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**Формування обліково-аналітичного забезпечення управління
ризиками сільськогосподарського страхування**

Алескерова Юлія Володимирівна

д.е.н., професор кафедри фінансів, банківської справи, страхування та
фондового ринку

Хмельницького університету управління та права імені Леоніда Юзькова,
Хмельницький, Україна. ORCID: <https://orcid.org/0000-0003-3072-4854>

Researcher ID: M-6099-2018

E-mail: aleskerovaaleskerova@gmail.com

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Анотація. У статті досліджено теоретико-методичні засади формування обліково-аналітичного забезпечення управління ризиками сільськогосподарського страхування в умовах високої ризиковості аграрного виробництва. Обґрунтовано роль сільськогосподарського страхування як ключового фінансового механізму захисту аграрних підприємств від негативних наслідків природно-кліматичних, виробничих та ринкових ризиків. Визначено специфіку страхових ризиків у сільському господарстві, зумовлену сезонністю виробництва, залежністю від погодних умов та нестабільністю доходів аграрних товаровиробників.

Особливу увагу приділено значенню обліково-аналітичної інформації у процесі формування страхових продуктів, оцінювання страхових ризиків та визначення обґрунтованих розмірів страхових платежів і страхових



відшкодувань. Розкрито роль бухгалтерського обліку та фінансово-економічного аналізу в забезпеченні достовірності інформації щодо обсягів застрахованого виробництва, страхових сум і фінансових результатів діяльності аграрних підприємств. Проаналізовано проблеми інформаційного забезпечення управління ризиками у сфері сільськогосподарського страхування, що стримують розвиток страхового ринку та знижують рівень довіри між страховиками й сільськогосподарськими товаровиробниками.

Запропоновано напрями вдосконалення обліково-аналітичного забезпечення управління ризиками сільськогосподарського страхування шляхом формування єдиної системи облікових та аналітичних показників, адаптованих до специфіки аграрного виробництва. Реалізація запропонованих підходів сприятиме підвищенню ефективності страхового захисту, зниженню рівня фінансових втрат аграрних підприємств та сталому розвитку системи сільськогосподарського страхування в Україні.

Ключові слова: сільськогосподарське страхування, страхові ризики, управління ризиками, обліково-аналітичне забезпечення, аграрне виробництво, фінансові ризики, страхові платежі, страхові відшкодування, аграрні підприємства, страхова діяльність.

Formation of accounting and analytical support for agricultural insurance risk management

Aleskerova Yuliia Volodymyrivna

Doctor of Economics, Professor, Department of Finance, Banking, Insurance
and Stock market

Leonid Yuzkov Khmelnytskyi University of Management and Law,
Khmelnyskyi, Ukraine

ORCID: <https://orcid.org/0000-0003-3072-4854>

Researcher ID: M-6099-2018

E-mail: aleskerovaaleskerova@gmail.com



Abstract. The article examines the theoretical and methodological foundations for the formation of accounting and analytical support for risk management in agricultural insurance under conditions of high risk inherent in agricultural production. The role of agricultural insurance as a key financial mechanism for protecting agricultural enterprises from the negative effects of natural-climatic, production, and market risks is substantiated. The specific features of insurance risks in agriculture, caused by the seasonality of production, dependence on weather conditions, and instability of income of agricultural producers, are identified.

Special attention is paid to the importance of accounting and analytical information in the process of developing insurance products, assessing insurance risks, and determining justified amounts of insurance premiums and indemnities. The role of accounting and financial-economic analysis in ensuring the reliability of information on the volume of insured production, insured sums, and financial performance of agricultural enterprises is revealed. The problems of information support for risk management in the field of agricultural insurance, which hinder the development of the insurance market and reduce the level of trust between insurers and agricultural producers, are analyzed.

Directions for improving accounting and analytical support for risk management in agricultural insurance are proposed through the formation of an integrated system of accounting and analytical indicators adapted to the specifics of agricultural production. The implementation of the proposed approaches will contribute to increasing the effectiveness of insurance protection, reducing financial losses of agricultural enterprises, and ensuring the sustainable development of the agricultural insurance system in Ukraine.

