

Article

Characteristics of Agricultural Risks and Methodology for Their Scientific Classification

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Abstract: This article provides a comprehensive analysis of the essence of agricultural risks, their main characteristics, and the methodology of their scientific classification. The risks arising in agriculture are examined based on natural-climatic, production, market, financial, institutional, and human factors. The study also presents a classification of risks according to their sources, impact levels, and management possibilities. Furthermore, the importance of risk assessment methods and risk management instruments, including insurance, diversification, and financial mechanisms, is substantiated. The results of the study have significant scientific and practical importance in ensuring the sustainability of agricultural production and in developing an effective risk management system.

Keywords: Agricultural Risks, Risk Classification, Risk Management, Risk Assessment, Insurance, Diversification, Financial Risks, Market Risks, Institutional Risks, Production Risks, Natural-Climatic Risks, Agricultural Sector, Sustainable Development

Introduction

In the context of modern globalization and climate change, the agricultural sector operates under the influence of a high degree of uncertainty and various risks[1]. The peculiarity of this industry is that it is directly related to natural and climatic conditions, and production processes are inextricably linked with biological factors. Therefore, agricultural producers regularly face numerous risks arising not only from internal, but also from external factors. Risks in agriculture are diverse and arise in connection with natural disasters, weather changes, insufficient development of production technologies, market volatility, limited financial resources, and changes in state policy. These factors have a significant impact on the volume, quality, and price of agricultural products, undermining the stability of producers' income[2].

From this point of view, a deep study of the essence of agricultural risks, their scientific classification, and the development of effective management mechanisms is one of the urgent scientific and practical issues. Proper risk classification plays an important role in identifying the sources of their origin, assessing the degree of impact, and developing effective management measures for them[3].

The purpose of this article is to analyze the main characteristics of agricultural risks, highlight the methodology for their scientific classification, and substantiate modern approaches to risk management. The research results serve to ensure the stability of

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agricultural production, reduce risks, and form an effective management system in the agricultural sector[4].

Literature Review

Issues of agricultural risks and their management have been widely studied in economic literature, and important theoretical and practical approaches in this area have been developed by various scientific schools. In particular, the scientific works of foreign scientists are of particular importance in the study of the essence of agrarian risks, their sources, and management mechanisms[5]. The approach developed by Hardaker et al. (1997) plays an important role in the systematic study of agricultural risks. They substantiated the need for comprehensive management of agricultural risks, dividing them into production, market, financial, institutional, and human-related risks. This approach is still widely used today in the classification of agricultural risks.

Boehlje and Trede (1977) also conducted an in-depth analysis of price and market risks in agriculture, noting that imbalances between supply and demand lead to sharp price fluctuations. In their opinion, diversification and the use of futures markets are one of the important tools for reducing market risks[6].

Fleisher (1990) emphasized the role of institutional factors in managing agricultural risks and substantiated that changes in state policy, legislation, and regulatory mechanisms have a significant impact on the economic activity of agricultural producers. In addition, studies conducted by Just and Pope (2003) analyzed the relationship between risk and production and showed that economic policy developed taking into account risks is an important factor in ensuring the sustainability of agriculture. In the reports of international organizations, in particular FAO (2014), the importance of insurance, state support programs, and innovative financial instruments in managing agricultural risks is emphasized. According to this organization, agricultural insurance systems are widely implemented in many countries as an effective means of risk reduction.

Also, in the World Bank (2011) research, the effectiveness of index insurance mechanisms in protecting agricultural producers from the consequences of natural disasters is substantiated. This approach is especially relevant in the context of climate change.

Risk is an important structural element of the agricultural economy, which directly affects production volumes, investment decisions, and the stability of farm income. Researchers note that economic policies developed taking into account risks play an important role in ensuring the sustainability of agricultural production (Just & Pope, 2003) [7]. Analysis of the above scientific sources shows that a comprehensive approach to the study of agricultural risks is of great importance, and their scientific classification, assessment, and development of effective management mechanisms are an important factor in ensuring the sustainable development of the agricultural sector.

