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Identification and Validation of Operational Welfare Indicators Appropriate for Small-Scale Goat Farming in Chile †

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Abstract: Goat production in Chile is carried by small-scale farmers obtaining milk and cheese as the main products. The welfare of goats under these types of production systems is currently unknown and no appropriate validated operational welfare indicators are currently available. We took the tasks of identifying operational welfare indicators and validating them with all stakeholders. A total of 37 operational welfare indicators were obtained. The use of these validated indicators and the welfare score is appropriate to Chilean goat production systems and may successfully increase the sustainability of production and farmers in Chile.

Keywords: behaviour; sustainable; value-added; appropriate; welfare

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1. Introduction

Goat production in Chile is carried out by poor small-scale farmers in semi-arid to arid agricultural conditions [1]. Milk and cheese are the main products obtained using artisanal, cultural, and traditionally-preserved methods where women and children are usually in charge of production [2]. The products are directly consumed by the family or sold to passers-by at good prices [3]. These production systems are similar in goat production around the world, especially in developing countries in the Americas and Africa.

Goats are adapted to higher temperatures and may seem suitable and sustainable animal for production under current global warming status in some areas of the world [4–6]. The interest in the welfare of production animals including goats has been increasing in recent years, both for milk and meat goat production systems [7,8]. Numerous studies have been carried out identifying potential welfare indicators for goats. Some on-farm goat welfare assessments based on qualitative and quantitative variables have been developed for intensive systems in Europe [9,10]. However, goat welfare under extensive systems in semi-arid areas of Chile is currently unknown and no appropriate validated operational welfare indicators are currently available. The incorporation of a welfare assessment system may also increase milk yield and cheese production, and may provide an extra added-value as demonstrated in other countries [8,11]. The aim of this work was to obtain appropriate operational welfare indicators (AOWI) for small goat farmers in Chile.

2. Materials and Methods

We first identified all possible goat welfare indicators described in the scientific literature by searching in databases such as Scopus, Web of Science, Scielo, and Pubmed. The welfare indicators were categorized as either direct or indirect, and a tabulated accordingly.

We then followed the guidelines of the European Food Safety Agency to validate the indicators with the relevant stakeholders [12]. Briefly, hazard analysis and critical control point methodology was used to validate indicators with the relevant stakeholder, which included farmers, staff working with goats, veterinarians, and animal welfare experts. A questionnaire was constructed in which each stakeholder had to evaluate the identified indicator for its perceived impact of animal welfare (magnitude) and its perceived easiness to measure (operational effectiveness) using a Likert scale (0 to 5). Any indicator with 60% of approval was considered to be validated by stakeholders.

A further on-farm real validation using the selected indicators was carried out to ensure their practicability and ease of measurement using a Likert scale from 1 to 5. This was carried out at four different farms in five different times. All indicators that had a score of 60% or more were finally classified as appropriate operational welfare indicator (AOWI).

All national and institutional ethical recommendations and guidelines were followed in order to preserve ethical integrity during the study.

Using the AOWI, we implemented a Goat Welfare Score system ranging from 0% to 100% of welfare, using a linear model where each indicator had a different weight according to the hazard analysis.

3. Results

We identified 48 welfare indicators in the peer-review literature. Only 40 of the initial welfare indicators were validated by goat production stakeholders (farmers, veterinarians, technicians, welfare experts) using the European Food Safety Agency guidelines. After the on-farm validation, 33 operational welfare indicators were obtained (Table 1). A welfare score system was developed including all indicators and validated in normal production conditions.

Table 1. Appropriate operational welfare indicators or goats according to type of indicators.

Appropiate Operational Welfare Indicator	
Direct Indicator	**Indirect Indicator**
Vocalization	Presence of rest area
Cleaning of the rear train and belly	Man-animal/operator relationship
Condition of nose	Water Quality
Alert attitude	Available accommodation space
Limping	Eyelet quality
Hydration	Grazing population density
Herd separation	Shelter (shade and rain)
Gaming behavior	Amount of food
Condition of breast rooms	Food quality
Time at rest	Availability of water
Condition of ear secretions	
Expression of Social Behavior	
Mastitis	
Thermal stress	
Bodily Injury	
Skin condition	
Hoof condition	
Injuries to members	
Body condition	
Breathing	
Travel activity	
Weight of the animal	
Kneeling for food	

4. Discussion

Our study showed that not all welfare indicators are well suited for different production system worldwide. Our study eliminated 32% of indicators that were identified in the scientific literature, indicating that some of them are either not practical in normal production conditions or that stakeholders do no not know them. This is important considering the local, economic, and educational level of farmers in every country or territory. Furthermore, a deeper analysis shows that even after validation by stakeholders, some indicators failed to be practical or operational. These results showed the relevance of incorporating the actual farmers, technical staff, and field veterinarians, into the validations of welfare indicators, rather than keeping the validation at an academic level exclusively. The use of these validated indicators and the welfare score are appropriate to the local Chilean goat production systems and may successfully increase the sustainability of production and farmers in Chile. Further studies should be focused on the temporal measurements of the AOWI and modifications to the mathematical welfare score system developed here.

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