way.

Opportunities for digital transformation of the agricultural industry:

- increasing production efficiency:
- precision agriculture: the use of drones, satellites and sensors allows you to obtain detailed information about the condition of the soil and crops, which makes it possible to optimize fertilizer application, irrigation and other agrotechnical measures;
- Automation and robotics: the use of robots and automated systems allows you to reduce manual labor costs and increase productivity.

Automation and robotics in agriculture are an important area of development that allows for increased production efficiency, reduced costs, and improved working conditions.

Automated systems and robots can perform many operations that previously required the involvement of a significant number of workers. This allows you to reduce the cost of wages and other social benefits. Automation allows you to increase production volumes due to faster and more accurate execution of operations. Robots can work around the clock without breaks and days off, which significantly increases labor productivity.

Automated systems ensure more accurate and uniform execution of technological operations, which has a positive effect on the quality of agricultural products.

Automation allows you to reduce the impact of the human factor on the production process, which reduces the risk of errors and defects; free workers from heavy and monotonous physical labor, improve working conditions and reduce the risk of injuries.

Examples of the use of automation and robotics are:

- **automated irrigation systems**: allow for precise dosing of water and other resources necessary for plant growth, which helps save water and increase yields;
- **harvest work**: can be used to harvest fruits, vegetables and other crops, which reduces manual labor costs and increases the speed of harvesting;
- **automated animal feeding systems**: provide accurate dosing of animal feed, which promotes their healthy growth and development;
- **soil cultivation work**: can be used for plowing, cultivation and other soil processing operations, which allows to reduce fuel costs and increase processing efficiency.

But the implementation of automation and robotics requires significant investments in the purchase of equipment and software and the need for qualified personnel: working with automated systems requires specialists with appropriate qualifications.

Automation can have social consequences: it can lead to job losses in agriculture, which requires addressing the problem of retraining and employment of workers.

Automation and robotics are a promising direction in the development of agriculture, which allows to increase production efficiency, reduce costs and improve working conditions. However, it is important to consider the possible social and economic consequences of the implementation of these technologies and develop measures to minimize them.

Digital technologies are opening up new possibilities for herd management, allowing you to monitor animal health, performance and location, which helps to increase livestock efficiency and optimize production processes.

How the herd management system works using digital technologies:

1. **animal identification:**each animal is assigned a unique identification number, which can be attached to it using a special collar, chip or other device;
2. **data collection:**using various sensors and gauges that can be installed on animals or in the premises where they are kept, data is collected on their health, productivity, activity, and other parameters;
3. **data transmission and processing:**the collected data is transmitted to a computer or other device, where it is processed using special software;

4. **analysis and decision making:**Based on the data obtained, the specialist can analyze the condition of the animals, identify problems, and make informed decisions regarding herd management.

The use of digital technologies in herd management has certain advantages:

- **improving animal health:**thanks to constant monitoring of the condition of animals, it is possible to detect diseases in a timely manner and carry out preventive measures, which helps maintain the health of the entire herd;
- **increasing herd productivity:**digital technologies allow you to monitor the productivity of each animal and timely adjust the diet or housing conditions, which helps increase milk yield and lean body weight gain;
- **cost optimization:**thanks to accurate accounting of costs for feed, veterinary drugs and other needs, it is possible to optimize the costs of maintaining the herd and increase the profitability of production;
- **improving product quality:**Monitoring animal health and housing conditions helps improve the quality of milk, meat, and other livestock products;
- **reducing environmental impact:**Digital technologies allow for more efficient use of resources such as water and feed, which reduces the negative impact on the environment.

The use of digital technologies in herd management is an important step towards increasing the efficiency and competitiveness of livestock farming.

- optimizing resource use: precision farming and other digital technologies allow for reduced use of water, fertilizers, and pesticides, which reduces the negative impact on the environment.

Precision farming and other digital technologies play a key role in reducing the negative impact of agriculture on the environment by optimizing the use of resources such as water, fertilizers and pesticides. Drones, satellites, sensors and other devices collect detailed information about the condition of the soil, crops, weather conditions and other factors that affect plant growth and development. The collected data is analyzed using special software, which allows you to obtain accurate information about the needs of each field area. Based on the data analysis, informed decisions are made regarding fertilizer application, irrigation and other agrotechnical measures. With the help of special equipment equipped with precision farming systems, work is performed with maximum accuracy and efficiency.