Keywords: agricultural insurance, insurance risks, risk management, accounting and analytical support, agricultural production, financial risks, insurance premiums, insurance indemnities, agricultural enterprises, insurance activity.



Introduction. Agriculture is one of the riskiest sectors of the economy, as its results largely depend on natural and climate conditions, biological processes, the state of land resources, technological factors, and market conditions. Uncertainty regarding crop yields, the likelihood of natural disasters, the spread of plant and animal diseases, or fluctuations in product prices creates the conditions for significant financial losses for agricultural enterprises. In such conditions, insurance becomes an important tool for ensuring economic stability and continuity of the production process.

The effectiveness of insurance mechanisms in agriculture largely depends on the quality of accounting and analytical support. It forms the basis for identifying risks, assessing their probability, modeling possible losses, and justifying insurance rates. A comprehensive combination of internal accounting information from enterprises and external sources — meteorological, statistical, market, and biological data — creates the conditions for accurate analysis of the risk environment and informed decision-making by both insurers and producers.

The development of analytical methods, digital technologies, and monitoring systems allows for a significant increase in the transparency and reliability of data in agricultural insurance. This, in turn, contributes to improving the effectiveness of insurance programs, strengthening the financial security of enterprises, and ensuring the sustainable development of the agricultural sector in the face of growing natural and economic risks.

Analysis of recent research and publications. The issues of risk management in the agricultural sector and the development of the agricultural insurance system have been widely reflected in the works of domestic and foreign scholars. A significant contribution to the study of the economic nature of agricultural risks, their classification, and the impact of natural and climatic factors on the performance of agricultural enterprises was made by Mesel-Veselyak V. Ya., Shpychak O. M., and Sabluk P. T. Their studies consider agricultural risks through the prism of sustainable agricultural development, food security, and structural transformations of the agrarian economy [1–3].



The formation and development of agricultural insurance mechanisms, including state-supported insurance models, are highlighted in the scientific works of Vovchak O. D., Vnukova N. M., Pikus R. V., as well as in applied studies devoted to agricultural risk insurance in Ukraine. These authors substantiate the role of insurance as an effective financial instrument for protecting farmers against losses and stabilizing their incomes, paying particular attention to actuarial approaches, tariff setting, and the balancing of insurance portfolios [4, 5, 10, 11, 13].

Accounting and analytical aspects of risk management and information support for insurance decision-making are addressed in the works of Butynets F. F., Pushkar M. S., and Golova S. F. The authors emphasize the importance of accounting systems, financial reporting, and information technologies as sources of reliable data for risk assessment and managerial decision-making in insurance activities. They also highlight the necessity of integrating internal accounting information with external statistical and analytical data [12, 14].

The current state and development trends of the insurance market in Ukraine, including the impact of economic shocks and crisis phenomena, are reflected in analytical publications and statistical sources that examine changes in the number of insurance companies, market capacity, and the introduction of innovative insurance products, such as index-based agricultural insurance [6–9].

Foreign research is presented in the works of Skees J., Barnett B., Just J., Miranda M., and international organizations such as the OECD. These studies focus on the application of econometric models, index insurance, reinsurance mechanisms, and comprehensive risk management frameworks in agriculture. The results of these studies prove the effectiveness of quantitative methods for risk analysis, loss forecasting, and improving the sustainability of agricultural insurance systems [15–17].

Unresolved part of problem. However, analysis of scientific sources shows that, despite a significant number of studies, the issue of comprehensive accounting and analytical support for agricultural insurance risks requires further development.



Approaches to combining accounting information from agricultural enterprises, meteorological and market data, and analytical methods in a single information system remain insufficiently systematized, which determines the relevance of this study.

The aim of the study. The purpose of the study is to substantiate the theoretical foundations and develop practical approaches to the formation of effective accounting and analytical support for agricultural insurance risk management. Within the scope of the set goal, it is planned to study the role of accounting and analytical information in identifying and assessing agricultural risks, determining directions for improving the information base for insurance decisions, as well as substantiating the importance of analytical methods for increasing the objectivity of insurance rates and the financial stability of agricultural enterprises and insurance companies.

