Features of innovative activities of agricultural organizations in the conditions of macroeconomic instability

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1 Introduction

Agricultural organizations have strategic importance for Russia in terms of ensuring the country's food security as a condition for maintaining the necessary standard of living for its population. In modern Russian conditions, characterized by macroeconomic instability, a complex geopolitical situation, and a high degree of uncertainty in the functioning of economic entities, especially in the agricultural sector, the probability of their bankruptcy increases due to their inability to counteract the negative influence of both external and internal factors. The phenomenon of macroeconomic instability itself is rooted in the cyclical nature of economic development, where fundamentally new relationships are formed between economic entities, and technological chains in management systems are built on the transformation of production and logistical processes.

Abstract.

The article argues for the necessity of boosting the innovation activities of agricultural organizations to overcome contemporary macroeconomic instability caused by the cyclicality of development in all economic agents, including those engaged in the agricultural sector. It describes the distinctive features of innovation processes in agriculture. A classification of innovations that can be implemented in agricultural enterprises is presented from a comprehensive perspective. The most effective and realistic types of innovations in the current conditions of external and internal environmental instability are highlighted. Special attention is given to the digital transformation of business processes in agricultural enterprises, showcasing their effectiveness. A step-by-step algorithm for implementing innovations in agricultural enterprises with the aim of enhancing their resilience to the impact of macroeconomic instability factors has been developed.

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Various aspects of the issues related to macroeconomic instability in agriculture have been addressed in a number of articles by domestic scholars, allowing us to identify its characteristics in the agricultural sector of the national economy [1-5]. However, questions related to the organization of innovative activities of agricultural organizations in the context of all their specific features and the impact of macroeconomic instability on the performance of such organizations have not yet found reflection in the works of scholars. This determines the need for further development of scientific research in this direction and the formulation of well-founded recommendations.

2 Materials and Methods

The main provisions of this article were formulated using publications that are available in professional journals indexed in Scopus and Web of Science databases, which pertain to the development of agricultural organizations in the context of macroeconomic instability. Comparative study, as well as the search for necessary materials, was conducted using the following keywords: agriculture, innovative activities, macroeconomic instability, cyclical development, digitalization, precision agriculture, algorithm.

3 Results

The results of a scientific study have identified the causes of modern macroeconomic instability that affect the efficiency of agricultural organizations. The need for improving their innovation activities in the livestock and crop farming sectors has been substantiated, and an author's classification of innovations in agriculture, along with a step-by-step implementation algorithm, has been presented.

Numerous factors influence the effective operation of agricultural organizations, among which one of the primary factors is contemporary macroeconomic instability. Its emergence in the Russian economy is largely due to factors such as the cyclicality of economic processes, comprising key components like demand and supply, production and consumption, as well as savings and investments. It is these components, with their high dynamics in the external environment, that create the primary cause of the turbulence in the modern country's economy.

The essence of economic cycles can be explained by the fact that any economic system, including agricultural enterprises, experiences phases of business activity, including peaks, downturns, and recoveries. In this case, changes in the external environmental factors occur unpredictably, leading to a range of problems, with the main ones being:

- an increasing level of uncertainty in activities when the relevant information about changes in the structural elements of the external and internal environment, in terms of volume and quality, does not meet the requirements of economic agents;
- a decrease in efficiency indicators characterizing the operational, investment, and financial activities of market participants;
- a reduction in the synergistic effect of corporate governance processes;

To mitigate these negative phenomena, innovation must be activated, primarily.

4 Discussion

Innovations in agriculture represent new, yet unrealized scientific developments from both domestic and foreign researchers, which, when utilized in projects of various orientations, will significantly enhance the financial stability of the Russian agricultural sector.
Several characteristics of the innovation processes in agriculture can be noted (Figure 1, compiled using source [6-8]).

Fig. 1. Features of the development of processes in agriculture.

In economic literature, various classifications of innovations in agricultural enterprises are provided. In our view, the most comprehensive classification is as follows (Table 1, compiled by the author).

**Table 1. Classification of innovations in agricultural enterprises**

<table>
<thead>
<tr>
<th>Classification sign</th>
<th>Type of innovation</th>
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<tbody>
<tr>
<td>1. Biological</td>
<td>1.1 New varieties of agricultural plants</td>
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<tr>
<td></td>
<td>1.2 New breeds of animals and poultry</td>
</tr>
<tr>
<td></td>
<td>1.3 Selection of animals and plants resistant to pests and diseases, the influence of unfavorable environmental factors</td>
</tr>
<tr>
<td>2. Technical</td>
<td>2.1 Development and use of a new type of machinery or equipment</td>
</tr>
<tr>
<td>3. Technological</td>
<td>3.1 New technological processes of crop processing</td>
</tr>
<tr>
<td></td>
<td>3.2 New technologies for raising animals</td>
</tr>
<tr>
<td></td>
<td>3.3 Digital Farming and Livestock Systems</td>
</tr>
<tr>
<td></td>
<td>3.4 Resource-saving technologies for the production and preservation of agricultural products of the new generation</td>
</tr>
<tr>
<td>4. Chemical</td>
<td>4.1 New types of fertilizers and crop protection</td>
</tr>
<tr>
<td>5. Economics</td>
<td>5.1 New Forms of Planning and Control of Agricultural Production in the Form of Budgeting and Controlling</td>
</tr>
<tr>
<td>6. Innovation in management</td>
<td>6.1 New Forms of Labor Organization and Motivation of Employees of Agricultural Organizations</td>
</tr>
<tr>
<td></td>
<td>6.2 Digital methods of selection, recruitment and advanced training of personnel of agricultural organizations</td>
</tr>
<tr>
<td>7. Innovation in marketing</td>
<td>7.1 Entering new segments of the agricultural market</td>
</tr>
<tr>
<td></td>
<td>7.2 Development of new sales channels for agricultural products</td>
</tr>
</tbody>
</table>

Fig. 1. Features of the development of processes in agriculture.
From the wide variety of innovations, it is possible to identify the most potentially effective and feasible for implementation [9]:

- Safe genetic engineering of seed material;
- Zero-discharge hydro system fishing;
- Ray-condensate irrigation systems;
- "Sea" potatoes;
- Computerized livestock management;
- Bioinsecticides and pollinators;
- Sleave-type grain storage facilities;
- Precision seeding technologies;
- "Smart" greenhouses;
- Sensors for monitoring soil depth during cultivation;
- Aeroponic farms (cultivating plants without soil).

