ARTIFICIAL INTELLIGENCE IN THE MECHANISMS OF STATE MANAGEMENT OF THE DEVELOPMENT OF THE REGIONAL AGRARIAN SECTOR IN THE CONTEXT OF THE NATIONAL SECURITY

IRYNA KOSACH[1*], VIKTORIIA MARHASOVA[2], VOLODYMYR LAGODIIENKO[3], OLEKSANDR HOLUBIEV[4], MAXIM PILIPENKO[5], ARTEM DEGTYAREV[6]

[1]Department of Management and Administration,
Chernihiv Polytechnic National University, Chernihiv, Ukraine
[2]Department of Entrepreneurship and Business,
Kyiv National University of Technologies and Design, Kyiv, Ukraine
[3]Department of Marketing, Entrepreneurship and Trade,
Odesa National University of Technology, Odesa, Ukraine
[4]Department of Enterprise Economics and Management,
Academy of Labour, Social Relations and Tourism, Kyiv, Ukraine
[5]Department of Management and Administration,
Chernihiv Polytechnic National University, Chernihiv, Ukraine
[6]Department of Management and Administration,
Chernihiv Polytechnic National University, Chernihiv, Ukraine
E-mail: [1]irish_kos@ukr.net, [2]viktoriya.margasova@gmail.com, [3]volodymyr@wiktoriya.com,
[4]oleksandrholubiev@gmail.com, [5]m_a_k_s_111@ukr.net, [6]artemdeg@online.ua

ABSTRACT

The purpose of the article is to develop conceptual provisions for improving the mechanisms of state management of the development of the regional agrarian sector based on the artificial intelligence technologies. Artificial intelligence is changing the paradigm of managing national, in particular economic and food security, as it can analyze large sets of data, learn from them and make decisions based on complex patterns. The use of the artificial intelligence technologies can overcome the limitations of the traditional systems of security management, including at the regional level, and improve existing mechanisms of state management. In its expanded form, artificial intelligence in the public administration mechanisms is data analytics, controlled machine learning, and cloud technologies. It is important to coordinate the timing of the use of artificial intelligence in public administration and enterprise management, since digital transformation in public administration is often slower than at the micro level improvement of the existing mechanisms of state management of the development of the agrarian sphere based on artificial intelligence has a two-vector implementation of priority directions. First, the goal of improving the mechanisms of state management is the integration of artificial intelligence into the security management system of enterprises. This concerns, first of all, the provision of cyber security and environmental security to improve threat detection and risk prevention. Based on the use of artificial intelligence, advanced analysis capabilities can be used, ensuring resilience of the public administration system to cyber threats. Specific intelligence technologies should also be selected and configured to eliminate cyber threats to regulate the development of the agrarian sphere, integration with existing systems into the regional system of the agricultural production development.

Keywords: *Artificial Intelligence, Agricultural Sphere, Agro-Industrial Production, State Policy, Mechanisms Of State Management, Regional Policy, Digitalization, Cyber Security, National Security.*

1. INTRODUCTION

Development of the solutions in public administration takes place based on the active use of such technologies as artificial intelligence, which is a driving force of further innovative changes in the functioning of the leading sectors of the economy, including agro-industrial production. Artificial

intelligence occupies a special place among information technologies in the state management of the agrarian sector development, using such techniques as natural language processing, machine vision, machine learning.

The essence of the problem of applying modern state management mechanisms to the development of strategic sectors of the economy lies in their impact on the state of the country's national security. Thus, effective state management of the development of the agrarian sphere, firstly at the level of regions, is closely correlated with the level of economic, ecological and food security of the country and is under the pressure of internal and external threats, the leveling of which becomes possible based on digital technologies and artificial intelligence. The use of the innovative artificial intelligence technologies in the agricultural sector makes it possible to prevent significant damage to the development of agriculture and processing industries through a quick and effective response to threats.

Among the main factors that negatively affect the agrarian sphere development and ensure food security, we'd like to single out the following:

1. Increased consumption of natural resources, which is the cause of excessive anthropogenic load, depletion and shortage of resource potential.

2. Climate changes and natural disasters. Research by scientists leads to the conclusion that the increase in the temperature of the Earth's surface can cause a decrease in the yield of food crops by twenty percent. Temperature increase of the Earth leads to an increase in the activity of pests and, as a result, crop losses will increase by 10-25%. In the future, this will lead to threats to food security and an increase in food prices.

3. Active urbanization of territories, which occurs in parallel with the reduction of agricultural land and the increase in the need for food on the part of the urban population.

4. Steady growth dynamics of food loss and food waste, which has a negative impact on the climate situation in the region.

Based on this, the solution to the problem of public administration involves the integration of modern artificial intelligence technologies, which can predict and respond to dangerous incidents autonomously and in real time. Thus, artificial intelligence changes the paradigm of managing national and, in particular, economic and food security, as it can analyze large sets of data, learn from them and make decisions based on complex patterns. Therefore, the use of artificial intelligence technologies can overcome the limitations of traditional systems of security management, including at the regional level, and improve the existing state management mechanisms.

Similar to the application in other management areas, the term "artificial intelligence" in the state management mechanism of the agrarian sector development can be considered:

1) In the context of the development of systems endowed with intellectual processes characteristic of a person;

2) In the context of the ability of a computer or computer-controlled robot to perform the tasks inherent in a human in a given workplace.

At present, the efficiency of mechanisms of state support for agricultural sector development is determined by the ratio of the efficiency of decision-making and the corresponding costs at the macroeconomic and regional levels. However, there is a problem of inconsistency between the elements of the state support system, which does not allow it to function as a whole and solve the strategic and tactical tasks of the industry development. This proves the relevance of implementing artificial intelligence technologies. However, the importance and expediency of digital transformations is not always clear to business representatives, as it requires significant financial investments, perfect regulatory and legal support for the investment process, and support from public authorities. This actualizes the issue of finding the optimal model of interaction between business and the state in order to ensure the goals of the development of the agricultural sector and in the context of compliance with the requirements of economic, environmental, food and information security. It is the motivational approach that forms the basis of the development of artificial intelligence technologies in the agricultural sector of the region. Important tasks are:

- research on trends in the development of agro-industrial production in EU countries and Ukraine with the identification of opportunities for the implementation of AI technologies;

- determination of priority tasks of mechanisms of state management of the development of the agrarian sphere;

- formation of a set of requirements for improving the process of implementing AI technologies in the management of the agrarian sphere;

- determination of priority areas for the use of AI technologies in the mechanisms of state management of the development of the agrarian sphere;

- development of an algorithm for the implementation of the mechanism of state support for the development of AI in the agrarian sphere with

justification of the organizational, financial and legal components;

- development of theoretical and methodological principles for the implementation of artificial intelligence in the cyber security system of the state management of the development of the agrarian sphere of the region in conditions of risks and external threats.

