

VETERINARY, ECONOMIC AND SOCIAL ASPECTS OF CATTLE WELFARE: A REVIEW

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Abstract. *The paper presents a review of the literature on cattle welfare. The objective of this review is to outline the veterinary, economic, and social aspects of cattle welfare and highlight the current problems, global trends, and solutions. The global major scientific reference databases (Web of Science, ScienceDirect, Scopus) were reviewed. The review brought the following findings: a change in scientific and practical approaches to the understanding and assessment of the welfare of productive animals that requires not only health maintenance, stress prevention, or the ability of animals to express natural behavior. Animal welfare gains more anthropometric traits, including such concepts as 'pleasure' or 'happiness'. The concept of 'positive welfare' has become a more popular trend in scientific research on animal welfare. The review identified positive trends of possible modification of production systems, to make them more diverse and animal welfare friendly. The research found livestock products consumers growing concerned about animal welfare and housing conditions. The concept of welfare is more commercialized, which encourages livestock producers to adhere to ethical production standards. However, the demand of consumers to meet high standards of animal welfare does not have sufficient economic leverage. Only a few are willing to pay more for the better welfare of the animals or to refuse to consume animal products from production systems with poor welfare conditions. This review was intended to draw the attention of scientists, farmers, and consumers to the problems of the humane treatment of productive animals. And to assist stakeholders in finding their place in the process of creating better conditions for animals that are used for food, helping people with their existence or with their lives.*

Keywords: animal welfare, cattle, health, housing, environmental enrichment, animal protection.

Introduction. To meet the growing population's demands for food and to mitigate the ecological impact it is necessary to make livestock rearing more efficient (Ponnampalam and Holman, 2023). Animal products give energy and are important sources of high-quality proteins, amino acids, minerals, vitamins, and bioactive compounds necessary for human nutrition. Milk, in particular, is called a complete food, with dairy products as a valuable component of a well-balanced diet (Balivo et al., 2023).

Animal welfare is getting more important and it is discussed globally regarding social and cultural, scientific, political, commercial, and ethical issues. The focus on the welfare of farm animals has not only affected intensive livestock production systems, due to the restrictive conditions in which animals are kept and the husbandry practices, like transport, and pre-slaughter handling in general (Gallo et al., 2022).

Animal welfare is the common welfare that is important for many stakeholders involved in the agro-food chain, like producers and consumers (Verbeke, 2009). The key welfare guidelines are extended especially regarding types of housing, some examples may be pasture access for dairy cows, nest boxes for laying hens, or straw bedding for pigs. The guidelines should not be too prescriptive on permitted housing, because producers need to be free to (Grandin, 2022).

According to D. Fraser (Fraser, 2018), the modern development of animal welfare (AW) is on three levels: fundamental research, intended to get a basic understanding of AW, study of how to assess AW, and study of how to translate obtained knowledge in practical standards or animal welfare criteria.

The consumer demands for farm animals' welfare have increased in recent years, which is an integral part of sustainable livestock farming. Producers must meet these demands by assessing animal welfare based on clearly defined and structured protocols for each species and production system. Then welfare certification can be guaranteed throughout the entire production chain. (Muhammad et al., 2022)

The objective of the paper is to conduct an analytical review of international scientific literature regarding the veterinary and socio-economic aspects of the animal welfare issue, focusing on contemporary trends, experiences and approaches to its resolution.

Methods and materials. The research was conducted by studying and reviewing scientific literature published on the Web of Science platform (Clarivate) and in the following online databases: ScienceDirect and Scopus (Elsevier). Access to these platforms was provided by Dnipro State Agrarian and Economic University. The generalization of information was based on our extensive experience in teaching the university course "Animal Hygiene and Welfare" and the findings of collaboration with international colleagues.

Results A reliable and real assessment of animal welfare should include numerous factors that reflect physical, psychological, and behavioral well-being. This requires a profound understanding of animal needs, their natural behavior, and biological functions. The farm-cattle industry is driven by public concern towards more animal-friendly production and processing systems that should meet the behavioral needs of animals, and sustainable, traceable, and ethical qualities of animal products.