What are the benefits of precision farming?

- **reducing water use:**precision irrigation allows water to be supplied only to those areas of the field that need it, which significantly reduces water consumption and conserves water resources;
- **optimization of fertilizer application:**using fertilizers according to the needs of each field area allows you to reduce their amount and prevent soil and water pollution;
- **reducing pesticide use:**precise application of pesticides allows treating only those areas of the field that are affected by pests, which reduces their total number and negative impact on the environment;
- **cost reduction:**optimizing the use of resources allows reducing costs for water, fertilizers, pesticides and other materials, which increases the economic efficiency of agricultural production;
- **improving product quality:**Providing plants with the necessary resources promotes their healthy growth and development, which has a positive effect on the quality of agricultural products.

The use of digital technologies to optimize resource use in agriculture is an important step towards sustainable development and environmental preservation for future generations. Digital technologies play a crucial role in environmental monitoring, providing the ability to quickly and accurately control the quality of soil, water and air. This contributes to the timely detection of pollution and prevention of its spread, which is critical for maintaining environmental safety and public health.

Monitoring the state of the environment using digital technologies is as follows:

1. **sensors and gauges**: located at various points, they collect data on the state of the environment, such as the level of air, water, soil pollution, temperature, humidity, noise level, etc.;
2. **unmanned aerial vehicles (UAVs)**: drones equipped with special cameras and sensors can survey large areas, collecting detailed information about the state of the environment, including the condition of forests, reservoirs, fields, etc.;
3. **satellites**: satellite images allow you to obtain a global picture of the state of the environment, track changes in ecosystems, detect pollution and other negative phenomena;
4. **monitoring networks**: data collected from various sources is transmitted to a centralized monitoring system, where it is processed and analyzed;
5. **software**: special software allows you to visualize data, create pollution maps, predict the development of the situation and make informed decisions on pollution prevention;

Using digital technologies to monitor the state of the environment has the following advantages:efficiency:digital technologies allow you to receive data on the state of the environment in real time, which ensures a quick response to pollution and other negative phenomena; accuracy: sensors and gauges provide high accuracy of measurements, which allows you to obtain objective and reliable information about the state of the environment; scalability: digital technologies allow you to cover large territories and obtain a global picture of the state of the environment; automation: automated monitoring systems allow you to reduce the impact of the human factor and ensure continuous monitoring of the state of the environment; forecasting: based on data analysis, you can predict the development of the situation and take preventive measures to prevent pollution.

The following digital technologies are used to monitor the state of the environment:

- **Internet of Things (IoT)**: a network of sensors and gauges connected to each other and the Internet allows you to collect data on the state of the environment in real time;
- **artificial intelligence (AI)**: used to analyze data, identify patterns and predict the development of the situation;
- **Big Data**: big data processing technologies allow analyzing significant amounts of information obtained from various sources;
- **cloud technologies**: provide data storage and processing, as well as access to them from any device;
- **geographic information systems (GIS)**: allow you to visualize data on a map, create pollution maps, and analyze spatial information.

The use of digital technologies for environmental monitoring is an important step towards ensuring environmental safety and sustainable development. Digital technologies can help in the development of organic agriculture, ensuring product quality control and certification. They can become a powerful tool for the development of organic agriculture, ensuring product quality control and certification.

The following digital technologies help organic production:

- **monitoring and control: soil condition when**sensors and probes can analyze soil composition, moisture content, temperature, and other parameters, which allows for optimization of soil cultivation and application of organic fertilizers; plant condition, when drones and satellites can monitor plant condition, detect diseases and pests at early stages, which allows for timely action without the use of chemicals; weather conditions, when weather stations and online services provide information about weather conditions, which allows for planning agricultural work and minimizing the risks of crop loss.
- **farm management: accounting and analysis, when**special software allows you to keep track of all production processes, analyze data and make informed decisions regarding farm management; automation, when automated irrigation systems and other technologies allow you to optimize the use of resources and reduce the impact of the human factor.

