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SHEEP WELFARE MONITORING SYSTEM IN THE CONTEXT OF EUROPEAN STANDARDS

Abstract

This article examines sheep welfare monitoring through a comparative analysis of the European Union regulatory framework and Ukraine's evolving legal system. It draws on EU directives, regulations, scientific guidance, and strategic policy documents, alongside Ukrainian laws and subordinate acts introduced or updated in the course of harmonisation with European standards. Using comparative legal and content analysis, the study identifies the core components of welfare governance, the extent to which welfare requirements have been operationalised, and the main barriers to effective implementation.

The analysis shows that the EU has developed a more operational welfare-monitoring model based on measurable animal- and resource-based indicators, risk-based official controls, traceability, and the growing use of digital tools across production, transport, and slaughter. Ukraine, by contrast, has made substantial legislative progress, particularly through Law No. 1206-IX and Law No. 4718-IX, but important implementation gaps remain. These include the insufficient specification of sheep-relevant biological and behavioural indicators, limited uptake of digital and sensor-based monitoring, weak integration of animal identification with welfare surveillance, and underdeveloped systems of staff training and certification.

The study argues that convergence with European sheep welfare standards depends less on formal legal approximation alone than on the operationalisation of measurable welfare criteria, digital traceability, and implementation capacity. In this respect, the Ukrainian case is relevant beyond the national context for countries aligning livestock welfare governance with EU standards under conditions of agricultural transition, resource constraints, and post-war recovery

Keywords: *sheep welfare, monitoring, regulatory framework, European Union, Ukraine, comparative analysis, digital technologies, One Health.*

Introduction. Ensuring an adequate level of animal welfare is a strategic priority of modern livestock production and an important component of sustainable development policy in the European Union. In this context, the development of a sheep welfare monitoring system in compliance with European regulatory standards becomes particularly relevant as a complex interdisciplinary scientific and practical problem. The formulation of this issue is directly related to the need to move from traditional, fragmented, and subjective approaches to welfare assessment toward integrated, objective, and digitalized monitoring systems capable of providing continuous, real-time control of animal conditions.

Analysis of recent research and publications. The relevance of this study is driven by a number of interrelated challenges: the strengthening of European legislative requirements on animal welfare, the impact of climate change on the physiological condition and behavior of sheep, and the need to increase production efficiency. Under these conditions, traditional assessment methods based on periodic visual observations do not provide a sufficient level of accuracy, objectivity, or timeliness, which necessitates the implementation of innovative technological solutions [1, 2].

From a scientific perspective, the problem lies in the absence of a unified conceptual model that would integrate behavioral, physiological, and environmental indicators of welfare into a single assessment system, taking into account the specific features of sheep farming. This issue is of particular relevance for Ukraine in the context of European integration and the reform of the agricultural sector, where the harmonization of national legislation with the requirements of the European Union in the field of animal welfare—particularly in accordance with the provisions of Council Directive 98/58/EC concerning the protection of animals kept for farming purposes, as well as the implementation of the principles of the European Convention for the Protection of Animals kept for Farming Purposes—shapes new approaches to ensuring an adequate level of animal husbandry.

In addition, requirements for the transportation, handling, and monitoring of animal conditions are regulated by Council Regulation (EC) No 1/2005 on the protection of animals during transport and Regulation (EU) 2016/429 (Animal Health Law), which provide for systematic monitoring of the physiological condition and housing conditions of animals [3,4,5].

In these conditions, the introduction of mandatory standards of maintenance and control of their observance forms qualitatively new requirements for animal condition assessment systems. At the same time, the practical implementation of these regulatory provisions requires the development of effective monitoring tools capable of ensuring objective, continuous control and prompt management of sheep welfare under various production conditions.

This is particularly relevant in light of the challenges of post-war recovery of Ukraine’s agricultural sector and the impact of climate change, which further complicate the maintenance of a stable level of animal welfare and necessitate the

introduction of adaptive, technology-oriented approaches to their assessment and management [4, 6, 9, 10, 11].