Welfare requirements and assessment. Animal welfare standards can have several key requirements. For example, H. J. Blokhuis (Blokhuis et al., 2010) divided animal welfare requirements into three main types. First, these are requirements based on minimal standards for the animal's housing and other resources, like bedding, stocking density, air quality, temperature, and access to food and water. Second, these are management requirements that outline the actions regarding the animals' health. They include requirements for the absence of pain, regular inspections of animals and feed with a certain frequency, as well as adherence to established veterinary care and euthanasia procedures. The final requirements take into account the condition of the animals and specify the outcomes that need to be achieved. These requirements include health-related indicators, such as the allowable grade of lameness and injuries, acceptable mortality rates, and the minimum permissible score that characterizes the state of the organism. These requirements were the guiding principles in elaborating different protocols for AW assessment (Krueger et al., 2020).

The requirements of animal welfare standards involve achieving four primary goals (Fraser, 2018). The first goal is to maintain the basic health and functioning of animal organisms, reflected in low disease rates and high indicators of survival, reproduction, and growth. The second goal focuses on the "affective states" of animals, particularly in preventing or minimizing unpleasant states like pain, distress, and hunger, and providing animals with the possibility to experience positive states like comfort or satisfaction. The third goal is to provide animals with the possibility to express natural behavior, especially motivated behavior, like reproduction. The final goal is to give animals access to natural environmental elements, like sunlight and fresh air. The practical realization of research occurs especially in cases where innovation simplifies animal housing and management, improves productivity, or reduces production costs.

If we think of animal welfare as a complex outcome that depends on a match between the genetic makeup of the animals, the production system in which they are kept, and the ability of the people to manage these animals in that system, then improving animal welfare needs to involve coordinated action in all three domains (Cojkcic and Morrell, 2023).

A one-factor animal welfare assessment (such as measuring plasma levels of cortisol and serotonin or measuring heart rate variation) does not cover all aspects of animal welfare. Therefore, the use of multi-indicator evaluation protocols is recommended that include a lot of indicators originally developed and conducted for intensive farming systems (Balivo et al., 2023).

The same species of animals have common needs that have evolved independently of their living environment, housing systems, management, and genetics. This allows to assess welfare based on their physiological state or behavior (e.g., body condition, cleanliness, internal pathology or injuries, lameness, and lesions), as well as on social interaction, game playing, and other behavior related to drawbacks in stall design or overall management (Edwards-Callaway et al., 2017; Butterworth et al., 2018).

In the systems where farms are integrated with slaughters, many indicators can be easily assessed under slaughter conditions (Grandin, 2017). In particular, severe hoof injuries and organ condemnations (Losada-Espinosa et al., 2021), indicate risks associated with cull rates and longevity in farms. Detecting infectious and non-infectious pathology (signs of previous infectious diseases, fatty liver disease, acidosis, etc.) can characterize the epizootic status on the farm and give valuable information about the balance of animal feeding. Bruises and "fresh" injuries can indicate welfare problems that occur in road transport and the stunning of livestock, as well as vocalization, could be an

effective indicator of poor welfare at the slaughter plant. They can also serve as potential markers for the worse quality of the final products (Hernandez et al., 2021). A lot of key welfare indicators can be assessed during slaughter using surveillance systems and artificial intelligence software. These systems are already developed for assessing the body condition of cattle (Albornoz et al., 2021).

Excessive reliance on records is a common mistake in developing an effective welfare auditing program because they are frequently not valid. Approaches to welfare assessment may not always be for all purposes and may depend on the type of the company, that requires on-site audit (van Eerdenburg et al., 2021).

The causes and consequences of AW impairment. Compromised welfare can manifest in several ways, depending on the severity of the stressor and its duration of action. For example, long-term impairment of animal welfare can have profound effects on the animal, such as sub-fertility, reduced life expectancy, impaired growth, body damage, disease, immunosuppression, and behavior anomalies. Therefore, it would be useful to have an early indicator of an incipient welfare problem so that countermeasures could be taken in time to prevent such long-term effects on the animals (Cojkic and Morrell, 2023).

Stress is the biological response elicited when an organism perceives a threat to its homeostasis, particularly when an animal perceives this situation as unpredictable and uncontrollable. The stress is manifested with two primary components the hypothalamo-pituitary-adrenal (HPA) axis and the sympathetic-adreno-medullary (SAM) system. Therefore, the response depends on the mediator released in the process of stress: glucocorticoids in the bloodstream and changes in behavior. Regarding the duration of the stress, it can be acute (short; lasting minutes or various days) or chronic (lasting weeks, months, or even years) (Martínez-Miró et al., 2016).