Statement of main research material. Accounting and analytical support is a set of methods, tools, and procedures that ensure the collection, systematization, processing, and analytical assessment of information necessary for identifying, measuring, and managing risks in the field of agricultural insurance.

Accounting and analytical support in the field of agricultural insurance is a comprehensive system that combines methods of accounting, statistics, economic analysis, actuarial calculations, and risk management. It forms a holistic information space within which the risks inherent in agricultural production are identified, measured, assessed, and predicted. The essence of this system lies in transforming primary accounting information and external statistical data into analytical indicators necessary for informed management and insurance decisions.

Insurance risk assessment is a key component of accounting and analytical support. The system summarizes data on weather and climate conditions, crop yield dynamics, biological factors, technological parameters of production, and market fluctuations. The use of statistical methods, economic and mathematical modeling, and variation analysis makes it possible to determine the probability of insured events, calculate expected losses, and form a scientifically sound basis for actuarial rates (Table 1).



Table 1 Main sources of data for assessing agricultural risks

Categories of data	Examples	Significance for insurance
Weather data	temperature, precipitation, wind, soil moisture	identification of natural and climatic risks
Biological data	plants and animal diseases, pests	assessment of biotic risks
Technological parameters	seeding rate, fertilizer, crop protection	forecasting performance and risk levels
Economic data	cost price, prices, profitability	calculation of the amount of insurance payments
Crop yield statistics	long-term data records	calculation of tariffs and crop yield variations

**Source: prepared by the authors based on their own research*

Formation of insurance rates is another important task of the analytical system. Since agriculture is characterized by highly variable natural conditions and cyclical production, insurance rates must be based on in-depth statistical analysis, actuarial calculations, and predictive models. Data collection and systematization allow for the formation of an economically sound rate that balances the interests of the insurer and the insured and at the same time guarantees the financial stability of the insurance product.

The control and confirmation of insured events play an important role. Accounting and analytical support includes recording technological operations, monitoring crops and animals, analyzing weather conditions at the time of a probable event, and comparing actual results with normative indicators. The existence of a structured information base minimizes the possibility of manipulation, ensures evidence in the process of assessing losses, and promotes transparency in relations between participants in the insurance process (Table 2).

Table 2 Functional components of accounting and analytical support

Function	Content	Result
Information function	data collection and its systematization	creation of a single information database
Evaluation function	risk assessment, determining probabilities	sound actuarial calculations
Control function	document screening, farm monitoring	accuracy of insured events
Predictive function	modeling of trends, scenario analysis	predictions of risks and possible losses
Management function	preparing solutions for agrarians and insurers	optimization of insurance programs

**Source: prepared by the authors based on their own research*



Supporting management related decisions is an integral part of the system, as analytical information allows farmers to adjust production technologies, determine the feasibility of insurance, and select optimal programs for protecting crops or livestock. For insurers, the analytical database provides the opportunity to form balanced insurance portfolios, forecast losses, and increase the effectiveness of insurance products. In summary, accounting and analytical support serves as a strategic tool that combines economic, statistical, and management mechanisms to stabilize the agricultural sector and ensure the effective functioning of the agricultural insurance system. The accounting and analytical support system in the field of agricultural insurance is based on the interaction of three key components: accounting information, external information, and analytical methods. It is the comprehensive nature of this system that enables a complete risk assessment, the formation of reasonable insurance rates, and support for strategic and operational management decisions in the field of agricultural production and insurance.

Accounting information is a fundamental part of the system, as it is generated directly at the enterprise level and reflects the actual characteristics of its production and financial activities. It includes accounting and management data, information on the structure of cultivated areas, production flowcharts, crop yield indicators, livestock numbers, and insurance claim statistics. The combination of these data allows analyzing productivity dynamics, tracking the impact of technological parameters on the level of risk, and assessing the enterprise's resistance to adverse factors. (Table 3).

