

SMART AGRICULTURE AND ICT ADOPTION: EVIDENCE FROM AZERBAIJAN

S. MAMMADOV

Seymur Mammadov

Azerbaijan Technological University, Azerbaijan

E-mail: s.memmedov@atu.edu.az

Abstract: *It is impossible to imagine our modern era without electronic services and digital technologies. Therefore, among the strategic tasks of our time, as well as many complex issues, as well as increasing the economic efficiency of ICT in the agricultural sector, intensifying the application of digital technologies, increasing productivity in all areas of activity due to these technologies, and making additional contributions to solving the efficiency problems of the agricultural sector as a whole is more of a priority. In the world, the processes of active use of "smart" technologies have risen to the maximum attractive level for most countries, and as a result, ICT technologies are being applied in leading fields of activity. Among the selected approaches and measures related to digitization of the agricultural sector and increasing the economic efficiency of the use of information technologies, providing necessary technological assistance to entrepreneurial and economic structures, providing advice and organizing training for the organization of effective use of ICT, modeling the use of natural resources, including land and water resources, preparation of targeted action programs, forecasting of climate changes, etc. directions are more requested. These mentioned problems and tasks are a sufficient priority for Azerbaijan. It is for this reason that the article paid special attention to the issues of increasing the economic efficiency of information and communication technologies in the agricultural field in accordance with the goals of the "Strategic Roadmap for the development of telecommunications and information technologies in the Republic of Azerbaijan" as well as "Azerbaijan 2030: National Priorities for socio-economic development". Because the agrarian sphere is an important economic sphere of strategic importance for Azerbaijan.*

Keywords: *innovation, investment, digital technologies, "smart" mechanisms, diversification, economic resources.*

1. INTRODUCTION

At a time when global risks are increasing and global threats are more evident, expanding the structure of the national economy in Azerbaijan, taking fundamental measures, and increasing the maneuverability of the economy require continuous work and the preparation of more justified mechanisms. In addition, there is a serious need for the intensification of the activity processes of various areas of the national economy, including the agricultural sector, measures to improve existing mechanisms in these directions, and to carry out improvements in this regard in a continuous manner and in accordance with modern challenges. At the same time, in-depth study of the resources of economic activity areas of the country's economy, which have more resources and are considered promising, identification and regulation of the main parameters of economic development potential, updating of standards, principles and criteria in these directions should be ensured. Already, traditional approaches and mechanisms, action strategies have undergone serious deformations in the context of global threats, under the negative effects of new complex conditions caused by global world problems, and their improvement and adjustment based on

the requirements of the current era, strengthening of their legal basis and legal base are characterized as important conditions.

On the other hand, the issues of sustainable and efficient implementation of the mentioned measures, i.e., achieving progress in the direction of achieving more appropriate and higher results by using ICT in the agricultural field, have come to the fore more prominently. Complex issues, approaches and priorities for the development of ICT across the country are expressed in the relevant strategic road map (decree of the President of the Republic of Azerbaijan on December 6, 2016).

2. ICT Development and Digitalization Processes in Azerbaijan's Agrarian Sector

In that strategic document, the near, medium and long perspectives and goals related to the development of ICT were determined based on justification, and now we are living in a period where their implementation processes are accelerating. But, let's admit that from the perspective of a researcher, despite the fact that our country has two sputnik satellites, that is, a space vehicle necessary for the expansion of ICT services, the development processes of digital technologies in Azerbaijan do not show a very high speed. Especially in the regions of the country, access to digital technologies and high-speed Internet are insufficient and it is difficult to say that there is an atmosphere of satisfaction. However, even with these, an electronic government portal, a package of electronic services, various digital platforms, and social and business-oriented electronic portals are already operating in our country. It is possible to note that the processes of expanding the use of ICT in the central government executive structures, as well as mainly in large economic entities, private companies and firms, and forming a digital service package are accelerating. It is true that ICT behavior and attitudes towards ICT in small and medium-sized enterprises are not yet in line with the requirements and criteria of the information society, and such economic subjects are sometimes not even interested in using ordinary computers in their activities. One reason for this is the traditional habit and stereotype, the other reason is the lack of information about the effectiveness of ICT and digital technologies, inexperience in the development and application of these mechanisms, as well as the lack of education in this direction.

Let's take the agricultural field and the effects and additional advantages that electronic mechanisms can provide in various fields of activity in this field are enough, from increasing the efficiency of farms to monitoring animal herds through digital technologies, taking security measures, or determining the situation through drones, real-time monitoring of farmland and plantations. organization of the mechanism, processing of important information without delay due to the data for making prompt and adequate decisions and making decisions at a high level, taking additional measures, etc. it is possible to adjust the issues. Along with financial resources, improvement of the action strategy, in-depth study and assimilation of the world experience, there should be relevant legislative acts and regulations, standards and instructions for working with various electronic tools should not contradict the laws. Currently, we are witnessing that the issue of using drones or other electronic devices anywhere is not so easy, and all these should have legal bases and regulatory mechanisms. That is, the time dictates the active use of such services to the subjects of the agrarian field.