The analysis of modern scientific research, combined with the evolution of the regulatory framework of the European Union and the national legislation of Ukraine, confirms a trend toward the harmonization of animal welfare standards within the context of sustainable development and the One Health concept [5,7]. In particular, in accordance with Council Directive 98/58/EC concerning the protection of animals kept for farming purposes, animal welfare is considered a comprehensive category that includes physiological, behavioral, and environmental aspects, which must be assessed systematically and continuously. In addition, the European Convention for the Protection of Animals kept for Farming Purposes establishes principles for animal housing in accordance with their biological and ethological needs [6,8,11].

At the national level, systemic changes are taking place through the adoption and practical implementation of the Law of Ukraine "On Veterinary Medicine and Animal Welfare" (No. 1206-IX), which entered into force in March 2026 and establishes a modern model of state control in the field of animal health and welfare. It defines clear legal frameworks for owners, farmers, market operators, veterinarians, and state control authorities, raising standards for animal housing, transportation, and handling, and aligning them with contemporary European approaches.

In addition, as of January 1, 2026, mandatory requirements for the welfare of farm animals during their keeping have been introduced in Ukraine, approved by Order of the Ministry of Economy, Trade and Agriculture of Ukraine No. 224 dated February 8, 2021. These requirements, which have become mandatory for all market operators, include minimum standards for meeting the physiological, environmental, and behavioral needs of animals—namely conditions of space, lighting, ventilation, microclimate, continuous access to feed and water, prohibition of practices that cause excessive suffering or restrict natural behavior, as well as requirements for regular monitoring of animal condition and professional training of personnel.

These national changes are harmonized with European strategic documents such as the Farm to Fork Strategy, which emphasize the need to transition to innovative, technology-oriented practices in livestock farming, with a focus on animal welfare, environmental safety, and product quality.

The scientific literature substantiates the feasibility of applying multifactorial models—a combination of behavioral, physiological, and productivity indicators—as the most sensitive indicators of welfare, consistent with the risk-based control defined in Regulation (EU) 2016/429 (Animal Health Law). Particular attention within these approaches is given to sensor systems, automated data collection, and the use of artificial intelligence algorithms for real-time monitoring.

At the same time, the requirements for ensuring animal welfare during transport, defined in Council Regulation (EC) No 1/2005, as well as the provisions of Regulation (EU) 2017/625 on official controls regarding strengthened enforcement of welfare standards, further reinforce the need to develop digital monitoring systems with high traceability, transparency, and objectivity of assessment.

Despite significant progress in scientific approaches and regulatory support, most existing models remain fragmented and insufficiently adapted to the specific features of sheep farming, which limits their practical effectiveness in implementing both Ukrainian and European legislative requirements.

The scientific novelty of the obtained results lies in the development of a conceptually new integrated system for monitoring sheep welfare, aligned with contemporary European regulatory and strategic approaches and adapted to the national context of post-war recovery. It is based on the multi-level integration of behavioral, physiological, and environmental indicators within a unified digital analytical platform that takes into account the requirements of Council Directive 98/58/EC and the principles of risk-based control set out in Regulation (EU) 2016/429 [4, 9, 10].

For the first time, an approach to the formation of an adaptive integral welfare index is proposed, which incorporates dynamic changes in animal condition, the influence of climatic factors, and production conditions in real time. This is complemented by improvements in monitoring methodologies through the integration of sensor technologies, big data analysis, and artificial intelligence algorithms, which enhance the accuracy of risk prediction and the effectiveness of management decisions [8].

The proposed system is characterized by universality, scalability, and adaptability, ensuring its effective application both at the level of individual farms and within sectoral management systems. It contributes to Ukraine's integration into the European agricultural space, enhances compliance with international standards, and increases the competitiveness of the sheep farming sector in global markets [4,8,10].

