Assessment of Accounting Risks Associated With Virtual Assets in Agro-Industrial Enterprises

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Abstract. This article addresses the urgent need to assess accounting risks arising from the use of virtual assets in agro-industrial enterprises. Against the backdrop of the digital transformation of the economy and the increasing prevalence of blockchain technologies, the study highlights the necessity of a systematic approach to identifying, classifying and mitigating risks associated with accounting for virtual assets. The primary objective of the research is twofold: first, to identify the key accounting risks associated with the integration of virtual assets into the financial and economic activities of agricultural enterprises; and second, to develop effective management methodologies. The research methodology incorporates analysis and synthesis, comparative analysis, expert evaluation and modelling. The findings reveal that the absence of a unified regulatory and methodological framework, the high volatility of virtual assets, ambiguous classification criteria and limited accounting personnel experience significantly increase the level of accounting risk. The study proposes a classification of these risks according to their source and potential consequences, and sets out ways to improve internal control and audit systems within agro-industrial enterprises. The objective of the present study is to address a scientific and practical gap in the methodological support for accounting virtual assets in the agricultural sector. This is a critical prerequisite for ensuring the transparency, reliability, and compliance of accounting information with the demands of the digital economy. The article presents a comprehensive analysis of accounting risks that emerge during the integration of virtual assets into the accounting systems of agro-industrial enterprises. The aim of the analysis is to develop scientifically grounded approaches to the identification, assessment and mitigation of these risks. This text focuses on the accounting of virtual assets in accordance with International Financial Reporting Standards (IFRS). It also examines the challenges of ensuring transparency and accuracy of financial information. The study demonstrates that the implementation of a risk-oriented approach to the accounting and auditing of virtual assets can enhance the financial stability and investment attractiveness of the agricultural sector. The conclusions emphasise the importance of developing industry-specific guidelines and educational programmes for accountants to support the effective integration of virtual assets into the accounting systems of agro-industrial enterprises.

Keywords: virtual assets, accounting risks, agro-industrial enterprises, financial reporting, internal control, assessment, IFRS.
JEL Classification: G32, M41, Q13

1 Introduction

The accelerated evolution of digital technologies, notably blockchain solutions and virtual assets, is generating novel prospects for agro-industrial enterprises in the domains of financing, accounting, and resource management. Concurrently, the implementation of such tools is accompanied by an increase in accounting risks associated with regulatory uncertainty, the complexity of classification and valuation of virtual assets, and the lack of established methodological approaches for their presentation in financial reporting. The inadequate regulation in national legislation, the limited practical experience of accounting personnel, and the rapid pace of digital innovation have been identified as contributing factors to the risk of distorted accounting information, which may have a negative impact on managerial decision-making, the investment appeal of enterprises, and their financial resilience.

This issue is particularly pressing in the agricultural sector, where businesses often struggle to adopt advanced technologies due to resource constraints and are exposed to significant external risks

related to seasonality, climate and market volatility. In these circumstances, managing accounting risks associated with virtual assets effectively is crucial for ensuring transparent financial reporting, building trust with investors and creditors, and developing a sustainable enterprise strategy.

2 Research Objective and Methodology

This study aims to identify the key challenges involved in assessing and managing accounting risks arising from the use of virtual assets in agro-industrial enterprises, and to develop scientifically grounded approaches to mitigating these risks. Achieving this objective involves addressing the following tasks:

• To define the economic nature and classification features of virtual assets in the context of accounting.

• To identify the main sources and types of accounting risks associated with virtual assets.

• To analyse current regulatory and metho-dological approaches to the accounting of virtual assets.

• To develop practical recommendations for improving internal control and audit systems in agricultural enterprises.

To achieve the set goal and perform research tasks, the study uses methods of analysis and synthesis (to formalise the conceptual framework and structure risk categories), comparative analysis (to study international and national practices of virtual asset accounting) and empirical methods (to collect and summarise practical information on the use of digital assets in the agricultural sector). The employment of a comprehensive methodological approach facilitates the establishment of a holistic understanding of the nature of accounting risks and substantiates directions for their effective management in the context of the digitalisation of agro-industrial production.

3 Theoretical and Methodological Foundations of Virtual Assets in the Context of Accounting

In the contemporary epoch of digital economic transformation, virtual assets are acquiring mounting significance as a novel category of economic resources that amalgamate the characteristics of financial instruments, intangible assets, and digital technologies. In order to achieve a comprehensive understanding of virtual assets within the accounting system, it is necessary to adopt a theoretical and methodological approach that considers their economic nature, legal status, functional purpose, and modes of use in business activities.

