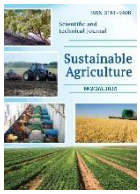
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The Role of Agricultural Insurance in Ensuring Financial Stability and Climate Resilience in the Agrarian Sector

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a r t i c l e i n f o

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a b s t r a c t

Agricultural production is highly dependent on natural conditions, which makes the sector particularly vulnerable to various types of risks. In addition to commercial risks such as price volatility, supply chain disruptions, and legislative changes, farmers in Uzbekistan face significant exposure to climatic and natural disasters. This paper analyzes the key features of agricultural risk in Uzbekistan and emphasizes the necessity of developing an effective agricultural insurance system. Given Uzbekistan's location in a high-risk agricultural zone with limited water resources and reliance on artificial irrigation, risk management becomes a critical element for ensuring sectoral stability and attracting investment. The study highlights the dual role of agricultural insurance: as a protective mechanism against income loss and as a prerequisite for credit access and financial sustainability. Furthermore, the paper suggests the implementation of a digital platform for integrating insurance infrastructure actors and enhancing efficiency in agro-insurance practices. The findings support the argument that a well-functioning agricultural insurance system is essential for sustainable agricultural development, food security, and increased investment in rural areas.

1. INTRODUCTION

Global climate change and complex economic and political situations occurring worldwide are causing new problems, risks, and threats, particularly in agriculture, an important sector of the economy. These include various negative environmental changes, such as a decrease in the volume and quality of land and water resources, declining crop yields, and an intensification of the negative impact of various anthropogenic factors on the environment.

Climate change, in turn, is leading to an increase in the frequency and intensity of natural disasters and extreme events directly related to weather, such as droughts, storms, floods, and degradation of agricultural lands. As a result, this sector and economic entities associated with its activities are suffering significant material and economic losses.

According to reports by the Food and Agriculture Organization of the United Nations (FAO), "Between 1991 and 2021, natural disasters caused losses in agricultural production value amounting to 3.8 trillion US dollars. This represents an annual average of 123 billion US dollars or 5 percent of global agricultural production"[1]. Therefore, it is crucial to develop sources and improve mechanisms for covering the significant economic damages and material losses in agriculture, not only under current conditions but also in the future.

In particular, increasing the financial sources and types of insurance is one of the systems that enables risk management in agriculture, provides insurance payments to financially compensate for crop losses and economic damage caused by unfavorable weather conditions, ensures the interests of involved parties in contracts between insurers and policyholders, and allows for effective operation of enterprises and farms in the sector. Therefore, economically developed foreign countries prioritize the effective organization and expansion of agricultural insurance services to provide financial protection for agriculture and its constituent entities against various natural disasters.

In this field, leading research institutions and centers worldwide are conducting noteworthy studies on the effective organization of agricultural insurance systems. These research areas include: reducing the risks for agricultural producers in the context of climate change; assessing and forecasting crop loss quantities; implementing agricultural insurance technologies and innovations; developing digital software platforms and intelligent insurance systems for insurance system participants; securely storing farmers' data through blockchain; enhancing transparency of insurance processes; examining the effectiveness of state subsidies allocated based on insurance programs; and improving financial incentive mechanisms to increase farmers' trust in insurance.

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2. METHODOLOGY

The effective organization and development of the insurance system in accordance with market requirements, including theoretical, methodological, and practical issues of agricultural insurance, have been extensively studied in the scientific research and works of many foreign economists, such as V.S. Averin, A.F. Bakirov, I.T. Dorzhieva, T.P. Lomakina, L.K. Nikitenkov, A.V. Nikitin, and D.B. Khudakov.

Domestic economists, including Kh.M. Shennayev, K.M. Kuldashev, A.S. Nurullayev, S.Kh. Umarov, R.S. Azimov, T.M. Baymuratov, G.T. Khalikulova, S.R. Sherov, U.G. Imomov, G.D. Adilova, I.Kh. Abdurakhmanov, A.T. Umirov, and A.A. Yadgarov, have made significant contributions through their scientific research to improving agricultural insurance relations and developing mechanisms and types of agricultural insurance in market conditions.

However, analysis of specialized literature reveals that the research conducted by the aforementioned scholars has not thoroughly examined the directions for improving and developing the agricultural insurance system and mechanisms in line with the requirements of digitalization of the economy and transition to a "green" economy. Furthermore, methods for differentially assessing the impact of factors causing material and economic damage and crop loss in producers' activities, considering regional characteristics of agricultural production, as well as determining insurance amounts and types based on this assessment, have not been sufficiently investigated. The need to develop scientific proposals and practical recommendations to address these highlighted issues and other current problems in the insurance system, as well as to digitalize agricultural insurance relations and implement them in the processes of developing the insurance system in accordance with modern requirements, formed the basis for selecting the topic of this dissertation.

