

Personal de transformación digital en la agricultura.

Personnel of digital transformation in agriculture.

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AYBIKA I. BEKSULTANOVA

Chechen State University named after A. A. Kadyrov  
Address: 32 A. Sheripov Street, Grozny, 364024, Russia  
[beksultanova.chesu@bk.ru](mailto:beksultanova.chesu@bk.ru)

PETMAT M. DZHANKHOTOVA

Chechen State University named after A. A. Kadyrov  
Address: 32 A. Sheripov Street, Grozny, 364024, Russia  
[dzhankhotova.chesu@ro.ru](mailto:dzhankhotova.chesu@ro.ru)

Recibido/Received: 14-02-2023. Aceptado/Accepted: 19-12-2023

Cómo citar/How to cite: Beksultanova, Aybika I. & Czhanxhotova, Petmat M. (2024).  
Personnel of digital transformation in agriculture. *Sociología y Tecnociencia*, 14 (1), 106-114. DOI: <https://doi.org/10.24197/st.1.2024.106-114>

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**Resumen:** El artículo sistematiza las tendencias mundiales en la difusión de tecnologías digitales en el campo de la agricultura. Con base en los datos de la observación estadística federal, así como del seguimiento de la madurez digital, se presentan resultados cuantitativos de la participación de los especialistas en TIC (incluidos los especialistas en TI) en el campo de la agricultura en el período 2019-2021. El propósito de este artículo es identificar el problema de la falta de personal calificado con competencias digitales en la agricultura, mostrar la situación actual de los recursos humanos, así como hacer recomendaciones sobre medidas de apoyo estatal.

**Abstract:** The article systematizes global trends in the spread of digital technologies in the field of agriculture. Based on the data of the federal statistical observation, as well as monitoring of digital maturity, quantitative results of the involvement of ICT specialists (including IT specialists) in the field of agriculture in the period 2019-2021 are presented. The purpose of this article is to identify the problem of the lack of qualified personnel with digital competencies in agriculture, to show the current situation of human resources, as well as to make recommendations on measures of state support.

**Keywords:** Human resources, digital transformation, agriculture .

**Palabras clave:** Recursos humanos, transformación digital, agricultura .

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## 1. INTRODUCTION

The deployment of the digital revolution on a global scale is increasingly immersing us in a new reality (Berezhnoy, 2018). The variety of technical and technological innovations that change our lives has increased many times in the last decade, and in the most diverse areas of human life (Sadovaya, 2018).

When it comes to digitalization, first we mean the infrastructure, hardware and software, the list of Internet platforms and offers (Beksultanova, Vatyukova & Yalmaeva, 2020).

Digital transformation is one of the national development goals of Russia until 2030. The use of digital technologies is designed to ensure qualitative changes in agriculture and social sphere, including in public administration. At the same time, the success of transformations largely depends on human capital, "digital" personnel — the shortage of IT specialists in 2024 is projected at the level of at least 1 million people.

In our country, the assessment of the digital maturity of key sectors and the social sphere as one of the indicators

The achievement of the national goal "Digital Transformation" is carried out according to three components: specialists who intensively use ICT; expenses of organizations for the introduction and use of modern digital solutions; industry indices, including a unique set of indicators for each industry (on average, 8-10 indicators for each of the 12 industries) (Order of the Ministry of Digital Development, 2020). These indicators allow us to reflect the most important factors for achieving digital maturity — resources (personnel and investments) and industry specifics of the spread of digital technologies.

The federal project "Personnel for the Digital Economy" solves the tasks of training specialists, as well as improving the digital literacy of the population necessary for the use of digital technologies. In addition, the national program "Digital Economy" from 2022 will be supplemented by the federal project "Development of human resources in the IT industry" - the government plans to allocate more than 27.9 billion rubles for its implementation by 2024, Deputy Prime Minister Dmitry Chernyshenko said (Tolmachev, 2021).