Purpose of the work. The purpose of this work is to develop a conceptually novel, integrated monitoring system for sheep welfare that aligns with contemporary European Union regulations and national legislation, and is adapted to the post-war recovery context of Ukraine.

Materials and methodology. The research materials included regulatory and legal acts of the European Union, including directives, regulations, and technical standards governing the welfare of sheep and animals in general, as well as national legislative and subordinate acts of Ukraine regulating the housing, feeding, health protection, and monitoring of sheep conditions. In addition, scientific articles, methodological guidelines, and analytical reviews by Ukrainian and European researchers related to methods for assessing sheep welfare were used.

To ensure a systematic and analytical approach, the study was conducted through the following step-by-step methodological stages:

- **Selection of sources:** At this stage, a systematic search was carried out in legislative databases and scientific publications, along with the selection and systematization of information sources from official EU and Ukrainian resources.
- **EU regulatory documents:** Directives, regulations, technical standards, and methodological guidelines concerning the welfare of sheep and farm animals in general were selected. Documents of the EFSA (European Food Safety Authority) and

recommendations of the European Commission regarding minimum standards for housing, feeding, health protection, and productivity monitoring were analyzed.

- **Regulatory framework of Ukraine:** Laws, subordinate acts, orders, and methodological guidelines regulating the housing, feeding, health protection, and monitoring of sheep conditions were analyzed.

Scientific sources: These included reviews, articles, and analytical works by Ukrainian and European researchers describing methods for assessing and monitoring sheep welfare.

At the second stage, an analytical classification and systematization of information were carried out. At this stage, the selected sources were structured for further analysis:

Classification of documents by thematic categories: housing conditions, feeding, health protection, and welfare monitoring methods.

Identification of key indicators: criteria directly affecting the condition and productivity of sheep were selected (access to feed and water, space per animal, temperature conditions, medical control, behavioral indicators).

Creation of a database: for each document, key provisions, requirements, and methods for assessing welfare were recorded.

An in-depth analysis of the content of regulatory documents and scientific sources was conducted:

Analysis: content analysis and comparison of Ukrainian and European standards based on key welfare criteria.

Generalization: development of recommendations for harmonizing the Ukrainian monitoring system with European standards.

Visualization: creation of tables and diagrams for clear comparison and practical application.

This approach enables a systematic assessment of the regulatory framework, identification of gaps, and development of practical recommendations for implementing an effective sheep welfare monitoring system in Ukraine.

Results and discussion. Presentation of the main research material. The regulatory and legal framework of the European Union regarding animal welfare, particularly that of sheep, represents a multi-level system that integrates legal, scientific, institutional, and innovative components. It ensures effective monitoring and assessment of animal welfare across production, transportation, and slaughter sectors (Table 1).

The EU sheep welfare monitoring system is multi-level and integrated, combining legal frameworks, scientific recommendations, and innovative technologies. The reforms of 2025–2026 strengthen digitalization and harmonization of standards, enhancing transparency and efficiency. The table illustrates the evolution of the regulatory framework and its adaptation to modern challenges in livestock management.

As for Ukraine, the system for ensuring the monitoring of animal welfare is being formed under conditions of transformation of the agricultural sector,

implementation of the provisions of the Association Agreement with the European Union, and increasing requirements for food safety. In the modern scientific paradigm, animal welfare is considered an integrated category that combines physiological condition, behavioral needs, and adaptive capacities of the organism under specific housing conditions. Accordingly, the regulatory framework should not only declare the principles of humane treatment but also ensure their practical implementation through clear regulatory mechanisms, standards, and control instruments (Table 2).