The purpose of the article is to develop conceptual provisions for improving the mechanisms of state management of the agrarian sector development based on the artificial intelligence technologies.

2. LITERATURE REVIEW

Publications of many scientists are devoted to the role of the artificial intelligence technology in the public administration system. Within the scope of research [1], [2], the influence of artificial intelligence on the activities of state administration was analyzed. Based on the results of the research, the authors identified the advantages and disadvantages of using AI in the mechanisms of state administration.

The authors [3], [4] are convinced that the development of new tools, such as business analytics, the use of data and artificial intelligence, are driving mechanisms for e-government. The researchers explored the challenges associated with the generative artificial intelligence in public administrations and its impact on the human-machine interaction in the public sector.

The purpose of articles [5], [6] is to analyze the features of the use of the advanced artificial technologies in public administration. The potential impact of conversational artificial intelligence on the public administration programs at universities is also explored. The authors explore how AI tools will help university programs be more efficient and how technology will support the sector of limited human resources.

The research of scientists [7] is relevant, within which the use of the artificial intelligence technology by state administration of Brazil is considered. The authors believe that AI has brought about changes to control bodies, mainly due to repetitive demands, that is, it has been a way of introducing violations for more predictive function and less decision-making.

Article [8] is based on the analysis of the theory and concept of public administration in the context of researching the advantages and disadvantages of using the artificial intelligence (AI) algorithms in the public services provision. The results show that while there are benefits to implementing algorithms in the public service, some serious challenges still exist when viewed through the theory lens. The

author believes that bringing citizens to the forefront in the development and implementation of the services provided by AI is a key to reducing the reproduction of social prejudices.

Scholars [9] argue that the digital age has brought many benefits to government systems around the world. This helped improve the quality of services offered to citizens. The authors investigated the challenges that the Moroccan public administration may face when making Artificial Intelligence decisions. It has been analyzed that slow progress in the adoption of digital technologies has put public administration at a disadvantage, while the world is moving so quickly towards more sophisticated AI solutions.

Article [10] is dedicated to the study of the combination of artificial intelligence technologies, changes in methods and approaches of public administration, improvement of the quality and level of public administration technologies. The results of the study prove that the implementation of artificial intelligence in public administration can free up manpower, save money, optimize management and organizational forms, contribute to the modernization of management, innovate the talent training regime, significantly increase the working efficiency, and contribute to the scientific, effective and intelligent development of public administration.

Article [11] analyzes promoting the responsible integration of artificial intelligence, ensuring the effectiveness of research methodologies, and maintaining ethical integrity in public administration inquiries. Scientists [12] devoted their research to highlighting some issues regarding the use and design of artificial intelligence systems for public administrations. The above was analyzed within the current national regulatory and institutional framework and in accordance with the guiding principles of the proposed by European Union regulation on artificial intelligence.

According to the authors [13], the use of artificial intelligence systems by state administrations in the context of administrative activities has grown significantly. The legal requirements that such systems must meet to be used are considered and the main safeguards that must be implemented in case of their use or implementation are analyzed.

It has been proved [14] that the central and local administration of the states needs serious and deep structural changes to reduce bureaucracy and public expenses, as well as to significantly improve the quality of services, productivity, accessibility and transparency of public institutions. According to the authors, it is digitalization and artificial intelligence

that are gradually integrated into state administrations and management process, and the results obtained confirm a significant increase in the managerial, economic and social efficiency.

The result of the authors' research [15] is an analysis of the use of artificial intelligence in public administration, which, in their opinion, has significant advantages, but also embodies ethical dilemmas of justice, transparency, privacy and human rights. Scholars believe that there is a lack of clarity in public administration about how decisions are made about these dilemmas and the impact of such decisions on public values.

Studies of the impact of artificial intelligence on the national security of the state are gaining more and more attention. We will analyze the publications of scientists in this direction.

Attention should be paid to research [16], [17], which analyzes the role of artificial intelligence in achieving the goals of sustainable development in ensuring the national security. At the same time, the authors note that it is necessary to take into account the potential imbalance of power to prevent inequality. Therefore, the result of the study is an analysis of the interaction between artificial intelligence, national security and environmental protection.

Scientific works [18], [19], [20-22] state that artificial intelligence technologies will become the most powerful tools in a generation for expanding knowledge, increasing well-being and enriching human experience. According to the authors, the AI is the basis for the innovative economy and is a source of great strength for countries, but on the other hand, it is a threat to the national security.

Papers [23], [24] consider the potential use of artificial intelligence techniques, such as machine learning and natural language processing, to automate certain tasks in public administration. The authors offer general policy recommendations in response to increasing transparency and reducing bias in AI algorithms intended for use by public officials in the context of the national security.

China's unique domestic politics have developed distinctive characteristics for its approach to the AI, which has provided the basis for research [25], [26]. The authors analyze national security issues and practical aspects of the AI management. Awareness of some human rights threatened by the AI use by the state for the national security was also explored.

Research papers [27-29] have analyzed the ways in which the AI can be used maliciously to launch the AI-enabled cyberattacks, and offer a number of recommendations for mitigating the risks associated with the adversarial AI use. Considerable attention is also paid to analyzing the implications of technical, legal, ethical issues, privacy challenges, and challenges to human rights and civil liberties regarding artificial intelligence (AI) and national security.

The authors [30-32] are convinced of the need to create the artificial intelligence system for the national security that would be ethical and legal at a time in history when transparency is considered essential for good governance. The specifics of the artificial intelligence use in war and national security are explored; strengths and weaknesses, as well as threats to the national security are considered.

It should be noted that scientists are also actively researching issues of the regional development based on the use of artificial intelligence technologies, blockchain etc [33-38].

Without underestimating the contribution of scientists to the indicated direction of research, we would like to draw attention to the fact that the issue of the artificial intelligence role in the mechanisms of state management of the agricultural sector development in the region in the context of the national security is considered sporadically and requires a deeper analysis.

3. METHODOLOGY

The theoretical and methodological basis of the study was formed by the fundamental theoretical developments of leading scientists from the specified subject. To achieve the goal, general scientific methods of knowledge of phenomena and processes were used: methods of induction and deduction - to clarify the relationship between the process of introducing artificial intelligence and the consequences for the agricultural sector in the context of ensuring the national security; methods of system analysis and generalization for systematization of existing scientific approaches, used theoretical sources and scientific literature; structuring method - to highlight positive factors influencing the agricultural sector development as a result of the implementation of artificial intelligence projects; statistical method - for analyzing the dynamics of the introduction of artificial intelligence in the leading areas of the economy; the method of system analysis , the method of abstraction and formalization - for the development of the conceptual foundations of the public administration mechanism; the method of logical generalization - for researching the experience of implementing artificial intelligence projects for the purpose of developing the agricultural sector; graphic method -

for displaying the theoretical and methodological material of the research.