The demand for "digital" specialists in Russia is growing every year. Due to the increasing pace of digitalization, not only IT companies need labor, but also other industries. The country lacks 1 million IT personnel. By 2027, this figure may double.

In recent years, the state has been promoting initiatives to train specialists: the main plans and initiatives are provided for by the federal project "Personnel for the

Digital Economy" and "Development of human resources in the IT industry" of the national program "Digital Economy". They are aimed at teaching students programming, developing digital skills in students of other fields and improving the IT competencies of university teachers.

Federal projects should help to cope with the shortage of IT personnel, and if the situation changes, they will respond and be supplemented with new measures. However, many initiatives in this area are not a matter of one day: it will take several years to assess the effect of such measures as increasing the number of specialized budget places in universities.

## 2. MATERIALS AND METHODS

The work contains the results identified in the framework of published reports and analytical materials of international organizations, specialized analytical publications, data from foreign and Russian news agencies, as well as interviews and articles by leading analysts and experts. The methods of the performed research contain theoretical and empirical parts, methods of description and are supported by graphical methods of illustrating data. The purpose of this article is to identify the problem of the lack of qualified personnel with digital competencies in agriculture, to show the current situation of human resources.

The following research methods were used in the work:

- Comparative approach;
- Classification;
- Generalization;

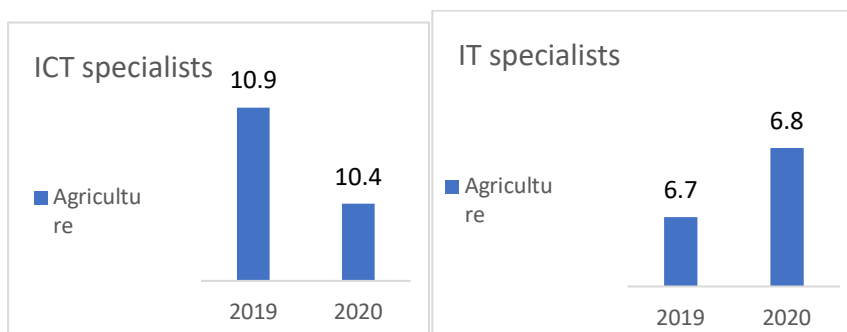
Semantic and statistical analysis.

