

DEVELOPMENT OF A SCORECARD AND A MATHEMATICAL MODEL FOR AN AGGREGATED ASSESSMENT OF THE G-COMPONENT OF SMALL AND MEDIUM-SIZED ENTERPRISES OF THE AGRO-INDUSTRIAL COMPLEX WITHIN THE FRAMEWORK OF THE ESG CONCEPTION*

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UDC 338.22:519.87:338.436-02232
JEL Classification: G11; G23; H55; J26; J32

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Development of a Scorecard and a Mathematical Model for an Aggregated Assessment of the G-component of Small and Medium-Sized Enterprises of the Agro-Industrial Complex within the Framework of the ESG Conception

The article defines that the managerial component of the ESG conception is the foundation for implementing environmental and social initiatives, as the quality of corporate governance determines a company's ability to adapt to external challenges, ensure transparency, attract investments, and build trust with stakeholders. In agri-food SMEs, where resources and management structures are often limited, the lack of systematic approaches to evaluating the governance component complicates their integration into global sustainable development initiatives, restricts access to financing, and reduces competitiveness. Therefore, developing a unified system of indicators and a mathematical evaluation model adapted to industry-specific characteristics is a relevant scientific and practical task. The aim of the study is to develop a system of indicators and a mathematical model for assessing the managerial component of agri-food SMEs within the ESG framework, aimed at enhancing their competitiveness and alignment with the Sustainable Development Goals (SDGs). The proposed indicator system integrates ESG and SDG principles and provides a quantitative assessment, facilitating comparisons between enterprises, promoting reporting transparency, and increasing appeal to investors. The mathematical model for the aggregated G-component evaluation is based on the weighted sum of 16 indicators, considering their contribution to achieving the SDGs. The model uses an SDG coefficient, which reflects the intensity of the links between each indicator and the corresponding Sustainable Development Goals. Indicator weights allow flexible adaptation of the model to the specifics of an enterprise, for example, giving greater weight to financial indicators during periods of economic instability. The four-level assessment scale clearly segments management status, providing practical recommendations for each level. The system of indicators and the mathematical model serve as a foundation for internal audit, strategic planning, and communication with stakeholders, including investors, banks, local communities, and others. The implementation of G-practices helps reduce operational and reputational risks, increase partners' trust, and facilitate access to ESG-oriented investments. Unlike existing approaches, which often focus on large corporations or are excessively formalized, the proposed system of indicators and mathematical model, through integration with the SDGs, provides a comprehensive approach to evaluating and enhancing the quality of corporate governance in agricultural SMEs, combining local management practices with global sustainable development priorities.

Keywords: ESG conception, G-component, Sustainable Development Goals, system of indicators, corporate governance, mathematical model, aggregated indicator, institutional foundations.

DOI: <https://doi.org/10.32983/2222-0712-2025-3-160-175>

Fig.: 2. Tabl.: 7. Formulae: 4. Bibl.: 28.

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УДК 338.22:519.87:338.436-02232
JEL Classification: Q01; Q13; Q56; L26; C51; C61**Чіков І. А. Розробка системи показників і математичної моделі агрегованої оцінки управлінського компоненту малих і середніх підприємств АПК у рамках ESG-концепції**

У статті визначено, що управлінський компонент ESG-концепції є основою для реалізації екологічних і соціальних ініціатив, оскільки саме якість корпоративного управління визначає здатність підприємства адаптуватися до зовнішніх викликів, забезпечувати прозорість, залучати інвестиції та будувати довіру з боку стейкхолдерів. У МСП АПК, де ресурси та управлінські структури часто обмежені, дефіцит систематизованих підходів до оцінки G-компонента ускладнює їхню інтеграцію в глобальні ініціативи сталого розвитку, обмежує доступ до фінансування та знижує конкурентоспроможність. Саме тому розробка уніфікованої, адаптованої до галузевих особливостей системи показників і математичної моделі оцінки є актуальною науковою та практичною задачею. Метою дослідження є розробка системи показників та математичної моделі

* The article includes the results of the research work on the topic «Development of a program for the development of small and medium-sized agricultural enterprises based on ESG guidelines to achieve their competitiveness and the Sustainable Development Goals» (State registration number 0125U000382)

для оцінки управлінського компонента МСП АПК у рамках ESG-концепції, спрямована на підвищення їх конкурентоспроможності та відповідності Цілям сталого розвитку (ЦСР). Запропонована система показників дозволяє комплексно оцінити управлінські практики МСП АПК, виявити слабкі місця та сформулювати рекомендації для покращення. Запропонована система показників інтегрує принципи ESG і ЦСР та забезпечує кількісну оцінку, що полегшує порівняння між підприємствами, сприяє прозорості звітності та підвищує привабливість для інвесторів. Математична модель агрегованої оцінки G-компонента базується на зваженій сумі оцінок 16 показників, із урахуванням їхнього внеску в досягнення ЦСР. Модель використовує коефіцієнт ЦСР, який відображає інтенсивність зв'язків між кожним показником і відповідними Цілями сталого розвитку. Ваги показників дозволяють гнучко адаптувати модель до специфіки підприємства, наприклад, надаючи більшу вагу фінансовим показникам у період економічної нестабільності. Чотирирівнева шкала оцінки дозволяє чітко сегментувати стан управління, надаючи практичні рекомендації для кожного рівня. Система показників і математична модель слугують основою для внутрішнього аудиту, стратегічного планування та комунікації зі стейкхолдерами, включаючи інвесторів, банки, місцеві громади тощо. Впровадження G-практик сприяє зниженню операційних і репутаційних ризиків, підвищенню довіри з боку партнерів і полегшенню доступу до ESG-орієнтованих інвестицій. На відміну від наявних підходів, які часто зосереджені на великих корпораціях або надмірно формалізовані, запропонована система показників і математична модель через інтеграцію з ЦСР забезпечує комплексний підхід до оцінки та підвищення якості корпоративного управління МСП АПК, яка поєднує локальні управлінські практики з глобальними пріоритетами сталого розвитку.

