

THE ROLE OF TECHNOPARKS IN TECHNOLOGICAL UPGRADING OF THE ECONOMY. THE EXAMPLE OF AGRICULTURAL PRODUCTION

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Abstract:

The challenges and achievements of technological upgrading are traditionally discussed in the context of the of high-tech production. However, such areas as agriculture and food production demand no less modern scientific and technological achievements. The challenges of appropriate feeding the population remain relevant. The article focuses on the examinations of issues related to the possibilities of involving modern technological achievements for the development of Russian agriculture. The main scientific methods of research were bibliographic analysis, statistical and factor analysis, comparative analysis, methods of analogies. The factual basis for the research was the official data of the Federal State Statistic Service (Rosstat), the data of technoparks in Russia, the results of modern scientific research of foreign and Russian scientists. A conclusion on the feasibility of involving the scientific and productive capacity of Russian technology parks for technological upgrading of agriculture in Russia is based on the analysis of the activities of the organizations in the country's science and technology sector, first and foremost technoparks.

Key words: *effective phenotyping technique, new technologies for the cultivation of agricultural products, technology parks*

INTRODUCTION

Until recently, Russia was a leader in the main areas of science and technology development, which indicated a high level of the country's innovative potential. At the moment, the leading positions have been lost. The current state of the economy is characterized by a backlog in many scientific and technical positions. Innovative development is essential to ensure the leading positions of the country's economy, improve competitiveness in international and interregional markets, and modernize the entire national economy. The innovative component of the country's economy should become a priority area of the country's development, only technical upgrading can become a key to the development of the domestic economy [12]. This is relevant for many branches and sectors of the economy of the Russian Federation, including agriculture and agro-industry.

Recently, the term "technopark" has featured prominently among the neologisms associated with information and communication technologies. This is partially due to

the fact, that plans for accelerated growth of the high-tech branch of the economy and the innovation system as a whole are connected with technoparks. At the same time, the questions that the residents' of technoparks products should ensure the innovative development of not only advanced "uncompleted" production, but also traditional ones, including agriculture-based industries, agriculture, agro-processing and its finished products, rural social welfare, etc. become increasingly frequent. It should be noted that the first such examples can be found. In particular, Technopark Skolkovo has interesting solutions in the field of education, medicine, tourism, agriculture, which the management of the technopark is ready to offer to domestic and foreign resident companies. In this regard, a great scientific and practical interest is the study of the capabilities of technology parks to ensure the innovative development of traditional sectors of the economy, including agriculture.

THEORY AND METHODS OF RESEARCH

Issues of technological development of agricultural production, agro-processing, its storage, transportation, bringing agricultural raw materials to finished products have been studied in the world science for a long time. The main issues that are being solved by researchers now primarily concern various aspects of farm management in terms of increasing yields of different crops, their quality (taste, appearance, vitamins and other useful substances, etc.), as well as issues of saving technological resources. For example, in the works of C. Campillo, S. Millan, R. Fortes, I. Lahoz, M.H. Prieto, and J.I. Macua [2, 3] an efficient water management system in the commercial processing of tomato farms in Spain was offered. The adjusted model they developed was tested by the tomato farm of the ROMA Company and "negligible savings of up to 20% of water in commercial fields and avoidance of situations of water stress or over-irrigation in different phenological stages of the crop. The model also permitted establishment of different deficit irrigation strategies" [2].

Ways of addressing such issues as sustainability of agricultural production, rational use of water resources, long-term prospects for effective agricultural waste management are proposed in the works of F.J. Egea, R.G. Torrente and A. Aguilar [5]. These scientists summarized the successful experience of functioning of one of the most effective agro-businesses in the world, located in Almería, in the south east of Spain for 40 years. Nowadays this business developed from traditional and natural agriculture is the main exporter of vegetables in the European Union. Important studies are being carried out in the context of solving the problem of early weeds management in large fields, for example, for wheat crops. The possibilities of using unmanned aerial vehicles to solve this problem have been analyzed in the works of D. Gómez-Candón, L. García-Torres F. López-Granados, J.J. Caballero-Novella, M. Gómez-Casero, A.I. De Castro, M. Jurado-Expósito [7, 8]. In the work of S. Cubero, W.S. Lee, N. Aleixos, F. Albert, and J. Blasco [4] the possibilities of using modern computer vision systems to predict yields for different crops, for early detection of potentially dangerous diseases, and for robotic harvesting have been presented.