Table 3 Accounting information as a source for insurance solutions

Type of information	Examples	Significance of insurance
Accounting data	expenses, income, balance sheet, capital	definition of financial stability and insurance amounts
Technological maps	seeding rate, agrotechnical measures	assessment of compliance with technologies and production risks
Crop yields	actual performance, long-term records	basis for actuarial calculations
Livestock data	numbers, biological characteristics	pet insurance, biotic risks assessment



Insurance claims history	frequency, reasons, number of losses	forecasting enterprise risk
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**Source: prepared by the authors based on their own research*

External information provides context for assessing risks that are independent of the enterprise's activities but have a significant impact on production results. This includes meteorological data, climatic characteristics, regional crop yield statistics, information on epiphytotic and epizootic processes, and agricultural market data. Integrating external and internal data allows you to model a complete picture of the risk environment (Table 4).

Table 4 External information resources for agricultural insurance

Category of information	Content	Use in risk analysis
Meteorological data	precipitation, temperature, wind, soil moisture	weather risk assessment
Climatic indicators	long-term weather records	calculation of variations and forecasts
Biological data	diseases, pests, outbreaks	modeling of biotic risks
Market information	prices, dynamics of demand, market fluctuations	calculation of insurance amounts and economic losses
Crop yield statistics	regional records for 5-30 years	basis for calculating tariffs and insurance reserves

**Source: prepared by the authors based on their own research*

Analytical methods are key tools of the system, as they convert collected data into quantitative risk characteristics, loss ratios, probabilities of occurrence of insured events, and projected scenarios. The main methods include statistical analysis of crop yield variation, actuarial calculations, risk modeling, sensitivity analysis, and comparative analysis of farms (Table 5).

Table 5 Characteristics of main analytical methods

Method	Essence	Result
Statistical analysis	study of variations, trends, correlations	assessment of crop yield stability and risk
Actuarial calculations	mathematic modeling of losses	determination of insurance tariff
Predictive modeling	scenario analysis, trendy models	loss and risk forecast
Sensitivity analysis	assessment of the impact of factors	identification of key risk sources
Comparative analysis	farms, regions comparison	identification of high-risk areas

**Source: prepared by the authors based on their own research*

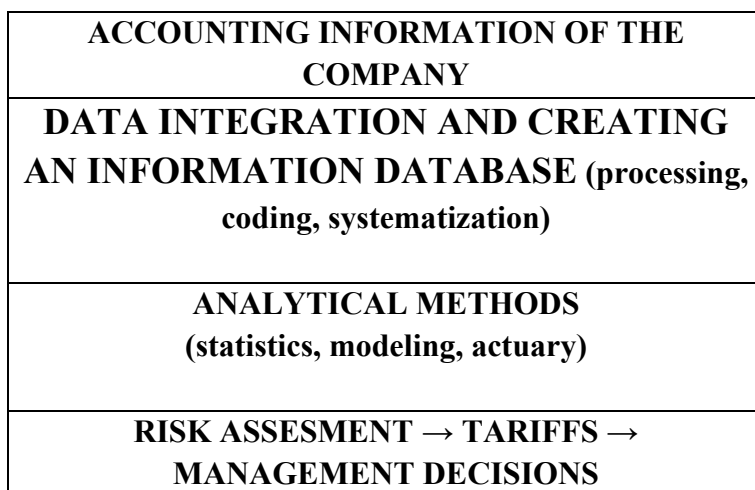


Figure 1. Schemes (text models) of the accounting and analytical support system

**Source: prepared by the authors based on their own research*

Accounting and analytical support in insurance activities in the agricultural sector performs several key functions that form a comprehensive mechanism for identifying, assessing, and managing risks. These functions are interrelated and aimed at ensuring information transparency, objectivity of insurance decisions, forecasting possible losses, and supporting the financial stability of agricultural enterprises and insurers.

The information function consists in providing all participants in the insurance process with reliable, verified, and structured information. It covers the collection, systematization, and transmission of data on production, technological, biological, and financial parameters that affect the level of risk. The availability of an accurate information base reduces information asymmetry and ensures the transparency of insurance conditions.

The evaluation function is focused on determining the level of risk, the probability of occurrence of insured events, and the scale of potential losses. It is implemented using statistical analysis, actuarial methods, risk modeling, and sensitivity analysis. Based on this, insurance rates are formed, insurance reserves are determined, and decisions are made regarding the feasibility of insurance coverage.