- **Certification and quality control: tracking when the**Digital technologies allow tracking the entire path of products from field to consumer, which provides transparency and confirms their organic origin; certification, when data collected using digital technologies can be used to obtain an organic certificate, which increases consumer confidence in the products.

The use of digital technologies in organic production has the following advantages:

- **increasing efficiency:**digital technologies allow you to optimize production processes, reduce costs and increase productivity;
- **improving product quality:**Monitoring the condition of soil, plants and production conditions helps improve the quality of organic products;
- **strengthening consumer confidence:**a transparent tracking and certification system confirms the organic origin of products and increases consumer confidence;
- **reducing environmental impact:**Organic production, supported by digital technologies, contributes to the preservation of the environment and biodiversity.

Digital technologies are an important tool for the development of organic agriculture, ensuring product quality control, certification and increasing production efficiency. Digital transformation contributes to increasing agricultural productivity, which is an important factor in ensuring food security.

The digital transformation of agriculture is a key factor in increasing its productivity and ensuring food security. It encompasses a wide range of technologies and innovations that allow optimizing production processes, reducing costs and increasing resource efficiency.

Digital transformation helps improve productivity through:

1. **precision agriculture:**The use of drones, satellites, sensors and other technologies allows obtaining detailed information about the condition of the soil, crops, weather conditions and other factors affecting yield. This allows optimizing fertilizer application, irrigation and other agrotechnical measures, which contributes to increasing yields and reducing costs;
2. **automation and robotics:**the use of robots, automated systems and other technologies allows for the automation of many processes in agriculture, such as harvesting, soil cultivation, animal care, etc. This reduces the need for manual labor, increases productivity and reduces the risk of errors;
3. **data management:**Digital technologies allow for the collection, processing and analysis of large amounts of data on the condition of crops, animals, soil and other factors. This allows for informed decisions on farm management, optimization of production processes and increased efficiency of resource use;
4. **Internet of Things (IoT):**The use of IoT devices, such as sensors and gauges, allows you to receive information about the state of the environment in real time. This allows you to respond to changes in a timely manner and take measures to prevent negative impacts on crop yields;
5. **cloud technologies:**The use of cloud technologies allows you to store and process large amounts of data, as well as provide access to them from any device. This helps to increase the efficiency of farm management and make informed decisions.

Digital transformation ensures food security.Increasing agricultural productivity through digital transformation contributes to increasing food production, which is an important factor in ensuring food security. It allows reducing crop losses through timely identification of problems and taking measures to solve them. Digital transformation contributes to improving the quality of agricultural products by controlling all stages of production. Increasing production and reducing losses contributes to reducing food prices, making it more accessible to the population.

The digital transformation of agriculture is an important factor in ensuring food security and sustainable development of society while reducing losses: digital technologies help reduce losses of agricultural products during storage and transportation. Digital technologies play a key role in reducing losses of agricultural products during storage and transportation, which is an important factor in ensuring food security and economic efficiency of agricultural production.

Digital technologies help reduce losses by applying:

- **monitoring of storage conditions: temperature and humidity -**sensors and probes can monitor temperature and humidity in storage facilities, which allows maintaining optimal conditions for storing various types of products and preventing their spoilage; product condition - using special cameras and sensors, you can monitor the condition of products during storage, detect signs of spoilage and take timely measures to prevent the spread of the problem.
- **logistics optimization: tracking -**using GPS trackers and other technologies, it is possible to track the location of vehicles, which allows you to optimize routes and reduce product delivery time; monitoring transportation conditions - sensors can monitor temperature, humidity and other parameters during transportation, which ensures the preservation of product quality.
- **inventory management: accounting - with**Special software allows you to keep track of product stocks, control expiration dates, and sell products on time to prevent spoilage; forecasting - based on data analysis, you can forecast production volumes and demand for products, which allows you to optimize stocks and reduce losses.
- **information platforms: connection between producers and consumers -**online platforms allow producers to find buyers and sell products without intermediaries, which reduces losses associated with transportation and storage; information exchange - information platforms allow the exchange of information on best practices for storing and transporting products, which helps reduce losses.

What advantages does this provide?