The research methodology is based on the following principles. When introducing artificial intelligence projects into the mechanisms of state management of the agricultural development, private and state goals should be clearly separated. The representatives of state interests and goals are represented by local public authorities, private motives and goals are characteristic of the representatives of small businesses, farms, and corporations in the agricultural sector. The system of goals is formed under the influence of socio-economic development and needs of different levels depending on the subjects. At the same time, there is a constant relationship between public goals and the interests of business entities, which must be taken into account when forming the goals of the artificial intelligence system. At the same time, interaction in the implementation of artificial intelligence projects is aimed at identifying points of intersection of the interests of business and the state in the context of compliance with the requirements of economic, environmental, food and information security. In the future, this provides a development vector for introducing the artificial intelligence technologies. Further, its effective implementation requires the formation of a complex of certain conditions and directions of mechanisms of state management and state support.

Therefore, it is important to define the contours of the goals of subjects and objects of the state management mechanism of the agrarian sphere development of the region based on artificial intelligence and their coordination. The main subjects by implementing the management mechanism are state structures D, the objects are business structures BS. Under the influence of the external environment, the interaction model, like any system model, forms a set of goals for each of the participants:

$$Z^D = \left\{ Z_i^D \right\}, \text{i} = \overline{1, N_{z^d}} ; \qquad (1)$$

$$Z^{BS} = \left\{ Z_i^{BS} \right\}, \text{i} = \overline{1, N_{z^{BS}}} , \qquad (2)$$

where N_{z^d}, $N_{z^{BS}}$ is the number of goals for each participant of the mechanism.

The output of the system is the decisions made, specific actions and results obtained, which are the intersection of interests within the framework of the set Z^D goals Z^{BS}

$$P^D = \left\{ P_i^D \right\}, \text{i} = \overline{1, N_{p^d}} ; \qquad (3)$$

$$P^{BS} = \left\{ P_i^{BS} \right\}, \text{i} = \overline{1, N_{P^{BS}}} , \qquad (4)$$

where P^D, P^{BS} are the actions of the subjects of business integration.

According to the entire set of decisions and concrete actions in the interaction, it is possible to single out the optimal set of actions (P^{opt}), which is a set of common interests of agrarian business and the public sector regarding the implementation of the artificial intelligence projects. Selection of the optimal population requires the definition of a criterion field, i.e. a system of criteria by which the parties' interests are aligned:

$$K^n = \left\{ K_i^n \right\}, \text{i} = \overline{1, K^n} \text{ is a set of defined criteria} \quad (5)$$

By grouping the criteria, the integration of the interaction of business and the state is carried out under the conditions of a mutually beneficial partnership. The result of decisions in the set P^{opt} the mechanism of state support for the agricultural sector development will be improved. The set (P^{opt}) includes decisions and actions from the aggregates P^D, P^{BS}, which meet the proposed criteria.

Thus, the improvement of the existing mechanisms of state management of the agrarian sphere development based on the artificial intelligence has a two-vector implementation of the priority directions.

4. RESEARCH RESULTS

Development of the agricultural regions of EU countries takes place mainly in the following directions:

• diversification of agricultural production — expanding the range of products and increasing the types of services. In this way, there is a reduction of risks for the agricultural sector and the increase in the stability of the rural regions of EU countries.

• restructuring of the agrarian production, which involves such areas of restructuring of the economy of agrarian regions as improvement of land relations, improvement of the agricultural situation, transfer of land to its own effective users, integration of small and medium-sized enterprises, provision of subsidies to producers.

• development of the social infrastructure of agricultural regions, which will contribute to the growth of the employment level, implementation of state programs to reduce the outflow of the most active strata of the rural population;

• institutional transformations that affect the development of regions. Attention is focused on the spread of financial instruments to support small

agricultural businesses. Projects of the integrated development of rural regions are being implemented based on the interactive planning methods, which can increase the income of the population and contribute to the improvement of the quality of life.

The total value of agricultural products in EU countries in 2022 was 537.5 bln euros this includes the cost of crops, animals, agricultural services. A significant share (53.6%) of the value of the total production of the EU agricultural industry in 2022 falls on agricultural crops (287.9 billion euros), among which grains and vegetables, and garden plants are prioritized (Fig. 1).
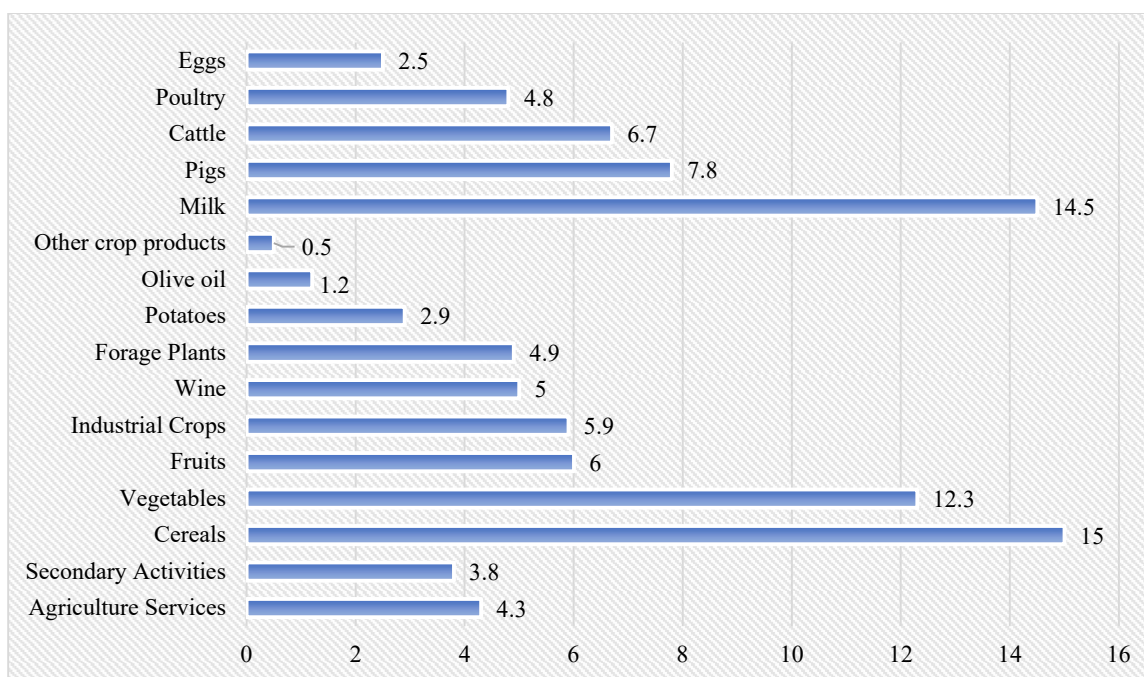

Figure 1: Structure of the agro-industrial production in EU countries, % (2022)

Source: https://ec.europa.eu/eurostat

Almost two-fifths (38.3%) of the total volume of production are accounted for by animals and products of animal origin (206.0 bln euros), priority here is given to pork and dairy products. Agricultural services (23.4 bln euros) and non-separate non-agricultural activity (20.3 bln euros) brought the rest (8.1%).