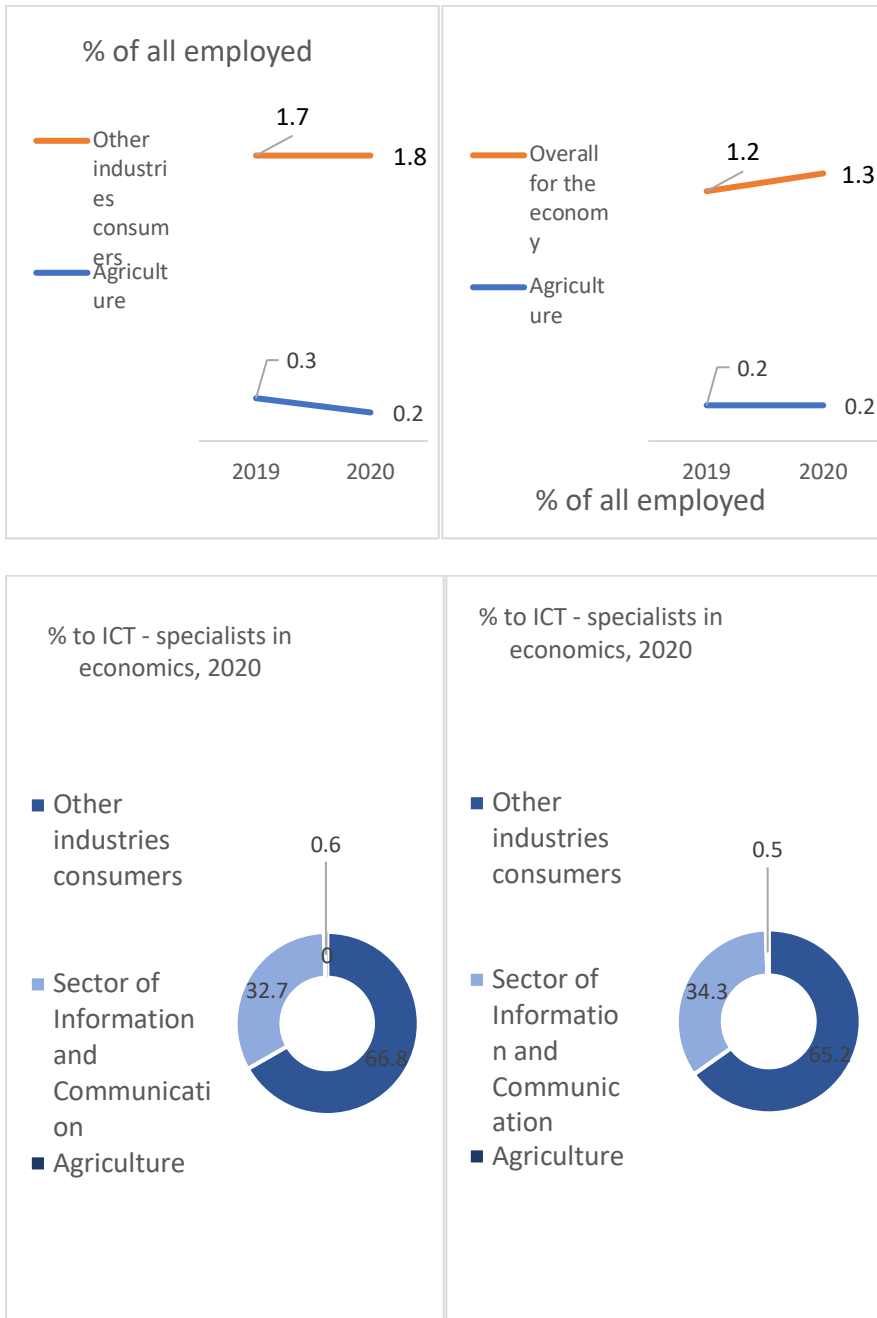
## 3. RESULTS

In 2020, 10.4 thousand people worked in the agricultural sector. ICT specialists, of which 6.8 thousand people were IT specialists (Fig. 1). Since 2019, their number as a whole has decreased by 4.6%. The share of IT specialists employed in agriculture is about 6 times lower than in other industries. In 2020, ICT specialists accounted for 0.24% of those employed in agriculture, including 0.16% of IT specialists. The contribution of the agro-industrial complex to the employment of ICT specialists is also small. In 2020, 0.6 and 0.5% of ICT and IT specialists in our country, respectively, worked in agriculture (Abdrakhmanova et al, 2021). The relatively low demand for IT specialists in agriculture is largely due to the fact that the most intensive implementation of digital technologies is carried out in large companies. Small business entities often do not have the resources to form a staff of IT specialists, using "boxed" technological solutions. The lack of qualified personnel with digital competencies produced by agricultural universities also hinders the increase in the number of ICT specialists employed in agriculture.

To solve this problem, you need:

- create a federal information resource that will host systematized information about the digitalization of the industry, including roadmaps, protocols, projects, information on the progress of implementation, as well as information from the regions about the positive experience of digitalization in the agro-industrial complex;
- to update educational training programs in agricultural universities and vocational schools;
- to develop digital competencies of employees (including in the field of unmanned technologies, AI, geoinformation systems, the Internet of things, etc.)
- synchronize agribusiness investment projects with territorial development strategies
- to ensure the release of visual information and methodological materials with information about digital technologies for different levels;
- develop courses and modules for training and retraining of personnel in digital technologies with their integration into curricula in agricultural education;
- to compile a list of agricultural producers with resource capabilities and prospects for the use of digital agricultural technologies, with the definition of pilot farms and subsequent replication of the accumulated experience;
- take measures to form the infrastructure necessary for digitalization of the agricultural sector in rural areas;
- synchronization of agribusiness investment projects with territorial development strategies.