It should be noted that it is important to make the most of ICT, to accelerate the development of agricultural fields and to create raw material resources required for agricultural processing enterprises, and to take additional measures in the direction of increasing productivity. However, necessary measures should be taken to overcome such issues. That is, there should be perfect legal bases and organizational-economic mechanisms for strengthening the infrastructure, taking more educational measures about ICT, and learning and adopting examples that reflect the practical efficiency of such mechanisms. It is

known that there are many concessions and state support mechanisms in the agrarian field, and they all arise out of a certain necessity, according to which laws are adopted, regulations are developed and approved, and when necessary, supreme orders and decrees are issued that replace laws. Therefore, it is necessary to make sure that the decisions taken are based on well-thought-out and justified mechanisms and reports, and can provide certain benefits in solving the problems of the agrarian sector and increasing efficiency.

The laws of the country adopted in the period after the restoration of independence, other legislative acts emerged out of objective necessity. So, starting from the first years of the restoration of independence, acute problems were accumulated in agriculture and in the agrarian field in general, reforms should be carried out and the agrarian policy of an independent state should be formed, and effective measures should be taken according to the world experience. In such a period, it was decided to carry out agrarian reforms in Azerbaijan, and under the leadership of the great leader Heydar Aliyev, these reforms were evaluated as the first large-scale agrarian reforms among the CIS countries. With this, important steps have been taken in the direction of increasing the efficiency of the use of land resources in our country, and useful measures have been implemented in terms of employment of the population. The Law of the Republic of Azerbaijan "On the Basics of Agrarian Reform", adopted on February 18, 1995, played an important role in these directions and provided the legal basis for the regulation of relations and mechanisms related to the implementation of agrarian reforms (Aliyev et al., 2017). On the other hand, the Law of the Republic of Azerbaijan "On Land Reform", which entered into force on July 16, 1996, strengthened the legal basis for the regulation of the use of existing land resources in the country and their efficient, intended use (Ibrahimov, 2013).

Since the beginning of the implementation of the oil strategy in our country, continuous work has been done in the direction of deep reforms in various areas of the economy, and in connection with them, the reforms in the agrarian field have been remembered for their high socio-economic efficiency. In the effective use of potential resources, including arable land, the application of state support mechanisms to small and medium-sized farmers and the provision of land shares has led to certain positive results. In this direction, legislative acts were improved, simple procedures were preferred, and the elimination of bureaucracy was one of the main goals. In addition, the creation of small and medium-sized enterprises in various directions of the agricultural sector, and the expansion of the processing network were motivated and stimulated through various state support mechanisms, including tax incentives.

As the independent state agrarian policy was formed and the problems of this field were solved, attention was paid to the development and adoption of perfect laws of the country. For example, in meeting the strategic task facing the agriculture and agrarian sector - the country's population's demand for important types of food, grain products, and first of all, wheat for food production, are of great importance. "The Law of the Republic of Azerbaijan on Grain" was adopted on June 16, 2000, and with this law, a legal framework was formed regarding the activities of the state and state institutions in the development of grain production and grain farming, supporting the activities of private subjects and investors in the development of grain, and the application of modern technologies. the mechanisms and legal bases of the regulation of the processes of keeping issues in focus have been raised to a new level [8]. In addition to these, various measures were taken by the state in order to stimulate more efficient work of agricultural and agricultural enterprises, small and medium-sized business entities, farms, expanding the structure of production and increasing the volume of production in that period, and the same at that time, a special law on tax benefits was adopted. For example, on November 27, 2001, the Law of the Republic of Azerbaijan "On granting temporary tax concessions to producers of agricultural products" came into force.

After the adoption of this law, the number of economic entities operating in various directions of agriculture and the agrarian sector in general increased, and it was possible to intensify the development of investment-oriented entrepreneurs and take stimulating measures. Thanks to the introduction of various financial instruments and new mechanisms, the possibilities of stimulating the activities of agricultural subjects have been expanded. For example, by the decree of the President of the country dated October 23, 2004, the legal basis of the mechanisms for applying leasing tools in the agrarian department was created and the necessary measures were taken in this regard (Decree of the President of the Republic of Azerbaijan on additional measures in the field of leasing expansion in the agrarian division. - Baku: city, October 23, 2004). On the other hand, in order to support the activities of agricultural producers, increase their motivation to work more efficiently, and increase their production capacity, the President of the country issued a decree dated January 23, 2007 "On state support to agricultural producers" (Badirzadeh, 2021). In connection with the implementation of this order, a mechanism of preferential loans was created to increase the production of agricultural products, subsidies were determined for many products, measures were taken to strengthen the material and technical base for the development of the field on the basis of high technologies.

Since the 2000s, special attention has been paid to the strengthening of the legislative base in our country in the direction of adopting and applying electronic mechanisms, taking into account modern global challenges. Measures for the transfer of high technologies and the application of progressive world experience have already begun to expand in various areas of the economy, including the agricultural sector. Staff training and training of specialists in this field, bringing electronic devices to the country, as well as stimulation of local production in this field, bringing electronicization to the fore in product production and sales have become the center of attention.

Taking into account that one of the important issues in increasing the efficiency of the agricultural sector is the cost-effective delivery of the grown and processed products to the final consumers, their introduction to similar sales markets, and the minimization of losses in these processes. At the same time, the creation of the legal basis for the implementation of electronic resources and trade deals on electronic resources was of great importance.