Contributions of EU member states differed significantly, which is due to differences in production volumes, agro-industrial specialization, and climatic conditions. More than half (57.3%) of the total volume of production of the agricultural industry of the EU falls on France (97.1 bln euros), Germany (76.2 bln euros), Italy (71.5 bln euros) and Spain 63.0 bln euros). The next group of EU member states was Poland (39.5 bln euros), the Netherlands (36.1 bln euros) and Romania (22.2 bln euros). Three quarters (75.5%) of the total value of EU agricultural products in 2022 came from these seven EU member states.

Since 2013, state management of the development of agrarian regions in the leading countries of the world has been focused on achieving global goals of sustainable development, such as:

promoting the diffusion of innovations;

increasing the competitiveness of agricultural production;

promoting the organization of the food production chain; restoration, preservation and development of ecosystems;

increasing the efficiency of the energy resources use, transition to a low-carbon economy;

promotion of the socio-economic development of agrarian regions.

In Ukraine, the agrarian sphere is the leading sphere of the national economy, in which a significant share of the population is employed. Its role in the national economy is determined by the following factors: ensuring the needs for food by the state; ensuring food independence and economic security; development of export potential; increasing the material well-being of the population. In the context of the EU integration with the EU, Ukraine has a significant potential for foreign trade in agricultural products and food, which

is due, on the one hand, to the developed agriculture, and on the other hand, to the insufficient level of providing the population with certain groups of food products. The current state of the agricultural sector development in Ukraine is determined by integration processes and factors of globalization, military actions and economic problems.

Development of the agricultural sector depends on the size of investments, forms of production organization, use of traditional or innovative technologies, as well as on many natural and biological factors. The analysis of the state of the agricultural production development in Ukraine in 2022 makes it possible to draw a conclusion about reduction of the production volumes of both plant and livestock products. Regions such as Vinnytsia became the leader in production (1.2 bln euros), Poltava (1.1 bln euros), Cherkasy (0.9 bln euros), Kyiv (0.8 bln euros). The Kherson, Donetsk, and Luhansk regions significantly lost their positions as a result of military operations (Fig. 2).

The fall in the gross production of crop production in 2022 occurred due to the decrease in the production volumes of the vast majority of its species, namely due to a reduction in the production of grain and leguminous crops, sugar beets, potatoes, vegetables, and melon crops. Poltava became the leader in the production of plant products during the analyzed period (0.9 bln euros), Vinnytsia region (0.8 bln euros), Kirovohradsk (0.7 bln euros), Khmelnytsk (0.7 bln euros). In comparison with the previous period, the overall drop in crop production was 28% (according to the data of the State Statistics Committee of Ukraine).

As for the volumes of livestock products, the situation here also indicates a drop in production volumes. Livestock production is more expensive for both the producer and the consumer in terms of cost, and in terms of profitability, it is not always profitable. This trend was the result of the decrease in the interest of private capital in investing its funds in this branch of agriculture due to its unprofitability and unpredictability of profit, which is caused by various risks (possible loss of livestock, fluctuations in purchase prices for meat and the uncertain position of the state in relation to agriculture, military actions). Vinnytsia Oblast (0.4 bln euros), Cherkasy Oblast (0.3 bln euros) and Kyiv (0.2 bln euros).

Thus, the mechanisms of state management of the agricultural sector development at the regional level should be aimed at solving the following tasks (Fig. 3).

In accordance with the above, the policy of state management of agricultural regions in the EU is aimed at mobilizing innovative potential, effective use of state and territorial cooperation to achieve sustainable development. In turn, the spread of digitization of management processes actualizes the issue of the development of state management mechanisms in the context of the implementation of the artificial intelligence projects.
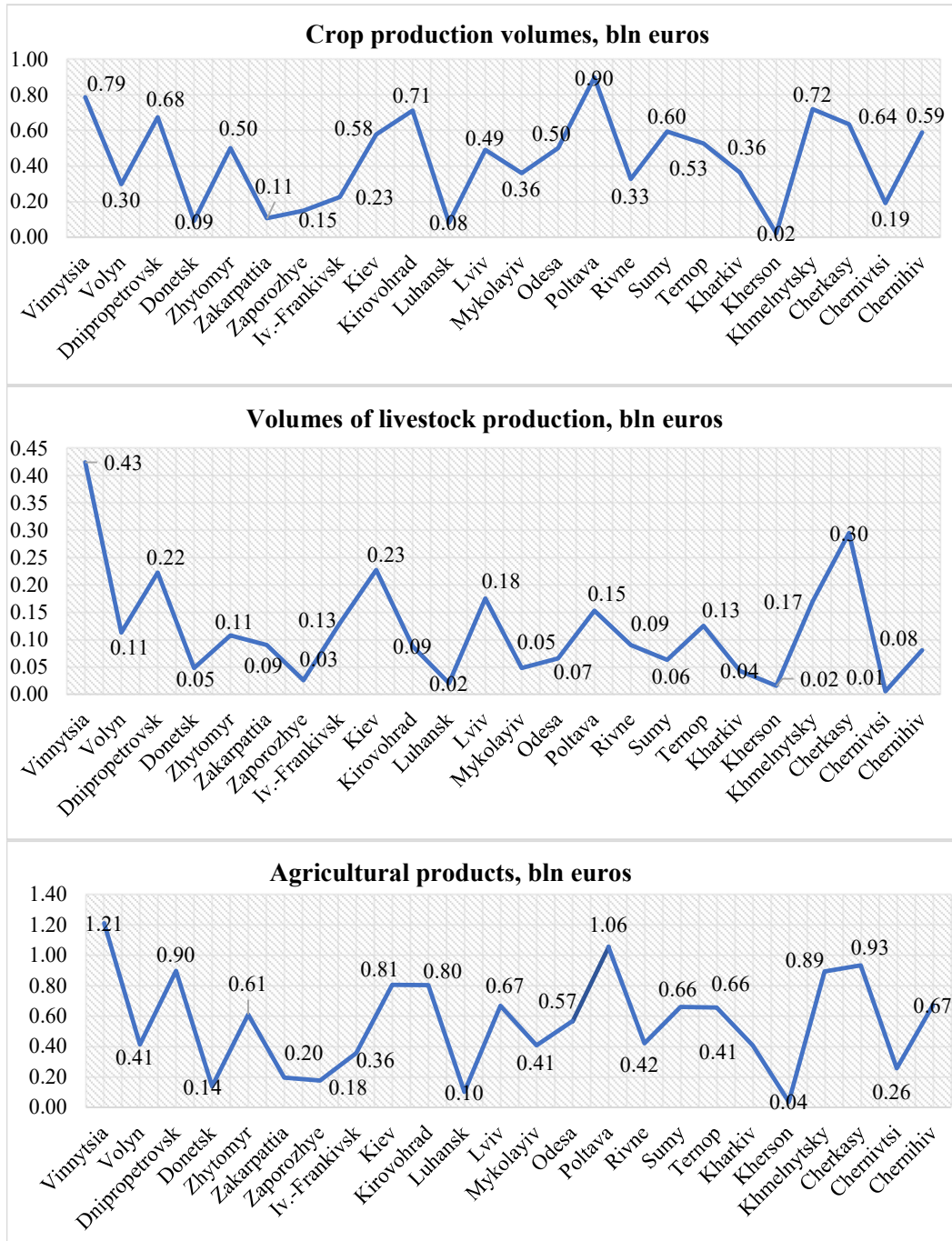
Figure 2: Volumes Of Production Of Agricultural Products In Ukraine For 2022 (Bln Euros)
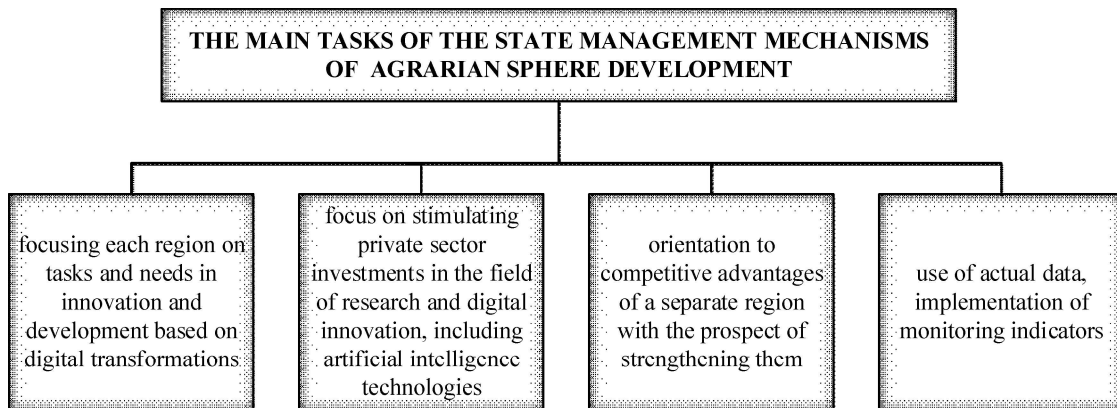
Source: https://www.ukrstat.gov.ua/

