Institutional peculiarities of agricultural technoparks formation in Russia

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Abstract. The article is devoted to institutional features of agricultural technoparks as a new form of scientific and industrial cooperation in agriculture, possessing system interrelation with steady development of rural territories, export of agricultural production and possibilities of a conclusion of a domestic agrarian science on world level of researches. Long-term crisis manifestations in Russian agriculture in recent years have only been purchased quantitatively, mainly due to the winning conjuncture of export markets, but not overcome qualitatively, which retains its main disproportions and related risks. The given crisis phenomena are considered in article as system which subsystems are agrarian science, state support of agricultural commodity producers, development and financing of rural territories. These three interrelated and interdependent problems, on the one hand, presented by the crisis of overproduction of budget-funded scientific research in agriculture, and by the crisis of profitability of agricultural production, on the other hand, by the crisis of budget financing of rural areas, can be comprehensively solved through the creation of agricultural technology parks as a means and mechanism for the development of continuous scientific and production cooperation in agriculture and its digital transformation.

1. Introduction
The urgency of the problems of creating industrial parks in the agricultural sector is primarily related to the state objectives of the National Project "Science", the program "Digital Economy of the Russian Federation" and its sub-program "Digital Agriculture". This provides, on the one hand, for the creation of scientific and educational centers in priority areas of scientific and technological development, and on the other hand, the formation of a mechanism of through scientific and production cooperation, which allows for the systematic integration of all parts of the country.

However, such areas of agricultural development as precision farming, breeding and seed production, production of high quality animal feed can achieve sufficient stability and profitability only under conditions of soil water regulation, including irrigation, which requires particularly significant investments of both private and public capital. According to M.R. Cameira and L.S. Pereira, irrigated farming currently accounts for 16 % of the world crop area, and by 2050, according to some expert estimates, its share in world food production may reach 44 %. At the same time, irrigated farming represents the most efficient environment for innovation related to all ecological and economic aspects of food production [1].

However, the introduction of these innovations creates the need for practical implementation of the institutional and economic mechanism for the development of continuous technologies, allowing for the testing and implementation of new technological solutions in a compact scientific and production
complex with relatively low capital intensity. Subsequent replication on a large scale will enable a qualitative change in the negative vector of rural development in Russia. Therefore, the purpose of the study is to study existing disproportions in the development of agrarian science, agricultural production and rural areas and to develop proposals for their smoothing through the formation of agricultural technology parks as a key link in the system integration of scientific and technological development of agriculture.

2. Methods and materials
The study was based on data on financing of the Russian agro-industrial complex, agricultural science and rural areas, as well as on regulatory acts in the sphere of agro-industrial complex development. The study used methods of statistical, institutional, structural and functional analysis.

3. Results
Agricultural technopark is a relatively new theoretical and normative category for Russia, which does not yet have established institutional certainty. Global interpretations of this concept are also broad and diverse, both for agricultural technoparks and technoparks in general. E.S. Howard and A.N. Link define the general category of "hi-tech cluster", where there are technopolises, technoparks, science parks, innovation centres, R&D parks, university research parks and many similar but less common forms [2].

I.O. Tyurina and the co-authors divide the types of technoparks by the tasks of their creation: as a tool for regional development, as a tool for accelerating the development of an economic cluster, or as a tool for the development of knowledge-intensive technologies. In practice, these tasks are complementary rather than mutually exclusive [3].

S.N. Levin and the co-authors note the particular importance of technoparks as an instrument of innovative development in the context of an enclave dual economy, which is a specific institutional system that distinguishes privileged economic actors with access to 'enclaves of wealth' related to exports, mainly of a raw material nature [4]. At the same time, a special form of dual economy has also emerged within the Russian agricultural sector, enclaves of which are agricultural holdings engaged in large-scale production of cereals for export, which is mainly of an extensive nature. Other agricultural producers and the agrarian scientific community, which have the potential to jointly introduce intensive technologies, are unable to implement it in practice due to insufficient concentration of capital and imperfection of the innovation support system. Meanwhile, if we consider agrotechnopark as one of the forms of high-tech clusters, the world experience shows that the most effective attractors of such clusters and system integrators of the innovation transfer process are universities and research institutes [5].

A. Poonjan and A.N. Tyler and A.N. Tyler identify five common regional factors for the development of high-tech clusters: the availability of universities and research institutes, the institutional environment, the level of industry development, and urbanization that allows for a sufficient territorial concentration of highly qualified personnel [6].

