

State policy for digitization in agricultural sphere: foreign experience

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Abstract— Today the world is in a new technological trend – the digital transformation. The transition to digital technologies in the world has been going on for several years and covers various sectors of the economy and social production – from the media and tourism to agriculture and health care. In 2017, the state program «Digital Economy» was adopted and implemented in the Russian Federation, which affected all major sectors.

It has always been important for Russia to study and partially use the positive experience of the technology development of the modern national states of the world, since Russia took this path somewhat later because of the social and political transformations that hindered this development.

In this regard, the experience of digitalization of agriculture in particular, of the countries-leaders of digital development, has both theoretical and practical significance. This article provides a brief overview of the digitization of agriculture in several European countries and the United States.

Keywords— *digitalization, agriculture, state policy, international experience, Germany*

I. INTRODUCTION (HEADING 1)

Klaus Schwab, the founder and permanent president of the World Economic Forum in Davos, said: «We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We will see stunning technology breakthroughs in fields such as artificial intelligence, robotics, autonomous vehicles, 3-D printing, nanotechnology, biotechnology and much more. « [1]

Indeed, the problem of the digital transformation of the world at this time is incredibly relevant. [2, 3] «Smart» technologies surround us even in everyday life; most people cannot imagine their lives without the Internet, various applications and devices. Of course, the process of digitalization is also traced in the industries. The leaders in this direction are IT companies, media, finance and insurance. Naturally, the introduction of digital technologies is being conducted in other sectors (albeit to a lesser extent), and agriculture is no exception. [4]

II. METHODS

The main research method is the comparative analysis method.

Digital economy is based on digital technologies, including e-commerce, state economic affairs through the use of digital technologies and even individual non-commercial events using information technologies of electronic business and electronic commerce. As for existing digital tools and technologies, the digital economy can be defined «narrowly as online platforms [such as Google and Facebook]», as well as actions that owe their existence on such platforms; but in a broad sense, all activities that use digitized data is part of the digital economy: in the modern economy and in the entire economy. Information and communications technology (ICT) providers include products, services and «platform-supported services» within the sharing economy; the main components of which are peer-to-peer short-term property rental and equal access to a peer-to-peer network (e.g. Uber). Co-financing (e.g. peer-to-peer lending) may also be included in the sharing economy. Services provided by the platform for enterprises in the "giant economy".

The digital age transforms everything: the nature of markets and products, production methods, delivery and payment methods, the scale of capital for global working, and the need for human capital. It also improves productivity, provides companies with new ideas, technologies, new management and business models, and creates new channels of market access. And all these aspects are at relatively low costs. It is not an exaggeration to predict that companies will increasingly rely on artificial intelligence for basic procedures and for more complex tasks.

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However, for digital technologies that affect economic development, appropriate policies should be adopted in order to remove obstacles that prevent developing countries from fully engaging the digital economy and optimizing its benefits while minimizing risks. It defines two sets of benefits: the so-called first and second order

profits. While the first order profit is associated with direct, more visible benefits of access to digital technologies by consumers, firms, and governments; the second order profit is associated with less visible, but much more significant benefits, associated with the development, management and distribution of digital technologies.

Developing countries must formulate policies with an ambitious goal of securing second-order profits. For example, policies aimed at increasing participation in electronic commerce and digital platforms can only increase a country's long-term competitiveness if there is a clear understanding that additional efforts will be needed to push the economy to the position of digital technology development and management.

Therefore, various initiatives should be combined into a single national strategy aimed at preparing the economy to go beyond the application and use of such technologies. This is not an easy task, especially because some of the policies designed to take over the benefits of the first order, and cannot initially be reconciled with the benefits of the second order.

Countries should pursue a bold knowledge-oriented agenda that goes far beyond infrastructure and takes into account issues such as creating, storing, processing and transmitting data – both within and outside national borders; data privacy and security; taxation in the digital economy; and non-discrimination and access. This bold political agenda should reflect the fundamental changes taking place in the forms of production; the importance of intangible capital; technology and branding; and manufacturing goods with embedded services in an increasingly digital environment.

In order to emphasize the importance of this cross-cutting approach, a digital development strategy should have a symbiotic relationship with trade, education, technology, innovation, services, and competition policies. For example, trade policies often include elements that go beyond traditional merchandise trade, such as services, e-commerce, data flows, intellectual property, and government procurement.

It is also necessary to introduce competition policies in the digital age, in order to solve the problem of deterring oligopoly and monopoly positions and protecting consumer interests. If the benefits of the digital economy are mainly related to the developers and managers of technologies and platforms, there should be free space for policy implementation and regulation.