Figure 3: The Main Tasks Of The Mechanisms Of State Management Of The Agrarian Sphere Development
Source: generated by the authors

In an expanded form, artificial intelligence in the mechanisms of public administration is data analytics, controlled machine learning, and cloud technologies. The global trend shows the spread of the use of the artificial intelligence technologies in many leading areas of production and service provision. According to the given data (Fig. 4), we can observe active development of investments in the use of artificial intelligence in the world starting from 2017. The stormy stage of 2020-2021 coincides with pandemic processes and, as a result, the active use of digital technologies. In 2022, according to the global trend, there is a decrease in the activity regarding investments in the use of artificial intelligence technologies ($85.06 billion compared to $125.36 billion), especially in the United States ($43.85 billion compared to 73.4 billion dollars in 2021).
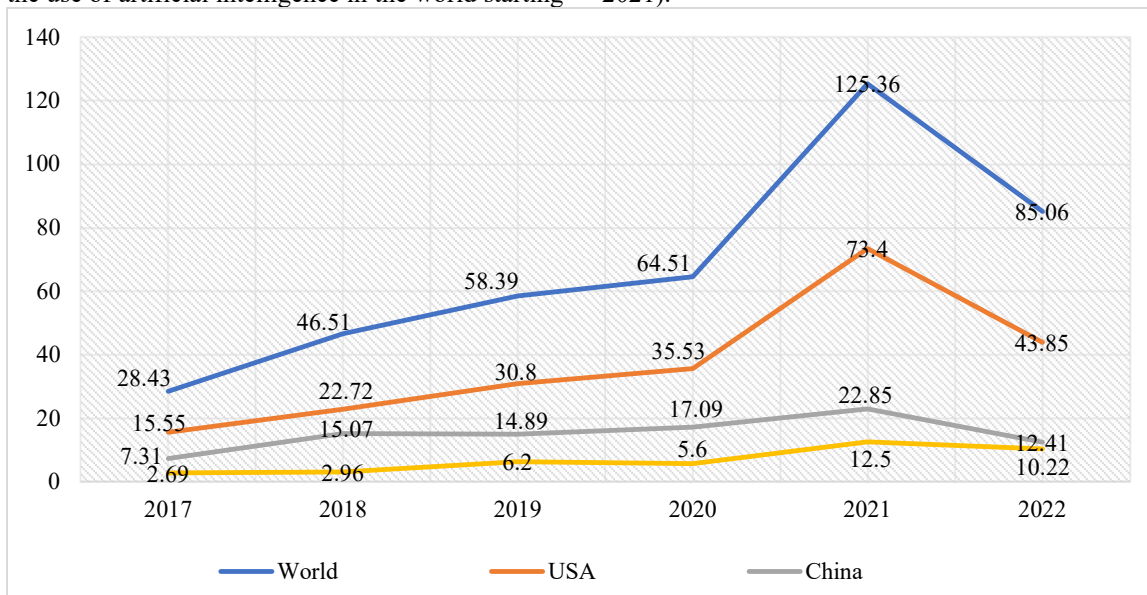

Figure 4: Investing In Artificial Intelligence Technologies (Billion $)
Source: https://ourworldindata.org/artificial-intelligence

However, a slight decrease in investment in the artificial intelligence technologies, insufficient funding of relevant projects does not mean that there are no innovative shifts in the mechanisms of public administration. Informatization, digitalization, implementation of cyber protection tools are the primary basis for the implementation of artificial intelligence technologies in public administration.

The experience of world leaders in the implementation of artificial intelligence technologies in public administration, such as the USA and China, allows us to draw a conclusion about the importance of complying with the following requirements for their improvement when used in the management of the agrarian sphere:

1. Availability of information, as a sufficient amount of reliable and high-quality data reduces the uncertainty of the operating environment of mechanisms and is necessary for learning and implementing artificial intelligence models.

2. Technical examination that provides necessity to carry out expertise of state institutions for the development, implementation and operation of artificial intelligence systems.

3. Availability of regulatory and legal support, which provides available regulations for the implementation of artificial control systems by adopting the decisions by state bodies authorities. Normative software also has to regulate the issues on the information privacy, cyber protection, conduct monitoring and formation reporting.

4. Transparent use of artificial intelligence systems in public administrative based on the control mechanisms, including during acceptance management decisions.

5. Partnership of the state and representatives of the agrarian business for development and implementation of common projects by using artificial intelligence.

