PROBLEMS AND PROSPECTS FOR INNOVATION IN KAZAKHSTAN AGRO-INDUSTRIAL COMPLEX

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ABSTRACT

An important element of the system of effective development of the agro-industrial complex of the Republic of Kazakhstan is the transition to innovation. Important measures have recently been taken to fundamentally improve innovation in the country. The progress achieved in innovation is still small, but this process is under way, and today it is possible to speak about the sustainability of such development in the economy as a whole, including in the agro-industrial complex. The purpose of this article is to identify main problems and prospects of innovation activity in the agro-industrial complex taking into account the peculiarities of agricultural production. The article analyzes the concept "innovation". Innovations in the agro-industrial complex can be understood as any innovation that allows you to gain a competitive advantage. Types, peculiarities and main directions of innovation activity in agro-industrial complex are defined. The main problems of innovative development of agro-industrial complex, as well as external and internal factors preventing innovation development in agro-industrial complex of Kazakhstan are defined and detailed. Possible ways to solve these problems are considered. Special attention is paid to the state support of innovation activity in the agro-industrial complex and to the enhancement of the role of the state in the development of the organizational and economic mechanism and the formation of the innovation development system.

Keywords: innovation, innovation activity, research and development work, agro-industrial complex, state support for innovation.

INTRODUCTION

The main requirements for achieving competitive production are: use of progressive technology, modern management methods, timely renewal of funds, ensuring flexibility of production, proportionality and rhythm of processes. Throughout the world, innovation is a driving force for social and economic development. World experience shows that innovation ensures sustainable development of production and maintenance of its competitiveness in the long term, constant generation and introduction of everything new, which provides technological and intellectual renewal.

Innovation in the economy of any state determines the level of development of production forces, competitiveness of products and services in the world market. This applies fully to our Republic as well. However, the process of creating innovative technologies and equipment is quite long and expensive of expenses.

Innovative development of Kazakhstan economy is characterized by contradictory trends. There is considerable potential in the field of basic and applied science, but the level of bringing the results of scientific research to practical innovations is low.

Despite the constant attention of innovation activity in our state, the pace and efficiency of innovation development in the agro-industrial complex is still far from the desired level.

MATERIALS AND METHODS

The theoretical basis of a research was made by works of domestic and foreign scientists, statistical data of Statistics committee of Ministry of National Economy of the Republic of Kazakhstan. Traditional content analysis of documents, statistical methods of the analysis of data, general and special methods of scientific cognition were used.

RESULTS AND DISCUSSION

One of the main conditions for the effective functioning of the modern agro-industrial complex is the active use of innovation. As early as 2005, the Program of formation and development of the national innovation system of Kazakhstan for 2005-2015 was approved [1], aimed at intensification of innovation activity in Kazakhstan. The last decade shows that the economy of the Republic of Kazakhstan has laid the foundations for accelerated technological development of all sectors of the real sector of the economy.

Some economists use the concept of "innovation" to refer to an abstract innovation independent of its scope, which has a certain economic effect, but innovation, in our view, already contains innovation and implies its concrete introduction and application. The idea itself, the invention is not an innovation until they have found their consumer.

Therefore, the term "innovation" is associated first of all with the innovations in the field of the equipment, technology, the organization of work and management based on achievements of science and the best practices and also with use of these innovations in the most different areas and fields of activity of the person.

Innovation provides competitive advantages.

Analysis of innovation activity in Kazakhstan shows marked growth. In 2014-2018, the number of enterprises with innovations increased 1.7 times from 1940 to 3230 enterprises. The volume of innovative products increased from 580386.0 million tenge in 2014 to 1179150.2 million tenge in 2018 or almost 2 times. Innovation costs for 2014-2018 Increased from 434602.4 to 861915.0 million tenge or 2 times [2]. An analysis of the cost structure of technological innovation by form of ownership shows that private sector costs prevail.

Despite the positive trends, the level of innovation activity in all types of innovation in Kazakhstan was low at 8.1% in 2014 and 10.6% in 2017, while in developed countries the share of innovative enterprises varies from 35% in Japan and Germany to 55% in Denmark and Finland [3].

The main reasons that limit innovation activity of enterprises are weak demand for innovation from industrial enterprises, lack of financial resources for the development of science and innovation, shortage of highly qualified workers in knowledge-intensive sectors of the economy. In addition, the number of new technologies acquired prevails over the number of scientific developments and technologies transferred, which indicates a low level of introduction of domestic scientific developments and technologies.

The analysis of the development of the agricultural sector of the economy of Kazakhstan shows that one of the main reasons for the low profitability of this sphere is the

low level of development and introduction of modern agricultural technologies and technologies for processing agricultural products. Intensification of production is not real without the use and introduction, transfer of innovative technologies of modern scientific achievements, digital solutions, international exchange. First President of Kazakhstan N.A. Nazarbayev, defining strategic priorities of the new stage of modernization of Kazakh society in the program of long-term development of Kazakhstan - 2050, noted modernization of agriculture as a necessity [4].