Methodology

The main purpose of preparing this article is to deeply analyze the essence and characteristics of agricultural risks, develop a methodology for their scientific classification, and substantiate theoretical and practical approaches to effective risk management. It is also planned to improve the mechanisms for ensuring the financial stability of agricultural producers and reducing risks.

Results and Discussion

In the research process, the content of agricultural risks, their sources of origin, and their impact on economic activity were comprehensively analyzed. The analysis showed that agricultural production is characterized by a high degree of uncertainty compared to other sectors, which is explained, first of all, by its strong dependence on natural and climatic conditions. In particular, such factors as drought, excessive precipitation, and frostbite lead to a sharp decrease in yields and negatively affect the income of producers[8].

As a result of the analysis, agricultural risks were divided into natural-climatic, production, market, financial, institutional, and human-dependent groups according to their sources of origin. It has been established that this classification plays an important role in the systematic study of risks and the development of risk management strategies[9]. In particular, natural-climatic and market risks manifested themselves as the most influencing factors. Also, the results of the analysis of risks by the scale of their impact showed the need to divide them into systemic (non-diversifiable) and individual (diversifiable) risks. Systemic risks cover a wide area, simultaneously affect the activities of many farms, and the possibility of reducing them is limited. It has been established that individual risks arise at the level of individual enterprises, and the possibility of managing them is relatively higher.

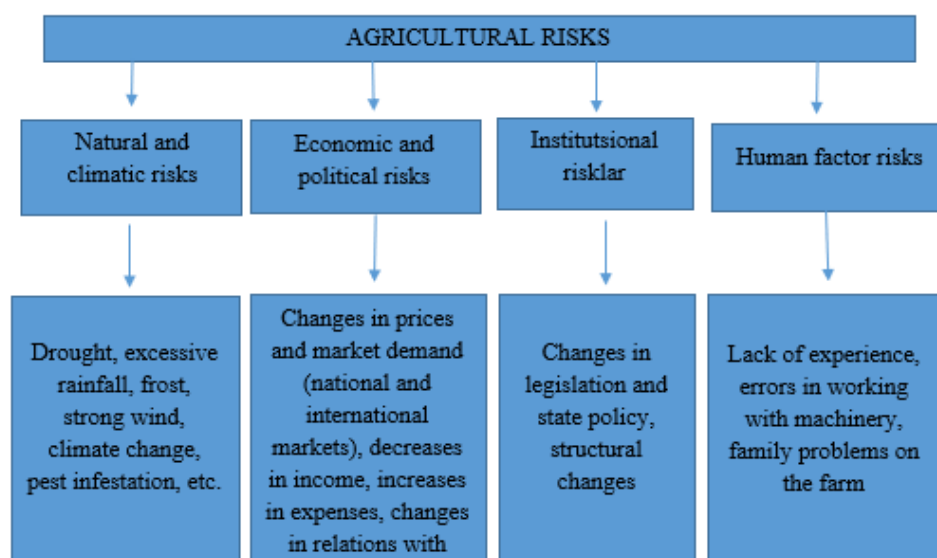


Figure 1. Classification of types of agricultural risks

In the course of the study, the effectiveness of using statistical methods in risk assessment, in particular, the standard deviation and the coefficient of variability, was substantiated. These indicators allow determining the level of stability of production results and assessing expected losses. At the same time, it was found that not only statistical indicators, but also the attitude of decision-makers towards risk are important factors in risk assessment.

The results show that for effective risk management in agriculture, it is necessary to comprehensively use various tools. In particular, such tools as insurance mechanisms, diversification of production, formation of financial reserves, vertical integration, and contractual production play an important role in reducing risks. In particular, the insurance system was assessed as one of the most effective tools for ensuring the financial stability of manufacturers[10].