Animals subject to chronic stress generally suffer from metabolic disturbances associated with reduced feed intake, a negative energy balance, an increased metabolic rate, and, subsequently, loss of body weight or reduced growth (Cojkic and Morrell, 2023).

Problems with animal handling may be associated with deficiencies in the environment such as slick floors or design mistakes in the handling facility. Two important measurables that can be scored numerically during animal handling are slipping and falling. Animals may become injured or stressed if they fall. Ease of animal movement through a handling facility on a farm or at a slaughter plant can be assessed by counting the number of animals, turning back, stopping, bulking, or refusing to move forward (Grandin, 2022).

The flooring can impact the health of animals, particularly the risk of developing orthopedic issues and lameness. Facilities with slatted flooring, as well as limited space or hard and slippery flooring, can have a negative impact on the health and behavior of animals, therefore affecting their welfare. We should assess access to clean drinking water and appropriate feed that corresponds to the species and can support their health for compliance with AW requirements (Valente and Stilwell, 2022).

The absence of pain is one of the main principles of good animal welfare, as well as the absence of illness. There are two groups of markers of farm animal welfare that can be measured and that are health-related. The first group comprises physical indicators including cut injury, body damage, abscess formation, swelling of the joints, and loss of hair or wool. The other group consists of physiological indicators, which include cortisol level, reduced feed intake, immunosuppression, adrenal activity, and altered physiological responses, e.g. depressed reproductive parameters (Cojkic and Morrell, 2023).

Good health is a necessary requirement for ensuring animal welfare, but it is not sufficient. A healthy animal can still exhibit stereotypic (not natural) behavior. It is necessary to collect data on the mortality and morbidity of all animals on every farm. Lameness (difficulties in movement) is connected with health, as it can be associated with either disease or poor housing factors (Fulwider et al., 2007)

Any condition that causes pain, such as broken bones and bruises during handling and transportation, painful procedures such as dehorning are included in the Health Domain, mentioned in the "Fifth Domain". Providing analgesics for pain relief reduced indicators of stress such as high cortisol levels in the blood. Poor stunning or poor euthanasia causes pain. There are many guidelines for assessing the effectiveness of stunning at slaughter. Monitoring of compliance with housing requirements and the use of analgesics after surgery cannot be assessed at a slaughter plant. Most of the currently available scoring tools assess conditions that would cause pain or discomfort (Grandin, 2022).

Stress negatively affects dairy cows' production, and increases the sensitivity of animals to their housing conditions. The primary changes associated with stress manifest in increased secretion of glucocorticoids and increased activity of the sympathetic nervous system, leading to biochemical and physiological alterations. (Fontoura et al., 2022). For instance, in dairy cows exposed to social (i.e.

housing conditions, overstocking, regrouping, feed delivery), physiological (i.e. initiation of lactation and parturition), or physical (ie heat or cold stress) stressors, responses involve alterations in energy balance and nutrient partitioning (Razzaghi et al., 2023).

Lameness is a major health and welfare problem, it includes a reduction in the time spent feeding, associations with low body condition scores, substantial negative effects on reproductive parameters and fertility performance, and increased culling. Lameness has a multifactorial and complex aetiology, resulting from interactions between the farm environment, management, nutrition, and animal characteristics. A potentially important factor influencing lameness is whether or not cows can access pasture within a production system (Arnott et al., 2017).

Although extensive production systems are generally regarded as more natural and welfare-friendly, they may not provide livestock with enough shelter from inclement weather, food or water (extreme climate events), or protection from predators (Gallo et al., 2022).

Satisfying nutritional needs through grazing, utilizing local breeds, and reducing stocking can contribute to energy resource conservation and improve environmental sustainability. However, the exclusively green feed may not meet the metabolic needs of ruminants. Pasture-based management typically involves a reduction, rather than refusal from concentrates, because it can be associated with the risk of reduced animal productivity and welfare. More than that, if pastures are not managed properly, animals may be at risk of injuries or nutritional deficiencies.