The state agricultural development program "Agribusiness 2020" [5] provides for innovative development of the industry, substantial renewal of fixed assets, especially their active part - machines and equipment. This is expected to be achieved through technological and technical modernization, i.e. the introduction of scientific and technological advances, the most important of which are resource-saving technologies of cultivation and harvesting of crops, domestic and foreign equipment of the last generation.

In the case of the agro-industrial complex, innovation is the introduction into economic practice of research and development results in the form of new varieties of plants, Breeds and animal species and poultry crosses, new or improved foods, Materials, new technologies in crop production, livestock and processing, new fertilizers and plant and animal protection products, New methods of prevention and treatment of animals and poultry, new forms of organization and management of various spheres of economy, New approaches to social services that improve production efficiency and competitiveness.

The main types of innovation in the agro-industrial complexare breeding-genetic; Technical-technological and production; Organizational, managerial and economic; Socio-ecological (Fig. 1). The first type of innovation applies only to agriculture.

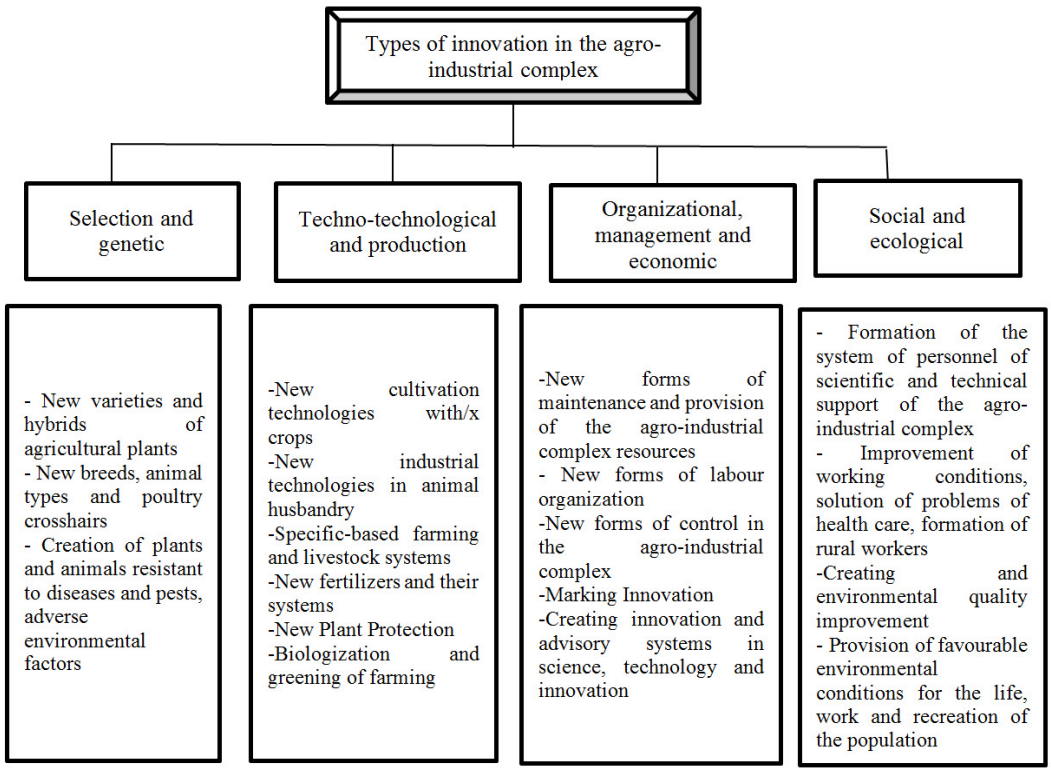

Fig. 1. Types of innovation in the agro-industrial complex

Innovative processes in the agro-industrial complex have their own specific conditions related to the peculiarities of regional, sectoral, technological and organizational conditions.

The main features of the formation of the innovation process in agro-industrial production include the following:

- Multiplicity of agricultural and processing products, significant differences in their production technology;
- Significant differentiation of individual regions of the country according to the conditions of production;
- Heavy dependence of agricultural production technologies on natural and weather conditions;
- Large differences in the production period for certain agricultural products and their processing products;
- High degree of territorial separation of agricultural production;
- Separation of agricultural producers (at all levels) from organizations producing scientific and technical products;

Different social levels of agricultural workers;

- Multiplicity of different forms and links of agricultural producers with innovative formations;
- Lack of a clear and scientifically sound organizational and economic mechanism for the transfer of scientific achievements to agricultural producers: and, as a result, a significant lag in the industry in the development of innovations in production [6].