Coordinating these policies at a high political level (for their later transformation into action) can determine the success of future programs aimed at developing platforms.

Since we are dealing with new trends, the leader countries will need to show an active, flexible and intelligent form of interaction in order to learn how to navigate in this sphere and get benefits. To this end, policymakers will need to coordinate policy from the

outset; they will need to experiment, control, evaluate, be pragmatic and collaborate.

The elimination of digital sections is a key factor in enabling countries to benefit from digital transformations and share them. However, the asymmetric distribution of first and second order profits within and between countries can increase income inequality, thereby creating additional barriers to the implementation of the above strategies and facilitating income convergence.

Finally, as suggested by a series of studies in the field of economic development, this strategy is likely to be more successful if the government, business, and workers combine their interests and cooperate in developing and implementing policies.

A lot of work can be done to develop and expand the role of the digital economy in developing countries. The more this enterprise is enshrined in the fundamental principles of wealth creation in the 21st century, the greater its probable success.

Traditionally, the agro-industrial complex is considered to be the most backward sector of the economy due to the specifics of the branch; but it acquires a new socio-economic context under conditions of the fourth industrial revolution. With the minimization of the risks associated with climatic influences, pests and diseases, having received information from fields and farms from sensors and navigators, thereby reducing costs, digital agriculture will become an industry that is capable of feeding the ever-growing population of the planet.

The importance of digitization in agriculture is confirmed by the introduction of the initiative of the Ministry of Agriculture of the Russian Federation that includes digital agriculture as a separate area in the Digital Economy program [5; 2.113]. Digital tasks of agriculture are also provided for in the Activity Plan of the Ministry of Agriculture of the Russian Federation for years 2019-2024 [10].

Only 10% of arable land is processed using digital technologies in Russia, and the non-use of these methods leads to a loss of 40% of the crop. Russia is now at 15th place in terms of digitalization of agriculture [7]. In this regard, we consider it necessary and useful to study the experience of countries in which digital transformations in agriculture have been successfully conducted for more than a year.

It is obvious that the state efforts of Russia in the near future will be aimed at increasing the market share of digital technologies in agriculture. To date, the amount of funding of information technology and digital component of agriculture in Russia is about 360 billion rubles. By year 2026, according to the plans of the Ministry of Agriculture of the Russian Federation, this figure will increase multiply - more than 5 times. It should be positively noted that in our country there are already a number of agricultural subjects actively introducing digital technologies. Thus, in particular, the Kuban agrofirma «Agronout» in 2017

