Specifics of innovations in the agricultural sector

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Abstract. The article is devoted to the study of the peculiarities that determine the specifics of innovative development of the agricultural sector of the Russian economy, especially in the conditions of fierce competition in the global market and economic sanctions applied by economically developed countries to Russia. The relevance of the study is due to the fact that the demand for increasing the rate of innovation in agriculture in the conditions of sanctions pressure becomes the most acute, since the old forms of production in the previous period have lost their relevance, and the new ones have not yet fully formed and developed.

It is concluded that innovation is one of the priority areas not only in practical activity, but also in research, because it is designed to investigate the presence of both failures and achievements in the development of the agricultural sector and its products in the domestic and foreign markets. The study allowed us to identify the determinants that determine the specifics of innovation in the agricultural sector, which were grouped according to certain characteristics. When characterizing the specifics, the presence of fundamental contradictions between the traditional way of life of the agricultural sector and the essence of innovation activity was taken into account.

1 Introduction

The agricultural sector is strategically important, because it provides an opportunity to meet one of the most stringent needs of the population - the need for a sufficient amount of quality and healthy food. In Russia it is developing on the basis of research and academic institutions, as well as innovative and rationalization proposals of agricultural workers, with financial support from the state, which together provides the entire population with basic foodstuffs, as well as high rating positions of agricultural products of Russia in the world market. At the same time, having advantages in terms of the quantity of products produced, Russian goods in general are often inferior to foreign competitors, due to insufficient level of innovative products, pre-sale preparation of goods or quality.

Therefore, the Doctrine of Food Security of the Russian Federation, approved by the Decree of the President of the Russian Federation, pays great attention to innovation processes. The topic of innovation in the conditions of competition is one of the fundamental in all sectors of the economy and is quite well studied. However, at present,*

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one of the most important tasks of Russian agricultural producers is not only the introduction of innovation or the creation of a model of innovative development, but also the development of the ability to generate innovative ideas. It should also be taken into account that the innovative development of agriculture can be interrelated with innovations and development of other sectors of the economy. For example, the volume and quality of harvesting and processing of crops depends on what machinery and equipment can be supplied by the machine building industry, and the yield and terms of storage and processing of raw materials are largely related to the innovations offered by the chemical industry.

Thus, the innovative development of agriculture and agro-industrial complex in general is important for ensuring food security of the population, is closely related to other sectors of the economy, and is also of great importance for the development of foreign trade and foreign economic activity of Russia.

All of the above has necessitated the need to study the specific features that determine the specifics of innovative development of the agricultural sector of the Russian economy, especially in the context of fierce competition in the global market and economic sanctions applied by economically developed countries to Russia. The demand for increasing the pace of innovation in agriculture in the conditions of sanctions pressure becomes the most acute, since the old forms of production in the previous period have lost their relevance, and the new ones have not yet fully formed and developed.

Thus, the study of the specifics of innovation in the Russian agrarian complex seems to be timely, as it will help to identify the main directions of development and prospects of innovation activity in this sector, taking into account global trends and local factors.

2 Materials and methods

2.1 Review of previous studies on the specifics of innovation in the Russian agricultural sector

In economically developed countries, research on the problems of innovative development of the agricultural sector is mostly devoted to the discussion of conceptual issues of innovation policy, identification of factors and classification of innovations. For example, Spielman & Birner (2008) [1] are devoted to the formation of a system of indicators as a tool for the development of evidence-based policy in the field of agricultural innovation. The role of agricultural innovation in economic development, economic growth and poverty reduction is explored in Chema, Gilbert & Roseboom (2003) [2].

In developing countries, studies are more devoted to the issues of improving the efficiency of agricultural production and measures of state regulation and stimulation of the development of innovation processes in the agricultural sector of the economy (for example, Tsvirko (2011) [3]; Alshynbay, Duysemaliyeva & Otarbayeva (2020) [4]; Jurkenaite (2012) [5], etc.). In the focus of research by Russian authors, the problems of innovative development of the agrarian sector of the economy are considered in different aspects. In the paper of Tsvirko (2011) [3] and others, the innovation systems in the agricultural sector of foreign countries are analyzed. The classification of innovation types in the agricultural sector is offered by Salomatin. (2011) [6], Ivanov (2008) [7] and others. The introduction of innovations in agriculture, barriers of the innovation process are devoted to the studies of Kurdyumov & Bushina (2015) [8].