3. Legal and Institutional Framework for ICT-Based Digital Transformation in Azerbaijan's Agrarian Sector

On May 10, 2005, the Law of the Republic of Azerbaijan "On Electronic Commerce" came into force based on the mentioned factors, and this law ensured the formation of legal bases for the introduction of electronic commerce and new technologies (Law of the Republic of Azerbaijan on electronic commerce. - Baku: - May 10, 2005, No. 908-IIQ). At the same time, the role of high technologies and progressive methods of operation is great in expanding the production of environmentally friendly agricultural products and exporting them to foreign markets while meeting local demand. That is, the purchase of environmentally friendly agricultural products by increasing productivity is a priority in modern times, and these issues are regulated by the relevant country's law in Azerbaijan (Ismayilov, 2017).

The issues of regulating the development of the agricultural field in accordance with the requirements of the time and evaluating scientific innovations using ICT in these directions, developing the field on scientific basis are of great importance. It is extremely important to consider these factors in practical processes and to have legal bases for regulation. In this regard, the Decree of the President of the country dated April 16, 2014 "On measures related to the improvement of management in the agricultural sector and acceleration of institutional reforms" was effective in realizing the intended issues and making improvements (Ismayilov,

2017). As a result, the existing mechanisms of action were maximally updated, institutional and structural reforms were carried out, attention was paid to transparency issues, and expansion of the scope of electronic services was a priority. The Decree of the President of the Republic of Azerbaijan dated April 16, 2014 on "Establishment of the Electronic Agriculture System in the Ministry of Agriculture" has caused fundamental changes in this field.

Thus, electronicization processes have been accelerated and due to the expansion of electronic services, the efficiency of management, control and implementation processes has been increased in various areas of agriculture and in the agrarian field in general (Ilyasov, 2013). At the same time, the creation of the "Electronic agricultural information system" has also created additional opportunities for increasing productivity. The operating principles of this system include transparency, organization of efficient management, acceleration of the introduction of innovations, expansion of business processes, etc. they attract more attention (<https://www.agro.gov.az/az/ekt/ektis-de-sistem-in-integrasiyasi-ve-movcud-funksiyonalligi>). Various ICT mechanisms and digital services in the agricultural sector are already effective and these issues have been raised to the level of priority.

In general, in increasing the socio-economic effect in agriculture and the agrarian field, in creating new jobs, in creating farms and agricultural enterprises taking into account traditional and common interests, in the productive use of various economic forms, as well as in the renewal and improvement of cooperative relations based on ICT mechanisms in the legislation detection and elimination of existing gaps is one of the important conditions. In terms of the mentioned factors, the Law of the Republic of Azerbaijan "On Agricultural Cooperation" adopted on June 14, 2016 has given a new breath to the cooperative movement and cooperative relations.

At the moment, the main goal is the effective integration of farms and other entrepreneurial subjects, individual entrepreneurs engaged in the agricultural field, citizens in various forms of subjects, public associations, as well as cooperatives, the creation of effective collectives and teams, the effective use of modern high technologies to achieve the set goals, and ICT-based it consists of giving preference to action mechanisms. Such approaches are the demand of the times. (<http://mincom.gov.az/az/view/news/615/reqemsal-iktisadiyyatin-esasi-kimi-ikt-infrastrukturu-movzusunda-beynelxalq-seminar-kechirilib>).

It should be noted that the continuous visits of the President of the country to the regions, familiarization with the existing problems on the spot, the creation of necessary infrastructure, the acceleration of socio-economic development and the allocation of additional funds from the reserve fund of the President for the implementation of priority projects, as well as the issuance of relevant presidential orders and decrees, will increase economic activity in the regions. , at the same time, it made it possible to create a solid foundation for expanding the use of modern technologies. In this regard, the need for our citizens to operate in a more transparent environment, to sufficiently benefit from their labor and citizenship rights, and to take necessary steps to ensure the openness and transparency of the society and the economy, has greatly increased the demand for an honest and transparent information society.

Accelerating the implementation processes of the "State Program for the Implementation of the National Strategy for the Development of the Information Society in the Republic of Azerbaijan for the Years 2016-2020" approved by the Decree of the President of the Republic of Azerbaijan dated September 20, 2016, in increasing the activity of civil society in our country and forming new sources of economic development. , played an effective role in identifying problems and determining their solutions.

In addition, in the Agrarian Research Center under the Ministry of Agriculture of the Republic of Azerbaijan established by the Decree of the President of the country dated May

22, 2018, purposeful work and scientific research are being carried out in the direction of the development of the field on a scientific basis. The decree of the President of the Republic of Azerbaijan dated December 14, 2018 "On the establishment of the Agricultural Supply and Supply Open Joint-Stock Company" was issued for the purpose of maximally efficient supply of products produced in the agricultural sector, elimination of defects in the processes of creation of reserves and delivery to final consumers, regulation of retail (Decree of the President of the Republic of Azerbaijan on the establishment of the Agrarian Research Center under the Ministry of Agriculture of the Republic of Azerbaijan. - Baku: - May 22, 2018) . At the same time, it is a priority to evaluate the use of ICT mechanisms in the development and modernization of management bodies in the agricultural sector (decree of the President of the Republic of Azerbaijan on December 6, 2016).

It is important to regulate the activities of agricultural subjects in accordance with the requirements of the time, to obtain necessary information about scientific-technological and digital technologies and to adopt progressive experience, to apply advanced technologies and effective methods, models, to provide agrarian services in order to increase productivity and reduce losses.