6. Permanent training and adaptation of the artificial intelligence systems that requires permanent renewal data, monitoring and improvement of models.

7. Adequacy and fairness of the artificial intelligence systems based on quality control data, drilling algorithms systems and criteria evaluations their effectiveness.

8. Accountability that provides formation of the independent bodies' supervision of the functioning of the artificial intelligence systems.

10. Cooperation of the human and artificial intelligence as a tool the human opportunities expansion.

Development of the artificial intelligence technologies for the agricultural sector is at an initial stage. The main reasons for this are its low structure, the weak level of awareness of business subjects regarding the artificial intelligence technologies, as well as the low level of communication between the state authorities and business regarding the expediency of their implementation. The low rate of activity regarding the use of artificial intelligence in the agricultural sector, in comparison, for example, with the financial sector or the field of transport services, is due to the widespread market perceptions of the insufficient maturity of these technologies (Fig. 5).
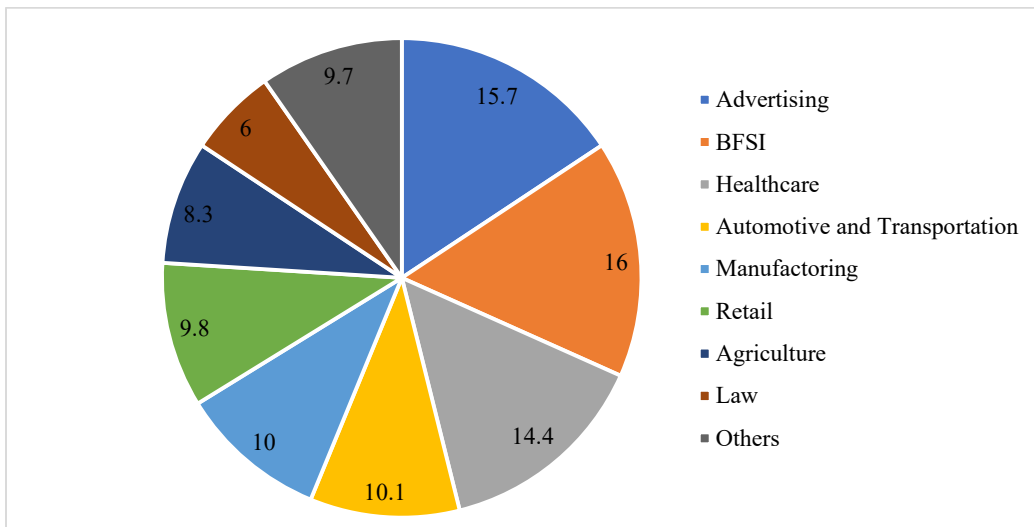

Figure 5: Global Artificial Intelligence Market (2022)

Source: https://ourworldindata.org/artificial-intelligence

Also, a significant barrier to the introduction of the artificial intelligence technologies is the high cost for customers and the need for sufficient modern infrastructure in rural areas. Most often, the main users are large agricultural corporations, while small and medium-sized businesses show interest, but do not always understand the practical benefit and economic effect of the application. China, the USA, India, Australia, and Spain are the leaders in the use of artificial intelligence technologies in the agricultural sector.

The use of artificial intelligence in the mechanisms of state management of the agricultural sector should be concentrated in the following areas:

- direct use in organizing the work of state authorities and local self-government;

- integration with cyber security systems used in the management of enterprises of the agro-industrial complex;

- introduction into the business processes of agricultural corporations;

- promotion of the use of the client-oriented algorithms in the agricultural products; market;

- logistics in the work of agribusiness corporations.

Using artificial intelligence in individual companies in the agricultural sector increases their organizational stability and production, and market flexibility. In this context, it is important to coordinate the timing of the use of artificial intelligence in public administration and enterprise management, since digital transformation in public administration often occurs more slowly than at the micro level. Thus, the implementation of artificial intelligence in the mechanisms of state administration, unlike in business, most often takes place through pilot projects.

Artificial intelligence is a whole class of digital technologies, which includes the following main areas of use in the agricultural sector:

- machine learning (basic technology for using robotics in offline mode);

- computer vision: satellite vision, analysis of satellite maps, etc.;

- intelligent and predictive analytics: yield forecasting models, real-time data analysis, forecasting possible equipment failures, etc.;

- robotics: fruit and vegetable picking robots, automated irrigation and crop processing systems, etc.

Therefore, artificial intelligence technologies, which are already used in the global agro-industrial sector, deserve a separate consideration (Table 1).

Table 1: The Use Of Artificial Intelligence Technologies In The Agricultural Sector Of EU Countries.

No	Artificial intelligence technology	Scope of application in the agricultural sector	Level of implementation
1	Use of robots	Drones operating in autonomous mode Automated irrigation systems Robotic complexes	A promising common technology
2	Computer visio	Monitoring of fields and planted crops, monitoring of pests, analysis of satellite maps	A promising technology that is at various stages of implementation
3	Intelligent analytics	Data mining, predicative analysis, Big Data	A promising technology that is at various stages of implementation
4	Systems of predicative analytics	Prediction of possible failures of agricultural machinery, prediction of accidents in agricultural production	Promising technology, limited adoption

Source: systematized by the authors

Geolocation systems, "smart farm" systems, "smart farming" and other intelligent solutions within the framework of the Agricilture 4.0 system of agriculture are actively used in agriculture in the EU. At the same time, gradual implementation of promising solutions of the Agricilture 5.0 system, which is characterized by the wide use of robotics, is taking place and artificial intelligence instead of human labor. The accelerated introduction of the artificial intelligence technologies is the global goal of the agricultural industry of leading countries in the context of ensuring the country's food security.

State support for the introduction of artificial intelligence in agricultural production is of particular importance. Currently, countries such as China, the USA, Canada, Great Britain, France, and South Korea have developed national strategies for artificial intelligence, the main directions of which include state support for the introduction of artificial intelligence technologies in the agricultural sector of the economy.

In the context of the innovative and investment development of agribusiness based on artificial intelligence, we'd like to consider the following changes in the existing mechanisms of the state policy, which are considered to be appropriate (Table 2).

Table 2: Improvement Of The Existing Mechanisms For Supporting The Development Of The Agricultural Sector Based On The Use Of Artificial Intelligence.T

No	Mechanism type	Suggestions for improvement
1	**Organizational mechanism**	1. Formation of communicative interaction between government structures and business regarding the possibilities of the implementation of artificial intelligence projects. 2. Training of personnel with competence in the application of artificial intelligence. 3. Establishment of advisory assistance from regional authorities. 4. Implementation of a monitoring system by the implementation of projects based on artificial intelligence to develop priority areas of state support.
2	**Legal mechanism**	1. Consideration in regulatory documents of the regional specifics of the use of artificial intelligence in the development of agricultural enterprises. 2. Improvement of regulatory and legal provision of the interaction between representatives of public authorities and business based on the public-private partnership relations.
3	**Financial mechanism**	1. Improvement of the tax incentives system, implementation of an effective insurance system of investment risks for business enterprises implementing artificial intelligence in their activities. 2. Budgetary support for priority projects directed for the artificial intelligence implementation.