Ключові слова: ESG-концепція, G-компонент, Цілі сталого розвитку, система показників, корпоративне управління, математична модель, агрегований показник, інституційні засади.

Рис.: 2. Табл.: 7. Формул: 4. Бібл.: 28.

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Introduction. In today's growing global challenges related to climate change, social instability, and the transformation of economic models, the ESG conception, which is aimed at shaping sustainable business practices, is becoming increasingly important. The implementation of ESG principles in the activities of small and medium-sized enterprises of the agro-industrial complex (hereafter referred to as AIC SMEs), which form the basis of food security, employment and rural development, is becoming especially relevant.

Among the three components of ESG, it is the managerial (G-component) that plays a key role, as it determines the efficiency of the organizational structure, the transparency of decision-making processes, the availability of anti-corruption mechanisms, strategic planning, and adaptation to external challenges. Despite the dominance of environmental and social aspects in the analytical field, it is corporate governance factors that serve as the basis for the implementation of environmental and social initiatives, the formation of trust among stakeholders and ensuring long-term competitiveness.

In general, AIC SMEs are characterized by a low level of formalization of managerial processes, which complicates the implementation of ESG strategies and limits the possibilities of external financing. This necessitates the creation of a clear, measurable and adapted to industry specifics G-component indicator system, which will assess the real state of management practices, identify problem areas and form the basis for strategic development in accordance with the Sustainable Development Goals (hereafter referred to as SDGs).

Thus, the relevance of the study is determined by the need to improve approaches to assessing managerial practices in the agricultural sector through the prism of ESG, which is a prerequisite for increasing the competitiveness of the sector, social responsibility and environmental sustainability.

Analysis of recent research and publications. Recent scientific research demonstrates the growing attention to the implementation of ESG approaches in the activities of agro-industrial enterprises, in particular in the context of implementing sustainable development goals and ensuring long-term competitiveness. Thus, T. Mirzoieva and N. Gerasymchuk [22] emphasize the primary importance of assessing natural, climatic, social and financial risks in agricultural business as a basic element of an ESG strategy that helps attract investment and minimize vulnerabilities in agribusiness. L. Bondarenko and I. Skoropad consider the general theoretical foundations of management of sustainable development of enterprises and emphasize the need to adapt managerial models to ESG requirements [6]. In this context, P. Lyska [16] considers corporate social responsibility as a «bridge» between internal management and external reputation in the context of the SDGs. At the same time, D. Bukreieva, T. Kovalenko, A. Manukian [7] introduce the conception of «green» management, which provides synergy between eco-innovations and business efficiency. This is complemented by the research of N. Horbal and Yu. Makarova [13], who focus on eco-innovations as a basis for socioeconomic growth in the sphere of agro-industrial complex.

T. Livoshko [18] analyzes the practices of monitoring ESG factors and proves that the effective implementation of ESG principles directly affects the competitiveness of economic entities. She draws attention to the importance of transparency of reporting and its regular updating as key factors in increasing investor confidence.

In the same context, B. Pshyk [25] considers certain aspects of ESG activity monitoring, in particular in terms of the managerial component. He allocates the need to develop specific metrics for AIC SMEs, which are adaptive in nature and take into account industry specifics.

Considering the analytical field of the ESG conception, V. Metelytsia, T. Gagalyuk and O. Kolisnyk [19] propose a unified structure of the ESGI report, which contributes to the analytical transparency and financial attractiveness of enterprises. In addition, V. Metelytsia explores the issue of standardization of the sectoral ESG report, which can become the basis for the State agrarian policy in the processes of post-war «green» reconstruction of the economy of Ukraine [20, 21]. Within this context, O. Oliynyk and D. Zakharov [23] focus on the standardization of non-financial reporting as the basis for business legitimation in the context of global challenges.

K. Yatsyshyna and T. Yatsyshyn [28] in their study assess the degree of readiness of Ukrainian enterprises to take into account ESG factors during strategic planning. The authors conclude that the institutional component remains the least integrated into corporate policy, which poses threats to the long-term stability of business. Further, V. Kravchenko [15] emphasizes that effective corporate governance is an important factor in the sustainable development of territorial communities.

A significant contribution to the development of scientific and methodological foundations for ESG activity management was made by L. Korchahina [14], who systematized the mechanisms for internal assessment of the ESG criteria. She proposed a multi-level evaluation model that combines quantitative and qualitative indicators of managerial processes. Also the research of M. Lyshenko and O. Petrenko [17] focuses on ESG marketing as a tool for the formation of market advantages, which strengthens the sustainable positioning of agrarian producers.

Thus, the analysis of literature sources demonstrates a growing trend towards scientific activity regarding ESG approaches in the business environment. Along with this, a common challenge remains methodological differentiation in terms of the managerial dimension, where there is insufficient systematization of approaches to the assessment and implementation of the G-component in small and medium-sized enterprises. The lack of uniformity of indicators, the shortage of adapted models for the agrarian sector of the Ukrainian economy, as well as the weak link between managerial indicators and the Sustainable Development Goals complicate the comparability, analyticity, and practical implementation of ESG strategies. This actualizes the need to develop a single, methodologically based G-scorecard, which will take into account the specifics of AIC SMEs, increase the transparency of management and contribute to the formation of competitive advantages in the context of sustainable development.

Formulation of the aim of the article. The aim of the study is to substantiate the significance of G-factors in ensuring the competitiveness of AIC SMEs in the context of the implementation of the ESG strategy, as well as to develop a structured system of indicators of the G-component that integrates quantitative and qualitative indicators. Within the limits of the set aim, it is planned to establish methodological foundations for the assessment of managerial processes, to determine the links between G-practices and the Sustainable Development Goals, to form a mathematical model for an integral assessment of the level of corporate governance, as well as to demonstrate its functionality and applied value on the basis of a typical enterprise of the agro-industrial complex.

Specification of the objective. Despite the growing interest in the ESG approach, in practice, the implementation of the managerial G-component remains the least formalized and researched component. Most AIC SMEs focus on achieving short-term operational efficiency, not paying much attention to the institutional foundations of sustainable development, which leads to a low level of managerial transparency, weakness of the internal control system, lack of formalized mechanisms for involving employees in decision-making, as well as distrust on the part of potential investors and partners.