In terms of legal and regulatory understanding, in our opinion, the agro-technopark is the closest to industrial technoparks already established in the institutional environment and successfully developing in the Russian Federation, but has its own sectoral specifics related to the peculiarities of agriculture. The National Standard of the Russian Federation adopted in 2015 is GOST R 56425-2015 "Technoparks. Requirements" characterizes a technopark in the field of high technologies as "a complex of objects, buildings, structures and equipment, which is designed to launch and bring to the market high-tech products and services, technologies, including through territorial integration with scientific and (or) educational organizations," which corresponds to the objectives of the agro-technopark, taking into account its main function of a system integrator of processes of through scientific and production cooperation in agriculture.

Thus, in accordance with the established foreign and domestic practice of industrial parks functioning, the agricultural technopark will be a scientific, business and educational center providing the interaction of authorities, development institutions, scientific organizations and business
community in their common interest in the development and implementation of innovations in the agricultural sector. However, the agricultural specifics of the agro-industrial park require that this generalized understanding of tasks and functions be complemented by a more holistic and detailed approach, since the system architecture of the agricultural technopark can and should be based on the prerequisites for solving complex problems of the agro-industrial complex of Russia and rural areas.

In order to overcome the systemic crisis in the agricultural sector, only partially bought by the positive situation in the main markets of agricultural products, established since 2014, the state has invested budgetary funds in agriculture and rural areas through three main institutional channels. The first one is financing of agrarian science, the second – state support of agricultural producers through various subsidies, and the third – subsidizing of rural areas, mostly known to be loss-making. At the same time, a significant part of the expenses for financing scientific research according to the state assignment falls on the state "dead" burden in the form of lack of implementation and commercialization of their results, at the same time the economic activity of agrarians is not effective enough due to technological backwardness of production. The Z. Mingaleva and co-authors research showed that 64,914 results of intellectual activity in the form of new technologies and software were commercialized in Russia in 2016, but the share of agricultural enterprises among buyers was only 0.66 % [7]. At the same time, the total government expenditure on innovation support is significant. For example, over the period from 2010 to 2015, over $140 million was allocated for the creation of infrastructure for innovative entrepreneurship in the regions alone, and annual subsidies for 26 territorial innovation clusters exceed $20 million. On the whole, the amount of annual state support to civil R&D is over $6.1 billion. [8].

Nowadays, domestic technologies based on the newest achievements of science are mostly not used in agricultural production. At the same time, according to the forecast of scientific and technological development of the agro-industrial complex of the Russian Federation for the period until 2030, in Russia by early 2016 there were up to 436 organizations engaged in research and development in the field of agricultural sciences, which is 10.4 % of all organizations engaged in research and development. On the whole, their number has fallen by 17.6 per cent since 1995, primarily due to a more than twofold reduction in the network of scientific organizations and higher education organizations under the Ministry of Agriculture.

Agricultural sciences occupy the second to last place in the structure of expenditures on science, far behind the traditionally leading technical (73.4 %) and natural (17.4 %) sciences.

At the same time, federal budget funds provide 59.6 % of expenditures for research and development in the field of agricultural sciences, which is higher than the average Russian level (56.5 %). Grants to the subordinate organizations of FANO within the framework of the State Program of the Russian Federation "Development of Science and Technology" for 2013–2020 for basic research in agriculture in 2016 amounted to about $114.6 million. The contribution of business to the financing of such research and development is steadily declining – from 14.8 % in 2002 to 9.4 % in 2016 [9].

In such a situation, sustainable development in rural areas remains at the doctrinal and project level due to the lack of cash flows there, attracting investors and qualified labor because of the same technological backwardness and lack of a quality institutional environment. Thus, the complex of the above problems is a kind of crisis of overproduction of R&D or a crisis of liquidity of budgetary funds, when the invested public funds do not bring proper social and economic effect. At the same time the volume of invested funds is unprecedented for the domestic agrarian science. Thus, the Federal Scientific and Technical Program of Agriculture Development for 2017–2025 provides for financing from the federal budget in the amount of $ 435 million.

The possible risk of insufficient budget and socio-economic impact of these funds will aggravate the systemic crisis of Russian agriculture and is unlikely to provide an opportunity for the repetition of such substantial investments, so it is necessary not only to inject new funds, but also to optimize their development, which can and should be achieved through agro-industrial parks. Technoparks and agrotechnoparks have a special connection with the processes of digital transformation of the
economy, which increases the number of jobs created within the framework of scientific and production cooperation both inside and outside the technoparks [10]. At the same time, technoparks are characterized by a particularly high economic efficiency of creating new jobs. For example, M. Olkiewicz and co-authors, comparing US and Polish technoparks, note that in the CAN-BE technopark (Pennsylvania) the cost per job is about $21,000, while in other forms of investment the same figure is at least $120,000. In a more Russian-like Polish environment, it would cost $4200 to create a job in a technopark, while outside the park it could cost over $20,000 [11].