Based on these factors, the priority tasks, functions and rights of the new and important central state institution were determined by the Decree of the President of the country dated May 21, 2019 "On the approval of the Regulation on the Agrarian Services Agency under the Ministry of Agriculture of the Republic of Azerbaijan" (Aliyev et al., 2017) . Such services have already been actively provided in the regions of the country.

We would like to touch on one issue. As is known, forecasting of activities in the agricultural field, implementation of projects, etc. the issues are quite complex, this field is also associated with various risks, and for these reasons, potential investors have difficulty and hesitate to invest in the agricultural field. Therefore, the functioning and transparency of insurance mechanisms, as well as their effectiveness, are considered important.

Drought, natural disasters, etc. The role of the insurance service in covering a significant part of the losses of agricultural subjects can be very effective. At the same time, the presence of effective insurance mechanisms would further increase the motivation for the increase of economic activity in the agricultural sector, the transfer of high technologies and the application of ICT mechanisms. In general, the creation of the legislative framework of the insurance mechanism in the agricultural field has attracted attention as a subject of discussion for many years.

Finally, on August 19, 2019, the Law of the Republic of Azerbaijan "On Agricultural Insurance" was adopted (Aliyev et al., 2017). There are facts that the first insurance payments have already been made to the affected farmers and rural households, and these should be considered commendable. New opportunities are opening up for the more reliable organization of activities in the agricultural field, as well as the expansion of risky, but profitable areas of activity using ICT, and in the near future, these may give their results.

Another historical and important issue for our country is the liberation of our lands and brutally destroyed villages, towns and cities that have been in the hands of the enemy for nearly 30 years. Already, large-scale revitalization and rehabilitation projects are being implemented in these areas, infrastructure is being created, housing estates are being built, roads and bridges are being built, and the restoration of economic areas has begun. Two new economic regions - Karabakh and Eastern Zangezur economic regions were created in the territories freed from occupation, and both regions have strong agricultural potential. It is gratifying that the pilot projects implemented in the liberated territories are based on "smart" technologies.

The application of high technologies on a large scale is the highest priority, and already the commissioning of Fuzuli International Airport, the laying of the foundations of the

"Aghdam industrial park" and the "Araz Valley Economic Zone", the intensive implementation of the "Smart village" pilot project in the area of Agali villages of Zangila, and a - the holding of groundbreaking ceremonies for other projects one after the other suggests that the demand for ICT in the territories freed from occupation will increase even more in the near future. (www.economy.gov.az)

Taking into account the negative effects of the COVID-19 pandemic on the agricultural sector in the liberated territories and other regions of the country, development priorities and directions of action require the application of ICT-based mechanisms in a wide format. The efficient operation of automated livestock farms and complexes, irrigation systems, management forms seems to be the most realistic at the expense of ICT, and since these issues are justified in the world experience, the ICT factor must be seriously considered and evaluated in practical processes. At the same time, taking into account the territories freed from occupation, specifying and defining the ways of increasing the economic efficiency of ICT in the agricultural field can be more effective.

No matter how fast Azerbaijan develops in terms of industry, even if it has the strongest industrial sector in the region, as well as the world-class high-tech oil and gas industry, it is not necessary to forget that Azerbaijan is also an agrarian republic, half of our population lives in rural areas. Traditionally, strong agricultural fields and agro-industrial complex have been formed and developed in Azerbaijan. In the context of global threats and in the provision of food security, which is one of the most complex problems of the millennium, the multiplier effect of the agricultural sector is great in reducing the level of hunger and poverty, as well as unemployment.

However, over time, the problems are also increasing, as due to global warming, land areas are decreasing and becoming flooded, salinized, drought levels are increasing, agricultural development is depleting resources, and the constant growth of the world's population is making the demand for new food resources even more acute. All this sets new tasks for the agrarian sector, giving greater priority to science and technology-based development in solving the problems of increasing productivity, ensuring productivity through extensive development, increasing the caloric value of important food products, increasing their quality, reducing losses, and making processing processes more efficient. organization etc. it requires a complex and systematic solution to such issues.

The agrarian field consists of complex elements and mechanisms due to its formation and development characteristics. It is known that humanity is faced with global hunger and food security, which is one of the most serious and acute problems of the millennium. The efforts of the leading world states and international organizations in this field are still not at the desired level and the expected results have not been achieved. On the contrary, the COVID-19 pandemic has made the problems in this direction even more complicated. In view of the above, increasing the efficiency of ICT use in the agricultural field can allow to eliminate a certain part of the mentioned problems. Thus, the active application of digital technologies increases efficiency and efficiency, and creates conditions for making adequate and preventive decisions. Digitization refers to the complex and integrated application of information and communication technologies in the economy and society. Digital technology has great potential in saving production resources, simplifying documentation and improving the quality of decision-making and farm management.

Digitization aims to help make agriculture productive, sustainable, efficient and environmentally friendly, i.e. purposeful use of production resources with minimal loss to produce food products of high quality and minimal impact on the environment. Agriculture mostly produces under the open sky and works with living organisms, which means that it is characterized by complex and dynamic production conditions that are difficult to predict and regulate, which creates additional problems in production processes (<http://mincom.gov.az>)

gov.az/az/view/news/615/reqemsal-iktisadiyyatin-esasi-kimi-ikt-infrastrukturu-movzusunda-beynelxalq-seminar-kechirilib).

