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Animal Welfare in Sheep: A Review of Evaluation Methods and Applications

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ARTICLE HISTORY

ABSTRACT

Animal welfare has emerged as a fundamental component of sustainable livestock production, reflecting both ethical considerations and productivity outcomes. This review focuses on the assessment and practical implementation of welfare indicators in sheep. It covers behavioral, physiological, and health-related measures, including body condition scoring, fleece cleanliness, lameness, respiratory conditions, and skin lesions. Furthermore, environmental and management-related factors such as housing conditions, feeding systems, and human-animal interactions are discussed in the context of their impact on welfare. Emphasis is placed on the integration of animal-based and resource-based indicators to ensure a comprehensive evaluation framework. The paper also highlights the importance of standardized protocols and training in conducting reliable welfare assessments, while acknowledging the challenges in large-scale field applications. In conclusion, understanding and improving sheep welfare requires a multidimensional approach that bridges scientific knowledge, practical tools, and ethical responsibility.

1. INTRODUCTION

Animal welfare is a definition that reflects the animal's quality of life and includes the animal's mental and physical health, happiness, and well-being (Lawrence et al., 2019). The first legal movement regarding the protection of animals and the right to life was realized by the Animal Protection Law in England in 1822. The first legal basis for welfare is the Treaty of Rome issued by the European Union (EU) in 1957. The Amsterdam Treaty of May 1999 is crucial in recognizing animals as sentient beings for the first time and includes a protocol containing legal provisions on their welfare (Martinez and von Nolting, 2023). The issue of animal welfare has become a subject of debate in many parts of the world since the 1960s. With the contribution of these discussions, the Universal Declaration of Animal Rights, the most comprehensive international text on animal rights and welfare, was declared in 1978 (Antalyalı, 2009; Fidan, 2012). Today, the European Union institutions and member states have taken valuable steps in animal welfare and have introduced many legal regulations.

2. ANIMAL WELFARE AND ITS RELATIONSHIP WITH WELL-BEING AND ANIMAL HEALTH

Animal welfare is interconnected with the concepts of 'well-being and animal health,' and evaluating these two conditions also means evaluating animal welfare (Dawkins, 2012). In an animal husbandry enterprise, it should be determined whether animal comfort is evaluated correctly based on scientific principles. If the animal is exposed to a negative situation and is mentally affected by it, it indicates that animal welfare is applied at a low level (Yener et al., 2013).

Many different European regulations on animal welfare have been published. Although no specific rules have been applied to ovine animals, Commission Decision 2006/778/EC (European Commission 2006) states that examining animals kept for farming purposes should cover general animal welfare requirements and requirements in specific laws (Cassidy, 2009). The role of the scientific community in developing effective welfare assessment programs should be enhanced through the involvement of relevant stakeholders: producer associations, animal breeding organizations, retailer and consumer organizations, policymakers, and veterinarians. In particular, veterinarians need to assess remedial options for sick animals or animals at risk of becoming sick in small ruminant emergencies, which will improve their welfare status (Caroprese et al., 2016).

2.1. The Five Fundamental Rights of Animals as Set Out by the European Union Council for the Welfare of Farm Animals

1.   Animals should not be starved or dehydrated; constant access to fresh water and food to keep them healthy and fit.

2.   Animals should be made comfortable; they should not be disturbed by providing appropriate environmental conditions, including shelter and resting places.

3.   Animals should be kept away from pain, injury, and diseases; preventive measures should be taken against diseases, and they should be diagnosed and treated quickly.

4.   Animals should be able to show their natural behaviour; space and comfortable housing for animals of the same species should be provided, and animals should be able to show their natural behaviour.

5.   Animals should be kept free from fear and stress; conditions and treatment to prevent pain and suffering (Askaroglu, 2006; Scott et al., 2006).

3. ANIMAL WELFARE IN SHEEP

Sheep welfare is the development of animals living in harmony with each other, taking into account their physiological needs and behaviors and the fulfillment of their care and feeding under appropriate conditions. Welfare is an indicator of the animal's mental and physical quality of life (Sejian et al., 2021).