In this regard, the agricultural technopark as a mechanism for overcoming the crisis phenomena in the agro-industrial complex is able to comprehensively solve three problems: the formation of sustainable self-financing of domestic agrarian science, increasing the profitability of crop and livestock production through the introduction of technical and technological innovations, which will solve the third strategic problem, providing sustainable financing of rural areas to buy the process of depopulation through improving their social and professional attractiveness.

Thus, the formation of agricultural technoparks will create a scientific and production basis for improving the ecological and social functions of agrolandscapes, but the necessary condition for this is the development of irrigated agriculture, which in the conditions of Southern Russia is a key factor in both profitability and sustainability of crop production, as well as the most efficient production of forage crops for farm animals.

This will make it possible to increase the area of reclaimed lands in Russia up to 17–18 million hectares, 10 million of which should be occupied by irrigated lands, which will make it possible to get 70–80 billion forage units, including 30 million tons of grain, and in terms of ecologically sustainable development of agriculture and preservation of soil fertility will create conditions for prevention of desertification, salinization of soils and other negative processes. J.F. Velasco-Munoz and the co-authors note that back in 2000 the concept “Blue Revolution in Agriculture” was proposed in the United Nations, based on increasing the ratio of yield to water use. Addressing irrigation water loss factors such as evaporation, runoff, and underground draining will not only conserve water as a valuable natural resource, but also make irrigated farming more environmentally friendly and increase the nutrient content of agricultural products. The technologies of drip irrigation, which provide water saving in the volume from 18 to 75 % of water used, have a special perspective here [12]. However, drip irrigation has a special capital intensity, especially in combination with digital precision technologies, which creates an additional need for capital concentration in agricultural parks to replicate and scale up these technologies.

In the social and economic aspect, the creation and expansion of irrigated agrocenoses comprehensively solves the most pressing problems of agricultural activity and sustainable development of rural areas, which, firstly, includes guaranteed control over key yield-forming factors and the possibility of scientifically sound programming of harvests, which allow for the expanded reproduction of production assets of the enterprise even in the most arid years in weather conditions. Moreover, the availability of irrigation is a critical factor for seed production, which makes it possible both to solve the most critical problems of import substitution of seed stock, and to form production chains in agriculture with a qualitatively higher added value than in the production of commercial grain, which, in turn, will ensure a high level of staff salaries, attracting young specialists and their targeted training in educational institutions of the Ministry of Agriculture of the Russian Federation, and, by sending them to the Ministry of Agriculture of the Russian Federation. In addition, agricultural technology parks are able to create not only new chains of agricultural production, including organic products, but also new channels for its implementation. Thus, Chinese agricultural technoparks have significantly influenced the development of sales and service cooperation in agriculture [13].

J. Yoon and co-authors note strong correlations between the presence of technoparks in the region and the export economic activity of small and medium-sized enterprises [14].

The institutional environment of agriculture, which has been forming in recent years, is quite favorable for the formation of agricultural technoparks as a means and mechanism for the practical implementation of state tasks. Thus, the passport of the national project (program) "Science" sets a
task to create by 31.12.2021 at least 10 scientific and educational centers in priority areas of scientific and technological development based on the integration of universities and scientific organizations and their cooperation with organizations operating in the real sector of the economy.

The Decree of the President of the Russian Federation from 21.07.2016 № 350 "About measures on realization of the state scientific and technical policy in the interests of development of agriculture" prescribes to develop and realize a complex of measures aimed at creation and introduction of competitive domestic technologies till 2026, providing, among other things, production of domestic original and elite seeds of agricultural crops, fodders for farm animals, which is directly connected with the through scientific and production cooperation in development of the agricultural sector.

4. Conclusion

Thus, there is an objective need to update the scientific support for the development and creation of new-generation land reclamation systems, the introduction of modern irrigation systems, resource-saving technologies of dairy and meat cattle breeding, closely linked to the production of fodder crops for irrigation.

However, the process of establishing an agro-industrial park itself is very complex from an institutional point of view. Significant results have been achieved in forming Russian high-tech industrial clusters. Thus, according to E.V. Pavel and co-authors, there are 192 operating organizations in Russia that meet the requirements to technoparks [15].

However, there are only two agricultural industrial parks, which are both de facto and de jure, in Russia: K-Agro in the Kaluga region and Stavropol in the Stavropol Territory, while the regional legislation of these subjects provides significant tax preferences for residents of agricultural parks.

Therefore, the implementation of this need also requires the practical implementation of the institutional and economic mechanism for the creation of knowledge-intensive agricultural production in irrigated agrocenoses, which will solve a set of practical issues of arrangement and development of irrigated lands within a single scientific and production complex and further borrow this experience to more successfully achieve the targets of the Federal Program "Science".

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