From an economic perspective, virtual assets are defined as a digitised form of value that exists exclusively in electronic environments. Despite their lack of physical substance, virtual assets can serve as a medium of exchange, an investment vehicle, a store of value, or a settlement instrument (The Law of Ukraine "On Virtual Assets" dated February 17, 2022 No. 2074-IX). These tokens can function as a means of payment, as capital investment tools, or as digital representations of rights to assets. In the context of accounting, this necessitates their clear classification among existing accounting objects, such as intangible assets, financial instruments, or inventories, depending on their intended use. The notion of virtual assets in the contemporary economy thus surpasses conventional conceptions of financial instruments, encompassing components of digital technology, economic value and social accountability. Virtual assets, encompassing cryptocurrencies, tokens, digital rights and other forms of digital value, are the consequence of the dematerialisation of value. These assets exist solely in digital form yet have the capacity to influence real economic processes, including investment, consumption, production and resource allocation.

In this context, virtual assets can be conceptualised as a conduit between abstract value generated in the digital realm and material well-being actualised in the physical world. However, the effectiveness and stability of this bridge are contingent upon the extent to which the practices surrounding the creation, circulation, and use of virtual assets are aligned with principles of energy efficiency and social responsibility. Of particular concern is the energy consumption associated with cryptocurrency mining, which has attracted significant criticism due to its environmental impact, raising concerns about the sustainability of such assets. Concurrently, the emergence of energy-efficient technologies (e.g., Proof-of-Stake algorithms) and environmental offset initiatives present opportunities to align the digital economy with the principles of sustainable development. The concept of social responsibility in the domain of virtual assets is manifested in three key aspects: firstly, the transparency of transactions, secondly, the accessibility of financial services to a more extensive demographic of the population, and thirdly, the capacity to support inclusive economic models. Consequently, virtual assets have the potential to function as instruments of financial innovation, as well as catalysts for socio-economic transformation, provided that their utilisation is integrated within ethical, environmental, and regulatory frameworks.

The fundamental nature of virtual assets is predicated on their ability to transform digital value into tangible economic outcomes. However, this transformation is only feasible when the digital infrastructure that underpins their operation is grounded in the principles of energy efficiency, environmental sustainability, and social responsibility. This approach enables virtual assets to be regarded not only as accounting objects, but also as integral components of a comprehensive paradigm of sustainable digital development (see Fig. 1).
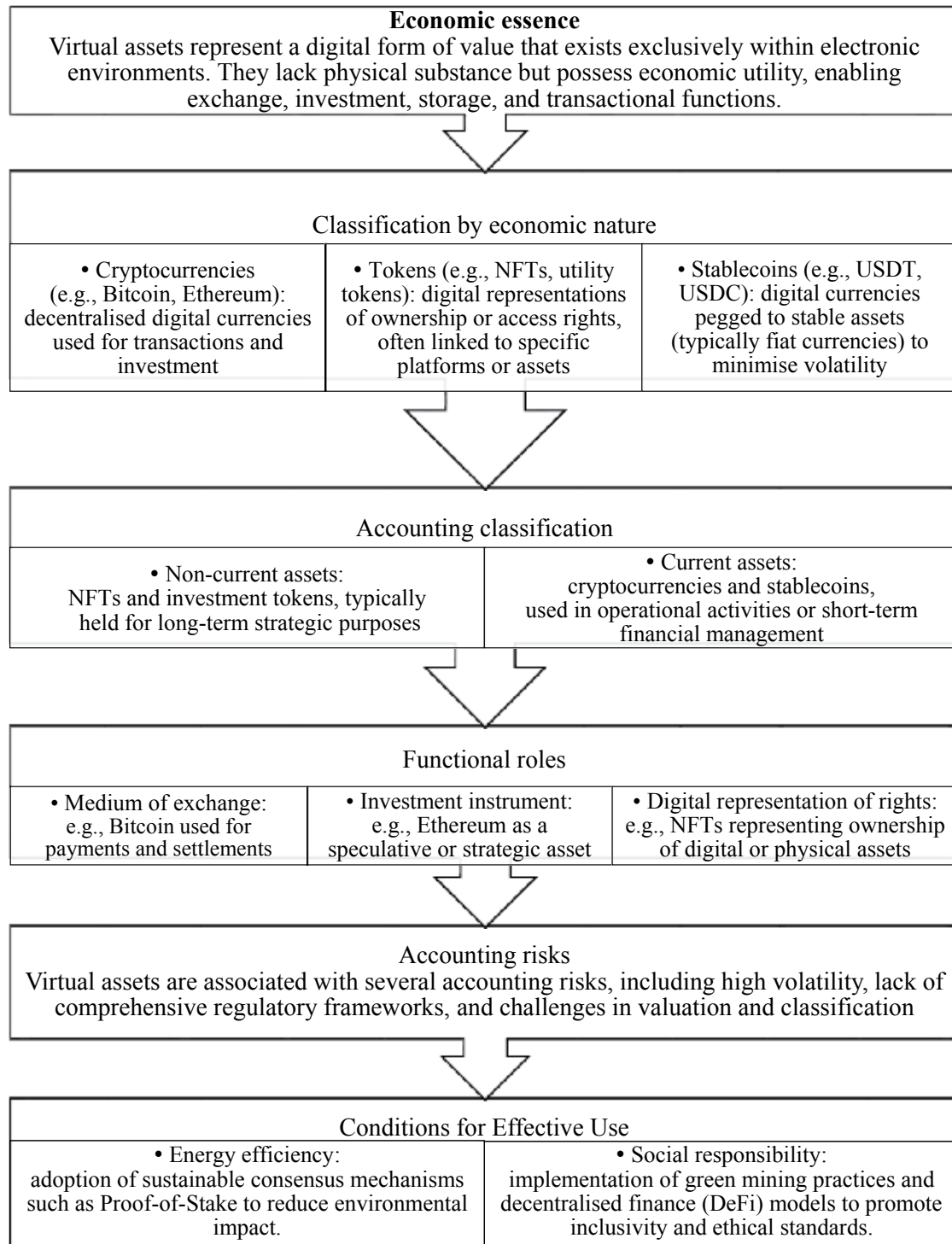
Economic essence
Virtual assets represent a digital form of value that exists exclusively within electronic environments. They lack physical substance but possess economic utility, enabling exchange, investment, storage, and transactional functions.