The possibilities of obtaining various agronomic data using an unmanned aerial vehicle are provided in a study by N. Pavón-Pulido, J.A. López-Riquelme, R. Torres, R. Morais, and J.A. Pastor [15]. Practical verification of the efficiency of this technology was carried out by the agricultural farm in the Region of Murcia (Spain)

As for opportunities to use the potential of Russian scientific and technical organizations, including innovative parks and technology parks, the sources of information for the analysis were Rosstat data [16], information from official sites of technoparks, as well as the results of special research on technology parks and innovation centers [6, 11, 13].

Prospects and opportunities for innovative development and technological upgrading in the field of agriculture are presented in the works of colleagues from Kazakhstan, including our joint work on the analysis of the prospects and

opportunities for innovative development of agriculture [9, 14].

A special area of research is the study of the possibilities of creating agrarian technoparks. G.S. Abdrassilova studied new types of agrarian associations (agroparks, agro-tourist farms, "vertical" farms, etc.), and combined them into special sets - agrarian technoparks [1]. According to her opinion creation of such agrarian technoparks in its opinion can provide a qualitative technological breakthrough in the field of production, storage and processing of agricultural products.

The main scientific methods of research were bibliographic analysis, statistical analysis, factor analysis, comparative analysis, methods of analogies.

RESEARCH AND RESULTS

The production of many types of agricultural products (especially vegetables and berries grown in greenhouses) is greatly influenced by technological factors of their cultivation. They are the temperature and air humidity, the temperature and soil humidity, the illumination, the content of nutrients in the soil, and impurities in the air and other factors. Outdoor agricultural production is more dependent on environmental factors. Natural factors such as drought or wetland (sustained rainfall), wind (under 12 on Beaufort scale) and hail, which can completely destroy crops, the presence of various weeds and the features of their growth, the danger of spreading various plant diseases and insect pests (locusts, Colorado beetle, etc.) and other factors are added. Huge crop areas are an additional factor that complicates the production of agricultural plants in terms of crop control. Therefore, there is an urgent need to monitor all these factors, to monitor in real time, to prevent possible abnormal regime of plant growth and possible damage in time. This requires special control equipment and technology.

At the same time, in the context of the transformation of the Russian economy, the various crisis developments, including global crises, the capabilities of domestic science and production for the creation of advanced technologies and equipment for agriculture are substantially limited. As a rule, this sector is beyond the commercial interests of innovative start-up companies, agricultural equipment manufacturers, and the state's capabilities are not enough for all sectors of the economy. Therefore, Russian agricultural sector still remains out of advanced technologies and promising research (except for New Varieties, where research is still done on a smaller scale).

Let's check this on the basis of statistical data on the volumes and dynamics of the main indicators of the science and technology sector in Russia functioning. Namely – the rates of advanced production technologies developed and used in Russia, including fundamentally new advanced technologies. The results of the analysis are shown in Figure 1 (compiled from: [16]).

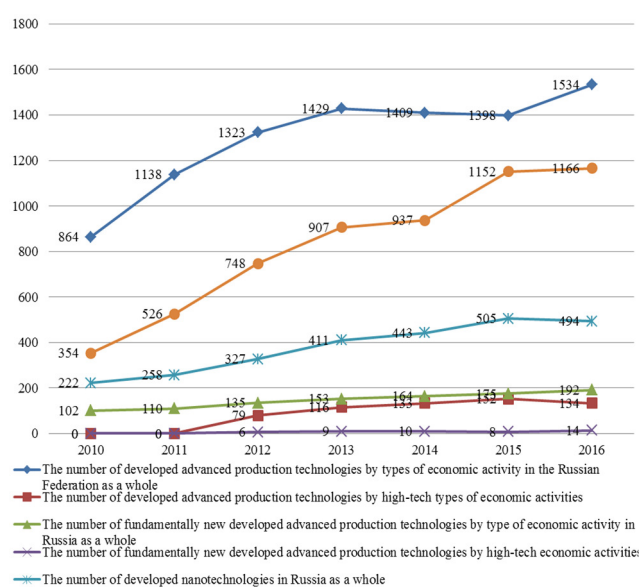


Fig. 1 Dynamics of development of advanced production technologies rates in Russia in 2010-2016

As it can be seen from Figure 1, for all indicators of the sphere of science and technical achievements, there is an increase in indicators values for the entire analyzed period. Thus, the share of developed advanced production technologies of high-tech economic activities as a whole in dynamics increased to 2016 (from 6.0% to 10.9%). This indicates an increase in the efficiency of high-tech economic activities in the share of fundamentally new developed advanced production technologies of high-technology economic activities in the total volume in the RF in 2012-2016, positive dynamics was observed from 4.4% to 7.3%. Similarly, the indicator values of the total number of developed nanotechnologies and fundamentally new nanotechnologies have grown. However, there is no agricultural sector, in this statistics at all.