In addition, the lack of a unified scorecard for evaluating the G-component makes it impossible to conduct benchmarking, reduces the analytical value of reporting, and complicates strategic planning. In addition, the problem is exacerbated by the fragmentation of the regulatory and methodological framework, which does not take into account the sectoral specifics of the agrarian sector and the level of institutional maturity of small and medium-sized enterprises.

Thus, a complex scientific objective can be specified related to the lack of a holistic tool for evaluating, structuring and improving the managerial practices of AIC SMEs in the context of the ESG conception, which inhibits their integration into global sustainable development initiatives and limits the possibilities of attracting resources for long-term development.

Presentation of the main material and scientific results obtained. The ESG conception is a multidimensional paradigm focused on ensuring the sustainable development of enterprises by integrating environmental, social and managerial aspects into business practices. Historically, the conception arose as a response to society's growing demands for environmental responsibility of companies, social justice and transparency of management [18]. It is the combination of these elements that allows you to determine not only the current efficiency of the enterprise, but also its strategic ability to adapt to changes in the external environment [27].

Based on the ESG conception, companies focus on long-term investments in sustainable development, which includes the introduction of innovative technologies, reducing the negative impact on the environment, and forming a positive corporate image [19]. In addition, the systematic application of the ESG criteria allows you to reduce reputational and operational risks, thereby contributing to attracting investments and strengthening trust from partners, investors, and consumers.

Scientific understanding of the ESG conception opens up opportunities for the development of integration management models that take into account the relationship between economic efficiency and socio-environmental responsibility [13]. Thus, the ESG conception is not just a set of ethical norms, but a comprehensive system of managerial standards aimed at ensuring a balance between the profitability of business and its contribution to the development of society and environmental protection [16].

The ESG conception has long ceased to be just a term, but has turned into a fundamental approach to risk and opportunity management in the modern business environment [6]. It is a comprehensive system that integrates environmental, social and governance criteria into the business strategy and operational activities of enterprises [15]. Although all three components are interrelated and interdependent, in our opinion, it is

the G-component that creates the basis for the implementation of environmental and social initiatives [26]. It acts as the basis for the sustainable development of the enterprise, because it directly affects the quality of strategic decision-making, the distribution of resources and the internal culture of the company.

Despite the traditional orientation of small and medium-sized enterprises of the agro-industrial complex to production efficiency, it is the managerial component (G-factor) that becomes a critical indicator of their long-term viability and competitiveness in the context of the dynamic global transformation of agricultural markets. Managerial resilience is not only the ability to make decisions, but also transparency, responsibility and adaptability to external requirements, in particular to international environmental and social standards [3, 8, 10].

The low level of formalization of managerial processes, typical for small and medium-sized agribusiness, creates risks of inefficient allocation of resources, corrupt practices, conflicts of interest, and loss of operational flexibility [22]. The introduction of a clearly structured G-scorecard allows minimizing these risks [4, 9, 10, 14, 23] in the following ways:

- institutionalization of decision-making procedures;
- transparent budgeting;
- independent audit;
- creation of a motivation system tied to efficiency;
- ensuring accountability of the management.

The managerial component of the ESG conception is a key driver of the institutional capacity of SMEs to adapt to the requirements of environmental regulation, improve working conditions and stimulate innovation [6, 17, 28]. Here, the implementation of a quality G-scorecard contributes to the achievement of a number of Sustainable Development Goals, especially in terms of strengthening gender equality (SDG 5), ensuring decent work (SDG 8), promoting innovation and infrastructure (SDG 9), reducing gender inequality (SDG 10), ensuring sustainable consumption and production (SDG 12), as well as improving the efficiency of institutions (SDG 16) [1]. Thus, the integration of G-factors into the strategy of AIC SMEs is not only a requirement of our time, but also a prerequisite for long-term competitiveness, adaptation to ESG trends and contribution to the global sustainable development agenda [7].

Within the framework of the ESG approach, the G-factor acts as an institutional catalyst that ensures the implementation of both the E- and S- aspects. For AIC SMEs, which often have limited resources and an underdeveloped strategic planning system, the G-scorecard can become a practical tool for optimizing internal processes, reducing transaction costs and strengthening trust from investors, banks and partners.

Also, it is especially critical that weak management significantly reduces the ability of SMEs to adaptation, strategic planning and integration of innovations – three key factors of competitiveness in a changing market [12]. That is why the development of a unified G-scorecard is of fundamental importance both as a tool for structuring managerial processes and as a means of communication and ensuring trust.

However, despite the objective key role of the managerial component in the implementation of the ESG strategy, in practice it is the G-aspect that remains the most vulnerable in terms of formalization, structure, and measurability. In many cases, businesses focus mainly on demonstrating environmental or social achievements, while managerial practices are presented as general declarations without adequate analytical depth. The situation is complicated by the lack of a unified methodology for assessing the quality of corporate governance, which leads to fragmentation of approaches, a decrease in data comparability and, accordingly, a low analytical value of reporting [19–21].

In addition, in the process of evaluating the G-component, secondary indicators are often used, which do not reflect the real effectiveness of managerial processes, but only state their formal presence. This creates an information asymmetry between enterprises and external stakeholders and does not allow to adequately assess the risks associated with managerial decisions [11; 23].

For better clarity, we will systematize the main problems that complicate the assessment of the G-component within the framework of ESG analysis, as well as note what negative consequences this can lead to (Tab. 1).

Taking into account the above, there is an objective need to create a universal G-scorecard, which would combine quantitative and qualitative indicators, be adaptive to industry specifics and ensure transparency of decision-making processes, distribution of responsibility, risk control and ethical behavior.