Classification by economic nature

• Cryptocurrencies (e.g., Bitcoin, Ethereum): decentralised digital currencies used for transactions and investment	• Tokens (e.g., NFTs, utility tokens): digital representations of ownership or access rights, often linked to specific platforms or assets	• Stablecoins (e.g., USDT, USDC): digital currencies pegged to stable assets (typically fiat currencies) to minimise volatility

Accounting classification

• Non-current assets: NFTs and investment tokens, typically held for long-term strategic purposes	• Current assets: cryptocurrencies and stablecoins, used in operational activities or short-term financial management

Functional roles

• Medium of exchange: e.g., Bitcoin used for payments and settlements	• Investment instrument: e.g., Ethereum as a speculative or strategic asset	• Digital representation of rights: e.g., NFTs representing ownership of digital or physical assets

Accounting risks
Virtual assets are associated with several accounting risks, including high volatility, lack of comprehensive regulatory frameworks, and challenges in valuation and classification

Conditions for Effective Use

• Energy efficiency: adoption of sustainable consensus mechanisms such as Proof-of-Stake to reduce environmental impact.	• Social responsibility: implementation of green mining practices and decentralised finance (DeFi) models to promote inclusivity and ethical standards.

Figure 1 Conceptual foundations for understanding the nature of virtual assets in the context of accounting

Source: compiled by the author

The classification of virtual assets within accounting frameworks poses a considerable challenge, as these assets may vary significantly in nature and functional purpose (Deloitte, 2018). It is recommended that the following key categories be distinguished, drawing on international practice and IFRS guidance: cryptocurrencies (e.g., Bitcoin, Ethereum), tokenised assets (representing rights to real or financial resources), utility tokens (providing access to digital services), and stablecoins (pegged to the value of traditional currencies or assets). This classification provides a robust foundation for determining suitable approaches to the recognition, measurement and presentation of virtual assets in financial reporting.

The recognition of virtual assets in accounting depends on their economic substance and the enterprise's intended use. According to International Financial Reporting Standards (IFRS) principles, an asset is recognised in financial statements when it is probable that future economic benefits will accrue to the entity, and when the asset's value can be reliably measured (PwC, 2021). In the case of virtual assets, this implies the necessity of control, identifiability, and the ability to obtain a reliable valuation. These assets are usually valued at fair market value, which requires the use of market-based approaches while accounting for high volatility and unreliable information.