3. RESULTS

In international practice, the main agricultural insurance programs implemented for farms are primarily structured in the following areas:

- Individual insurance against specific risks;
- Comprehensive insurance against multiple types of risks;
- Insurance based on regional yield index;
- Weather index-based insurance;
- Farm income insurance (agricultural producers are insured not only against crop failure but also against declines in agricultural product prices).

The agricultural insurance mechanism is designed to compensate for large-scale losses inflicted on agriculture due to natural disasters and unforeseen events. The insurance mechanism plays a crucial role in preventing risks in the agricultural sector and reducing their likelihood of occurrence.

The Specific Features of Agricultural Insurance Include the Following:

- Ensuring the stable operation of enterprises engaged in agriculture through the use of agro-insurance services;
- The occurrence of unexpected events in agriculture and the fact that such events are often unbounded or difficult to limit in scope;
- Compensation for various forms and scales of financial losses incurred by agricultural enterprises through agro-insurance mechanisms;
- Serving as a guaranteed protective tool to support the sustainable functioning of agricultural enterprises;
- Facilitating the timely satisfaction of consumer demand for agricultural products produced by these enterprises;
- The limited capacity to fully compensate financial losses caused by unforeseen events affecting agricultural enterprises.

The Economic Situation of Farms in the Agrarian Sector Can Be Highly Volatile Due to Several Factors:

- A decline in prices paid to farmers as a result of political reforms, trade agreements, and market liberalization;
- Power imbalances in relationships with retailers, including strong pricing pressure imposed on farmers;
- Risks related to sanitary measures and livestock diseases;
- Climate change: there is a general understanding that the frequency and intensity of extreme meteorological events are increasing. Climatic risks are more significant for crops, whereas sanitary risks are more critical for livestock farming, but neither can be disregarded. Pests can severely affect crops, while adverse weather conditions can seriously damage livestock production through pasture degradation or reduced fodder availability.

One of the Key Characteristics of Agricultural Production is Its High Dependence on Natural Conditions. Therefore, in addition to commercial risks—such as price volatility of products and resources, behaviors of buyers and suppliers, changes in legislation, and others—farmers also face significant risks associated with various types of natural events.

Damage caused by natural disasters in agriculture can significantly undermine the stability of the sector and adversely affect its development.

Uzbekistan is located in a high-risk agricultural zone. Due to the limited availability of natural water sources and low levels of precipitation, the majority of agricultural output relies on artificial irrigation systems. Consequently, the risk of crop failure increases when irrigation water becomes scarce or when agro-technical activities cannot be carried out in a timely manner. Under artificial irrigation conditions, the labor-intensive nature of agricultural production, along with the rising costs of fuel and lubricants, creates an increased need for timely fertilization and agro-technical interventions. These factors contribute to higher production costs per unit of output in agriculture. All of these elements lead to low profitability in agricultural production, which in turn negatively impacts the attractiveness of the sector for large-scale private investment.

Discussion. The primary objective of agricultural risk insurance is to partially or fully compensate farmers for potential losses of crops or livestock resulting from adverse natural events such as droughts, hail, storms, epidemics, and others.

Thus, agricultural insurance is aimed at preventing sharp fluctuations in the income of agricultural producers, particularly those caused by natural risks.

Another essential function of agro-insurance is to improve the financial standing of agricultural producers, especially from the perspective of their creditworthiness. In practice, all types of lending institutions—commercial banks, credit unions, and private lenders—require assurance that a farmer has a guaranteed level of income protection in the event of natural disasters, crop failures, or livestock loss. Therefore, agricultural insurance often becomes one of the key prerequisites for farmers to access credit.

Moreover, the presence of a well-developed agricultural insurance system enhances the investment attractiveness of the agrarian sector, as it increases the guarantee of returns for potential investors.

These issues are particularly relevant for Uzbekistan. In the country, the state remains the primary regulator of agricultural production, providing preferential loans to farms through commercial banks and organizing the centralized supply of essential resources—such as chemicals, fertilizers, and other inputs—necessary for agricultural production. One of the most important conditions for farmers' access to credit resources is the availability of guaranteed insurance coverage.