Research has shown that environmental factors (care-feeding, management, etc.) are more effective than genetic factors in determining an animal's efficiency level (Ramadan, 2012). To maintain their health and vital activities, sheep should be fed with appropriate and sufficient amounts of feed according to age, weight, behavior, physiological needs, and targeted yield. Animals should be provided with the opportunity to access sufficient feed and water in terms of quality and quantity at appropriate intervals to meet their needs. Feeding and watering equipment should be designed and positioned so that feed and water are not contaminated and animals do not harm each other. By keeping the floor dry, animals should be able to lie down, rest, stand up, and meet their other needs (Caroprese, 2008). The temperature and humidity of the shelter should be within acceptable limits. In cases where natural lighting is insufficient in animals housed indoors, eight hours of artificial lighting per day should compensate for this deficiency

(Prescott et al., 2003). Cleaning the inside of shelters frequently is obligatory to prevent negative effects caused by bad appearance and odour. The tools and equipment used in shelters should be cleaned and disinfected at certain intervals and frequencies to prevent the reproduction and transmission of disease-causing agents (Yoksa, 2024).

4. MEASURING ANIMAL WELFARE IN SHEEP

Providing the natural living conditions of animals in the most appropriate way in breeding conditions does not mean that welfare is implemented very well. If their environment does not meet the wishes of the animals, they will react to this situation. How they react, and the severity of the reaction varies according to the animal species. In this respect, animal welfare is difficult to measure. It is easier to be determined by specialized people according to the animal species (Browning, 2022). Measuring animal welfare involves evaluating various factors, including physiological indicators, blood tests, yield parameters, and subjective assessments (Serra et al., 2018).

4.1. Physiological Indicators

Life in itself is an indicator of welfare. The most basic welfare criterion is the continuation of life (Mellor and Stafford, 2004). Other criteria should be evaluated after that. Therefore, mortality rates should be examined first before determining farm animals' welfare. Some diseases can develop very rapidly and cause death. At the same time, sudden deaths due to stress can also be seen. Another physiological observation is the reproductive performance of animals. Even if the five most basic welfare criteria are

Table 1. Welfare Quality Principles and Associated Assessment Measures

Welfare principle	Welfare criteria	Example of assessment measure
Good feeding	Absence of prolonged hunger	Body condition score (BCS)
		Provision of supplementary feed
	Absence of prolonged thirst	Quality and reliability of water provision
Good housing	Comfort around resting	Cleanliness, dry lying area at all times
	Thermal comfort	Protection from extreme weather
		Panting
	Ease of movement	Adequate space (housed sheep), rough terrain
Good health	Absence of injuries	Injuries
		Lameness
	Absence of disease	Mastitis, sheep scab, footrot, lamb losses
	Absence of pain induced by management procedures	Castration, tail docking
Appropriate behavior	Expression of social behaviours	Social behaviours are uncommon in sheep except at breeding/lambing time.
		Normal maternal behaviour
	Expression of other behaviours	Grazing behaviour.
		Predator avoidance
	Good human–animal relationships	Avoidance distance.
		Behaviour when handled.
		Knowledge of stockpersons
	Absence of general fear	Reaction facing a novel situation

met, animals not feeling comfortable in their environment may have reproductive problems. Diseases can be detected by observing or examining the animals. Especially lameness or foot-leg problems, which are frequently seen in cattle and sheep, can be determined this way (Dwyer and Bornett, 2004).

4.2. Blood Tests

Stress causes many problems in animals. When stress is experienced, the body responds behaviorally and physiologically to this factor. If these two responses consume too much of the body's biological resources, the pre-pathological stage is first seen in the body, and several pathological problems occur. This situation will cause damage to animal welfare (Broom and Kirkden, 2004).). However, if the cause of stress is known or suspected, blood is taken from the animals. Stress hormone levels in the blood such as adrenal cortical activity (plasma cortisol levels), anterior pituitary activity (prolactin and β-endorphin), changes in fluid balance (hematocrit), and muscle degeneration indicators (creatine kinase levels) are analyzed to assess animal welfare. This approach enables effective traceability of welfare status (Rushen et al., 2008; Sommavilla et al., 2017).