Table 1

**Obstacles to the assessment of the G-component of small and medium-sized enterprises
of the agro-industrial complex within the framework of the ESG conception**

Problem	Manifestations	Consequences for Analytics
Lack of standardized methodology	Use of different sets of indicators across companies	Inability to compare the ESG profiles between enterprises
Focus on formal attributes	Existence of codes without assessment of their implementation	Underestimation of actual governance risks
Insufficient reporting detail	General statements without metrics	Lack of possibility for quantitative analysis
Ignoring mid-level managerial processes	Focus only on top management	Distortion of the real governance picture
Lack of feedback from employees and stakeholders	Quality of internal communications is not assessed	Distrust towards companies' self-reporting results

Source: summarized and systematized on the basis of [2; 6; 19–22]

Such a system could act as both a diagnostic tool and a guide for improving corporate governance practices.

Thus, in order to form a holistic universal system of G-indicators, it is advisable to consider them in the structure according to the areas of assessment, which include both quantitative and qualitative indicators (Tab. 2).

The carried out analysis shows that the assessment of the ESG management component at the present stage faces numerous challenges, among which the key ones are methodological blurredness, lack of reliable quantitative indicators,

and insufficient practical relevance of many existing metrics. The proposed systematization of problems and the fundamental structure of the assessment demonstrate that without an integrated and balanced approach to the measurement of the G-component, it is impossible to obtain an objective picture of the state of corporate governance. In particular, only a combination of formalized and behavioral characteristics allows you to adequately assess both the regulatory and documentary base and the real managerial practices of the enterprise.

Table 2

Potential directions for assessing the G-component of small and medium-sized enterprises of the agro-industrial complex within the framework of the ESG conception

Assessment Area	Quantitative Indicators	Qualitative Indicators
Governance transparency	Number of disclosed board decisions; regularity of financial reporting	Existence of openness policy; reporting format
Stakeholder engagement	Frequency of employee surveys; level of participation in decision-making	Involvement of employees in corporate ethics; feedback channels
Anti-Corruption policy	Number of detected abuse cases; amount of funds spent on audit	Effectiveness of whistleblowing mechanisms
Reward system	Share of performance-based bonuses; pay gap ratio	Transparency of reward criteria; flexibility of remuneration system
Risk management	Existence of reserve fund; frequency of risk management plan updates	Assessment of crisis preparedness; response procedures

Source: summarized and systematized on the basis of [23–25; 28]

Most of the existing indicators are either overly formalized – focused mainly on compliance with formal regulations and standards – or, on the contrary, are too general and declarative, which makes it impossible to identify the real state of corporate governance in practice [19]. In addition, such approaches often do not take into account industry specifics, the scale of the enterprise or the level of its institutional maturity [20]. As a result, this limits the possibilities of comparative analysis between enterprises, creates barriers to informed decision-making by investors, and forms information asymmetry between stakeholders [21, 23]. That is why a potential G-scorecard should be based on two key principles of transparency and efficiency of internal managerial procedures. Transparency encompasses the openness of decision-making processes, the accountability of management to employees, shareholders and other stakeholders, as well as providing access to up-to-date information on the financial and non-financial aspects of the company's activities. Efficiency, in turn, presupposes the presence of clear policies, control mechanisms, motivation systems and adaptive risk management that directly affect the stability of the organization's functioning.

The universalization of the G-indicator system is of key importance for improving the efficiency of management at the enterprises of the agro-industrial complex. It allows not only to unify approaches to corporate governance assessment, but also to identify weaknesses in managerial practices, form specific recommendations for their improvement and provide a transparent, evidence-based basis for decision-making by all involved parties – from internal employees to external investors.

In the context of small and medium-sized enterprises in the agro-industrial complex, such a system should be at utmost adaptive, understandable, accessible for implementation, as well as focused on increasing strategic sustainability, openness and operational efficiency [14]. As a result, trust is formed, reputation is strengthened, and, consequently, the company's competitiveness grows against the backdrop of the growing influence of the ESG criteria.

Based on the generalization of the results of the study, the following G-scorecard is proposed (Tab. 3).

The system of G-indicators of the ESG conception is structured according to evaluation criteria and takes into account the principles of transparency and efficiency of managerial processes. Here, each indicator has a clear definition and methodological substantiation, and to ensure the uniformity and comparability of data, a point scale of assessment from 0 to 2 points is introduced. It allows you to quantitatively record the level of development of managerial procedures in the context of individual criteria: from complete absence (0 points), through partial implementation (1 point), to full implementation (2 points).

It is proposed to consider the proposed system of indicators in more detail:

- openness of managerial decisions – openness is the cornerstone of ESG management, ensuring transparency and accountability of management. The availability of documented minutes of meetings, clear recording of decisions made and their publicity for stakeholders (employees, partners, investors) reduce the risks of behind-the-scenes agreements, corrup-

Table 3

**Scorecard for assessing the G-component of small and medium-sized enterprises
of the agro-industrial complex within the framework of the ESG conception**

№	Indicator	Definition	Scoring (0-2)
1	Decision-making transparency	Recording of key decisions (minutes, reports)	0: no records; 1: partial; 2: decisions documented
2	Updating internal policies	Frequency of review/update of internal rules and procedures	0: >5 years; 1: every 2-5 years; 2: <2 years
3	Employee involvement in decision-making	Possibility for farmers/employees to give proposals (meetings, surveys)	0: no mechanisms; 1: irregular; 2: regular meetings
4	Conflict resolution mechanisms	Availability of mediation or arbitration procedure in internal disputes	0: absent; 1: basic; 2: detailed
5	Wage transparency	Whether the remuneration system is clear and documented	0: non-transparent; 1: partially transparent; 2: fully transparent
6	Regularity of financial reporting	Frequency of preparing and auditing reports (month, quarter, year)	0: annually; 1: quarterly; 2: monthly
7	Involvement of independent accountant/ auditor	Whether external specialist verifies reporting	0: never; 1: once every few years; 2: annually
8	Budgeting and cost control	Availability of annual/seasonal budget with planned vs. actual comparison	0: no budget; 1: budget without reconciliation; 2: budget with reconciliation
9	Reserve fund	Formation of financial «safety cushion» for emergencies	0: <1% of expenses; 1: 1-5%; 2: >5%
10	Linking bonuses to performance	Connection of bonuses to key indicators (yield, profit, quality)	0: absent; 1: partly defined; 2: clearly defined
11	Flexibility of remuneration system	Possibility of one-time/seasonal allowance for unplanned work	0: none; 1: fixed; 2: flexible
12	Training and development programs	Provision of training in modern farming methods	0: absent; 1: occasional; 2: systematic programs
13	Executive remuneration transparency	Whether information on management compensation is public (for employees)	0: hidden; 1: partially; 2: fully transparent
14	Code of ethics	Availability and public access to ethical conduct code	0: absent; 1: basic; 2: comprehensive
15	Whistleblowing mechanism	Anonymous or external channel for complaints	0: absent; 1: internal; 2: external/anonymous
16	Administrative risk management	Procedures for assessing and minimizing risks (weather, market prices, etc.)	0: absent; 1: partial; 2: comprehensive procedures