Table 1 analyzes the evolutionary development of innovation processes related to the agricultural sector of the economy.
Table 1

<table>
<thead>
<tr>
<th>Purpose</th>
<th>NARS (National Agricultural Research Systems)</th>
<th>AKIS (Agricultural Knowledge and Innovation Systems)</th>
<th>AIS (Agricultural Innovation Systems)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Research organizations</td>
<td>Research, dissemination and educational organizations</td>
<td>It is assumed that all subjects of the agrarian sector of the economy (state and private sector) will be involved in the creation and realization of innovations.</td>
</tr>
<tr>
<td>Outcome</td>
<td>Theses technological developments and their dissemination</td>
<td>Development and implementation of technological innovations</td>
<td>Institutional approach to the development of innovation processes.</td>
</tr>
<tr>
<td>Organizationa</td>
<td>Use of science to create New technologies</td>
<td>Availability of innovative industry knowledge</td>
<td>Application of new knowledge for socio-economic innovation.</td>
</tr>
<tr>
<td>Mechanism of innovation processes</td>
<td>Technology transfer</td>
<td>Knowledge and information exchange</td>
<td>Interaction and innovation among stakeholders.</td>
</tr>
<tr>
<td>Role of policy</td>
<td>Resource allocation, Prioritization of development</td>
<td>Related research, extension and education</td>
<td>Stimulating innovation.</td>
</tr>
<tr>
<td>Strengths</td>
<td>Infrastructure and human resources development</td>
<td>Communication between participants in the innovation process</td>
<td>Strengthening interaction between all stakeholders; creating favorable conditions.</td>
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</table>

2.2 Methodological approaches to identifying and assessing the peculiarities of innovations in the agricultural sector

- "product innovation: the introduction of a good or service that is new or significantly improved in terms of its performance or intended use. This includes significant improvements in technical specifications, components and materials, firmware, user-friendliness or other functional characteristics";
- "technological innovation: the introduction of a new or significantly improved method of production or delivery. This includes significant changes in technology, equipment and/or software";
3 Results and Discussion

The study allowed us to identify the determinants that determine the specifics of innovation in the agricultural sector, which were grouped according to certain features. When characterizing the specifics, the presence of fundamental contradictions between the traditional way of life of the agricultural sector and the essence of innovation activity was taken into account.

The conducted research allowed us to group the factors determining the specificity of innovation in the agricultural sector into the following groups:

1) Specificity determined by the perception of innovation and innovation activity in the agricultural sector and its diffusion;
2) Specificity determined by the peculiarities of agrarian enterprises and the complexity of innovation;
3) Specificity set by the action of external environment factors;
4) Specificity formed by the requirements of ecological, sanitary-hygienic, and other types of food security;
5) Specificity of qualified personnel and motivation.

The standard innovation process involves attitude formation, adoption of innovations and diffusion (spreading) of innovations.

As is known, any innovative changes are a stress for the system. In the agricultural complex, due to the inherent traditionalism in business processes, the introduction of innovations occurs differently.

The formation of relations takes a longer time: innovative activity encounters resistance from the established and rather conservative system of agricultural production. To a greater extent, this applies to the formation of attitudes towards radical innovations, which result in a transition from established ways of doing business to new practices.

The second group, along with the specifics of the output products, includes determinants related to the size of companies and their characteristics. Small, medium and large enterprises have their limitations and advantages in this process. Therefore, the specificity of innovation should take into account:

- company size;
- status;
- resources;
- stage of life cycle;
- social significance of the activity.

If we talk about the pioneering of innovative developments, we should note such an important characteristic of the company as the availability of the resource component. In this regard, companies with fewer resource constraints have an undoubted advantage over others.
small farms. Agrarian divisions within holdings, having almost unlimited access to such resources as research laboratories, marketing programs, production and financial resources, are more active and faster in introducing innovations due to greater information awareness, availability of resources for research and development activities. These enterprises have more access to financial resources necessary for investing in risky innovation projects. In addition, agricultural structures within holdings have a higher level of innovation culture.