Risk management tools in agriculture

In the historical process of agricultural management, science and practice have discovered numerous and diverse methods of risk management. These methods can be divided into two main groups:

1. a strategy for the transfer and mutual distribution of risks between various economic entities;
2. strategies for reducing enterprise risks.
3. The main factors influencing risk management in agriculture, their content and impact on agriculture are described in the table as follows (Table 1).

Table 1. Main factors influencing risk management in agriculture

№	Factor type	Content	Impact on agricultural activity
1.	Natural and climatic factors	Drought, cold, mudslide, heavy precipitation, sharp change in weather	Decrease in yield or loss of crops
2.	Regional factors	Availability of an irrigation system, geographical location	The level of risk varies by region.
3.	Factors of production	Crop cultivation technology, agrotechnical measures	Directly affects the quality and quantity of the harvest
4.	Financial factors	Financial resources of the enterprise, investment opportunities	Possibility of creating the necessary infrastructure to reduce risks
5.	Insurance factor	Level of access to insurance services	Creates a mechanism for compensation for emergency losses
6.	Risk frequency	Risk event recurrence period	Allows for risk assessment and determination of insurance rates.
7.	Insurance coverage level	Optimal level of insurance coverage 65-70%	Provides financial stability for manufacturers

Enterprise risk management tools are diverse and can be used independently by farms. In this case, it is convenient in all respects to choose the method of crop insurance as an instrument for the transfer and distribution of risks[11].

An additional way to reduce risk in agricultural production is the selection of means of production and the selection of multi-purpose products. The multifunctionality of the means of production is the possibility of switching from the production of one type of product to the production of another. For example, a cowherd can be transformed into a bullherd in a short time[12].

Instead of land where only certain crops can be grown, a plot of land where various crops can be cultivated has always been a place that meets the wishes of the majority. The multifunctionality of the manufactured product is also convenient due to the fact that it can be sold in different markets and used in various sectors of the economy. For example, potatoes intended for the production of alcohol can be sold to trade and food processing enterprises, or used on the farm itself for feeding cattle. Wheat intended for industrial processing can be sold in the foreign market if there is a surplus in the domestic market[13].

Natural hedging occurs when there is a negative correlation between the yield and the cost of production. This has a stabilizing effect on the income of enterprises, since farms can reduce losses that may arise as a result of a decrease in yields at the expense of higher prices[14].

For example, in countries with a transitional economy, the occurrence of such situations depends more on the legislative framework regulating land relations. This situation predetermines a significant risk for investors who want to invest in the agricultural business. Another example is that there may be restrictions and prohibitions on the use of certain types of crop protection products, which can significantly affect the income of crop-growing enterprises. Such risks are called institutional risks. Another source of risk - especially in peasant farms - is the risk associated with the human factor.

Family crises, such as the death of the farm owner or divorce, also negatively affect the financial condition of the farm. Negligence in handling agricultural machinery and animals is also classified as a risk associated with the human factor. The cumulative impact of production, price, institutional, and human-factor risks is defined by the general term business risk[15].

In general, as a result of the analysis conducted, it has been proven that the scientific classification of agricultural risks and the improvement of their management mechanisms are

an important condition for ensuring sustainable development in the agricultural sector.

The results of the conducted research showed that agricultural production is subject to a high level of risks, and their effective management plays an important role in ensuring the sustainable development of the agricultural sector and economic efficiency. In the study, risks were grouped by natural-climatic, production, market, financial, institutional, and human factors, and their sources and degree of influence were determined.

The importance of the integrated use of statistical methods, insurance, diversification, and financial mechanisms in assessing and mitigating risks has been determined. At the same time, the development of strategies for differentiating and managing systemic and individual risks contributes to minimizing losses in agricultural production and increasing income stability.

Conclusion

In conclusion, implementing an effective risk management system in agriculture is a key condition for increasing production stability, ensuring the financial security of economic entities, and strengthening the country's agricultural sector.

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