Source: developed by the authors

The stages of implementation of the state support mechanism for the artificial intelligence development in the agricultural sector are shown in Fig. 6.

It is appropriate to provide the following practical recommendations for reforming the existing mechanisms of state support for the regional development of the agrarian sphere in the conditions of the introduction of artificial intelligence:

- coordination of communicative interaction between business representatives and public authorities regarding the implementation of the artificial intelligence projects in the activities of business entities and the functioning of government structures;

- development of the innovative infrastructure, development of the personnel training system for public authorities in the project and investment management,

- implementation of a monitoring system for the introduction of the artificial intelligence technologies to develop priority areas of state support.

- projects aimed at state support of small and medium-sized businesses, namely farms, is relevant. For small enterprises, the implementation of artificial intelligence systems is a factor in ensuring their competitiveness, and state support mechanisms can solve this issue in the conditions of limited finances.

One of the main goals of the strategic management of the introduction of artificial intelligence in the process of state management of the agricultural sector development is to increase the specific weight of farms and state authorities that use the artificial intelligence technologies in their activities.

The duality of the introduction of artificial intelligence into the mechanisms of state management of the agrarian sphere of the region is as follows.

First of all, the goal of improving public administration mechanisms is the integration of artificial intelligence into the security management system of enterprises. Based on the use of artificial intelligence, advanced analysis capabilities can be used, ensuring the resilience of the public administration system to cyber threats. In parallel, there should be a balance between technological implementation and management of potential risks of dependence on automated systems.

Secondly, there must be selected and configured specific technologies intelligence to eliminate cybernetic threats to regulate the development of agricultural spheres, integration with existing systems into the regional system of the agrarian production development, and also safe and effective management information for detection threats.
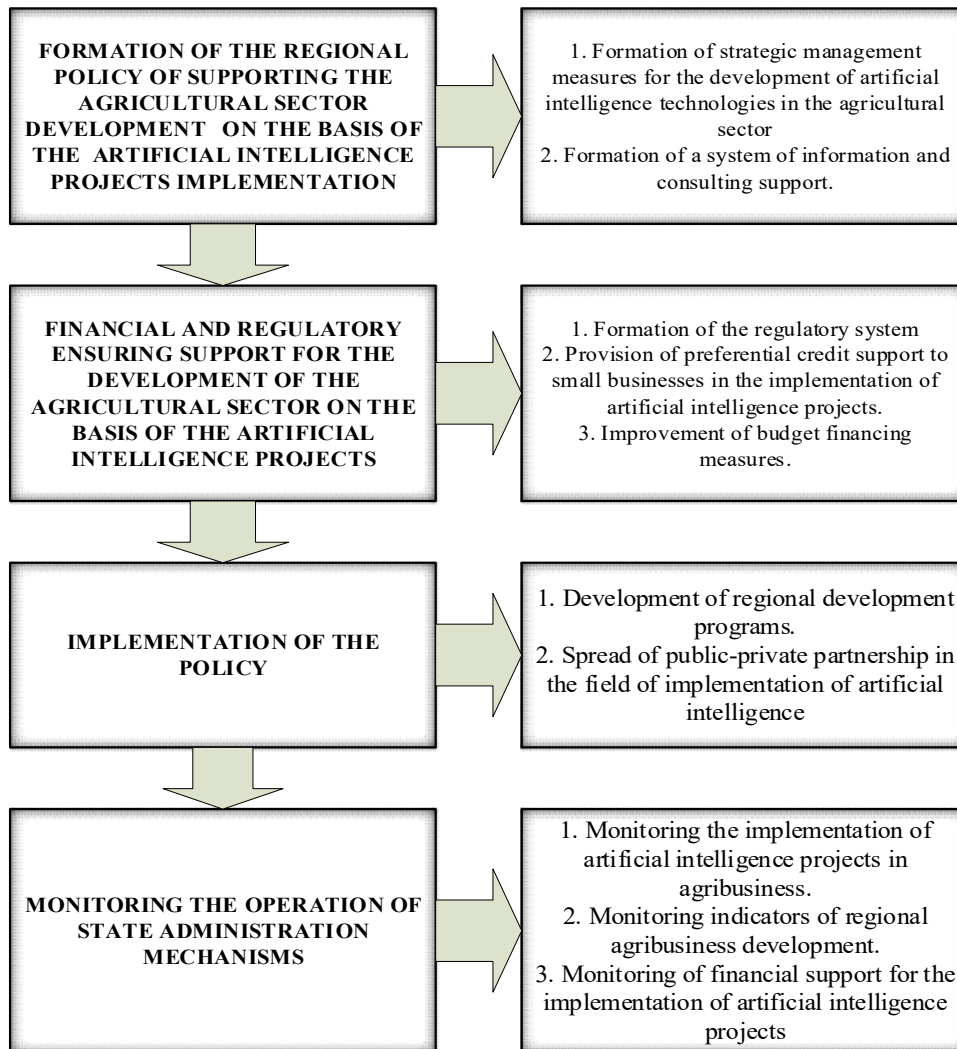
Figure 6: Stages Of Implementation Of The State Support Mechanism For The Agricultural Sector Development Based On The Introduction Of Artificial Intelligence

Source: developed by the authors

Nowadays, the artificial intelligence technologies are actively used in the field of public administration to ensure digital security. The implementation of the artificial intelligence technologies in the mechanisms of state support for the development of regional agricultural production should, among other things, be focused on data protection and creation of additional opportunities for the prevention of threats in the digital space. The possibilities of artificial intelligence in the field of security are related to the automatic detection of threats and the use of software to neutralize them. However, since cyber-threats are characterized by persistent dynamics, constant replication of virus software, automated artificial intelligence systems must be improved and the degree of their automation increased. Therefore, an important condition for the introduction of artificial intelligence into the mechanisms of state administration is the revision of the principles of building a defense system based on artificial intelligence.