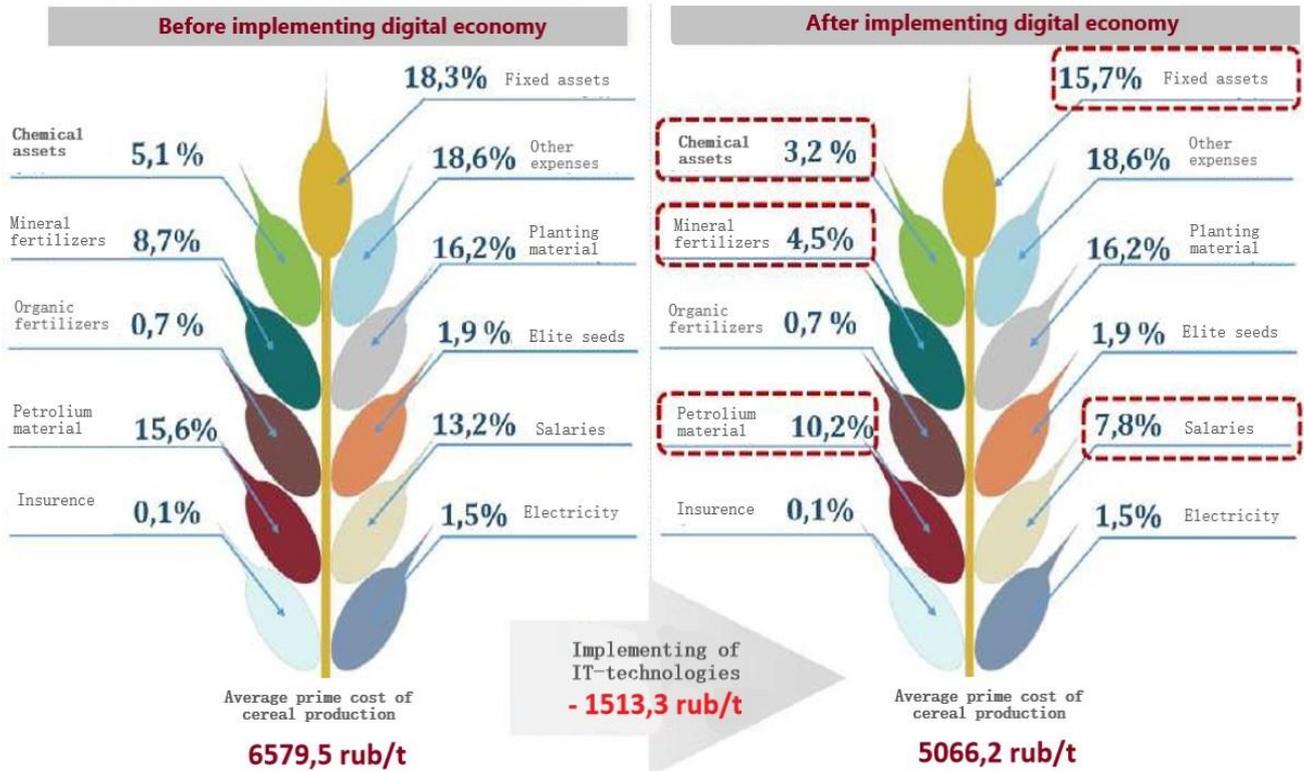


Fig. 1. The digital technologies application level according to Rosstat and the Ministry of Agriculture of Russia [9,7]

developed and tested a fertilization project that takes into account the real state of the soil. The estimated economic effect from the use of this technology is 50 million rubles a year.

The use of new digital technologies is becoming a key factor in the growth of production and profitability of agriculture. The state of the use of digital technologies according to the Federal State Statistics Service and the Ministry of Agriculture of Russia are presented in Fig. 1.

The potential of the digital economy of agriculture of Russia is presented in Fig. 2. It was developed by the Analytical Center under the Ministry of Agriculture of the Russian Federation. Among the successful examples of digitization of agriculture over the past year and a half, we can mention the activities of the Russian company «Agrotterra».

In 2017, the Russian company «Agrotterra», in cooperation with the Israeli SMART Fertilizer, equipped smart sensors in the Kursk and Tula regions with a total area of over one thousand hectares, which made it possible to increase the yield of soybean by 11.2% and wheat by 6.5% in just one year [8].

It should be noted that programs related to digital farming exist in many countries. Such a global news portal, as Business Insider, provides estimates of the share of the «Internet of things» in agriculture. This is 43 million dollars with the possibility of achieving this volume by year 2020 to 75 million dollars. Today, the level of digitalization of the agro-industrial complex is increasing by 22.5% per year, and after seven years the volume of the «smart» sector of agriculture will be in total \$ 2.6 billion [8].

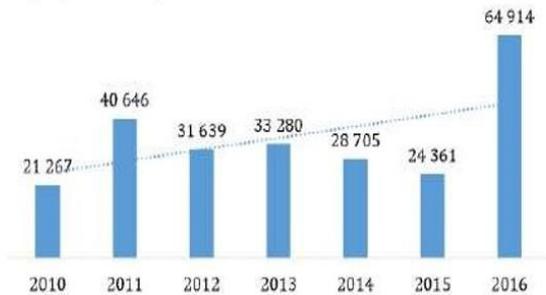
When analyzing the dynamics of the digital transformation of the agricultural sector in the world, one

can find quite astonishing indicators. For example, at the beginning of the decade, about 20 companies supplied innovations that automate the management of agriculture, and today about 2000 companies are engaged in this activity. In addition, a special sector «AgTech» was formed, which for several years has been competing in the investment segment with «FinTech».

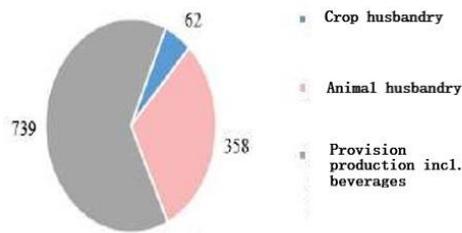
The United States of America, with the leading level of introduction of digital technologies in agriculture (almost half of the country's farms are involved), accounts for more than 40% of the global market. Such large agricultural companies as «John Deere», «Trimble», «Iteris Inc» and many others actively use various digital technologies, for example, yield mapping systems, unmanned vehicles and aircraft, touch sensors, etc. [7]. So, in particular, «John Deere» invested more than \$ 300 million in the purchase of Blue River technology in 2017, which is known for developing and integrating the so-called «computer vision» and training technology of spraying into the machines. To distinguish the weeds the Blue River developed a special visual algorithm. This has reduced the amount of use of herbicides, and to use them only by point-application, thereby optimizing expenses of the farmers.

