ASSESSMENT OF THE RELEVANCE AND EFFECTIVENESS OF THE DEVELOPMENT OF THE AGRICULTURAL SEGMENT BASED ON THE INTEGRATION OF INFORMATION TECHNOLOGIES

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Introduction. Agriculture is one of the most relevant areas of the national economy, which has individual characteristics in terms of production. The agro-industrial complex of Armenia has a key place in the development and life of the state, due to the fact that it is on its basis that the countries of the world are provided with food necessary for the life of the population. The development of this sector of the national economy has a fairly strong impact on the level of well-being of the population, because in some countries the level of agricultural production reaches as much as 90% of all trade goods.

Over the past decades, the agro-industrial complex (AIC) of Armenia has not been a business that would be attractive to an investor, due to a number of factors, i.e., a long production cycle, high exposure to natural risks, expressed in crop loss, the impossibility of automating biological processes and others. Until recently, the use of information technology in the agro-industrial complex was expressed only in the use of electronic computers and software with a narrow focus, in particular, financial management and transaction tracking. Despite this, information and digital technologies have great potential, through which it is possible to significantly improve the quality and efficiency of production processes in agriculture. The issues of increasing the productivity of the agro-industrial complex are becoming especially relevant in view of the rapidly growing population of the Earth, which, according to experts, by 2050 may approach 10 billion (Figure 1) [Dudnikova,Tkachev, Voloshchuk, 2019, 56-63].

Thus, the world population can reach more than 9.7 billion people, and therefore, to feed it, it is necessary to increase food production by more than 70%. Based on this, the agro-industrial complex needs to be modernized, scaled up and the efficiency of production processes increased. One of the solutions to the emerging problem is innovative activity in the agro-industrial complex, based on the active development and integration of digital technologies.
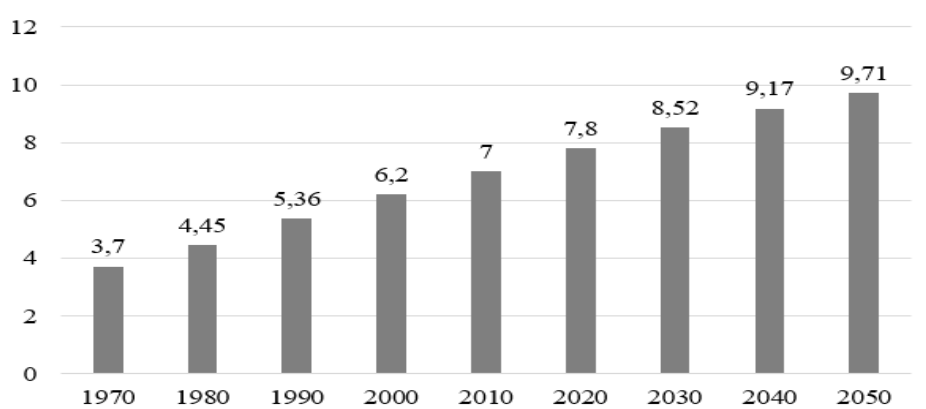
Figure 1. Projected world population (in billion people)

Methodology. Within the framework of the presented work, an analysis was made of the experience of the development and integration of information technologies in the agricultural field. The presented materials are backed up by real experience and research in this area. Theoretical and statistical research methods were used. To obtain the most relevant and objective data, statistical information was studied regarding the experience and effectiveness of the use of information and digital tools in agriculture, both around the world as a whole and separately on the territory of Armenia. The paper analyzes the current experience of using automated systems in agriculture, as well as highlights original conclusions regarding the prospects for further development in this segment.

Various scientific materials served as sources of information in the work. So, for example, the paper analyzed the scientific materials of such authors as: Dudnikova E.B., Tkachev S.I., Voloshchuk L.A., Voskoboinik V.F., Markaryan M., Cherkasov E.A., Koloskova D.A., Belova AS, Berdnova EV, Dulnev V.I., Belousov F.F., Tikhonov L.I. and others. In each of these works, the essence of the issue concerning the study of the field of application of alternative energy sources is separately disclosed. For example, in the materials used, such questions were raised as: the trend in indicators of sustainable development of agricultural production; deviation of physiological parameters in animals and computer diagnostics of diseases; information and computing support for the veterinary service; analysis of the use of automated and robotic systems in agriculture and a number of others.

Literature review. The agro-industrial complex is of tremendous relevance in its study today. To a greater extent, the relevance of studying this sector is due to the fact that it is agriculture that occupies a key place in the population of Armenian citizens. It is through agriculture that most of the food is produced, the presence of which is considered a paramount condition necessary for the life and functioning of any person. For the successful and more efficient functioning of this sector, it is necessary to integrate

and develop innovative systems and technologies that automate work activities, one of which is digital technologies. Information and digital technologies in general have more than once led to global changes in the life of society, increasing the efficiency and rationality of the functioning of processes in certain professional areas of human life.