Innovations also find their application in the sub-sectors of agricultural enterprises: crop cultivation and animal husbandry. For example, various agrotechnologies can be applied in crop cultivation (see Figure 2).

Fig. 2. Types of agricultural technologies used in agricultural enterprises

Most of the innovative solutions in agriculture are related to the digitization of its business processes. Industry 4.0 and innovative technologies are transforming agriculture and turning it into a new domain known as Agriculture 4.0 [10].

It is quite evident that the implementation of digital solutions in the business processes of agriculture is very costly and can mainly be financed by large companies, i.e., agro-holdings. However, there are approaches that can be adopted by any agricultural enterprise. Precision farming is meant here, as a leading trend in resource-efficient technologies in agriculture.

The issue of precision farming is actively discussed in economic publications and sparks debates among practitioners [11-13].

Precision farming is a modern concept of agricultural management based on the use of digital methods for monitoring and optimizing agricultural production processes with the aim of increasing the quantity and improving the quality of agricultural products, conserving all...
types of resources, increasing profitability, and reducing the negative impact on the environment.

All authors agree that the use of chemical plant protection agents and the application of fertilizers in precision farming should be carried out differentially, taking into account a complex set of factors, including soil fertility.

Supporters of widespread adoption of precision farming systems provide a detailed characterization of its advantages (see Figure 3).

Fig. 3. Economic result from the use of precision farming elements.

Despite such obvious advantages, the system of precision agriculture is currently being implemented in only 28 Russian regions, with the Lipetsk, Oryol, and Smolensk regions leading the way. This indicates the need to intensify the efforts of agricultural organizations in the field of implementing precision agriculture as the primary driver of innovation in crop production.

Thus, it can be concluded that only one of the directions for implementing digital innovations in agriculture presents a multitude of challenges that agricultural enterprises must address to make optimal management decisions in this field. For this reason, the work being carried out should be systematic and follow a specific algorithm, which is proposed in the following content (Figure 4, created by the author).

Effectiveness of the introduction of precision farming in field cultivation

Differentiated tillage
- Increase in crop yields
- Fuel and lubricants savings
- Reduction of agricultural work time
- Improving the quality of tillage

Differentiated seed sowing
- Using Parallel Driving

Differentiated application of fertilizers and herbicides
- Increase in crop yields
- Reduced seed consumption
- Fuel and lubricants savings
- Increase in labour productivity
- Improving the quality of agricultural work
- Reduction of agricultural work time
- Fuel and lubricants savings

Differentiated irrigation
- Increase in crop yields
- Saving fertilizers, drugs and fuels and lubricants
- Improving the quality of the crop
- Saving water
- Reduced energy costs
- Increasing crop yields
The most significant stages in the general innovation implementation algorithm at an agricultural enterprise are as follows:

1. Studying the innovation market in the field of agricultural production.
2. Comprehensive diagnostics of the current economic situation of an agricultural enterprise.
3. Identification of problem areas in the activities of an agricultural enterprise.
4. Determination of the need of an agricultural enterprise for innovations (marketing, product, organizational, technical, technological).
5. Market studies of innovations in the field of agricultural production.
6. Selection of alternative options for the implementation of innovations at an agricultural enterprise.
7. Economic assessment of innovation implementation at an agricultural enterprise.
8. Selection of innovations for implementation at agricultural enterprises according to the criterion of maximum efficiency.
9. Development of an investment project for the introduction of innovations as part of all the necessary sections.
10. Development of a schedule for the introduction of innovations and the formation of an implementation group.
11. Experimental innovation.
12. Full implementation of innovations in the work of an agricultural enterprise.
13. Evaluation of the results of innovation implementation.
14. Adjusting innovation objectives or setting new objectives.
15. Preparation of the personnel of an agricultural enterprise for the implementation of innovations.

Fig. 4. Algorithm for introducing innovations at an agricultural enterprise in order to increase its resistance to the influence of factors of macroeconomic instability.
5 Conclusion

Agricultural organizations play a strategically important role in ensuring food security in Russia, providing the country's population with food at or above modern food consumption standards. The sustainable, progressive development of agricultural organizations is significantly hindered by macroeconomic instability as a natural process in the cyclical development of economic entities under the conditions of high dynamism in the external environment.

To reduce the impact of the consequences of macroeconomic instability on the efficiency of agribusiness activities, it is necessary, first and foremost, to activate their innovative activities by implementing various innovations in all business processes. Special attention should be paid to the digitization of subsectors such as crop production and livestock farming.

In the agricultural sector, precision agriculture is the leading vector of digital modernization as a modern concept of managing agriculture, based on the use of digital methods to optimize the results of agricultural production with the goal of increasing the quantity and quality of various agricultural products.

The implementation of digital innovations on agricultural enterprises involves carrying out this process according to a specially developed algorithm, which includes a complex of interconnected works, starting with the procedure of comprehensive diagnosis of the economic situation and ending with the adjustment of tasks for the implementation of a complex of innovations in the agricultural sector.

References

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