The main indicators of innovation activity in the agro-industrial complex of Kazakhstan are presented in table 1.

Table 1 - Innovation activity in the agro-industrial complex of Kazakhstan

Indicators	2014	2015	2016	2017	2018
1.Number of the enterprises, units	1769	1812	1972	2031	2314
from them:					
- innovating across all types of innovations, units	137	139	110	116	220
2. Level of innovation activity across all types of innovation, percent	7.7	7.7	5.6	5.7	9.5
3. Volume of innovative products, million tenge	20837.2	25595.9	17424.3	21 716.9	18743.6
4. Volume of innovative products sold, million tenge	10542.9	13937.0	15808.3	21 935.5	18188.8
5. Volume of sold innovative products (goods, services) supplied for export, million tenge	634.8	949.5	1610.9	2 079.4	2278.2
6. Expenses on innovation, million tenge	9612.6	5507.9	9420.6	12904.3	20059.8

The dynamics of innovation indicators in the agro-industrial complex shows their considerable fluctuation. In 2014-2018, the number of enterprises with innovations in this sector of the economy increased more than 1.6 times to 220 enterprises. The level of innovation activity decreased markedly in 2016 and 2017, and only in 2018 there was a

marked increase.

The volume of innovative products decreased from 20837.2 million tenge in 2014 to 18743.6 million tenge in 2018 or by 10%. At the same time, the volume of sold innovative products increased by 7645.9 million tenge or 27.5%, and the volume of sold innovative products supplied for export increased 3.6 times. The costs of innovation in the agro-industrial complex increased by 2014-2018 times in 2.1, amounting to 20059.8 million tenge in 2018.

The structure of innovation in agro-industrial complex (Fig. 2) is dominated by food and technological innovations in food production.

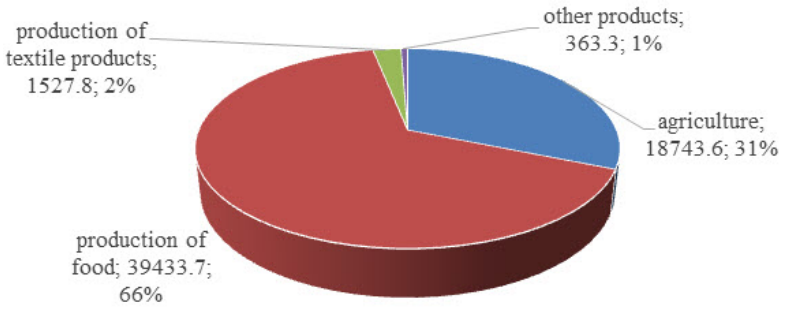

Fig. 2. Structure of innovative products by the agro-industrial complex sectorsin Kazakhstan in 2018

Among the priorities for the development of innovative processes in the agro-industrial complex are:

- Technical re-equipment of the complex organizations;
- Energy and resource-saving technologies for production, storage and processing of agricultural products;
- Soil fertility reproduction, prevention of all types of soil degradation, development of adaptive technologies of agroecosystems and agrolandscapes;
- Development of organic agricultural production. In the zone of the North there is a unique opportunity to focus on huge land resources production of environmentally safe products, to work out technologies of organic farming;
- Creation of a modern system of information and infrastructure support of innovation activity in the agro-industrial complex;
- Development of the state innovation policy and strategy at the federal and regional level aimed at the development of progressive technological patterns;
- Formation of organizational and economic mechanism of the agro-industrial complex operation on an innovative basis;
- Strengthening the role of state organizations in enhancing innovation;
- Development of regional and municipal innovative programs for the development of agro-industrial complex;
- Improvement of the system of personnel training in the field of innovation activity, ensuring increase of innovation activity of organizations and commercialization of the results of scientific research.

The full introduction of innovative technologies in the domestic agro-industrial complex is hampered by a number of factors:

- Lack of a close and effective link between scientific institutions and implementing entities;
- Lack of systematic and consistent innovation in agribusiness, which often leads to economic damage and losses;
- Low level of financing, with a concomitant decline in scientific potential in the agricultural science sector;
- Lack of a targeted State strategy to support, coordinate and monitor agrarian innovation development;
- A large percentage of imported food products;
- Lack of qualified personnel in the innovation industry;
- Low level of solvent demand for scientific and technical products;
- Lack of experience in lending to the innovation sector in the agro-industrial complex [7].

State support and development of agrarian science play a significant impact on the development of innovation activity in the agro-industrial complex.

In order to increase the efficiency of management of scientific and technological assets of the state in the agrarian sphere, scientific support of strategic directions of development of agro-industrial complex and introduction of innovations by the Ministry of Agriculture of the Republic of Kazakhstan, as early as 2007 the joint-stock company «KazAgro Innovation» was established, on the basis of which in 2015 NCJSC «The national agrarian scientific and educational center» (NCJSCNASEC) was created.