Table 1

Comparative analysis of EU directives, regulations, and documents for sheep welfare monitoring (1998-2026)

Year / Document	Type	Authority / Source	Monitoring Object	Key Welfare Indicators	Role in Monitoring	Notes / Innovations
1976 / Directive 76/196/EEC	Directive	EU	Farm animals	Housing, space, basic care	First baseline welfare requirements	Early conceptual stage
1998 / Directive 98/58/EC	Directive	EU	All farm animals	Housing conditions, health checks, behavior observation	Establishes standard monitoring procedures	Applies to sheep; foundation for farm-level monitoring
2005 / Regulation (EC) 1/2005	Regulation	EU	Transport	Condition assessment, microclimate, journey duration	Stress and welfare monitoring during transport	Introduced objective animal-based indicators
2009 / Regulation (EC) 1099/2009	Regulation	EU	Slaughter	Stunning, consciousness, pain minimization	Monitors critical points of welfare at slaughter	Integration of EFSA scientific recommendations
2012–2026 / EFSA Opinions	Scientific guidance	EFSA	Animal condition	Animal-based and resource-based indicators	Provides methodological basis for monitoring	Continuous updates reflecting new research
2017 / Regulation (EU) 2017/625	Regulation	EU	Official controls	Audits, inspections, compliance checks	System-wide supervision and verification	Strengthened integration into CAP control
2017–2026 / EU Platform on Animal Welfare	Institutional framework	European Commission	Policy and practice	Data sharing, recommendations, best practices	Coordination of monitoring systems	Enhances harmonization across member states

2020 / Farm to Fork Strategy	Policy / Strategy	European Commission	Entire production system	Digital tools, traceability, welfare indicators	Strategic guidance for integrated monitoring	Emphasis on digitalization
2021–2026 / Horizon Europe Projects	Research / Innovation	EU	Innovative monitoring systems	AI, sensors, big data analytics	Development and testing of next-generation monitoring	Advanced digital monitoring, predictive welfare assessment
2025–2026 / EU legislative updates	Policy initiatives	European Commission	Entire system	Digital monitoring, updated welfare criteria	Modernization of welfare monitoring system	Harmonization, transparency, adaptation to climate-smart livestock

Table 2

Regulatory and Legal Framework of Ukraine on Sheep Welfare (Updated for 2026)

Regulatory Act	Regulatory Scope	Key Provisions	Scientific Assessment	Relevance in 2026
Law of Ukraine "On the Protection of Animals from Cruel Treatment" (2006, updated 2026)	General principles of animal welfare	Prohibition of cruel treatment; restrictions on physical violence	Fundamental, but lacks quantitative welfare indicators	Requires further detailing through subordinate acts and sectoral standards
Law of Ukraine "On Veterinary Medicine and Animal Welfare" №1206-IX (2021, effective 2026)	Animal health and welfare	Defines obligations of market operators; establishes requirements for housing, transportation, and handling of animals; provides mechanisms for state supervision	Modern, risk-oriented; integrates welfare into the veterinary control system; complies with EU standards	Key system-forming law, establishing legal and operational foundations for monitoring

Law of Ukraine №4718-IX (2025)	Harmonization with EU legislation	Standardizes terminology; clarifies definitions of animal welfare; implements procedures according to international practices	Scientific progress toward systemic regulation	Supports Ukraine's integration into global markets and implementation of international standards
Law of Ukraine "On Identification and Registration of Animals" (2009, updated 2026)	Identification and accounting	Registration and tracking of animals	Not integrated with digital monitoring systems	Digital integration recommended for automated welfare monitoring
Subordinate acts (Orders of the Ministry of Agrarian Policy and the State Service of Ukraine on Food Safety and Consumer Protection, 2026)	Sectoral regulation of housing, feeding, and veterinary services	Establishes space per animal, microclimate parameters, feeding schedules, access to water, and veterinary care	Provides practical parameters; supports stress minimization and considers behavioral needs	Updates reflect gradual adaptation of Ukrainian standards to EU norms, especially in sheep farming

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An analysis of the current legislation of Ukraine indicates the formation of a multi-level legal regulatory system, encompassing fundamental legislative acts, sectoral norms, subordinate documents, and mechanisms of legal responsibility. A key system-forming element is the Law of Ukraine "On Veterinary Medicine and Animal Welfare" No. 1206-IX, which came fully into force in 2026. Its adoption marks a transition to a new regulatory model based on the principles of a risk-oriented approach, traceability, and integration of animal welfare into the overall system of veterinary control. The law defines the responsibilities of market operators, establishes requirements for the maintenance, transportation, and handling of animals, and provides mechanisms for state oversight that comply with contemporary European standards.