Dairy calves' welfare is rapidly gaining long-deserved attention from science and dairy farmers' communities. However, the elevated morbidity and mortality rates referred to in the literature reflect that there are still major problems in calves' husbandry despite the advances already made in recent years. The development of technologies may assist the traditional time-consuming welfare evaluations and improve calves' health and welfare on dairy farms (Silva et al., 2023)

Enriching the living environment and improving welfare conditions. Concern about animal welfare is nothing new. producers have always been concerned about the condition of animals in their care and have tried to ensure that they are healthy and well nourished. In this tradition of animal care, good welfare is seen largely as the absence of illness or injury (von Keyserlingk et al., 2009).

For instance, animals' relationship with humans is defined as their perception of humans based on their previous interactions. In addition to genetics, a good human-animal relationship is the result of appropriate behavior by stockpeople and infrequent unpleasant interactions between humans and animals. The presence of positive experiences and the absence of negative experiences allow cows to develop trust and confidence in humans. A positive relationship between dairy cows and humans has been linked to increased cow productivity and safety in the farm working environment (Barry et al., 2023).

Lately, with more research on animal emotional experiences, there has been a shift in the focus of animal welfare: from a mere drop of suffering, which allows the avoidance of negative feelings, to providing animals with positive experiences. There is a demand for the development and implementation of positive welfare possibilities for farm animals to ensure that they have an acceptable quality of life. This is primarily connected with ongoing public concern about the livestock quality of life under industrial practices, including dairy cows. Assessing the affective state of animals is an ongoing complex problem, as there is no "gold standard" for its evaluation. Thus, to assess the success of interventions aimed at providing possibilities for positive welfare, the assessment of affective states is essential (Grandin, 2022).

Diversification of the environment through environmental enrichment strategies is one suggested avenue for providing animals with opportunities for positive experiences, which is designed to facilitate the animals' need for exploration, free movement, or a broader range of behavioral expressions. Enrichment strategies are often implemented to prevent affective states in animals, which have gained attention following research on the relationship between animals' living environment and their emotional experiences. Indications of more positive affective states were found following either a period of environmental enrichment or in animals housed in more stimulus diverse compared to basic housing conditions in different species including, dairy cows, and dairy calves (Russell et al., 2023).

The provision of enriched environmental conditions has been widely implemented in other animal production industries, based on evidenced welfare benefits. However, the implementation of enrichment on dairy farms is limited. In addition to this, the relationship between enrichment and dairy cows' affective states is an under-researched area. One specific welfare benefit of enrichment strategies which has been observed in a number of species, is increased affective well-being.

Innovative measures for improving the living environment may include automated brushes for the care of dairy cows. The study demonstrates that cows are highly motivated to use brushes. The automated grooming brush for cows is an example of how animals can experience positive emotions (von Keyserlingk et al., 2009).

As A. Crump (Crump et al., 2019) stated, if animals had access to additional environmental resources, they were calmer, satisfied, and more positively engaged than under standard living conditions. For example, animals given overnight access to pasture have a longer duration of lying compared to cows kept indoors constantly. Additionally, cows were less bored and fearful when provided with additional behavioral possibilities through living environment enrichment. (Russell et al., 2023).

Regarding health, cows on pasture-based systems had lower levels of lameness, hoof pathologies, hock lesions, mastitis, uterine disease, and mortality compared with cows on continuously housed systems, and also benefits for behavior, in terms of improved lying/resting times and lower levels of aggression. Potential areas for concern within pasture-based systems included physiological indicators of more severe negative energy balance and unpredictable weather conditions (Arnott et al., 2017).

Recently, the concept of "positive welfare" has gained popularity among domestic colleagues (Petkun et al., 2023). The concept of "positive welfare" appeared in literature in response to reducing the focus on negative aspects and enhancing positive aspects of AW and good life. The way one conceptualizes and studies positive welfare is inherently linked to one's ethical views. There are multiple co-existing concepts and definitions of positive welfare that are influenced by ethical views from different interest groups including the scientific community (Rault et al., 2020).

The concept of positive welfare acknowledges emotions and anthropomorphic terms (such as happiness and comfort) that show progress in the animal welfare research domain. Nevertheless, collective dialogue and the commonly created concept of "positive welfare" allow for dynamic research and the translation of this into innovations led by farmers, which is necessary for existing science to make a significant contribution to society (Muhammad et al., 2022).

Animal welfare economic component. If animals are productive and generate a proper income for their owners, they must be in good condition and good health. The farmers usually give priority to preventing diseases and injuries, as well as to providing access to food, water, shelter, and other essential needs, showing that their care is on health and living conditions. First and foremost, the priority is economic benefit and efficiency, especially regarding addressing zoonoses, which affect both animal and human health.