Accordingly, the theoretical and methodological principles underpinning the accounting of virtual assets should be based on a combination of prudence, reliability, relevance and comparability, while taking into account the unique features of the digital landscape and the rapid evolution of financial technologies (Huang et al., 2023). Developing a unified methodology for accounting for virtual assets is essential for ensuring transparent financial reporting, effective risk management and the integration of agro-industrial enterprises into the digital economy.

4 Accounting Risks Arising from the Use of Virtual Assets in Agro-Industrial Enterprises

In the context of digital transformation within the agro-industrial sector, there is an increasing adoption of virtual assets by enterprises as instruments for financial mobility, investment, settlements, and participation in agri-financial platforms. However, the implementation of such assets is accompanied by a range of accounting risks that reflect both general economic and sector-specific characteristics. The risks emanating from virtual assets are not only attributable to the complexity of such assets, but also to the absence of established accounting approaches within the prevailing regulatory framework (Haija M., 2021).

One of the most significant risks is that of classification uncertainty, which arises from the lack of clear criteria for assigning virtual assets to specific accounting categories. The recognition and valuation of virtual assets can be complicated by the fact that they may be treated as intangible assets, financial instruments, or inventories, depending on their functional purpose. Currently, IFRS lacks a dedicated standard for virtual assets, meaning enterprises have to rely on analogies with existing standards (e.g., IAS 38, IAS 2 and IFRS 9). This increases the risk of subjectivity and interpretive ambiguity. For example, if an agricultural enterprise uses cryptocurrency to pay suppliers for seeds or fertilisers, it should be classified as a current asset, like cash or cash equivalents. Conversely, if the enterprise invests in tokens representing a share in an agricultural co-operative or a right to future harvests (for example, via agri-DeFi platforms), these assets may exhibit characteristics of financial instruments or long-term investments. In the absence of clear methodological guidance, there is a risk of misclassification, which can undermine the reliability of financial reporting (Resler, 2024).

A second significant risk is the volatility of virtual asset values, which makes them difficult to measure on the reporting date and can cause substantial fluctuations in financial results. For example, if an agricultural enterprise holds some of its working capital in stablecoins or cryptocurrencies, changes in their market value could significantly impact financial outcomes. The absence of an active market for certain tokens used in agricultural blockchain projects, such as those that grant access to agronomic data or logistics services, makes it more difficult to determine fair value. This creates a risk of unreliable asset valuation, contradicting the IFRS principles of prudence and reliability.

A third critical risk is regulatory uncertainty, which is evident in the absence of clear national accounting standards for virtual assets and the ongoing development of the legal framework. In Ukraine, as in many other countries, the legal regulation of virtual assets is still in its early stages. Although the Law of Ukraine "On Virtual Assets" sets out general principles for the circulation of such assets, it does not provide specific provisions for their accounting treatment. This creates a risk of legal ambiguity, particularly with regard to the taxation of virtual asset transactions. For instance, when an agricultural enterprise receives payment for its products in cryptocurrency, questions arise concerning the timing of revenue recognition, the tax base and how exchange rate differences should be treated. Without clear regulatory guidance,

compliance with principles of tax transparency and financial accountability is complicated (OECD, 2020).

One of the critical risks associated with the utilisation of virtual assets within agro-industrial enterprises pertains to the inadequate qualification of accounting personnel. This risk originates from a deficiency in the provision of adequate training and preparedness among specialists in relation to their engagement with digital assets. This deficiency serves to elevate the probability of errors in the processes of recognition, valuation, and disclosure within the context of financial reporting. It is evident that agricultural enterprises, particularly those of a small and medium size, frequently demonstrate an absence of a meticulously delineated internal control system for operations involving virtual assets. For instance, the absence of procedures for verifying blockchain transactions or controlling access to crypto wallets engenders a heightened risk of fraud, asset loss, or unauthorised transactions. This is of particular significance within the context of seasonal agricultural production, where irregular cash flows and elevated liquidity risks are prevalent.

Another significant contributing factor pertains to the inadequate levels of digital and financial literacy exhibited by accounting personnel within agricultural enterprises. Those with no prior experience of handling virtual assets may misinterpret their economic substance, leading to errors in recognition, measurement, and disclosure. For instance, tokens that grant discounts or access to agricultural services may be erroneously categorised as expenses, despite their nature as assets with deferred benefits. The accounting risks associated with the use of virtual assets in agro-industrial enterprises are multifaceted, encompassing classification, valuation, regulatory, organisational, and human resource dimensions. In order to mitigate the aforementioned risks, there is a necessity for the development of industry-specific methodological guidelines, the adaptation of international standards to the national context, and the enhancement of digital competence among accounting professionals.