Approaching from the importance of modeling the development of the agricultural sector in Azerbaijan, improving it in accordance with the requirements of the global era, as well as in the conditions of the justified determination of strategic goals, it is possible to note that the disclosure of the real potential in the activity of the agricultural sector, the important aspects of bringing global approaches and the use of high technologies to the fore in a wider scope being understood and implemented. The point is that the implementation of these strategic approaches and priority tasks, the acceleration of the development of the agricultural sector on the basis of ICT, as we mentioned at the beginning, is a very complex issue and requires the solution of many problems. We have also seen from the international experience that due to the efficient use of ICT, extensive development of the agricultural sector, increase in productivity, reduction of manual labor, higher results can be achieved by using "smart" technologies in animal husbandry and crop production, optimization of the cost of the products to be produced, it is possible to increase the level of profitability (<https://www.agro.gov.az/az/ekt/ektis-de-sistemin-integrasiyasi-ve-movcud-funksiyonalligi>). In addition, the issues of activating the use of ICT during the development of agricultural areas, increasing the variety and volume of food products, and determining the solutions to the problems of reducing the level of hunger and poverty have also become very relevant for the agrarian sector of our country, and especially in the projects that are currently being implemented in the revitalization of territories freed from occupation. is a much sought after tool. For example, construction of residential areas based on "smart" technologies, creation of agro-industrial infrastructure, preference for digital technologies in entrepreneurship and business development can be examples of this.

4. The Role of Agrarian Reforms and Digital Technologies in Strengthening Food Security and Economic Growth

Under the conditions of the development of economic forms based on private property in the agrarian field, entrepreneurial activity was rapidly formed, free production-economic relations were established, interest in the proper realization of the produced products, the effective use of financial results, and the improvement of the living conditions of the population increased. The agrarian reforms carried out in the republic were of a complex nature and included both agricultural enterprises and processing and service enterprises. The results achieved during the agrarian reforms implemented in Azerbaijan are generally positively evaluated by both local experts and experts of international organizations. The goal of the agrarian reforms carried out in the Republic of Azerbaijan as well as in the post-Soviet countries at the initial stage of the transition from the administrative - emirate economy to the market economy can be formulated as follows: to achieve the development of private ownership in the agricultural sector and the establishment of an economic system based on market relations in general, to bring the agricultural sector out of the crisis situation and creation of food abundance in the country. In accordance with these goals, the structure of the agrarian field was renewed, the plots of land were privatized and the agricultural production units were reorganized. The infrastructures of the agricultural sector have been created, the market has been liberalized. The level of payment of the country's demand for argar products at the expense of domestic production has been significantly increased.

Taking into account the importance of the agricultural sector, agrarian reforms in this sector should be continued, these reforms should be continued on the basis of new, modern information technologies. Reforms carried out on the basis of modern information technology have created a certain revival in the field of agriculture as well as in other fields of the Republic of Azerbaijan. This is evidenced by the stabilization of the level of investment in

agriculture and the increase in competition between agricultural producers. At the same time, the volume and quality of the use of modern technologies, including data collection, storage and processing systems, in the agro-industrial complex is also increasing. At the same time, both the volume of data and the need for high-quality processing and reliable results that can be relied on for decision-making are increasing. As a result, there is a demand for analytical systems and especially deep analytics for rural agriculture.

There are areas of the economy in which it is absolutely necessary to adopt innovations, for example, agriculture and the agrarian sector can be a clear example of this. The great role of the agricultural sector in solving the problems of solving food security problems, creating food abundance, strengthening food security, providing access to important food products, providing food in a stable form in accordance with the financial capabilities and consumption level of all sections of the population for a sustainable and long-term period and has multifaceted functions.

In this area, both food products are grown and the economic activity of rural regions is increased, new opportunities are formed for increasing the income of the population, the potential for strengthening employment is created, the threat of forced migration of labor resources is reduced, and in general, the opportunities for solving the socio-economic problems of the territories and regions are expanded. To a large extent, accelerating the development of the agricultural sector based on new technologies has a positive effect in a number of directions and has a multiplier effect on other areas of the country's economy as a result of mutual relations:

- 1) diversifies the structure of the national economy;
- 2) ensures effective use of existing natural and economic resources of the regions;
- 3) makes significant contributions to the development of the non-oil sector;
- 4) plays an important role in increasing non-oil exports;
- 5) the development of the agricultural sector has a strong impact on increasing the economic activity of the country's regions;
- 6) strong potential is realized in solving employment problems of agricultural fields and agrarian sector;
- 7) the balanced development of the agricultural sector is one of the important activities of the country's food security and acts as a guarantor of national economic security and food security;
- 8) the development possibilities of the agrarian field are suitable for the application of new technologies and there is a great need for this;
- 9) the formation and development of innovative entrepreneurship is accelerated due to the application of agrarian ICT, etc

On the other hand, it is important to have an internet infrastructure that allows for a more efficient solution to socio-economic development issues and to form an internet network, especially high-speed broadband internet opportunities and provide services. If we approach these problems in the example of Azerbaijan, we should note that our country is just forming conceptual approaches and operational mechanisms related to ICT, we still need to study the world experience at a high level and look at the issues of application in accordance with the economic goals of our country.