Source: author's own development

tion or abuse. This contributes to the formation of trust in management, allows stakeholders to control the logic of decisions and assess their compliance with the company's strategic goals. In SMEs where resources are limited, transparency of management decisions is key to attracting external financing and supporting partners;

- regular updating of internal documents – the constant updating of regulations, instructions and procedures reflects the company's ability to adapt to changes in the legal, economic or social environment. Outdated policies can lead to ineffective decisions, violations of the law or reputational damage, especially in the areas of labor relations, procurement or compliance with environmental standards. For example, in the agrarian sector, timely updating of procedures to comply with new safety standards or environmental regulations ensures competitiveness and reduces the risks of fines;
- inclusiveness of management – involving employees in decision-making related to their work is a modern standard of efficient management. This increases staff motivation, loyalty, and productivity, as well as reduces the likelihood of internal conflicts. In SMEs, inclusiveness allows you to identify bottlenecks in operational processes thanks to the ideas of employees who interact directly with production. For example, in agriculture, proposals from agronomists or machine operators can optimize costs or improve product quality;
- availability of formalized conflict resolution procedures – formalized mechanisms, such as arbitration or mediation, ensure predictability and fairness in dispute resolution. In the agro-industrial complex, where conflicts can arise due to financial (e. g., profit sharing) or production (e. g., raw material quality) issues, such procedures prevent escalation, reduced productivity, or loss of key employees. The lack of clear mechanisms often leads to lawsuits or loss of reputation;
- employees' understanding of the pay structure – transparency in the salary structure, bonus criteria and documented payment rules is the basis of social justice. This protects the business from accusations of discrimination or manipulation, and it also creates a motivation system where employees have a clear understanding of how their efforts affect income. In SMEs, a transparent payment system helps to reduce staff turnover and increase trust in management;
- frequency of financial reporting – regular and timely reporting of financial performance allows management to respond quickly to deviations such as cost overruns or cash gaps. In the agrarian sector, where seasonality and external risks (weather, resource prices) significantly affect operations, frequent reporting provides an opportunity to adjust budgets, plan purchases and avoid financial crises. For SMEs, it is also a signal to investors about the reliability and transparency of the company;
- external financial control – the involvement of independent accountants or auditors increases the confidence of investors, creditors and partners in the company's financial statements. For SMEs that often seek to attract grants, bank loans, or ESG-focused investments, external controls are critical. It also reduces the risks of internal fraud or errors in financial transactions, which is especially important in the agrarian sector with its complex supply chains;
- planning and control of budget execution – financial discipline based on clear budgeting, regular updating of plans and analysis of execution, is the basis of effective management. In SMEs, this allows for the optimal distribution of limited resources, avoiding cost overruns and responding flexibly to changes in the prices of crop protection products, fuel or fertilizers. In agriculture, where costs depend on external factors, budgeting is the key to stability;
- formation of a reserve fund – the availability of financial reserves for unforeseen circumstances, such as drought, crop failure, or economic crises, is a sign of a mature management system. In the agrarian sector, the reserve fund protects the enterprise from force majeure and provides liquidity in times of crisis. For SMEs, the lack of such a «safety cushion» often causes insolvency or business closure;
- transparent bonus system – a system of bonuses tied to specific results (for example, yield, product quality, resource savings), creates a direct link between the employee's efforts and his remuneration. This increases motivation, loyalty, and reduces staff turnover. In SMEs, where resources for bonuses are limited, a clear and transparent system allows you to effectively stimulate key personnel;
- flexibility of the remuneration system – the ability to provide allowances for unscheduled work, for example, during peak loads (harvesting) or force majeure (elimination of natural disasters), demonstrates care for personnel and management flexibility. This avoids informal payments or «gray» employment, which is common in agriculture, and increases employee confidence;
- investing in staff training – regular employee training aimed at updating knowledge about innovations, safety standards or environmental requirements is a strategic investment in the company's competitiveness. In the agrarian sector, where the introduction of new technologies (e. g. precision farming) or compliance with international standards is critical, staff training ensures business sustainability and efficiency;
- transparency of managerial staff income – openness of information about management remuneration builds trust among employees, partners and external stakeholders. In an ESG management system, top-down transparency is not only an ethical norm, but also a prerequisite for responsible management. For SMEs, it is also a way to avoid speculation or internal tensions about the fairness of the distribution of income;

- the presence of a code of conduct – a code of ethics based on the principles of honesty, responsibility and mutual respect, establishes uniform rules for all members of the company. This prevents discrimination, corruption, or moral conflicts by creating a healthy corporate culture. In SMEs, a code of ethics helps maintain reputation and attract partners who value ethical business conduct;
- mechanisms for reporting violations – creating safe channels for anonymous or secure reporting of abuse, corruption, harassment or labor violations is a sign of a mature culture of responsibility. Such mechanisms allow you to quickly respond to problems, preventing their escalation. For SMEs, it is also a way to protect their reputation and avoid legal risks;
- administrative risk management – the systematic identification, assessment and response to administrative risks – from weather conditions to changes in tax or regulatory policy – is a prerequisite for business sustainability. In the agrarian sector, where external

shocks (price changes, new standards, climate challenges) are part of the activity, efficient risk management ensures stability and long-term development. The absence of such procedures makes the enterprise vulnerable to even minor changes.