The volume of financing of applied scientific research in the field of agro-industrial more than 1.3 thousand people, including scientists with a degree of 60%, the average age of which is 46.7 years. There is a significant material and technical base - more than 280 thousand hectares of land, buildings and structures with an area of more than 900 thousand square meters, almost 3 thousand units of agricultural machinery and other assets.

At present, the structure of Kazakh agrarian science does not correspond to the best world practice (table 2) [8].

Table 2 - Structure of industry science in different countries

Country	Operator	Institutes	Experimentalstations	Knowledgecenters
Kazakhstan	NCJSC NASEC	23 SSA	14	10
Argentina	INTA	4 fundamentaland 15 applied	47	320
France	INRA	14	80 experimentalfarms, 16 technologicalinstitutes	
Canada	AAF Canada	19	Associations, farmers, Higher Education Institutions	
USA	ARS USDA	10	91	2900
Turkey	AGDAR	7	21 regionaland 40 sectoral	

The current state of sectoral agrarian science of Kazakhstan is characterized by insufficient financing, lack of motivation to increase the efficiency of scientists, difficulties in introducing scientific developments, insufficient development of the system of knowledge dissemination, outdated scientific and technical infrastructure, aging of scientific personnel, insufficient level of transfer of advanced foreign technologies, lack of available financing at

the initial stages of innovation introduction, insufficient demand for innovative developments, etc. In this regard, it is necessary to reform agrarian science in order to increase the availability of educational and consulting services for agricultural producers (table 3).

Table 3 - Targets to increase economic accessibility of educational services, results of agrarian science and consulting services

Indicators	2014	2015	2016	2017	2018
The number of implemented scientific developments covered by State support measures is one, units	-	-	17	20	22
The number of the agro-industrial complex subjects covered by educational and consulting services of results of agrarian science, units	2375	10193	11567	12891	14340
Number of implemented innovative projects on transfer and commercialization and agricultural technologies, units	2	12	15	18	21

There is always a lag in the actual results of agricultural production from the possibilities of obtaining them with the full and correct use of scientific and technological achievements. This is true of the present. For example, the productive potential of plants and animals is realized at a level not exceeding 35-40% of genetically conditioned. At the same level, opportunities to increase soil fertility are being used. In addition to the development of scientific research, this requires an increase in innovative capacity in all other areas, and an increase in the capacity to make wider and more effective use of existing and expected future scientific and technological achievements.

Among the new ideas that need to be implemented in the agricultural complex of Kazakhstan as soon as possible are:

- Unmanned aerial vehicles to control farmland. These machines allow not only to draw up maps of farmland in a timely manner, but also to analyze the NDVI vegetation index. The use of NDVI in agriculture makes it possible to monitor crop clogging, analyse soil heterogeneity and disease development, control sievings, map and much more.

- Unmanned transport agricultural equipment. Unmanned tractors are under development around the world. The first prototypes already exist. These machines will be able to process the land and harvest crops on their own without a person according to a previously programmed scenario. In addition, there are already mini-robots for spot recognition of weeds and crop diseases and accurate application of chemicals or fertilizers as needed.

- Automation of processes of processing, storage and production of agricultural products. Innovative technologies of agricultural object automation allow to fully automate all processes, equipment and technological processes. This reduces production downtime, minimizes human impact and improves productivity, reduces grain loss and degradation.

- Sensors, sensors and automatic process control systems. Sensors located everywhere on farmland can continuously transmit on radio channels parameters of controlled crops and transport: humidity, temperature, fuel reserve, level of health of the plant. The obtained data are stored on the server and analyzed, warning the heads of peasant farms in a timely manner about the need to apply certain measures.

- GPS trackers and MCDS systems for recording grain movement from the field to the elevator. Thanks to GPS trackers, the route of agricultural machinery is constantly controlled, and the systems of control and control of access of agricultural transport allow not only to ensure entry/exit on the current of only certain machines, but also to carry out photo and video recording of entry and exit of the car at the moment of weighing of the car body. And automatic determination of gross weight and containers will be a pleasant bonus.

- Exact farming. The term is a kind of synthesis of all previous innovations. Precision farming involves a comprehensive high-tech agricultural management system that includes geographic information systems, yield assessment technologies, Variable Rate Technology, and remote earth sensing technologies. In other words, accurate farming involves an "individual approach" to different sections of the field. It is a kind of "top pilotage" in crop production.

CONCLUSION

Thus, one of the main tasks that ensure innovative agricultural development is to create favourable conditions for formation of an innovation fund and its effective application in production for reducing the existing differences between the results obtained in production and the potential of scientific and technological development. This includes both a quantitative set of innovations available and accessible to consumers and their ability to improve production, economic and other indicators of agro-industrial activities.

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