If this is the case, we hope that our country's continuous ICT-related policy and measures taken will bear fruit, and it will be possible to effectively use the opportunities of ICT in various areas of the economy, including the agricultural sector. Only after that, a solid foundation can be created for modeling the development of ICT on a wider level in our country, and for the implementation of large-scale investment-innovation and technological-digital projects. Along with these, measures should be taken to build confidence in the use of ICT services, prevent inequality in the distribution of information resources, organize the

effective use of ICT to strengthen the safety of people's lives and the stability of society, update the currently used technologies, and basically form new generation networks.

These factors and approaches to the mentioned issues are considered very important for all areas of society and all sectors of the economy, including the agricultural sector in our example. Solving the efficiency problems of the agricultural sector is one of the important factors in the production and creation of reserves of important types of food products in the country, and also, as we said earlier, the development of the agricultural sector based on ICT could have a great effect in eliminating dependence on imports, and it is possible to note that these processes have already begun.

The problems and solutions of the diversification and diversification of the country's economy require a complex and systematic approach, and here the main priority is the involvement of the possible resource potential of the economy in the economic and financial circulation, the creation of fertile conditions for investments, and the application of mechanisms and tools that allow ensuring economic efficiency. . The main goal of these approaches and priority activities is to minimize the dependence of the economy on the oil and gas factor. In a word, the creation of effective mechanisms for the productive and innovative development of the economy, as well as increasing the efficiency of those mechanisms due to the application of ICT, attract more attention. On the other hand, it requires the creation of a business environment that allows for innovative and intensive development in the country, increasing the attractiveness of investment and innovation, as we mentioned earlier, the creation of appropriate ICT infrastructure in the regions of the country as well as in the central cities. In addition, taking into account that the measures taken regarding the effective use of ICT are at the initial level, special attention should be paid to the issues of training high-level and qualified personnel and training specialists in this field along with the relevant infrastructure.

It should be noted that in the current conditions, it is impossible to imagine effective economic development and progress without ICT. The Internet and electronic resources have laid the foundation for revolutionary changes in society and economy, and these processes are deepening to the maximum. In particular, the great importance of ICT resources and infrastructure can be shown from the point of view of the rapid spread of progressive practice at the global level, as well as from the point of view of information exchange. Realizing the importance of maximum acceleration of ICT infrastructure development, at the same time, they are striving for the development of technologies, their development and application, and the spread of digital mechanisms and tools with greater intensity in areas of economic activity. It is believed that ICT resources will be in greater demand in the near future as one of the most productive tools for increasing the efficiency of the economy. These resources allow entrepreneurs, every specialist, tradesman and citizen to form and develop their socio-economic relations (Badirzadeh, 2021). We are also of the opinion that ICT has a strong influence in terms of realizing the existing potential of various sectors of the economy and stands out for its strong potential in eliminating problems in this field with its multifunctional capabilities, in developing more effective and productive mechanisms and operational tools in accordance with the requirements of the time.

5. Strategic Roadmaps and ICT-Based Modernization of the Agrarian Sector in Azerbaijan

In recent years, new mechanisms and tools for the development of the agricultural sector and the realization of the strategic goals of agriculture have been defined in our country, and continuous measures are being taken in these directions. Even in the decree of the President of the country dated April 16, 2014 "On measures related to the improvement of management in the agricultural sector and the acceleration of institutional reforms", it is envisaged to improve the management processes in this field in accordance with the

requirements of the modern era, and to accelerate the application of new technologies [4]. It is as a result of the implementation of this decree that preference was given to development on scientific grounds in the agrarian field and in the leading directions of agriculture, and attention was paid to the application of new technologies and electronicization. On the other hand, in the "Strategic Roadmap for the perspective of the national economy of the Republic of Azerbaijan" approved by the decree of the President of the country dated December 6, 2016, along with a number of goals, the application of new technologies, including digital technologies, was given serious importance in almost all directions. In addition, in the "Strategic Road Map for the Development of Telecommunications and Information Technologies in the Republic of Azerbaijan", approved by the decree of the President of the country dated December 6, 2016, the issues of expanding ICT services and actively applying digital technologies in all areas of society and economy are specifically addressed. found the opposite. In another strategic road map, the "Strategic Road Map for the production and processing of agricultural products in the Republic of Azerbaijan" approved by the same decree, a wide range of measures were provided and the goals of electronicization were mainly prioritized. As one of the sectors of the economy where the impact of ICT can be significantly positive, it is justified to take systematic measures in the agricultural sector in recent years. Thus, with the productive use of ICT in the agrarian field, as well as in various areas of agriculture, including the active application of new technologies, additional opportunities arise to achieve productivity growth, sale and export of cultivated products under more favorable conditions.

We are of the opinion that there is a greater need for new formats and approaches in the development of the agricultural sector in our country and its modeling in the regional aspect, and we consider it important to give more importance to the issues of increasing the economic efficiency of ICT in these processes. This necessity is also directly related to the new objective realities, as we stated at the beginning. In all regions covered by the agrarian sector of our country, including the territories freed from occupation, and in its agro-processing enterprises, high technology-based approaches should be unequivocally and intensively dominated, and serious importance should be given to the wider application of electronic and digital mechanisms, and as a result, the development of the agrarian sector intensification, increasing the economic efficiency of ICT should be achieved.