Adoption of innovations in the agricultural sector is determined by such properties of innovations as complexity and simplicity. Some innovations have a better chance of adoption because they are more understandable and simple. Others, perhaps too technically or technologically complex, based on basic scientific research, require a longer period of time to study and adapt to the practice of agricultural activity.

The speed and frequency of innovation adoption is influenced by such a characteristic as the status of the participant in the innovation process. For example, studies provide evidence of a linear relationship between status and innovation (Gartrell & Gartrell (1985) [10]; Lewis et al. (1989) [11]). According to research, those participants who have very high status or resources tend to increase their awareness of innovation very quickly (Gartrell & Gartrell (1979) [12]). As a consequence, this leads to the displacement of small farmers (fewer opportunities to innovate - poorer performance - withdrawal from the market).

When identifying the determinants, it is necessary to pay special attention to the risks inherent in these groups. For example, the analysis has shown that innovations in the agricultural sector, more often than not, act as an experiment, so they are accompanied by a high probability of realization of risks due not only to the loss of profit, but also losses in case of failure. Such conditions include:

- seasonality and weather conditions;
- stretching in time.

Thus, innovations in the agricultural sector can initiate new political movements and initiatives. For example, the “green revolution” initiative in India. Another example, the sanctions pressure on the Russian agricultural sector, led to the formation and implementation of import substitution policy, which is a serious incentive for the modernization of the agricultural complex and stimulates the development of innovation activity (Fig.1).
Despite the positive dynamics, Russia lags behind developed countries in a number of indicators of the agricultural sector, for example, in the World Bank ranking on the indicator "annual wheat production, million tons" Russia ranks 3rd, and on the indicator "grain yield per hectare", Russia ranks only 100th.

Realizing the complex context of innovation in the agrarian complex, it is worth noting the need for various participants in the innovation process. Thus, without large agrarian business it will be difficult to introduce technological innovations and modernize production. At the same time, small (including family) agrarian business is able to implement innovations, having both large farms and small family agricultural enterprises. The former give more yields using innovative technologies, but also pollute the environment to a greater extent. The latter, with a relatively small production volume and innovative capabilities, preserve the ecosystem to a greater extent.

Stable growth of both the volume of products produced and the increase in the value chain can only be supported by a well-considered innovation policy that creates an efficient, dynamic and competitive sector built according to the canons of the innovation economy model.

The study allowed us to identify the determinants that determine the specifics of innovation in the agricultural sector, which should be used when developing an innovation model of enterprise development in the agrarian sector of the economy. As an example, we can propose to use the matrix approach to building an innovation model, presented in Fig.2.

**Fig. 1.** Dynamics of the main indicators of innovation in the agricultural sector under sanctions conditions

**Fig. 2.** Scheme of the innovation model development matrix for agricultural enterprises
This scheme (Fig. 2) will reflect the previously discussed determinants that determine the specificity of innovation in the agricultural sector. Also, for effective diffusion of innovations in the agricultural sector it is necessary to create a special professional network for dissemination of information about innovations.

Researchers of innovation processes traditionally rely on the acceleration of the process of introduction and diffusion of innovations. However, agriculture is often more difficult to introduce new ideas due to the more routine nature of agricultural labor, adherence to traditional business practices and adherence to customs and traditions in agricultural production (especially in developing countries). The proposed approach can be useful and will allow for more clarity not only in formulating objectives, but also in assessing and planning for opportunities.

4 Conclusion

Innovation in agriculture is of vital importance worldwide and research related to its application can be utilized for proper application. It is important to consider the effects of technological change as well as the determinants of innovation adoption. It is critical to apply this model to conservation practices and other "non-commercial" innovations in agriculture. An in-depth understanding of how and why individuals and agricultural social collectives adopt technological change requires in-depth case studies over time. Above all, the social, economic, and political conditions of innovation must be studied using models and methods of modern structural analysis. All of this provides the basis for the continued utilization of a large body of research material.

References

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