For the effective integration of managerial practices into the strategy of sustainable development of enterprises, it is important to clearly define how individual indicators of the G-scorecard interact with the global sustainable development goals defined by the UN. The connection between them allows not only to assess the level of corporate governance, but also to ensure the long-term sustainability of enterprises through the implementation of international standards and responsible practices. Since many aspects of managerial practices directly affect social, economic and environmental outcomes, it is important to consider how G-scorecard indicators can contribute to the achievement of specific Sustainable Development Goals, while ensuring the optimization of managerial processes and increasing the competitiveness of organizations (Tab. 4).

Table 4

Matrix of relationships between the indicators of the G-component of small and medium-sized enterprises in the agro-industrial complex and the Sustainable Development Goals

№	Indicator	Relevant SDGs
1	2	3
1	Decision-making transparency	SDG 1: No Poverty; SDG 8: Decent Work and Economic Growth; SDG 13: Climate Action; SDG 16: Peace, Justice and Strong Institutions
2	Updating internal policies	SDG 1: No Poverty; SDG 2: Zero Hunger; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 13: Climate Action; SDG 16: Peace, Justice and Strong Institutions
3	Employee involvement in decision-making	SDG 2: Zero Hunger; SDG 4: Quality Education; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 10: Reduced Inequalities; SDG 16: Peace, Justice and Strong Institutions
4	Conflict resolution mechanisms	SDG 2: Zero Hunger; SDG 8: Decent Work and Economic Growth; SDG 10: Reduced Inequalities; SDG 13: Climate Action; SDG 16: Peace, Justice and Strong Institutions
5	Wage transparency	SDG 1: No Poverty; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 16: Peace, Justice and Strong Institutions

End tbl. 4

1	2	3
6	Regularity of financial reporting	SDG 1: No Poverty; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 16: Peace, Justice and Strong Institutions
7	Involvement of independent accountant/auditor	SDG 1: No Poverty; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 16: Peace, Justice and Strong Institutions
8	Budgeting and cost control	SDG 1: No Poverty; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 12: Responsible Consumption and Production; SDG 16: Peace, Justice and Strong Institutions
9	Reserve fund	SDG 1: No Poverty; SDG 10: Reduced Inequalities; SDG 13: Climate Action; SDG 16: Peace, Justice and Strong Institutions
10	Linking bonuses to performance	SDG 1: No Poverty; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 10: Reduced Inequalities; SDG 16: Peace, Justice and Strong Institutions
11	Flexibility of remuneration system	SDG 2: Zero Hunger; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 10: Reduced Inequalities; SDG 16: Peace, Justice and Strong Institutions
12	Training and development programs	SDG 2: Zero Hunger; SDG 4: Quality Education; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 16: Peace, Justice and Strong Institutions
13	Executive remuneration transparency	SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 9: Industry, Innovation and Infrastructure; SDG 10: Reduced Inequalities; SDG 16: Peace, Justice and Strong Institutions
14	Code of ethics	SDG 1: No Poverty; SDG 5: Gender Equality; SDG 10: Reduced Inequalities; SDG 16: Peace, Justice and Strong Institutions
15	Whistleblowing mechanism	SDG 2: Zero Hunger; SDG 5: Gender Equality; SDG 8: Decent Work and Economic Growth; SDG 13: Climate Action; SDG 16: Peace, Justice and Strong Institutions
16	Administrative risk management	SDG 2: Zero Hunger; SDG 13: Climate Action

Source: author's own development

To visualize the relationships between each indicator of the G-component and the corresponding Sustainable Development Goals (SDGs), it is proposed to use a heat map, which allows you to quickly and visually assess the level of integration of managerial practices into global sustainability priorities. At the same time, the heat map identifies less covered areas where there is potential to improve the compliance of G-practices

with the UN goals, which increases the overall effectiveness of the enterprise's ESG strategy (Fig. 1).

Based on the resulting heat map, a mathematical model was developed for an aggregate assessment of the level of implementation of the G-component in the ESG system. It is designed to provide a quantitative interpretation of qualitative managerial characteristics, to form a single integral index, as

Indicator	The relationship of G-system indicators to the UN Sustainable Development Goals									
	SDG1	SDG2	SDG4	SDG5	SDG8	SDG9	SDG10	SDG12	SDG13	SDG16
Decision-making transparency	1	0	0	0	1	0	0	0	1	2
Updating internal policies	1	1	0	1	1	2	0	0	1	2
Employee involvement in decision-making	0	1	1	2	2	0	1	0	0	2
Conflict resolution mechanisms	0	1	0	0	1	0	1	0	2	2
Wage transparency	2	0	0	0	2	1	0	0	0	2
Regularity of financial reporting	1	0	0	0	1	2	0	0	0	2
ment of an independent account / auditor	2	0	0	0	1	1	0	0	0	2
Budgeting and expenditure control	1	0	0	0	2	2	0	0	0	2
Reserve fund	2	0	0	0	0	0	0	1	0	2
Link between bonuses and productivity	2	1	0	1	2	1	2	0	0	1
Flexibility of the payment system	0	1	2	1	2	0	1	0	0	2
Training and development	0	0	0	1	2	0	0	0	0	2
Executive compensation transparency	0	0	0	1	1	1	1	0	0	2
Code of ethics	1	1	0	0	0	0	1	0	0	2
Whistleblowing mechanism	0	1	0	0	1	0	0	0	2	2
Administrative risk management	0	1	0	1	0	0	0	0	1	0

Fig. 1. Heat map of the links between the indicators of the G-component of small and medium-sized enterprises in the agro-industrial complex and the Sustainable Development Goals

Source: author's own development

well as to provide an opportunity to compare the quality of the managerial apparatus between different entities of the agro-industrial complex of Ukraine.

The proposed model is based on a weighted sum of assessments of 16 corporate governance indicators, each of which is evaluated on a scale from 0 to 2, where it also demonstrates the impact of indicators on the implementation of a particular SDG (0 – no or minimal impact on implementation, 1 – moderate impact, 2 – high impact).