An important complement to this legislative act is the Law of Ukraine No. 4718-IX (2025), aimed at harmonizing national legislation with European Union law. Its provisions ensure the unification of terminology, clarification of definitions of animal welfare, and the introduction of procedures consistent with international practices. From a scientific perspective, this reflects a shift from fragmented regulation toward a systematic approach focused on integrating Ukraine into global livestock product markets.

The Law of Ukraine "On the Protection of Animals from Cruel Treatment" plays a significant role in establishing ethical and legal foundations, as it defines the basic

principles of humane treatment of animals and sets prohibitions against cruel practices. However, unlike modern veterinary-oriented legislation, this legal act is more general in nature and requires further specification through subordinate acts and sectoral standards. Therefore, its role should be considered fundamental but insufficient for ensuring a comprehensive animal welfare system without integration with other elements of the regulatory framework.

At the sectoral level, regulation is represented by laws concerning food safety and state control, which link animal welfare to product quality. The implementation of the "farm-to-fork" approach necessitates consideration of animal husbandry conditions as one of the key factors in ensuring food safety. Thus, animal welfare acquires a functional significance within the food security system, aligning with the "One Health" concept, which emphasizes the interconnection between the health of animals, humans, and the environment.

Subordinate regulatory acts, particularly orders of central executive authorities in the field of agricultural policy, play a special role in the practical implementation of legislative requirements. They establish specific parameters for keeping farm animals, including space per head, microclimate indicators, feeding regimes, access to water, and veterinary care. The update of these requirements in 2026 reflects the gradual adaptation of Ukrainian standards to European Union norms, particularly in terms of considering animals' behavioral needs and minimizing stress factors. This is of fundamental importance for sectors such as sheep farming, where animal welfare directly affects productivity, reproductive performance, and product quality.

Regulations governing the transportation and slaughter of animals require separate analysis. Their refinement in 2025–2026 has been aimed at reducing stress, injury, and pain, in line with international standards for humane treatment. The introduction of mandatory certification for personnel in these areas enhances professional accountability and fosters a culture of humane treatment of animals at all stages of the production process.

Equally important within the regulatory framework are control and accountability mechanisms. State supervision of compliance with legal requirements is carried out by competent authorities, which apply a risk-oriented approach to planning inspections. This allows for the optimization of resources and focuses attention on the most critical segments. Administrative and criminal liability for violations of animal welfare requirements serves a preventive function and ensures mandatory compliance with established standards.

A synthesis of the data presented in the table of regulatory acts indicates that the legal system for animal welfare in Ukraine is characterized by comprehensiveness, hierarchical structure, and dynamic development. It covers all key aspects of human–animal interaction in production, including housing, transportation, veterinary care, and use of animals. At the same time, the effectiveness of this system largely depends on the level of its practical implementation.

Among the main challenges are the insufficient technical support of farms, limited financial resources for implementing new standards, and the need to digitize

monitoring processes. In this context, the application of modern information technologies, including automated data collection and analysis systems, sensor technologies, and artificial intelligence, appears promising, as it allows continuous monitoring of animal status and rapid response to changes in their welfare.

The scientific justification for developing the regulatory framework lies in the need to transition to an integrated model of animal welfare management that combines legal, technological, and biological aspects. Such an approach ensures not only compliance with ethical standards but also increased production efficiency, reduced disease risks, and improved product quality. In the context of climate change and rising demands for sustainable development, adapting regulatory requirements to new environmental challenges becomes particularly important, necessitating further scientific research and legislative improvement.