Table 2. ANI 35L Welfare Assessment Framework

Category (Total Range)	Subcategories (Score Ranges)
I. Locomotion/Social (−0.5/20.5)	• Indoor space (0.0-3.5) • Herd structure (0.0-2.0) • Replacements (−0.5-3.0) • Manger space (0.0-3.0) • Water (0.0-2.5) • Outdoor space (0.0-3.0) • Pasture months (0.0-3.5)
II. Flooring (−1.0/12.0)	• Comfort (−0.5-2.5) • Cleanliness (0.0-2.5) • Slipperiness-sleep (0.0-2.5) • Passage ease (0.0-1.0) • Slipperiness-transition (0.0-2.0) • Outdoor floor (−0.5-1.5)
III. Environment (0.0/10.0)	• Thermo-pasture (0.0-1.5) • Thermo-barn (0.0-1.5) • Outdoor paddock (0.0-1.5) • Grass quality (0.0-1.5) • Steepness (0.0-1.5) • Pasture months (0.0-2.5)
IV. Management (−1.0/7.0)	• Feed area clean (0.0-1.5) • Water area clean (0.0-1.0) • Rest area clean (0.0-1.5) • Equipment (0.0-1.0) • Animal checks (0.0-1.0) • Hospital pen (−1.0-1.0)
V. Animal (−8.0/22.0)	• Coat condition (−1.0-3.0) • Cleanliness (−1.0-3.0) • Hooves (−1.0-3.0) • Lameness (−1.0-3.0) • Lesions (−1.0-3.0) • Body condition (−1.0-3.0) • Mutilations (−1.0-1.0) • Culling age (−1.0-1.0)

4.3. Animal Welfare Through Yield Parameters

The easiest method to determine welfare is to follow animal productivity. Animals react to negative situations by decreasing their productivity. Instability, such as decreased or increased feed consumption, causes yield losses. Enterprises that do not care about animal welfare will realize how important animal welfare is when they experience yield decreases (Frondelius et al., 2020).

4.4. Subjective Assessments

Determination based on the principle of determining the physical condition of animals by scoring method. By repeating the scoring method, one can determine how current conditions are affected and how changes over time occur. Feather scoring and determining foot and leg wounds are the most determined

evaluation methods. In addition, several scoring methods can be used to evaluate the physical conditions of animal shelters (Lamon et al., 2021).

In this context, the Welfare Quality assessment system provides a structured framework for evaluating animal welfare on farms through a bottom-up scoring method. It combines various animal-based indicators into welfare criteria, which are then grouped into four main principles: good feeding, good housing, good health, and appropriate behavior. Feather condition, lameness, and cleanliness scoring are common physical measures used in the Welfare Quality protocol, especially in poultry and ruminants (Blokhuis et al., 2013).

Similarly, the Animal Needs Index (ANI) is another welfare assessment tool that integrates multiple criteria such as space allowance, flooring quality, climate, health management, and animal-human interaction. ANI allows for a semi-quantitative evaluation of housing systems based on how well they meet the behavioral and physiological needs of animals (Seo et al., 2007).

Both systems emphasize the importance of repeated scoring over time to monitor changes and ensure that any interventions positively influence animal welfare.

5. WELFARE QUALITY IN SHEEP

Animal welfare is an increasingly important issue for European consumers and citizens. It is an integral part of the Community's 'farm to fork' policies and one of the strategic priorities. Animal welfare is a well-established scientific discipline, and because it is multidimensional and, therefore, cannot be measured directly, several parameters have been identified and utilized instead (Brito et al., 2020). Researchers agree

that various measures should be applied to assess animal welfare. Since 2001, different welfare monitoring systems have been developed in some European countries. Most of these systems are primarily based on environmental observations, measurements assumed to influence animal welfare (Molitorisová, and Burke, 2023). However, the links between specific measurements and the welfare status of animals are not always clearly understood. Therefore, the European Commission developed the Welfare Quality Project to develop animal-based measures to assess animal welfare at the farm level, based on measuring the actual welfare status of animals in terms of their behavior, health, and physiology (Blokhuis, 2008).

This project aims to meet societal concerns and market demands, develop reliable on-farm monitoring systems, product information systems, and practical species-specific strategies to improve animal welfare. Four animal principles and twelve criteria were identified (Canali and Keeling, 2009).