To account for the contribution of indicators to the achievement of the Sustainable Development Goals (SDGs), the model uses the SDG coefficient (C_i), which is calculated as the sum of the estimates of the linkages of each indicator with the SDGs (based on a heat map). Indicator weights (w_i) allow you to flexibly customize the model depending on the company's priorities.

The overall score (G) is normalized to a scale of 0-100, providing ease of interpretation and comparison.

The model formula is as follows (1):

$$G = \frac{G_i}{G_m} = \frac{\sum_{i=1}^{16} w_i \times S_i \times C_i}{\sum_{i=1}^{16} w_i \times 2C_i} \times 100, \quad (1)$$

where S_i – assessment of the i -th indicator, G_i – current corporate governance indicators, G_m – reference level of corporate governance; w_i – indicator weight, C_i – SDG coefficient.

This model allows you to assess the current state of corporate governance and identify priority areas for improvement. For example, low scores on indicators such as «Employee engagement in decision-making» or «Code of ethics» may signal the need to develop inclusive practices or ethical standards. In the context of the agro-industrial sector, the model is especially relevant because it takes into account the specifics of the industry, where transparency, financial discipline and adaptability to external risks (weather conditions, price volatility) are critically important.

The resulting score G is interpreted according to four levels (Tab. 5).

The introduction of these four levels of assessment of the integral index of corporate governance provides a detailed differentiation of the states of managerial practices of AIC SMEs. This allows for a more accurate assessment of the level of maturity of management, taking into account limited resources, low level of formalization and specific challenges of the agrarian sector. This takes into account the specifics of these enterprises, which often have limited resources, a low level of formalization of management and require clear and practical recommendations for improvement.

Thus, the estimates of the G -indicators of a typical AIC enterprise are given in Tab. 6.

Table 5

System of interpretation of the levels of corporate governance of small and medium-sized enterprises of the agro-industrial complex in the ESG system

Level	Characteristics	Improvement Measures
Critical level ($G < 30$)	Managerial processes at the enterprise are at an initial stage of development or have significant shortcomings. The absence of structured procedures, transparency, and control mechanisms creates high risks for operations, limiting compliance with ESG standards and the ability to attract resources	<ul style="list-style-type: none"> ▪ implementation of basic transparency policies and development of a code of ethics; ▪ ensuring regular financial reporting; ▪ engaging external consultants to develop budgeting and risk managerial procedures; ▪ launch of pilot initiatives, such as anonymous reporting channels, to build employee trust
Low level ($30 \leq G < 50$)	Managerial practices are partially implemented but have substantial gaps. There are some elements of transparency or reporting, but a lack of systematization and stakeholder engagement limits compliance with ESG standards and competitiveness	<ul style="list-style-type: none"> ▪ publication of key managerial decisions; ▪ regular updating of internal regulations; ▪ implementation of mechanisms for employee involvement in managerial processes; ▪ establishment of a reserve fund; ▪ building partnerships with local organizations to support ESG initiatives
Medium level ($50 \leq G < 75$)	The managerial system demonstrates a moderate level of development with some structuring and transparency. However, it lacks innovative approaches and flexibility to fully comply with ESG standards, which hinders the attraction of strategic resources and integration with the SDGs	<ul style="list-style-type: none"> ▪ introduction of digital tools for monitoring finances and risks; ▪ development of employee training programs with a focus on the SDGs, particularly innovation and sustainability; ▪ creation of regular communication channels with stakeholders
High level ($G \geq 75$)	The managerial system is well developed, complies with international ESG standards, and contributes to sustainable development. A high level of transparency, inclusiveness, and adaptability ensures competitiveness and a significant contribution to achieving the SDGs	<ul style="list-style-type: none"> ▪ positioning the enterprise as a leader through publication of successful ESG practice cases; ▪ implementation of digital platforms for ESG reporting and stakeholder engagement; ▪ establishing partnerships with global organizations to support the SDGs; ▪ development of social projects for local communities, e. g., educational programs, to strengthen contribution to the SDGs

Source: author's own development

It is worth noting that the model can be adapted by changing the weights of indicators, for example, by giving more weight to financial indicators («Regularity of financial statements», «Budgeting and cost control») during periods of economic instability or ethical indicators («Code of ethics», «Whistleblowing mechanism») to attract ESG-oriented investors. The model serves not only as an assessment tool, but also as a basis for strategic planning, contributing to increasing competitiveness and sustainable development in the agrarian sector.

To demonstrate the functionality of the proposed mathematical model, an example of calculating the integral index of the level of corporate governance for a typical AIC enterprise is given. This approach creates the basis for further practical

application of the model as a tool for monitoring, benchmarking and strategic planning of managerial changes, taking into account the requirements of the ESG approach.

Thus, the estimates of the G -indicators of a typical AIC enterprise are given in Tab. 6.

At the first step, based on the data from the heat map, we calculate the coefficient C_i for each indicator as the sum of the estimates of the links with the SDGs (Tab. 7).

At the second step, we will calculate the aggregate indicator of the current level of corporate governance using the formula (2). We assume that the level of weight of all indicators

is equivalent to each other, i. e. $w_i = \frac{1}{16} = 0,0625$.

Table 6

Estimates of G-indicators of a typical AIC enterprise

№	Indicator	Symbol	Rating
1	Transparency of decision-making	S_1	2
2	Update of internal policies	S_2	1
3	Involving employees in decision-making	S_3	0
4	Conflict resolution mechanisms	S_4	0
5	Transparency of remuneration for work	S_5	1
6	Regularity of financial statements	S_6	1
7	Engaging an independent accountant/auditor	S_7	2
8	Budgeting and cost control	S_8	0
9	Reserve fund	S_9	1
10	Linking bonuses to performance	S_{10}	2
11	Flexibility of the payment system	S_{11}	2
12	Training and development programs	S_{12}	1
13	Transparency of executive remuneration	S_{13}	1
14	Code of ethics	S_{14}	0
15	Violation reporting mechanism	S_{15}	1
16	Administrative risk management	S_{16}	1

Source: author's own development

Table 7

Matrix of intensity of links between the indicators of the G-component of small and medium-sized enterprises of the agro-industrial complex and the Sustainable Development Goals