Additionally, this contributes to improving the financial stability of farming enterprises, thereby enhancing the overall investment attractiveness of agricultural projects. Currently, household and farming enterprises account for 96% of the total gross agricultural output. The rapid development of farm enterprises demands reforms in the agricultural support infrastructure and financing system. This significantly increases the relevance of developing an agricultural insurance system in Uzbekistan.

Several Mechanisms Can Be Identified as Risk Management Tools in Agriculture. These include on-farm measures such as the diversification of production programs, as well as risk-sharing strategies like marketing contracts, pre-signed production agreements, utilization of investment funds, and services provided by insurance companies.

Table 1.

Main risks in the food value chain

Types of risks	Agricultural entities				
	Raw material suppliers	Farmers and dehkans	Domestic and international trade representatives	Food processing enterprises	Retailers
Production risks	*	***	*	*	*
Operational risks	**	***	**	***	**
Market risks	**	***	*	***	**
Financial risks	*	***	*	*	*
Technological risks	**	***	*	**	*
Political risks	**	**	*	**	*
Infrastructure risks	*	*	*	*	*

*Note: Risk levels: ***high, **moderate, *low.*

Insurance is Considered the Most Effective Tool for Risk Management in Agriculture. There are two essential requirements that must be met in agricultural risk insurance: managing the negative effects of asymmetric information and mitigating the consequences of systemic risks. Natural disasters or livestock diseases pose specific challenges for agricultural insurance.

In the absence of reinsurance, government guarantees, or subsidies, systemic risks can force insurance companies to charge extremely high premiums—often unaffordable for most farmers—and require large capital reserves. This implies that comprehensive agricultural insurance schemes require strong support from the public sector.

In World Trade Organization (WTO) member countries, public support in agriculture must comply with WTO agreements. One permissible form of assistance includes compensation for income loss that does not distort trade in agro-insurance services. Such government aid is only provided when income loss exceeds 30% of the average gross income or the equivalent of net income over the previous three years.

In this context, it is essential to ensure an efficient distribution of rights and responsibilities among the parties involved in building the system. Farmers, as policyholders, should benefit from access to quality insurance services at affordable prices; insurers should be able to provide these services at a reasonable level of profitability; and the state should focus on facilitating the creation of an effective system for insuring agricultural risks. Ultimately, such an approach will help ensure the sustainable development of agriculture, even under conditions of limited resources.

The development of agro-insurance relations is crucial for ensuring the sustainable development of agriculture, maintaining social stability in rural areas, and safeguarding food security.

Agricultural risk insurance refers to the calculation of compensation in monetary equivalent for damages or losses to specific insured objects, as stated in the insurance contract, resulting from an insured event. However, compensation must not exceed the insured sum.

This characterization makes it possible to develop a matrix of insured and uninsured agricultural risks specific to the nature of agricultural production.

A study of agricultural risk insurance mechanisms across different countries shows that despite the diversity of experiences and models, several insurance frameworks can be adapted and recommended for implementation in Uzbekistan.

An analysis of the current state of agricultural insurance suggests that a general trend of declining insurance indicators is observed across all countries. This is primarily reflected in the low proportion of insured sown areas. The significant decrease in the insurance payout coefficient indicates that existing models of agricultural insurance are insufficiently effective.

The insurance market and services, as an integral part of any country's economic system, must be efficiently organized and sustainably developed.

To address these pressing challenges, it is advisable to develop a digital electronic platform that integrates and coordinates the activities of all infrastructure participants involved in the insurance system. This platform should be widely implemented into practical insurance operations.

4. CONCLUSION

In conclusion, the development of a robust agricultural insurance system in Uzbekistan is not only a necessary response to the sector's vulnerability to natural risks but also a key instrument for enhancing the financial and investment environment in rural areas. The current agricultural production model, heavily reliant on state support and artificial irrigation, underscores the need for comprehensive risk management tools. Agricultural insurance serves multiple functions: it provides a safety net for producers against unpredictable natural disasters, improves credit access by enhancing farmers' financial reliability, and increases investor confidence in the agrarian sector. The research further concludes that international models of agro-insurance can offer valuable frameworks for adaptation in Uzbekistan, but a context-specific, integrated, and technology-supported system is essential for long-term success. Establishing a unified digital insurance platform could significantly improve coordination and transparency across stakeholders. Ultimately, expanding agricultural insurance coverage is vital for promoting rural resilience, achieving food security, and stimulating economic growth in Uzbekistan's agricultural sector.

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