5 Methodological Approaches to the Assessment and Management of Accounting Risks

Agro-industrial enterprises generally operate with limited resources for implementing complex financial instruments and face additional challenges such as production seasonality, market volatility, and a generally low level of digital maturity. These factors have been identified as increasing their vulnerability to accounting risks related to virtual assets. The absence of clear methodological guidance within the current legal framework and international standards serves only to compound the aforementioned risks (Irodenko, 2024). The development of methodological approaches is a necessary precondition for establishing a systematic risk management mechanism that ensures:

– Identification of risk sources at all stages of the accounting process;

– quantitative and qualitative risk assessment, taking into account sector-specific characteristics;

– implementation of effective internal control and audit procedures;

– adaptation of international standards to the national regulatory environment;

– improvement of digital and financial literacy among accounting personnel.

In the absence of a robust methodological framework, agro-industrial enterprises may be susceptible to compromised financial transparency, distorted financial statements, regulatory non-compliance, and diminished investment appeal (Leha et al., 2025).

The methodology for evaluating virtual assets should be based on a systematic, risk-oriented, and adaptive approach that reflects the specific characteristics of the agricultural sector and the unique nature of digital assets. The primary stage in the management of accounting risks is their identification, which involves the detection of potential sources of risk through the analysis of business operations involving virtual assets. In this particular context, functional analysis methods are of particular utility, as they facilitate the identification of the stage of the accounting cycle (recognition, measurement, classification, or disclosure) at which a given risk may emerge. For instance, when cryptocurrencies are utilised for settlements with counterparties, the risk may emerge during the preliminary documentation and fair value assessment stages.

The second stage of the process involves the quantitative and qualitative assessment of risks. This can be conducted using a risk matrix that considers both the likelihood of occurrence and the potential impact on financial reporting. In the context of agricultural enterprises, the application of adapted evaluation scales is recommended, with consideration given to seasonality, the volume of virtual asset transactions, the enterprise's level of digital maturity, and the presence of internal control policies. To illustrate this point, the risk of cryptocurrency volatility may be assessed as high in terms of impact but moderate in terms of likelihood if the enterprise primarily uses stablecoins. The third stage of the process entails the development

and implementation of risk management measures, which may include both organisational and technical tools. Organisational measures encompass the establishment of internal accounting regulations for virtual assets, the implementation of internal control procedures, and the enhancement of accounting personnel qualifications. As Bardash and Hrabchuk (2021) demonstrate, technical tools encompass the utilisation of specialised software for digital asset accounting, the automation of fair value assessment processes, and the integration with blockchain platforms for transaction verification.

The fourth stage of the process is risk monitoring and review. This stage entails the regular evaluation of the effectiveness of implemented measures and the adaptation of methodological approaches in response to changes in the regulatory environment, market conditions, and technological developments. In this context, the establishment of an internal audit system is imperative, as it provides independent verification of the accuracy of virtual asset accounting and ensures compliance with International Financial Reporting Standards (IFRS) reporting requirements. This comprehensive methodological approach, integrating risk identification, assessment, control, and monitoring, enables agro-industrial enterprises to ensure the reliability of accounting information and to enhance financial resilience, investment attractiveness, and adaptability to the challenges of the digital economy (Ernst & Young, 2022).

In order to identify, assess and manage accounting risks that have the potential to significantly affect the reliability of financial reporting, tax compliance and managerial effectiveness, practitioners frequently utilise an accounting risk matrix (see Fig. 2).

The accounting risk matrix is an analytical model that employs two key parameters to classify risks: the likelihood of occurrence and the degree of impact on the enterprise's accounting system. The objective of the risk register is threefold: firstly, to facilitate the visualisation of risks; secondly, to determine the relative priority of each risk; and thirdly, to provide a foundation for the development of risk management measures. Methodologically, the matrix is based on a risk-oriented approach adapted to the specific characteristics of agricultural production, considering seasonality, limited resources, and the enterprise's level of digital maturity. The presented matrix incorporates six key types of risks:

• Cryptocurrency volatility (risk of asset value fluctuation).

• Classification uncertainty (risk of misclassification within accounting categories).

• Complexity of fair value measurement (risk of inaccurate valuation).

• Regulatory instability (risk of changes in legislation).

• Insufficient staff qualification (risk of errors due to lack of expertise).