In the system of Rosstat indicators for statistical estimation of the level of technological development of the economy branches by such indicators as "Number of developed advanced production technologies by types of economic activity", "Number of new for Russia developed advanced production technologies by types of economic activity", "Number of fundamentally new advanced production technologies by types of economic activity", "Number of used advanced production technologies by types economic activity", "Number of developed nanotechnologies by types of economic activity" there is no "Agriculture" sector (including current statistical data). According to sectoral statistics, there is only industry information "Production of food products, including beverages, and tobacco" on these indicators, which belongs to processing industries. Thus, according to Rosstat statistics, new production technologies for agriculture are not being developed in our country.

The only indicator for Rosstat data since 2016 is the indicator "Number of new technologies acquired by organizations (technical achievements), software by types of economic activity" (until 2016 this point is "0" in the statistical reports). According to the statistics on this indicator, in 2016 Russian agricultural enterprises acquired 426 new

technologies (technical achievements) and software. The distribution of technologies by type of activity is shown in Fig. 2 (compiled according to [10, 16, 17]).

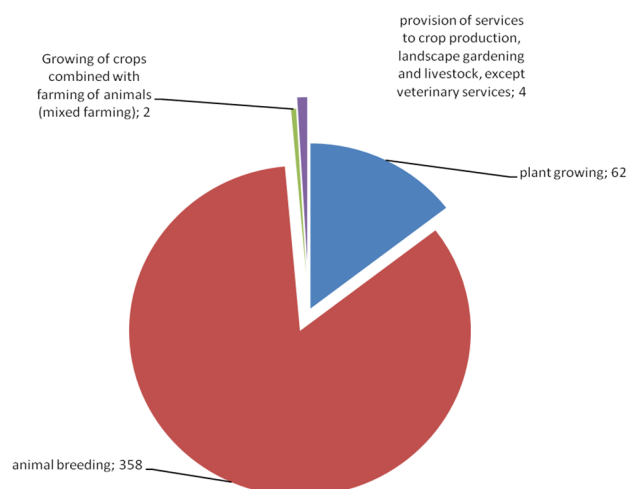


Fig. 2 Structure of new technologies acquired by Russian agricultural organizations (technical achievements), software by types of production in 2016

As can be seen in Figure 2, the main buyers of new technologies (technical achievements), software among the agricultural organizations of Russia were livestock enterprises (358 new technologies). 62 new technologies have been acquired by crop production enterprises. 2 technologies acquired large enterprises of a mixed type (livestock and crop production). And 4 technologies belong to the category of services for agriculture. They are mainly leasing operations of agricultural machinery. For example, the purchase of Kamaz tractors through Rosagroleasing, which helped the enterprises of the Novgorod Region operate grain harvesting machinery and export grain from wetland soils to, leasing equipment of the Rostselmash group of companies (Kirovets wheel agricultural tractors), etc.

Overall in the country in all economic activities in 2016, 64,914 new technologies (technical achievements) and software were purchased. Thus, the share of agricultural enterprises was only 0.66% (!). This is apparently not enough for a successful technological upgrading of the country's agriculture and its sustainable development.

The current situation requires the search for new solutions to technological upgrading of agriculture in Russia and its particular regions. And one of the ways out of this situation is in using the opportunities of the most successfully operating country' technoparks to create new advanced technologies for agriculture. In our opinion, the availability of skilled labor and capital, the possibility of involving scientific personnel and researchers, high speed and low logistics costs, minimum bureaucracy with import/export [16] and a number of other advantages that can be consolidated in technology parks can be prerequisite for successful solving of this problem.

CONCLUSION

The results of statistical analysis on the creation of advanced production technologies and their application in the sectors of the domestic economy have shown that

new production technologies for agriculture are not being developed in our country. Global experience shows that, on the one hand, the effective functioning of technology parks is most evident during crises, because crises initiated their creation, especially at the first stages of development. The fact is during crisis, resource-saving technologies and new types of products are more necessary than ever, moreover, the unemployment problems worsen. On the other hand, the trigger for revival and recovery from crisis is the support of scientific research and innovation: new jobs are created, a favorable infrastructure is created, and the general situation in the regions is improving [18].

Today, Russia faces the important task of implementing a rapid technological breakthrough and achieving the world's leading positions in scientific and technological development. The success of its implementation largely depends on ensuring a suitable infrastructure for the implementation of a set of scientific and industrial projects generating technological leadership in all key areas of society. In this context technoparks, whose role is to ensure conditions for the effective growth of promising technology projects, to create opportunities for accelerating the transition from scientific developments to the production of competitive products and to increase the speed of introduction of new technologies into mass production, assume particular importance. This fully applies to the agricultural sector, which is experiencing an acute shortage in modern equipment and technologies, data processing software technologies and technical means of controlling agricultural production.

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