Consumers increasingly demand high animal welfare standards. More than that, the European Commission and other organizations, like the World Organisation for Animal Health (WOAH, OIE), have recognized animal welfare as an important attribute of sustainable agricultural development. To answer these requirements, farmers and all those involved in the production of animal-derived food must establish credible animal welfare certification schemes that will reflect and endorse the best practices (Valente and Stilwell, 2022).

In particular, in products labeled with a high mark of welfare, the bedding type and requirements for improvement are clearly indicated. For instance, by the cleanliness of animals, you can quickly determine whether appropriate bedding is used on the farm and make due management decisions. Many high-welfare programs provide pasture access for livestock or sheep (Crump et al., 2021).

Market segmentation leads to many retailers working with producers and setting animal welfare standards in their contracts, to conduct regular audits or inspections of the suppliers' facilities and their practices. However, most of these standards and measures are believed to be primarily focused on ensuring adequate welfare by minimizing negative factors rather than promoting positive factors to achieve a "good" life (Muhammad et al., 2022).

The fact that people understand the value of animals can differently influence their welfare. It's not just that improving animal welfare leads to increased profit; recognition of the intrinsic value of animals, which places a moral responsibility on people to ensure animals don't suffer, can also improve animal welfare (Rault et al., 2022).

Additional information significantly increases the intention to buy products with an improved level of animal welfare. Public concern about the methods of farm animal rearing does not always correspond to traditional demand and supply models. The role of consumers can be limited to choosing between products and services and does not necessarily involve emotional engagement and influence on production systems through purchasing behavior (Muhammad et al., 2022).

At the same time, it is evident that economic motivation for improving animal welfare in low-income countries can lead to positive changes for animals. For instance, in South Africa, animals for international trade have better welfare conditions in export abattoirs compared to animals in local abattoirs or with animals killed during traditional slaughter on homesteads (Rault et al., 2022).

The modern consumer is increasingly interested in dairy products obtained from pasture-based cows, which have better nutrition because of improved animal welfare and life environment. In particular, in Denmark, Norway, and Switzerland began to develop new healthy dairy products (cheese and butter products with new flavors and textures) by managing the animal feeding system. Currently, this is a growing market that is attracting interest worldwide (Holmquist, 2021).

Society's attitude and methods of influence. Ethical (moral) considerations indicate that people are aware of the responsibility for animals and of their duty to take care, particularly to prevent animals' suffering. (Garner, 2011). Fear, pain, or stress in animals can be defined as experiences of negative or bad welfare, and efforts should be made to minimize such experiences in animals (Johansson-Stenman, 2018).

Farmers prefer a biological approach to animal welfare, which highlights the health, fertility, and productivity of animals. Both animal scientists and urban citizens consider animals to be natural living beings, emphasizing the need for good mental welfare and the necessity of a living environment where they can behave naturally. For instance, surveys in the US and the UK showed that consumers consider welfare for farm animals mainly in better living conditions (Duijvesteijn et al., 2014).

There are a lot of studies that deal with the structure and preferences of stakeholders regarding animal welfare. The gender of an individual and the broader society are believed to influence different understandings of animal welfare issues and their values, females, for example, and the general public tend to express greater concern for animal welfare and inappropriate farming practices compared to other stakeholders (Duijvesteijn et al., 2014).

Although most consumers appear satisfied with the quality and safety of food products, some of them remain skeptical about management methods and current standards used in food production. Consumers are interested in knowing how producers care for and ensure animal welfare during the production process. At the same time, there is no consensus on consumers' willingness to pay more for better welfare, therefore, it is crucial to consider non-market strategies such as collective arguments or dialogues to improve the farm animals' welfare. (Lusk, 2011).

According to the Food Ethics Council, society can have a positive influence on food production, distribution, and consumption. Citizens express their thoughts on animal welfare and apply to the government, officials, and other stakeholders to improve and raise animal welfare standards (Sørensen and Fraser, 2010).

Animal welfare organizations' campaigns can use the media to illustrate specific aspects of farm animal management to build opposition to a particular farming practice, or system, lobbying and putting pressure on retailers to influence animal husbandry and animal welfare (Stafford, 2014).