**Figure 1.** ICT specialists (including IT specialists) engaged in agriculture (HSE ISIEZ, 2022)

Agriculture is among the industries for which digital maturity is assessed as part of monitoring the achievement of the corresponding indicator of the national goal "Digital Transformation", established in Decree No. 474. In December 2021, the strategy of digital transformation of agro-industrial and fisheries complexes<sup>19</sup> was approved, which, among other things, is aimed at achieving their digital maturity.

Due to the conservatism of the industry, the high cost of implementing some key ICTs and the large share of small businesses in the structure of the agro-industrial complex, the digital transformation of this sector requires state support. Strategies and programs for the development of digital agriculture are implemented by almost all leading countries in the production of agricultural products — the EU, the USA, China, etc. The purpose of such initiatives is to increase productivity and reduce the costs of agricultural activities through the use of digital technologies, improve the quality and health of food products (for example, by reducing the content of antibiotics and pesticides in it).

Thus, the agricultural block of the European Horizon 2020 program provides for investments of 200 million euros for research and innovation in agriculture, for projects on the development and piloting of robotics in agriculture, for projects on the development of the agricultural Internet of Things network.

Among the most common instruments of state support for digital transformation in the world are the provision of subsidies for the implementation of technological solutions (for example, UAVs), the creation of a unified data infrastructure for agriculture, increasing the digital literacy of farmers and popularization of the introduction of innovative solutions.

The recipients of support are usually small business entities — relatively small enterprises, which the introduction of digital solutions helps to reduce the cost gap from large businesses.

In the approved strategy of digital transformation of the Russian agro-industrial and fisheries complexes, the following areas are identified as priorities:

- introduction and large-scale dissemination of digital technologies in the main segments of the agro-industrial complex, including electronic document management systems and digital profiles of enterprises (including also data on genetic potential), AI technologies, the Internet of Things, remote sensing of the Earth and satellite systems, etc.;

- support for import substitution of electronic equipment and software necessary for the digital transformation of the agro-industrial complex to ensure food security;

- promoting the expansion of sales opportunities for agricultural producers, the introduction of traceability systems for products (grain and processed products, livestock products), monitoring of fishing activities, accounting for agricultural activities and land, providing access to digital platforms, including for small businesses;

- improvement of digital literacy and development of digital competencies of employees in order to increase the speed of adaptation of information technologies in the agro-industrial complex, including the creation of new and improvement of existing training and advanced training programs.

In the conditions of breaks in the established value chains, the import substitution of key technological solutions will increase in the near future. At the same time, the possibilities of introducing digital technologies by agricultural producers will be limited by the lack of investment resources. In this regard, broad measures of state support for the modernization and digitalization of the material base of agribusiness are needed, primarily in the part of MFH.

#### 4. DISCUSSION

Thus, the data presented in this article indicate a shortage of qualified ICT specialists, including in the consumer industries of digital technologies. This particularly affects IT professionals, primarily programmers, as the most mobile and globally competitive category of employees.

Also, the digitalization of the industry is constrained not only by an acute shortage of qualified personnel, but also by a small demand for this category of specialists. This is largely due to the fact that the most intensive implementation of digital technologies is carried out in large companies, and not in small forms of management that do not have the resources to form a staff of IT specialists.

To improve the situation and solve the problems associated with the shortage, it is necessary to increase the volume of training of specialists in areas related to digital technologies at industry universities, stimulate the training of specialists in digital technologies, intensify research activities on this issue, compile a list of agricultural producers with resource capabilities and prospects for the use of digital agricultural technologies, with the definition of pilot farms and the subsequent replication of the accumulated experience.

#### 5. CONCLUSION

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