In order to model and improve the development of the agrarian field in the context of the goals arising from the strategic road maps, and in order to increase efficiency, we are of the opinion that in our country, first of all, in the regions, in the subjects of agriculture and the agrarian field in general, in rural districts and rural settlements, even in remote villages, computers and Internet networks, more measures should be taken to actively use various ICT products and programs, accessibility of these technologies and services should be ensured. At the same time, on the basis of such technologies, it is possible to take effective measures in a number of important areas of activity in the agricultural field:

- systematically analyzing the activities of farms and taking complex measures, establishing a "smart" management system;
- regulation of activity processes in remote form, assignment of additional tasks and monitoring of resource use;
- greater emphasis on intelligence in the management of agricultural production areas, detection and evaluation of cost reduction resources;

In modern times, ICT development problems should be the highest priority for our country, and the amount of financial resources directed to this field should be increased. So, in order to achieve high results in these directions, the market of technologies and innovations should be developed, the factors of freedom and freedom of the economy should be taken into account, the institution of free economic zones should be formed, more high

technologies - ICT-based technoparks, agricultural industrial parks, agricultural science and industry parks, special economic zones, agrarian clusters, etc. should be organized.

Currently, 51 agrarian parks have been established and are in the process of being established in most regions of our country, and these parks are given ten-year tax and customs concessions by the state, but we believe that although these steps are a progressive approach, the agroparks created and operating are mainly those of ordinary farmers and agricultural enterprises. They are not so different. One of the main reasons for this is the lack of widespread use of ICT mechanisms.

The attitude towards digital technologies is becoming conceptual, and focusing not only the central links of state structures, but also structural units at the regional and local level, private sector subjects and state enterprises on expanding the use of ICT is becoming a priority task. For this, the current situation in our country should be viewed and evaluated in the context of global changes and risks. At the same time, in terms of the new situation and realities, it is important to determine more favorable ways of increasing the economic efficiency of ICT in the agricultural sector, taking into account our territories freed from occupation, and we will focus on these issues in the last paragraph.

There is a great need to increase the economic efficiency of the agricultural sector, increase productivity and rationally use the resources in this field, to update and improve the mechanisms, to develop and implement more efficient mechanisms using proven and tested technologies in the world experience. When we looked at the world experience, we noted different aspects of approaches related to them and focused on the adaptability of the experience of certain countries for Azerbaijan, and we will express their summarized content in the final part of the work. However, we believe that in the coming years, a more advanced stage of economic reforms and transition to technological innovation should be started in Azerbaijan. In addition to the leading oil and gas sector of the country's economy, other economic sectors should be modernized at a high level, the application of ICT should be deepened to the maximum, and the use of digital mechanisms should be intensified (Azerbaijan 2020: a vision of the future Development Concept).

It is very important to model the activity of the agricultural sector, to develop more profitable and attractive mechanisms of action, to increase the level of profitability of this sector. There are certain stereotypes, lack of treatment, etc. ways to get rid of such factors and situations should be sought and determined at a more fundamental level. In other words, the agricultural sector should not be understood as subsidies, preferential state support mechanisms, we also agree that such approaches are widespread in the world experience, but there is also a truth and reality that Azerbaijan is also a part of the world, has moved to a market economy and as a basic principle efficiency of the economy is accepted. In other words, the agrarian sector should be developed to such an extent that more technological innovations and ICT should be used so that the optimization of costs incurred, i.e. reducing costs, and balancing the incomes of the participants in production - production subjects, become possible, which in turn are important increase the interest in the production of food products - agricultural products, motivate and form additional incentives for efficient operation. Of course, all these are complex processes and require the further intensification of institutional and structural reforms at the country level, the maximum updating of economic development priorities in the regional aspect and their adaptation to current challenges, the determination of multiplicative goals taking into account prospective development determinants, that is, approaches to the development of the agricultural sector, applied ICT and other models based on digital mechanisms, "intelligent" technologies, as well as allowing the discovery of the potentials of creating added value and forming financial sources of this area and other related economic areas, and being involved in economic, commercial and financial circulation, as well as accelerating the economic development of the agricultural

sector, social development in the regions and in our country - it is possible to make additional contributions to economic development processes. Therefore, while accepting that science and technology are the main factor of economic development and progress of the 21st century, it is necessary to master the ways and methods of sufficiently benefiting and using this factor effectively. mechanisms, action strategies and models that can realize their potential should be defined, developed and actively used in them.

Formation of the material and technical base for the development of large-scale infrastructure, rehabilitation and revival, social and production areas in Karabakh, Eastern Zangezur economic regions, implementation of local, republican, regional and world-level projects on various types of transport, reconstruction of the railway network, a putting into operation the international airport - Fuzuli International Airport, laying the foundations of Zangilan and Lachin International Airports, conducting intensive work at the international level in connection with the opening of the Zangezur Corridor, which will connect Azerbaijan with the Nakhchivan Autonomous Republic, which is part of it, and the development of various directions of the hemp industry in these economic regions and as a whole starting the implementation of measures for the evaluation and efficient use of the development resources of the agrarian area, for example, the intensification of the processes of creating the Agdam industrial park, which will consist mainly of agro-industrial processing enterprises, the foundation of the "Araz Valley Economic Zone" in Jabrayil district, the electricity of the lands freed from occupation, formation of stable supply systems with drinking water and natural gas, construction of new networks and substations, establishment of enterprises, construction of residential areas, taking measures to ensure socio-economic development in various directions, giving priority to the creation of effective and multifunctional ICT-based action mechanisms in the agricultural field draws attention. We believe that in these processes, the rapid adoption of new technologies, especially in the socio-economic development of the region and the acceleration of the solution to the employment problem after the return of the "Great Migration", the expansion of the activities of agricultural fields and the increase of the role of the agricultural sector in the economy of the region in general will play an important role. Therefore, it is important to use these mentioned directions of activity more productively due to increasing the economic efficiency of ICT in the agricultural field. It is true that different types of state programs and strategies are implemented in our country and national priorities are targeted. Currently, the "State Program for Socio-Economic Development of the Regions of the Republic of Azerbaijan in 2019-2023", approved by the order of the President of the country dated January 23, 2019, is being implemented, and in this program, increasing economic activity in the regions of the country, especially the main non-oil sector of the agricultural sector, is being implemented.