Indicator	SDGs										
	1	2	4	5	8	9	10	12	13	16	C_i
S_1	1	0	0	0	1	0	0	0	1	2	5
S_2	1	1	0	1	1	2	0	0	1	2	8
S_3	0	1	1	2	2	0	1	0	0	2	8
S_4	0	1	0	0	1	0	1	0	2	2	6
S_5	2	0	0	1	2	1	0	0	0	2	8
S_6	1	0	0	0	1	2	0	0	0	2	6
S_7	2	0	0	0	1	1	0	0	0	2	6
S_8	1	0	0	0	2	2	0	1	0	2	8
S_9	2	0	0	0	0	0	1	0	2	2	7
S_{10}	2	0	0	0	2	1	2	0	0	1	8
S_{11}	0	1	0	1	2	0	1	0	0	2	7
S_{12}	0	1	2	1	2	0	0	0	0	2	8
S_{13}	0	0	0	1	1	1	1	0	0	2	6
S_{14}	1	0	0	1	0	0	1	0	0	2	5
S_{15}	0	1	0	1	1	0	0	0	2	2	7
S_{16}	0	1	0	0	0	0	0	0	1	0	2

Source: author's own development

$$G_i = \sum_{i=1}^{16} w_i \times S_i \times C_i = 0,0625 \times 2 \times 5 + \dots + 0,0625 \times 1 \times 2 = 6,6. \quad (2)$$

At the third step, using the formula (3), we will calculate the reference assessment of the level of corporate governance.

$$G_m = \sum_{i=1}^{16} w_i \times 2C_i = 0,0625 \times 2 \times 5 + \dots + 0,0625 \times 2 \times 2 = 13,5. \quad (3)$$

At the fourth step, according to the formula (1), we will determine the general level of corporate governance (4):

$$G = \frac{G_i}{G_m} = \frac{6,6}{13,5} \times 100 = 48,6. \quad (4)$$

Based on calculations according to the described mathematical model for assessing the level of corporate governance, which takes into account the links with the Sustainable Development Goals (SDGs), an overall score of $G = 48,6$

was obtained. This result corresponds to a low level of corporate governance, which indicates the need for a comprehensive review of managerial practices to achieve ESG standards (Fig. 2).

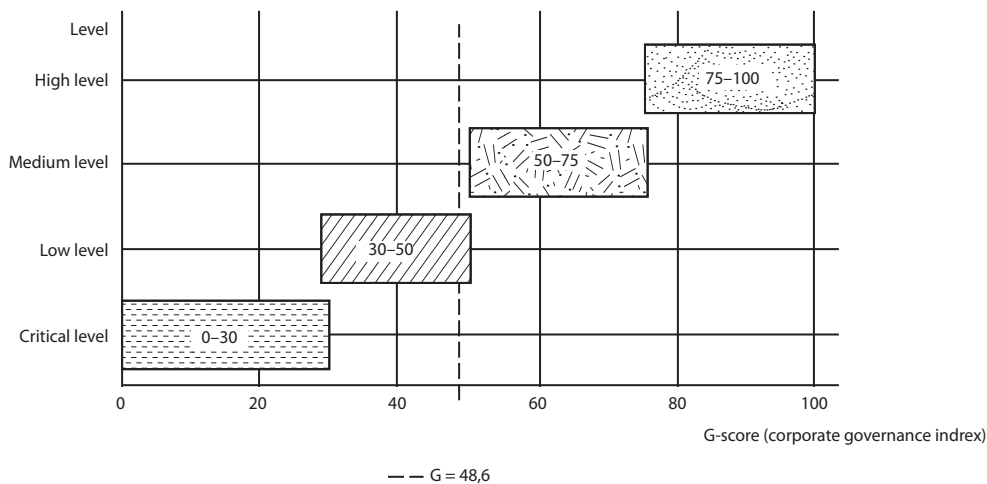


Fig. 2. Assessment levels of the G-component of small and medium-sized enterprises of the agro-industrial complex in the ESG system

Source: author's own development

The presented visualization of the results clearly illustrates the distribution of four levels of G-component assessment in the ESG system for AIC SMEs. The proposed segmentation of levels allows you to accurately identify the state of corporate governance and determine priority areas for improvement. In our opinion, this contributes to increasing the transparency, adaptability and competitiveness of AIC SMEs, as well as their integration into global sustainability initiatives through compliance with ESG standards and the Sustainable Development Goals (SDGs).

Conclusions. The introduction of the ESG conception in the activities of AIC SMEs is a strategically important step to ensure their competitiveness, sustainable development and integration into global economic processes. Of particular importance is the managerial component, which serves as the basis for the implementation of environmental and social initiatives, the formation of transparent and effective managerial practices, as well as the strengthening of trust on the part of stakeholders. The study emphasizes that the low level of formalization of managerial processes in AIC SMEs creates significant obstacles to compliance with ESG standards, attracting investments and achieving the Sustainable Development Goals.

The developed G-component indicator system, which includes 16 quantitative and qualitative indicators, allows for

a comprehensive assessment of the state of corporate governance, taking into account the sectoral specifics of the agrarian sector. These indicators cover key aspects of transparency, inclusiveness, anti-corruption mechanisms, financial discipline and risk management, which are critical for SMEs with limited resources.

The developed mathematical model of the aggregate assessment of the G-component serves as a universal tool for quantitative measurement of the level of corporate governance, its comparison between enterprises and determination of strategic priorities.

It takes into account the links with the SDGs, which enhances the practical value for AIC SMEs in the context of global sustainability initiatives.

Thus, the study confirms the need for a systematic approach to assessing and improving the managerial practices of AIC SMEs within the framework of the ESG conception. The implementation of the proposed system of indicators and model will contribute to increasing the transparency, efficiency and competitiveness of agrarian enterprises, their adaptation to modern challenges and contribution to the achievement of the SDGs. Further research can be aimed at testing the model on different types of AIC SMEs and its adaptation to changes in the regulatory environment.

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Стаття надійшла до редакції 31.08.2025 р.

Статтю прийнято до публікації 14.09.2025 р.

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