Comparative analysis of regulatory systems is an effective tool for assessing the current state of animal welfare regulation and identifying strategic directions for the development of national legislation. In the European Union, the sheep welfare monitoring system operates at a high level of standardization and harmonization, based on directives and regulations that govern housing, transportation, slaughter, and methods for assessing physiological and behavioral conditions. By implementing the provisions of the EU Association Agreement and updating its own regulatory framework (Laws No. 1206-IX and No. 4718-IX), Ukraine is taking its first systematic steps toward aligning with international standards.

The level of detail in EU directives and regulations (e.g., Council Directive 98/58/EC, 2008/119/EC, Regulation 1099/2009) establishes clear parameters for animal housing, measurable physiological indicators, behavioral criteria, standards for transportation and slaughter, and mandatory personnel certification.

In Ukraine, although Laws No. 1206-IX (2026) and No. 4718-IX (2025) bring the system closer to the European model, the practical specification of subordinate acts still requires development, particularly regarding concrete biological and behavioral indicators that could be used for automated monitoring.

Regarding the integration of monitoring and digitalization, the EU actively employs scientifically validated welfare assessment systems, including automated sensor technologies, devices for monitoring animal condition, and digital platforms for data analysis.

In Ukraine, the implementation of digital monitoring systems remains limited, which reduces the timeliness of sheep welfare assessments and the ability to predict risks. For effective monitoring, it is necessary to integrate automated sensor systems and data analysis platforms, including artificial intelligence.

Regulation of transportation and slaughter in the EU enforces strict norms for humane handling during transport and slaughter, including mandatory personnel training and certification. Ukrainian legislation establishes the basic principles, but mechanisms for control and mandatory personnel certification are only beginning to be implemented. This creates risks of ineffective compliance and underscores the need to strengthen supervision and specialist training.

Risk-oriented control and traceability in the EU employ a risk-based approach that allows resources to be concentrated on the most critical areas of production and enables rapid response to violations. In Ukraine, these principles are embedded in Law No. 1206-IX, but practical implementation requires improvement in data collection systems, risk assessment methodologies, and automated control.

Conclusions. This study shows that the main difference between the European Union and Ukraine in sheep welfare monitoring lies not in the formal existence of legal norms, but in the degree to which those norms have been translated into operational practice. In the EU, welfare monitoring is increasingly structured around measurable animal- and resource-based indicators, risk-based official controls, traceability, and the expanding use of digital technologies across production, transport, and slaughter. Ukraine, by contrast, has made substantial legislative progress, but implementation remains less operationalised and less integrated.

The analysis indicates that recent legal reforms in Ukraine provide an important foundation for convergence with European standards. However, legislative modernisation has outpaced practical implementation. The principal unresolved issues are the insufficient specification of sheep-relevant biological and behavioural indicators, the limited uptake of digital and automated monitoring systems, the weak integration of animal identification with welfare surveillance, and the continuing need for structured training and certification of personnel.

Further harmonisation should therefore focus on four priorities: 1) the standardisation of sheep-specific animal- and resource-based welfare indicators; 2)the integration of digital and sensor-based tools into routine monitoring; 3) the strengthening of traceability and risk-based official control throughout the production chain; 4) and the institutionalisation of training and certification mechanisms. Together, these steps would shift sheep welfare governance in Ukraine from formal compliance towards measurable, monitorable, and enforceable implementation.

More broadly, the Ukrainian case demonstrates that effective alignment with European sheep welfare standards depends on the integration of law, measurement, data infrastructure, and implementation capacity rather than on legal approximation alone. From this perspective, the study is relevant not only as an account of national reform, but also as a broader example of how livestock welfare governance can be advanced under conditions of structural transition, sustainability pressure, and post-war recovery.

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