- **Reducing product losses:**Digital technologies can significantly reduce losses of agricultural products during storage and transportation, which helps increase production efficiency and ensure food security.
- **Cost reduction:**Reducing product losses allows for lower production and transportation costs, which increases the economic efficiency of agricultural production.
- **Improving product quality:**Ensuring optimal storage and transportation conditions helps preserve the quality of agricultural products and their consumer properties.
- **Increasing competitiveness:**Reducing losses and improving product quality increases the competitiveness of agricultural producers in the market.

Using digital technologies to reduce agricultural losses is an important step towards sustainable agricultural development and ensuring food security.

- Quality improvement: digital technologies allow you to control the quality of agricultural products at all stages of production.

Digital technologies are revolutionizing agriculture, providing unprecedented opportunities to control and improve product quality at all stages of production. From field to fork, digital tools help ensure the highest quality standards, satisfying consumer needs and increasing producers' competitiveness.

Digital technologies improve the quality of agricultural products, namely:

- **Monitoring and control in the field, when soil condition, plant condition, weather conditions are analyzed**. Sensors and sensors analyze the composition of the soil, its moisture content, temperature and other parameters. This information allows you to optimize soil cultivation, fertilization and irrigation, which contributes to healthy plant growth and improved crop quality. Drones and satellites monitor the condition of plants, detecting diseases and pests at an early stage. This allows you to take timely measures to protect plants without the use of chemicals, which has a positive effect on product quality. Weather stations and online services provide information on weather conditions, which allows you to plan agricultural work and minimize the risks of crop loss due to adverse weather events.
- **Quality control during harvesting and storage: after harvesting, storage.**Automated harvesting systems ensure careful and high-quality harvesting of fruits, preventing their damage and

loss of quality. Sensors and sensors monitor temperature, humidity and other parameters in storage, which allows maintaining optimal conditions for product storage and preventing its spoilage.

- **Tracking and certification: c**Digital technologies allow tracking the entire path of products from field to consumer, which ensures transparency and confirms their quality and origin.
- **Certification**: data collected using digital technologies can be used to obtain quality certificates, which increases consumer confidence in products.
- **Data analysis and decision making: with**Special software allows you to analyze data obtained from various sources and identify patterns that affect product quality.
- **Decision making**: based on data analysis, specialists can make informed decisions about production management, process optimization, and product quality improvement.

Using digital technologies to improve the quality of agricultural products has its advantages, such as:**quality improvement when**Digital technologies allow you to control the quality of products at all stages of production, which contributes to obtaining a high-quality harvest; reducing losses by timely identifying problems and taking measures to solve them allows you to reduce product losses due to diseases, pests or spoilage; increasing competitiveness through high-quality products is an important factor in competitiveness in the market; meeting consumer needs, when digital technologies help producers meet consumer needs for high-quality and safe agricultural products. Digital technologies are a powerful tool for improving the quality of agricultural products. Their use allows producers to obtain high-quality crops, meet consumer needs, and increase competitiveness in the market.

The process of managing the digital transformation of the agricultural complex must become successful and stable. For the successful implementation of digital technologies in the agricultural complex, it is necessary to create favorable conditions for the development of innovations and attraction of investments. Important areas of public administration are:

- infrastructure development: ensuring access to the Internet and developing IT infrastructure in rural areas;
- SME support: providing financial and advisory support to small and medium-sized enterprises for the implementation of digital technologies;
- personnel training: training and retraining of agricultural workers to work with new technologies;
- ensuring cybersecurity: data protection and ensuring information confidentiality in the agricultural and industrial complex;
- stimulating innovation: supporting scientific research and development in the field of digital technologies for the agro-industrial complex;
- international cooperation: exchange of experience and attraction of best practices from other countries in the field of digital transformation of the agricultural complex.

The digital transformation of the agricultural sector is an important factor in ensuring its sustainable development. Effective management of this process requires a comprehensive approach that takes into account technological, economic, social and environmental aspects.

According to expert forecasts, after 2025, half of the global economy will actively use digital technologies, which will significantly increase the efficiency of business processes. Developed countries are leading in this direction, rapidly implementing innovations such as digital platforms, artificial intelligence and robotics.