The methodology of the mentioned process begins with a detailed assessment of needs and planning, in which current threats are identified, vulnerabilities of the agricultural sector are assessed, and precise goals for the integration of artificial intelligence are determined, as shown in Fig. 7.
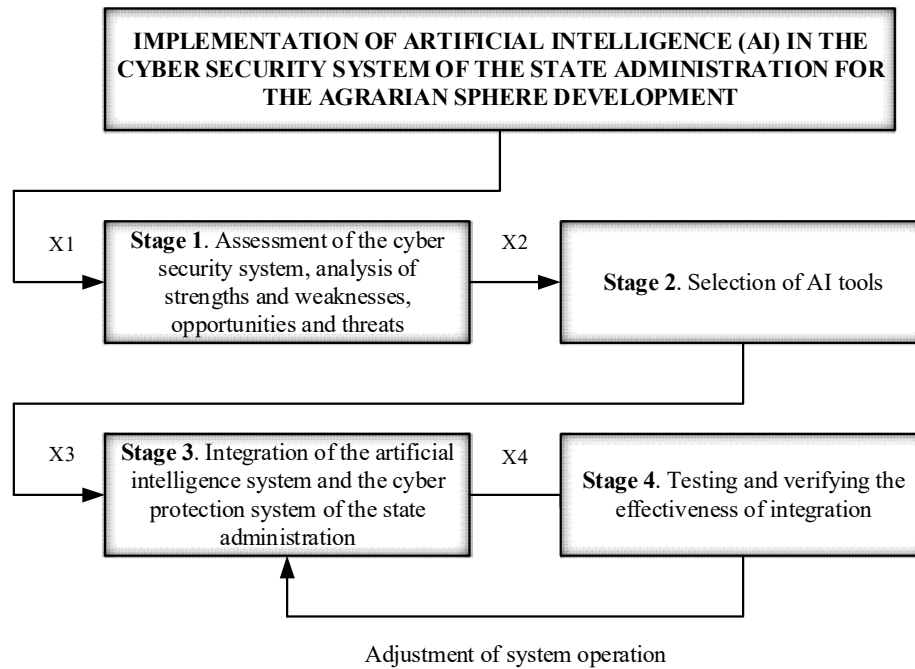
Figure 7: Implementation Of Artificial Intelligence In The Cyber Security System Of The State Administration Of The Agrarian Sphere Development Of The Region

Source: developed by the authors

Since the implementation of state management mechanisms for the agrarian sector development directly depends on financial support, each stage of the introduction of artificial intelligence into the cyber protection system is characterized by a certain amount of resources, which subsequently affects the overall result of the implementation of the mechanism:

$$F = f(x_1, x_2, x_3, x_4), \qquad (6)$$

where X and is the amount of resource costs for each stage (stage).

At the first stage, an assessment of the existing cyber security system of the state administration of the agricultural sector is carried out to determine its strengths and weaknesses, potential threats, and formulation of the main goals for the implementation of artificial intelligence technologies. During this stage, it becomes possible to match the capabilities of the system with expectations from artificial intelligence.

The next stage involves the selection and configuration of specific artificial intelligence tools. The selection takes place based on their ability to meet the established requirements and the ability to adapt to changes in the external environment.

In the future, the artificial intelligence system will be integrated with the cyber protection system of the state administration. In the process of integration,

effective interaction of artificial intelligence solutions with existing systems based on data exchange and providing real-time analysis should be ensured. This phase guarantees effective cooperation artificial intelligence systems with already functioning cyber security systems.

Following stage responsible for testing and verification efficiency integration artificial intelligence systems. Testing provides modeling cyber threats to check speed reaction artificial intelligence systems Further rating efficiency includes critical analysis data and indicators efficiency, as a result what is defined the impact of artificial intelligence new system of state administration.

Possible adjustment work systems aimed at promotion equal accuracy and minimization errors during work systems. As a result happens better adaptation artificial intelligence systems before their appearance new ones threats

Artificial intelligence serves as the basis of transformational processes in the state management of the development of the agrarian sphere of the region, creating conditions for the implementation of effective, flexible and transparent management mechanisms. Limitations when using the proposed approach are the relevance of statistical information and its limitations, especially with regard to the

study of artificial intelligence implementation processes in agro-industrial companies operating on the Ukrainian market and having production facilities in front-line regions and territories where military operations are conducted. However, in contrast to existing studies, the proposed solutions allow taking into account the two-vector nature of the formation of state management mechanisms, taking into account the motivation of agricultural producers and the achievement of the goals and priority tasks of the regional management of the development of the agrarian sphere. It is also advisable to single out a set of risks that may accompany the processes of introducing artificial intelligence into the management of the development of agricultural production:

- understandability: artificial intelligence systems can be complex and opaque, so it is difficult to understand exactly how they participate in the formation of a management decision;

- limited supervision – artificial intelligence systems often operate under the conditions of the limited supervision and observation, which does not always make it possible to eliminate potential risks;

- abuse: excessive implementation of artificial intelligence systems can reduce the number of employees, which causes a negative social effect;

- confidentiality issues: artificial intelligence systems analyze large arrays of data, which can sometimes be a violation of the problem of access to commercial secrets.

- security risks: artificial intelligence systems, despite cyber protection, may be subject to hacking or hacker attacks, which may affect the confidentiality and integrity of information.

Artificial intelligence makes it possible to simplify the collection and processing of data in the development of program documents for the development of the agro-industrial complex, analysis of indicators of the efficiency of industry development and indicators of the level of budgetary support. However, in further studies in the direction of the problem of introducing AI technologies into the mechanisms of state administration, it is advisable to take into account the increased level of risks arising as a result of military aggression and threats to national security and the high turbulence of the external environment of the agrarian sphere of both Ukraine and EU countries. This creates the possibility of setting up automatic monitoring and control tools for each public authority, including in the field of ensuring food safety. The key role in the improvement of mechanisms for the agrarian sphere development belongs to the public authorities at the regional level, the functions of which include the organization of the interaction of all elements of the mechanism, the regulation of its functioning procedures, and control over the implementation of support measures.

5. CONCLUSIONS

Thus, the conducted research made it possible to draw a conclusion about the complexity of the mechanisms of state management of the development of the agrarian sphere, which involves taking into account diversification, restructuring of agricultural production, active implementation of institutional transformations, which in the conditions of globalization of the world economy becomes possible on the basis of the gradual use of AI technologies. However, the improvement of state management mechanisms should occur in parallel with the integration of artificial intelligence into the security management system of enterprises. This concerns, first of all, the provision of cyber security and environmental security to improve threat detection and risk prevention. The methodology for the development and implementation of the state support mechanism should be based on the motivational aspect of the sphere of public administration and agrarian business, taking into account the specifics of regional development, detailed assessment of needs and monitoring of threats. Determining the priority areas for the use of AI technologies in the mechanisms of state management of the development of the agrarian sector, taking into account risks and external threats, made it possible to form the following priority approaches:

- data governance: authorities should use clear data governance policies to ensure the accuracy, reliability and representativeness of AI system training;

- transparency of algorithms: Governments should ensure transparency of algorithms used in artificial intelligence systems;

- regulatory oversight: governments must establish clear regulatory frameworks for managing the implementation of artificial intelligence in mechanisms of state management of agricultural development on the basis of confidentiality and accountability.

- public involvement: Governments should involve interested business entities and the public in the development and use of artificial intelligence in public administration.

By taking these steps, the public administration system can take advantage of AI while mitigating risks. Therefore, AI has the potential to make government governance mechanisms for the region's

agricultural development efficient and transparent, but it is important to use AI responsibly and ethically to ensure that it benefits all business stakeholders.

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