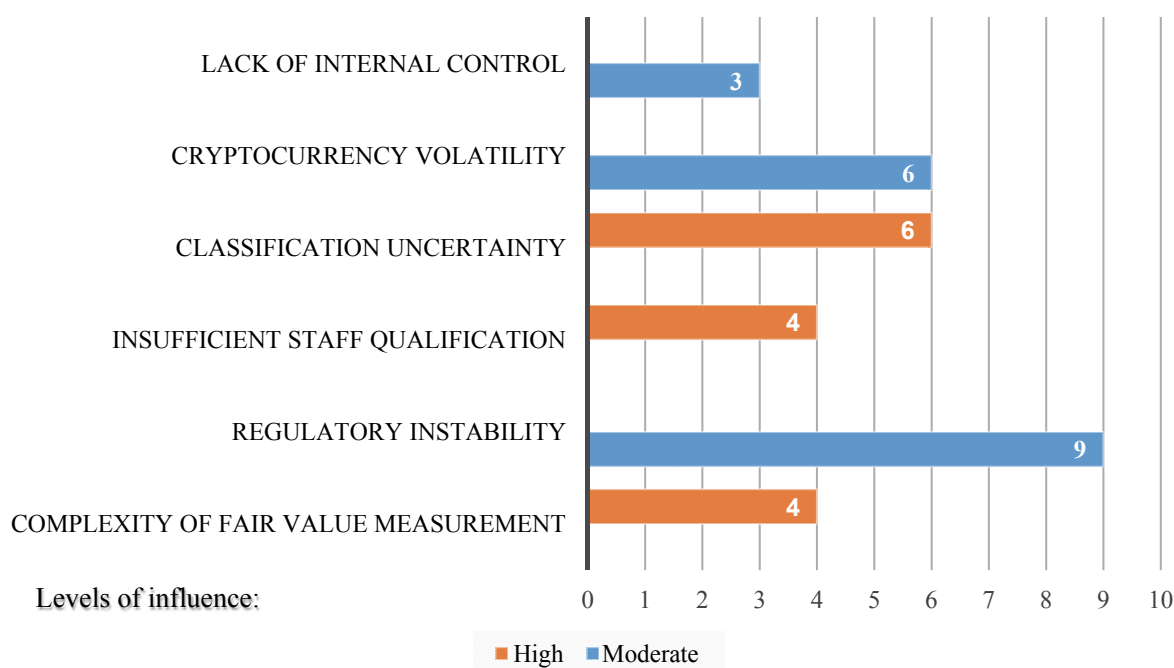• Lack of internal control (risk of unauthorised transactions).

Figure 2 Accounting risk assessment matrix for an agro-industrial enterprise using virtual assets
Source: compiled by the author

Each risk is evaluated on a scale ranging from 1 to 3 for both likelihood and impact, with the overall risk level determined as the product of these two indicators. The highest risk level (9) is assigned to regulatory instability, highlighting the critical importance of legal guidance in the accounting of virtual assets. It is important to note that whilst the remaining risks have been categorised as either moderate or average, they nevertheless require the attention of management. The accounting risk assessment matrix is a valuable instrument for agro-industrial enterprises, facilitating not only the identification of potential threats but also the formulation of a robust risk management policy in the context of digital transformation.

6 Conclusions

Integrating virtual assets into the financial and operational activities of agro-industrial enterprises carries a variety of complex, multi-layered accounting risks, necessitating a systematic approach to identifying, assessing and managing them. Primary risks include uncertainty over classification, difficulties in measuring fair value, regulatory instability, volatility of digital assets, and organisational and human resource factors affecting the quality of accounting information. These risks can only be effectively managed through the implementation of a comprehensive methodological framework combining risk-based assessment, internal control mechanisms, adaptation of international financial reporting standards to the national context and enhancement of digital competence among accounting personnel. The proposed risk assessment matrix is designed to assist agricultural enterprises in prioritising potential threats, facilitating informed managerial decision-making, and ensuring transparency in accounting processes. In light of the distinctive characteristics inherent to the agricultural sector, it is recommended that industry-specific methodological guidelines be developed for the accounting of virtual assets. It is imperative that these considerations encompass the dynamics of production seasonality, the constraints imposed by limited resources, the co-operative structure inherent in agribusiness, and the escalating imperative for innovative financial instruments. It is imperative to allocate particular attention to the development of a regulatory framework that ensures legal clarity and tax transparency in transactions involving virtual assets.

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