The development of a digitalization strategy for the agricultural sector should be based on an analysis of global trends and take into account the specific needs of the industry. It is important to assess the level of digital transformation at different levels: from an individual enterprise to the industry complex, in order to understand the impact of these changes on national and international markets, competitiveness and business efficiency (Fig. 1).

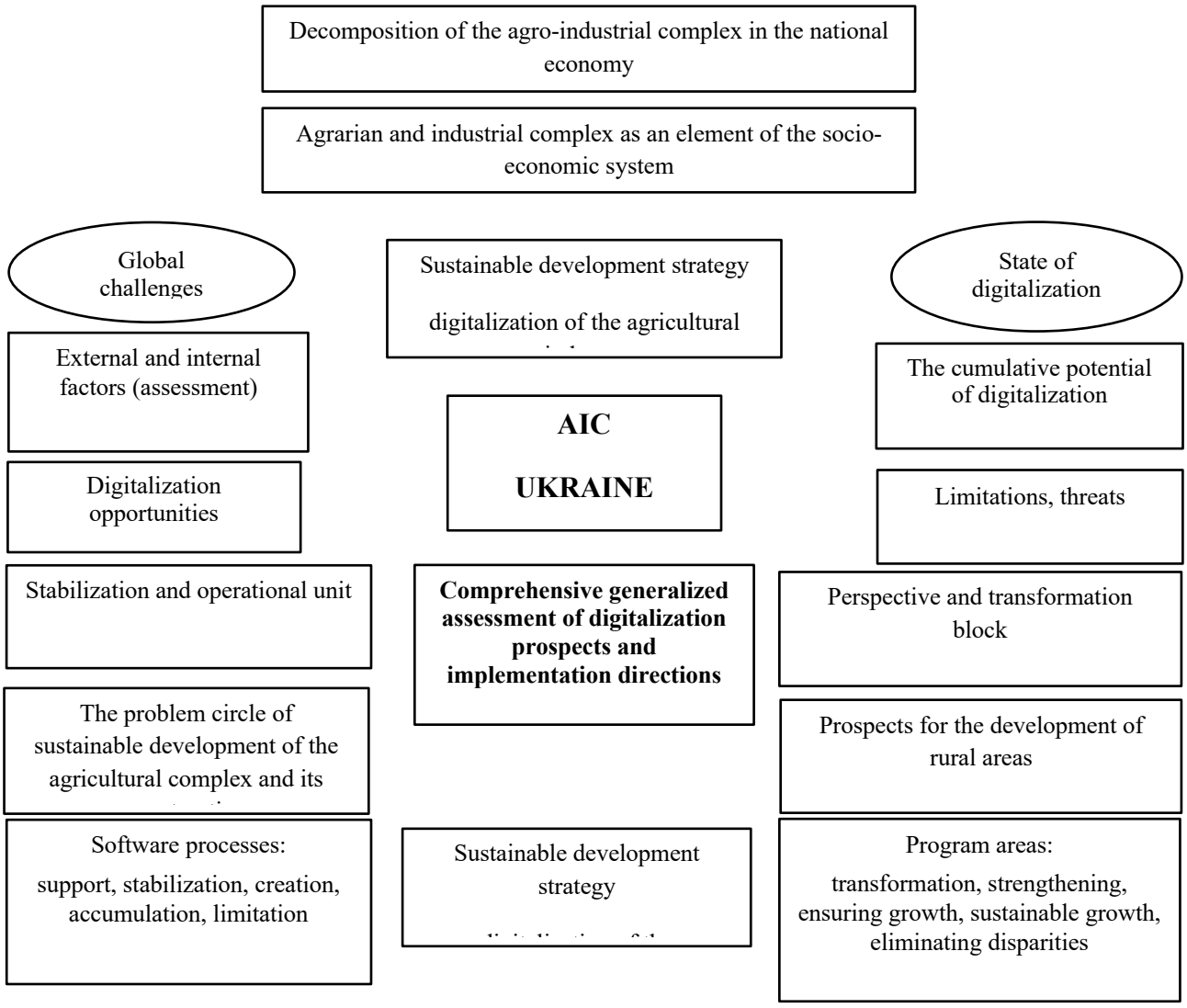

Fig. 1. *Conceptual framework for implementing strategic directions for the digitalization of the Ukrainian agribusiness*