Despite this, to date there are no studies, as a result of which an assessment of the state and prospects for the development of digitalization of agriculture is made. As a result of this factor, a problem arises, expressed in the absence of a methodological apparatus that reveals these issues, on the basis of which a vector is set for the development and development of other innovative technologies from the field of digitalization of agriculture. It is an exhaustive description of the current state and development prospects that can lead to really relevant and important research in this area, as well as direct resources to the development of innovative or modernization of existing technologies. Based on this, the author attempts to analyze the current situation and identify development prospects in the issue of digitalization of agriculture, followed by systematization of the knowledge gained [Voskobojnik, 2013, 26-29].

Analysis. According to the materials of the international independent Agricultural Policy Institute, the key trend of the world economy in the last decade is the widespread introduction of digital technologies. In agriculture, the priority direction is the use of an integrated management system for the fleet, equipment, and more. However, the level of digitalization in agriculture remains low. The world leaders in the implementation of digital technologies are IT companies, media, finance and insurance (Figure 2).

	overall level of digitalization	Asset Management	Transaction	Business Processes	Sales	Workflows
Information Technologies						
Media						
Finances and Insurance						
Wholesale						
High Technologies						
Oil and Gas						
Production of basic goods						
Logistics						
Building						
Agriculture						

McKinsey и CBINSIGHT

■ – The highest   ; ■ – High   ; □ – Average; ■ – Below average; □ – Low ; ■ – The lowest

Figure 2. Comparative level of digitalization by sectors of the world economy

As can be seen from fig. 2, the level of implementation of digital technologies in the agricultural sector is quite low today, yielding to almost all other sectors of the economy. It should be noted that according to the Ministry of Economy of Armenia, at the

current time in our country, only 10% of arable land is processed on the basis of integrated digital technologies. In parallel with this, it is noted that the non-use of innovative information technologies can lead to a loss of up to 40% of the economic effect [Markaryan, 2010, 76-84].

Despite the low level of development of digital technologies in the agro-Industrial complex today there are still a number of inventions that have proven their effectiveness in real application. Some of these examples are smart greenhouses, automatic robotic harvesters and others. In the modern world, studies of the possible integration of digital technologies in solving problems in the agricultural field continue, but this happens at a rather low level and speed. This factor is also a consequence of insufficient funding aimed at the innovative development of the agro-industrial complex [Cherkasov, Koloskova, Belova, Berdnova, 2019, 35-39].

Studying the key current directions in the field of digitalization of agriculture, it should be noted that it is robotization (automation) and work with big data that are the fundamental vectors, the development of which can increase the efficiency and rationality of technological processes in the agro-industrial complex. It should be noted that the automation of production processes is understood as the use of such equipment, which makes it possible to carry out the technological process according to a predetermined mode. In this case, a person does not use physical force, but only controls the correct operation of machines. It is also worth noting that the introduction of automatic and remote control systems for the production equipment of the agro-industrial complex is one of the priority measures to ensure the safety of workers today.

Analyzing the main processes taking place in developed foreign countries regarding the digitalization of agriculture, it should be noted that in order to ensure high competitiveness in world markets, the agro-industrial complex needs to rapidly increase the level of digitalization through the use of innovative achievements in the field of digital technologies [Dul'nev, Belousov, Tihonov, 2014, 111-116].

The Internet of Things (IoT) is a key technology that can increase the efficiency of the agro-industrial sector in the future. The Internet of Things is a network of interconnected physical things or devices that have embedded sensors, and software that exchanges data between society and information systems through a huge number of standard communication protocols. In addition to sensors, the network may include actuators that are located inside the objects themselves and operate with each other using wireless and wired networks. These devices have the following functions: reading; work activetion; programming; identification; the possibility of automated work due to the presence of intelligent interfaces. Relevant data on figure 3 shows the priority areas for the use of IoT technology in agriculture in the near future [Iskaliev, Bekaeva 2020, 52-58].
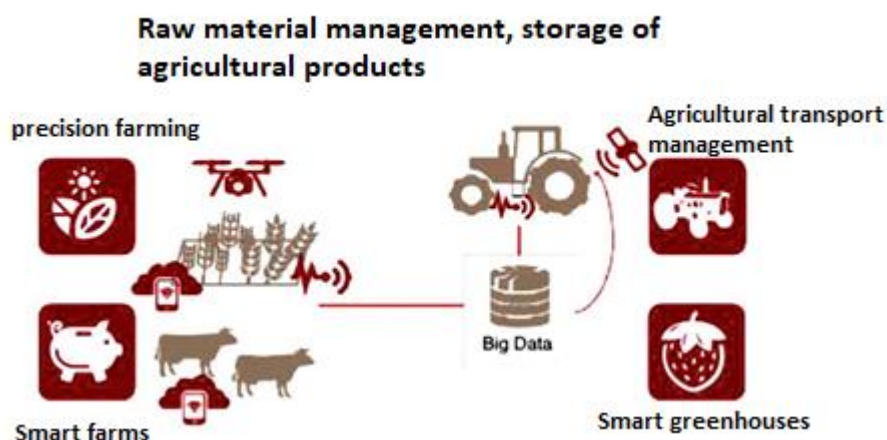
Figure 3. Areas of use of IoT in agriculture