CONCLUSIONS AND SUGGESTIONS

The directions of modeling the priorities of increasing the efficiency of the use of ICT in the agricultural field and determining the areas in which such technologies bring more benefits have been fundamentally analyzed and theoretical-methodological approaches have been systematized and evaluated in accordance with the challenges of the modern era. In addition, taking into account the strategic role of the agricultural sector and the agro-industrial complex in the formation of the long-term reliable supply of the country's population with important types of food, conceptual approaches to the use of ICT in the agricultural sector were determined and efforts were made to enrich them with author's approaches.

The materials we have prepared for the study of the directions of increasing the economic efficiency of ICT in the agricultural field, the researches we have made possible to formulate a group of results, and they are as follows:

1. The efficiency issues of ICT in the development of the agrarian field have not yet entered an intensive phase, and the implementation of targeted programs in these directions, there is a serious need to develop the development of the agricultural sector on the basis of more sustainable and different mechanisms and to expand the role of ICT in those processes.
2. Complex measures related to the creation of a more productive activity environment in the agricultural field and the introduction of mechanisms, the cultivation and collection of products and the reduction of losses to a minimum level, the creation of reserves, the development of more effective action strategies, the increase of the efficiency of ICT in the processes of delivering competitive agricultural products to consumers, and including institutional measures should be implemented, state policy should be improved and state support mechanisms should be in line with the challenges of the modern era.
3. Sufficiently benefiting from the ICT experience of technologically developed countries and the mechanisms of using digital technologies are important conditions, and if we proceed from these factors, we believe that in the near future, a deeper study of the world experience, taking effective measures to increase the economic efficiency of ICT, especially in the agricultural field, the application of digital technologies in a wider spectrum, the justification and implementation of projects on the basis of "smart" technologies, the wide use of the opportunities of ICT in increasing the attractiveness of the investment-innovation environment in the country should be systematic, and optimal control and implementation mechanisms should be developed.

REFERENCES

1. Strategic Roadmap for the development of telecommunications and information technologies in the Republic of Azerbaijan. It was approved by the Decree of the President of the Republic of Azerbaijan dated December 6, 2016. - Baku: - 2016. - 65 p.
2. Decree of the President of the Republic of Azerbaijan on additional measures in the field of leasing expansion in the agrarian division. - Baku: city, October 23, 2004, No. 468.
3. Azerbaijan 2020: a vision of the future Development Concept: Monitoring Report on the direction of development of information and communication technologies. Center for Economic and Social Development Fund for the Development of Entrepreneurship and Market Economy Swiss Agency for Development and Cooperation. - Baku: - 2016, - 32 p.
4. Strategic Roadmap for the production and processing of agricultural products in the Republic of Azerbaijan approved by the decree of the President of the Republic of Azerbaijan on December 6, 2016. / – Baku: – 2016. – 177 p.
5. Aliyev, I., Soltanli I. Problems of modernization of the agricultural sector and ensuring competitiveness. - Baku: European publishing house, - 2017 - 428 p.
6. Decree of the President of the Republic of Azerbaijan on the establishment of the Agrarian Research Center under the Ministry of Agriculture of the Republic of Azerbaijan. - Baku: - May 22, 2018, No. 89.
7. Badirzadeh, G.Ş. Evaluation of the efficiency of information and communication technologies in the development of the agricultural sector in Azerbaijan // - Baku: Journal of agricultural economics, Baku. 2021, – P. 55-64.
8. Law of the Republic of Azerbaijan on grain. Baku city, June 16, 2000, No. 898-IQ.
9. An international seminar on ICT infrastructure as the basis of the digital economy was held: [Electronic resource] / URL:<http://mincom.gov.az/az/view/news/615/reqemsal-iktisadiyyatin-esasi-kimi-ikt-infrastrukturu-movzusunda-beynelxalq-seminar-kechirilib>.
10. Ilyasov, RA New management era - electronic government. [Electronic resource] / URL:<https://modern.az/az/news/43620>.

11. System integration and existing functionality in EKTIS. [Electronic resource] / URL:<https://www.agro.gov.az/az/ekt/ektis-de-sistem-in-integrasiyasi-ve-movcud-funksiyonalligi>.
12. Law of the Republic of Azerbaijan on electronic commerce. - Baku: - May 10, 2005, No. 908-IIQ.
13. Ismayilov, V.I. Improvement of the organizational and economic mechanisms of production and sale of products in the agrarian department: / Doctor of Economics Diss. Abstract. / – Baku, 2017. – 59 p.
14. Ibrahimov, ER Ilham Aliyev and modern agrarian policy. / Baku: Azernashr, 2013. – 936 p.
15. www.economy.gov.az