Here are some key aspects of this transformation:

- Digitalization as a major trend: Digital technologies are expected to become an integral part of most sectors of the economy before and after 2025. This includes process automation, the use of big data, cloud computing, and other digital tools.
- Innovation as a driving force: Developed countries are actively investing in research and development of new technologies. Particular attention is paid to artificial intelligence, which has the potential to revolutionize many areas. Similarly, the introduction of robotics makes it possible to automate routine operations, thereby reducing the human factor.
- Improving business efficiency: Digital technologies allow for process optimization, cost reduction, and productivity improvement. This creates new business opportunities and contributes to economic growth.

These trends suggest that digital transformation is an inevitable process that will have a significant impact on the global economy in the coming years.

According to scientists' calculations, the comprehensive digitalization of agricultural production allows reducing costs by 23%, and the use of GPS navigation technologies, differentiated fertilizer application and parallel driving systems provides cost savings of 11–14%, 8–12% and 8–

13%, respectively. According to experts, the digitalization of agriculture contributes to increasing the efficiency and sustainability of agribusiness through fundamental changes in the quality of management, the application of technological and management processes based on modern methods of analyzing and using information about the state and forecasting changes in agriculture.

The digital transformation of agrarian relations is characterized by a radical rethinking of agribusiness processes and technologies, the introduction of modern technologies into production, the automation of routine processes and the creation of a new corporate culture, and its main tasks are the transition to digital agriculture, data integration for analytics, the creation of information resources, state support, product traceability, the development of digital platforms, the optimization of supply chains, the development of online trade, legislative regulation, education and international integration aimed at increasing the efficiency and competitiveness of the agricultural sector.

Conclusions. Adherence to the concept of sustainable development is a relevant vector of development of modern organizations. Implementation of such a strategy provides the company with a number of competitive advantages, increases its investment attractiveness, forms a positive image and ensures compliance with EU requirements. At the same time, the issue of implementation and development of digital technologies in the activities of agricultural formations is becoming increasingly important.

Digital modernization of the agricultural sector opens up opportunities for increasing predictability, productivity and flexibility of agricultural production. This, in turn, contributes to strengthening food security, stability and profitability of agribusiness. For the successful implementation of digital technologies in the agricultural sector, it is necessary to create favorable conditions that would stimulate innovation in agriculture.

The state should play a key role in this process, ensuring a systemic approach to digitalization. This includes:

- improvement of agricultural legislation;
- legalization of the concepts of "digital transformation of agrarian relations" and "digital agriculture".

The main directions of the digital transformation of agrarian relations are re-equipment for the automation of production processes, rethinking of agricultural enterprise management models, introduction of modern agricultural technologies to increase efficiency, changing models and processes of activity, as well as the transition to new ways of organizing work and the introduction of digital technologies in agribusiness..

Based on the analysis of existing approaches, the digital transformation of agrarian relations can be defined as a legally regulated process that includes technologies, strategies, and the integration of new methods and models aimed at transitioning to the modern level of agribusiness. This involves changing the organization and conduct of agricultural production, managing agricultural production and related processes based on the effective use of electronic and digital technologies and establishing electronic communication.

It is important to note that the digital transformation of agrarian relations is a component of agrarian information relations, which are included in the subject of agrarian law, and therefore is considered as an agrarian legal category.