The control function ensures verification of insured events, assessment of the accuracy of reported losses, and monitoring of the condition of insured objects. Control is exercised by analyzing the compliance of actual indicators with regulatory ones,



checking documents, related technical materials, and weather conditions. This reduces the risk of insurance fraud and ensures fairness of payments.

The predictive function is aimed at forecasting future trends in production, risk levels, potential losses, and the financial consequences of insured events. The use of predictive models enables farmers and insurers to prepare for potential threats, build insurance reserves, and optimize production plans.

The management function ensures the formation of rational management decisions regarding insurance programs, insurance rates, deductibles, contract terms, and risk management strategies. Based on analytical data, companies can optimize crop structures, technological processes, and financial strategies, while insurers can determine strategies for forming insurance product portfolios.

Table 5 Main functions of accounting and analytical support and their content

Function	Content	Expected result
Information function	data collection, systematization, verification	creation of a reliable information base
Evaluation function	evaluation of risks and losses	reasonable tariffs and reserves
Control function	verification of insured events	fraud minimization, payment accuracy
Predictive function	crop yield, risk, loss forecast	preparation for future threats
Management function	decision-making and program optimization	improving the effectiveness of insurance

Source: prepared by the authors based on their own research

The functioning of the accounting and analytical support system ensures the improvement of insurance mechanisms in agriculture and contributes to the stability of production. Accurate analytical calculations and forecasts increase the objectivity of insurance rates, which reduces the risk of losses for insurers and lowers the cost of insurance for farmers. This creates conditions for fair insurance terms and mutually beneficial cooperation between insurance companies and agricultural producers.

Since the agricultural sector is significantly affected by natural, climatic, and biological factors, high-quality accounting and analytical support allows for the effective prevention of financial losses related to droughts, excessive precipitation, frosts, and plant and animal diseases. Comprehensive risk analysis also contributes to



improving the economic stability of farms, which has a positive impact on the country's food security (Table 6).

Table 6 Importance of accounting and analytical support for agricultural sector

Direction of influence	Advantages
Tariff accuracy	reduction in insurers' losses
Fairness of insurance	optimal conditions for farmers
Loss prevention	minimization of economic risks
Economic stability	stability of production and development

**Source: prepared by the authors based on their own research*

Accounting and analytical support for agricultural insurance is a key component of the agricultural risk management system. It forms a scientifically sound information base that combines accounting data, technological indicators, meteorological observations, crop yield statistics, and market information. The comprehensive use of this data makes it possible to objectively assess risks, forecast potential losses, and set economically sound insurance rates.

The functional structure of the system — comprising informational, evaluative, control, prognostic, and managerial components — provides comprehensive coverage of insurance processes, from risk identification to decision-making regarding insurance programs and their financial support. Thanks to this, the accounting and analytical system creates a basis for increasing the transparency of the insurance process, minimizing information asymmetry, and strengthening trust between farmers and insurance companies.

In general, accounting and analytical support is not only an insurance tool, but also an important component of the strategic management system for agricultural production, ensuring a high level of predictability, controllability, and economic efficiency in the development of the industry.

Conclusions. The study resulted in determination that accounting and analytical support is a key element of effective risk management in agricultural insurance. Its comprehensive nature, which combines accounting information from enterprises, external statistical and meteorological data, as well as modern analytical methods,



creates a reliable information base for identifying, assessing, and forecasting agricultural risks.

It has been substantiated that the use of a systematic approach to the formation of an analytical base contributes to increasing the objectivity of insurance rates, reducing the risk of insurance fraud, and ensuring the financial stability of insurance programs. High-quality accounting and analytical support enable agricultural enterprises to make more informed management decisions, optimize production processes, and minimize financial losses from adverse factors.

Overall, improving accounting and analytical support for agricultural insurance is of strategic importance for the development of the agricultural sector, increasing its competitiveness, and strengthening food security. Further research should focus on the development of digital risk analysis tools and the implementation of integrated information systems in agricultural insurance practice.

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