Consumers may consider improvements in animal welfare as a collective responsibility of stakeholders, that combines motivated accusations on one hand and moral responsibility on the other. Therefore, consumers/citizens can use "imperative statements" (e.g., "we demand meat processed responsibly") or "language of blame" (e.g., narratives such as "intensive farming is harmful to animal welfare" or "trimming is horrible for animals"). With these arguments, consumers/citizens can make farmers accountable for what they consider right or wrong in animal husbandry.

There are animal rights groups that express concern about specific methods and farming systems, giving detailed descriptions of the consequences for animal welfare. They understand animals as sentient beings and will challenge any practice that subjects farm animals to negative experiences (Muhammad et al., 2022).

To achieve their goals, animal rights organizations voice their concern using words related to the feelings of animals, like "pleasure", "pain", "suffering", and "happiness". Scientists and veterinarians use words like "comfort" and "satisfaction," which form the basis of scientific assessments of positive welfare. Therefore, the value of animal care and husbandry channels the discourses and narratives about what good animal welfare and a good life are.

It is clear, that understanding and importance of animal welfare is different for each individual, region, and culture. Animal welfare is a complex and multifaceted topic that includes scientific, ethical, economic, cultural, social, religious, and political dimensions, and it is closely connected to the environment and human health (Rault et al., 2022).

The future of the dairy industry may depend on consumers' confidence that dairy cows are reared properly. A negative attitude towards livestock systems that fail to provide appropriate standards of animal welfare can make consumers ignore buying products from certain producers.

Conclusion

The results of the conducted review of scientific literature indicate a constantly increasing concern of scientists and society regarding animal welfare issues and standards, particularly in livestock husbandry. The "animal welfare" concept is getting more anthropometric, and going beyond the "Five Freedoms" aspects. Stakeholders' responsibility for high animal welfare standards in the production of animal products is increasing under the influence of scientific, professional, and socio-economic factors.

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ДОБРОБУТ ВЕЛИКОЇ РОГАТОЇ ХУДОБИ З ПОЗИЦІЇ ВЕТЕРИНАРНОГО, ЕКОНОМІЧНОГО ТА СОЦІАЛЬНОГО АСПЕКТІВ: ЛІТЕРАТУРНИЙ ОГЛЯД

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Резюме У статті наведено аналіз зарубіжних літературних джерел щодо добробуту великої рогатої худоби. Метою літературного огляду було розкрити ветеринарні, економічні та соціальні аспекти добробуту в скотарстві, сучасний стан проблеми та світові тенденції щодо напрямів її вирішення, висвітлених у англomовних наукових літературних джерелах, використовуючи найбільші світові реферативні бази даних наукової літератури (*Web of Science, ScienceDirect, Scopus*). Виявлено зміщення акцентів у наукових і практичних підходах щодо сприйняття і оцінки стану добробуту продуктивних тварин, які значно виходять за межі лише підтримання здоров'я, попередження стресу чи можливості реалізації тваринами природної поведінки. Добробут тварин набуває все більше антропометричного змісту, включаючи такі поняття як «задоволення» або «щастя». Поняття «позитивний добробут» стає своєрідним трендом в наукових дослідженнях добробуту тварин. Встановлені позитивні тенденції щодо модифікації виробничих систем у напрямі диверсифікації умов існування тварин, вони стають більш дружніми по відношенню до добробуту тварин. Виявлено зростаючу стурбованість споживачів тваринницької продукції умовами утримання та добробутом тварин. Все більше це поняття набуває комерційного відтінку, що заохочує виробників тваринницької продукції дотримуватися етичних стандартів виробництва. Проте наративи та гучні заяви суспільства щодо необхідності дотримання високих стандартів добробуту тварин поки що не мають достатніх економічних важелів, оскільки лише незначна частина суспільства готова платити дорожче за кращий добробут, або ж свідомо відмовитися від тваринницької продукції, отриманої від тварин у виробничих системах з незадовільним добробутом. Цей літературний огляд покликаний привернути увагу науковців, практиків та суспільства до проблем, пов'язаних із гуманним ставленням до продуктивних тварин, знайти для кожного з них своє місце у створенні кращих умов для тих, хто підтримує задоволення харчових потреб людства своїм існуванням або ж ціною власного життя.

Ключові слова: благополуччя тварин, велика рогата худоба, здоров'я, утримання, збагачення середовища, захист тварин.

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