5.1. Data Collection, Evaluation, and Welfare Scoring

After all measurements have been performed, a bottom-up approach is used to evaluate animal welfare: first, the collected data (the values obtained for the various measures on the farm) are combined to calculate the criterion scores; these criterion scores are then aggregated to calculate the principal scores, and finally, the farm is assigned to a welfare category based on its principal scores (Keeling et al., 2013).

Table 3. ANI 35L Welfare Categories

Total ANI Score	Welfare Category
< 11	Not suitable with respect to welfare
11 – 16	Scarcely suitable with respect to welfare
16.5 – 21	Little (mediocre) suitable with respect to welfare
21.5 – 24	Fairly suitable with respect to welfare
24.5 – 28	Suitable with respect to welfare
> 28	Very suitable with respect to welfare

5.2. Criterion Scores Calculation

While not always the case, some criteria may depend on various measures (e.g., a low body condition score could result from either hunger or illness, or both). Except for a few rare cases where the interpretations can be clearly differentiated, to avoid double-counting, the measures are assigned to a single criterion. The data produced by measures related to a particular criterion is interpreted and synthesized to produce a score that reflects the unit's compliance with the criterion. This compliance is expressed on a scale from 0 to 100 (Botreau et al., 2009).

5.3. Welfare Category Assignment

Four welfare categories have been established to meet stakeholders' requirements:

•Excellent: Animal welfare is at the highest level.

•Enhanced: Animal welfare is good.

•Acceptable: Welfare is above or meets minimum requirements.

•Not Classified: Animal welfare is poor and falls below an acceptable threshold.

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The threshold for excellence is set at 80, for enhanced welfare at 55, and for acceptable welfare at 20. The categories do not rely on average scores; to be classified as "Excellent," a farm must score above 80 in all principles, or over 55 in two principles. Farms that score above 20 in all principles and above 55 in at least two are classified as "Enhanced." "Acceptable" farms must score above 10 in all principles and above 20 in three principles. Farms failing to meet these minimum standards are classified as "Not Classified" (Botreau et al., 2007).

6. ANIMAL NEEDS INDEX (ANI-35L MODEL) IN SHEEP

The animal needs index (ANI) is one of the most utilized methods for measuring animal welfare (Ofner et al., 2003). It analyses the extent to which the requirements needed for good animal welfare on farms are met under current conditions of care, feeding, and housing. This index was first applied in Austria and Germany. The animal needs index has five components to assess animal welfare (Bartussek, 2001).

The first four categories focus on locomotion/social interaction, flooring, environment, and management system, while the fifth category involves direct evaluations of the animals themselves. It has been reported that the indicators used in this system for on-farm animal welfare assessments are valid (meaning they are relevant to animal welfare), reliable (consistent in repeated measurements), and feasible (considering time and financial constraints) (Sakar et al., 2022). When this method is applied to sheep farms, factors such as the shelter's features, space per animal, litter cleaning, and ventilation systems play a significant role in the evaluation. In the ANI welfare assessment method were scored a total of 33 criteria in 5 different categories: I) Locomotion/social interaction, II) Flooring, III) Environment, IV) Management, and V) Animal-based parameters. The final score according to the ANI method varies between −10.5 and 71.5 (Napolitano et al., 2009). After the ANI assessment process is completed, businesses are classified into six different welfare parameters based on their total ANI scores. The welfare categories according to the total scores are provided in Table 3 (Bartussek, 1999).

7. CONCLUSION

In order to feed the rapidly increasing human population, it is necessary to fulfill the production increase targets with sustainable breeding. A significant portion of meat, milk, fleece, etc., which are the basic needs of humans, are provided by sheep. Breeding of sheep is important because sheep are more numerous and easier to care for and feed than cattle. Compliance with welfare rules is a must for healthy and highly productive sheep breeding. If welfare is not provided on the farms, health problems such as lameness, mastitis, infectious diseases, and behavioral disorders may occur. This leads to a severe decrease in fertility, meat yield, milk yield, and fleece yield in sheep. Welfare in sheep breeding means that the sheep are healthy and happy, and the products obtained from such animals are of high quality in terms of both quantity and quality. Therefore, this situation contributes to the health of people fed with healthy and quality food.

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