"Smart" agriculture aims to maximize the automation of technological processes occurring in the agro-industrial complex, while increasing the yield and quality of products. For example, according to experts of this market, automated systems for feeding, milking and monitoring the health of livestock are capable of increasing milk yield by more than 30%. For example, based on the use of GPS systems or global positioning systems that can be installed at any agro-industrial complex, the farmer gets the opportunity to control the functioning of agricultural machinery. Another such means are remote measurement sensors. On their basis, on a remote basis, the level of soil moisture, air temperature, etc. is controlled. These tools alert specialists in real time, indicating the intended actions in order to carry out the necessary measures in a particular non-standard situation. Also an important role is played by various tools that allow automating business processes (Figure 4) [Plaksin I., Trifanov, Plaksin S., 2018, 36-43.].
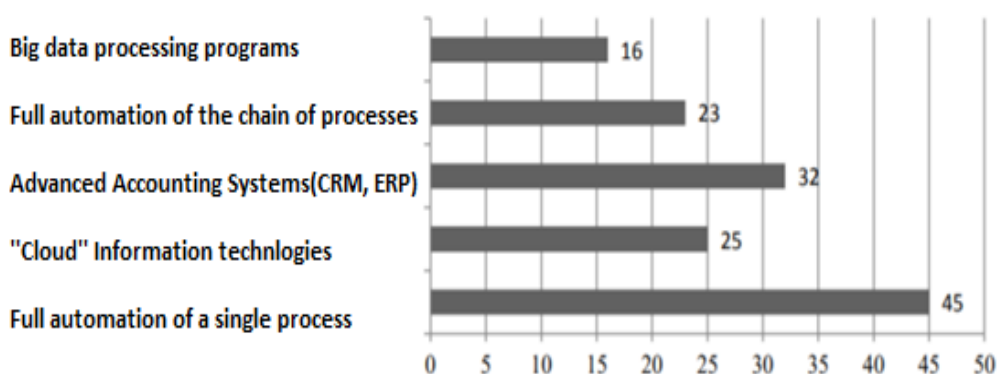

Figure 4. Implemented technological innovations in agriculture, %

The key direction of integration of information technologies in the agro-industrial complex is to maximize automation at each of the stages of production functioning in the general system. On the basis of information technology tools, the organization of systematized operations is carried out, through which the use of enterprise resources is carried out in an automated manner. Digital technologies include a number of production and software-technological tools that are combined into a technological chain through which such processes are performed as: collection, storage, processing and output of information flows. The main goal, which is laid down in the integration of IT, is to reduce labor costs when using and processing information resources.

Based on the above information, the introduction of digital and information technologies in order to provide automated technological processes in the agro-industrial complex can realize a kind of revolutionary transition in decision-making for the farmer based on tools that allow you to perform quick and accurate analyzes of certain factors.

Conclusions. The main goal of this work was to study the innovative activities related to the integration of information and digital technologies in the agro-industrial complex of Armenia. The attention of the article was focused on the impact of innovation processes and the development of technological processes in the economic aspect. Thus, the segment of information technology, which is developing at one of the most intensive rates in comparison with other sectors of the modern world, is of great relevance in almost all spheres of life of a modern person.

One of the directions of active development and integration of information technologies is the agricultural industry. Through various electronic and automated systems, modern farmers are able to significantly increase the efficiency of production on their farm. In conclusion, it should be noted that through widespread digitalization, it is possible to automate, rationalize the use of resources, and other things that can greatly increase the efficiency of the farmer's work.

The materials presented within the framework of this article can be used by scientific representatives who aim to improve the efficiency of agricultural enterprises by the integration of various information technologies. After studying this article, the researcher can find out the priority areas and prospects for the development of digital technologies in the agricultural sector, as well as get acquainted with the current information regarding the current state of development of this issue. Based on this, the presented article has the material necessary for the initial study, which introduces the reader to the key issues related to the topic of this study.

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Assessment of the relevance and effectiveness of the development of the agricultural segment based on the integration of information technologies
Key words: information technology, automation, agriculture, enterprise, efficiency, robotization, digitalization

Information technologies occupy a key place in the development of issues of improving the rationality and efficiency of modern enterprises. This direction of technological progress finds its application not only in solving various professional tasks, but also in various household and other issues of daily human activity. The widespread development of information technologies presents tremendous results in improving the efficiency and rationality of the work of modern enterprises. One of the directions of development of this segment is the agro-industrial complex. To date, various advanced and other innovative technologies are being integrated in agriculture, which greatly simplify the life of a modern farmer. Within the framework of this work, the issue related to the assessment of the relevance and effectiveness of agricultural development through the introduction of information technologies is covered in more detail. The main subtasks of this article are the study of the following aspects: the relevance of the development of information technologies within the framework of the modern agro-industrial complex of Armenia; the need for the development of information technologies within the modern agro-industrial complex of this country; promising technologies integrated today from the field of information technologies in the agro-industrial complex of Armenia. The author has obtained unique conclusions that can be useful in further research in similar fields of science.