REFERENCES

1. Bodrova D.V. Institutional aspects of the development of the digital economy in Ukraine. Scientific notes of the V. I. Vernadsky TNU. Series: Economics and Management. 2019. No. 30 (69). P. 163 – 168. DOI:https://doi.org/10.32838/2523-4803/69-5-57
2. Gazuda M.V., Gazuda L.M., Herceg V.A. Key aspects of digitalization of agriculture. Scientific Bulletin of Uzhhorod University. Series "Economy", 2024. 1 (63). Pp. 79-86.
3. Geets V.M. Social reality in digital space. Economy of Ukraine. 2022. No. 1. P. 3-28.
4. Hrytsenko A.A., Hrytsenko O. A. Institutionalization of the digital economy: contradictions and directions for their resolution. Economic Theory and Law. 2021. No. 1 (44). P. 25 – 28.
5. Zaburanna L. V., Yarmolenko Y. O. The potential of implementing an agricultural digital cooperation platform for the convergence of regions in the process of sustainable development. Economics of the Agricultural Complex. 2019. No. 3. P. 87–96. (Personal contribution: the concept of agricultural digital cooperation was developed).
6. Digital Quality of Life Index in Ukraine and the World for 2022. URL:https://pingvin.pro/gadgets/news-gadgets/indeks-czyfrovoyi-yakosti-zhyttya-v-ukrayini-ta-sviti-za-2022-rik.html(date of application: 01/15/2025).
7. Koleshnya Ya.O. Modern digital business models: essence, overview and features. Entrepreneurship and Innovation. 2022. No. 24. P. 87-91. DOI:https://doi.org/10.32782/2415-3583/24.14
8. Kravchuk N.O., Rymar O.G., Bortnik N.V. Digital economy as one of the directions of development of the post-war economy of Ukraine. Market economy: modern theory and practice of management. 2022. No. 3 (52). P. 155-169. DOI:https://doi.org/10.18524/2413-9998.2022.3(52).275799
9. Kraus K.M., Kraus N.M., Manzhura O.V. Technological mode of production of industrial and post-industrial society: digital transformation and innovative modernization. European Scientific Journal of Economic and Financial Innovations. 2022. No. 1 (9). P. 58-73. DOI:http://doi.org/10.32750/2022-0105
10. Rudenko M.V. The impact of digital technologies on agricultural production: a methodological aspect. Scientific notes of the V. I. Vernadsky TNU. Series: Economics and Management, 2019. Volume 30 (69). No. 6. Pp. 30-37.
11. Svinous I. V., Gavryk O. Yu., Tkachenko K. V., Mykytyuk D. M., Semisal A. V. Current status and problems of implementing digital technologies in the practice of agricultural enterprises. Investments: practice and experience. 2020. No. 15-16. P. 35–39. DOI: 10. 32702/2306-6814.2020.15-16.35 (access date: 20.02.2025).
12. Stepanenko T.O. Theoretical and methodological principles of sustainable development of the enterprise. Scientific notes of V. I. Vernadsky TNU. Series: Economics and Management. 2020. Vol. 31 (70). No. 6. P. 136–141. URL:https://www.econ.vernadskyjournals.in.ua/journals/ 2020/31_ 70_6/25.pdf(date of application: 01/15/2025).
13. Stoyanets, N. (2024). MANAGEMENT OF INNOVATIVE DEVELOPMENT OF ENTERPRISES IN THE CONDITIONS OF GLOBALIZATION CHALLENGES. Economy and Society, (60). https://doi.org/10.32782/2524-0072/2024-60-86
14. Tarasyuk, A., Hamaliy, V. (2021). Trends in the digitalization of agricultural enterprises in Ukraine. SCIENTIA FRUCTUOSA (BULLETIN of the Kyiv National University of Trade and Economics). No. 139(5). P. 72–85. DOI: 10.31617/visnik.knute.2021(139)05 (access date: 22.02.2025).
15. Tkachuk G.O. “Digital” transformations: relationship with the system of economic security of the enterprise. Economics of the Food Industry. 2019. Vol. 11. No. 4. P. 42–50. DOI: 10.15673/fie.v11i4.1545 (access date: 22.02.2025).
16. Chabanyuk O.M., Loboda N.O. Basic principles of the concept of sustainable development. URL:https://conf.ztu.edu.ua/wp-content/uploads/2019/12/64.pdf(date of application: 01/15/2025).
17. Yurchuk N. P., Kiporenko S. S. Peculiarities of using digital technologies in agribusiness. Eastern Europe: Economics, Business and Management, 2022. No. 3 (36). Pp. 109-116.
18. Yakushko, I. V. Prerequisites for the emergence of digital transformation and factors of its development in economic systems. Problems of modern transformations. Series: economics and management. 2022. DOI: 10.54929/2786-5738-2022-3-03-05 (access date: 02/22/2025).