In Europe, Germany ranks as the first in terms of agriculture digitization. The Federal Ministry of Food and Agriculture of the Federal Republic of Germany (BMEL) pays special attention to the formation of conditions under which the implementation of the digital transformation of the agro-industrial complex is feasible. At the same time, the Ministry considers the consequences of digitization for the industry and the equality of the benefits of new technologies for farmers, consumers and the environment to be the main priorities.

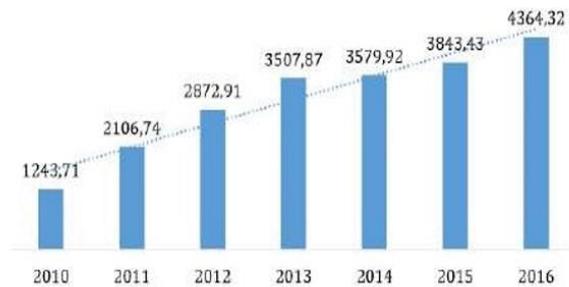
The acquisition quantity of new technologies and softwares in units



Acquisition of new technologies and softwares by agricultural producers in 2016 in units



The volume of innovative articles, labor, services includes products produced on the basis of various technological innovations, in billion rubles



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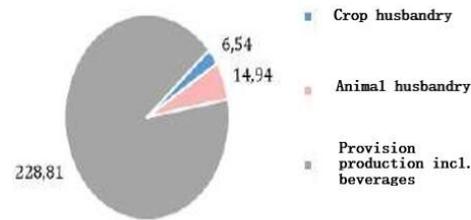


Fig. 2. Costs before and after the implementation of digital economy [9,8]

For nearly two decades in Germany, the industry has practiced the use of precision farming systems and smart farms. Continuous improvement of hardware and software allows us to significantly improve the agricultural process, for example, to implement a more efficient coupling of the tractor and mounted implements or to organize optimal logistics chains, starting from the means of production and ending with the flow of products to their consumers.

Opinions often diverge, when assessing the profitability of digitalization for medium and small agricultural companies; so the German Ministry of Food and Agriculture, in cooperation with experts, outlined the main policy directions for actively supporting the transition of agriculture to a new technological level. These areas are related to the development of rural infrastructure; collecting data on geolocation, means of production and climatic conditions; the formation of leadership, including representatives of the federal ministry, subjects and research institutes responsible for digitalization; organization of experimental fields and cooperation with the European Union.

The transfer of knowledge and management of available data are the main issues in this sphere. The active participation of the state should provide the most favorable embodiment of the potential of digitalization, as well as limit the impact of possible risks. This will in the future give the prospect of strengthening the agricultural sector in Germany.

An interesting project is being implemented in Switzerland, where the first (in the Europe) demonstration farm was organized with the funds of the state budget and under its control, which has 75 hectares of land at its disposal. In this appreciable enterprise, new approaches to automation of agricultural management will be developed, the impact of new technologies on the economy, labor

productivity, and the environment will be studied. This experience will help determine which technologies are effective and can be applied in real agriculture, and which ones need to be improved.

The Irish state program "Smart Farming" has been operating since 2014. Individual entrepreneurs in the field of agricultural production are offered various options for the use of digital technologies and platforms that can reduce expenses and the level of harmful emissions. Currently, 1900 farms are working in the program. The savings in each of them averaged 5000 euros in year 2017; the fuel consumption was reduced by 10% [7].

The practical significance lies in the possible use of the positive experience of European countries in adjusting the roadmap for digitization of the Russian economy in terms of the development of these processes in the agriculture.

The materials of this article can be used in the process of teaching specialized disciplines for students and undergraduates, as well as for the economists. It is also possible to use the materials in the framework of advanced training on topical issues and problems of digitization of agriculture for interested categories of students.

III. CONCLUSION

Digitization of agriculture in the Russian Federation will allow us to solve a whole layer of problems, which is formed by the previous way of managing. With the current level of income of the population of Russia, it is capable increase the food consumption by at least 2-3 times, reduce the trade margin on the agricultural products and briefly increase labor productivity in this area of production. Many tasks can be solved by relying on successful foreign experience. It is obvious that many countries are facing the main task in increasing the efficiency of agriculture – to

increase its productivity and returns per unit of area due to the development of digital farming.

The digitalization of agriculture is proceeding at an impressive pace in many countries and, undoubtedly, improves the state of the economy. Nevertheless, the process of digitalization is inseparable from a number of difficulties. In a country with «smart» agriculture, employment problems may arise. Therefore, countries that start the transformation of economic sectors (including the agro-industrial complex) need to take the world experience in this direction into account.

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