



Baseline Assessment of Dairy Cow Welfare Using Animal and Resource-based Indicators in Camarines Sur, Philippines

Angelo Francis F. Atole^{1*}

¹ Department of Animal Science, Central Bicol State University of Agriculture, San Jose, Pili, Camarines Sur, 4418, Philippines

* Correspondence: angelo francis.atole@cbsua.edu.ph

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Abstract: The increasing interest in dairy cattle production raises animal welfare issues that need to be assessed and addressed on the farm. No prior studies have assessed the welfare status of dairy cows in small-hold dairy systems in Camarines Sur, Philippines; hence, this study. On-farm animal- and resource-based indicators were applied using the Welfare Quality® Assessment Protocol for dairy cattle to assess herd-level welfare, with binary data reported as percentages of farms. The welfare criteria for animal-based indicators were assessed by observing the dairy cows on the farm. Sixteen dairy farms were assessed, with a total dairy cow population of 125 (mean: 7.8, median: 7.5, mode: 8). The welfare criteria for resource-based indicators were assessed by evaluating the farm resources. The majority of the dairy farms visited have well-fed dairy cows (87%), with low injury rates (13-20%) and disease rates (0-13%). Additionally, they were provided with a comfortable (76-93%) and sufficient (67-100%) resting area, thereby avoiding agonistic behavior (0%). Some dairy farmers need education on the benefits of clean and accessible water and facilities (73-100%) to improve dairy cow welfare. The majority of dairy farmers considered the importance of comfort, protection from adverse weather (67-87%), and spatial requirements (67-100%). However, grooming facilities were absent, compromising dairy cow welfare. The animal-based indicators on the farm reflected better dairy cow welfare; however, some dairy farmers should improve the resource-based indicators to provide their cows with better welfare.

Keywords: Animal-based indicators; animal welfare; dairy cows; resource-based indicators

1. Introduction

Bicol (Region 5) is a large region in the Philippines, covering 17,366 km² (5.67% of the country's land area), and includes the Province of Camarines Sur [1, 2]. Camarines Sur is the largest province (5,327 km²), comprising 31% of the Bicol region, and experiences year-round rainfall [2]. This implies that dairy farmers can cultivate forages in Bicol year-round to feed dairy cattle. Furthermore, the vast agricultural land enables a year-round forage supply. The abundance of forages contributes to high milk production at a low cost. However, feeding forages does not always guarantee that a cow will produce more milk. Some dairy farmers are unaware of the natural needs of dairy cows for well-being [3]. For example, dairy cows require daily access to pasture and exposure to sunlight (i.e., freedom to express normal behavior), protection from inclement weather (i.e., freedom from discomfort), and protection against diseases (i.e., freedom from pain, injury, or disease). These situations may be

exacerbated when the frequency and duration of the region's rainy and dry seasons are imbalanced. During the extended rainy season, dairy cows have reduced access to the outdoors, thereby limiting grazing behavior. Moreover, excessive rainfall can cause muddy, slippery floors, which may lead to foot rot and leg injuries. During the extended dry season, the supply of high-quality fresh forage is scarce, leading to low-quality forage and hunger. In extreme heat, dairy cows may experience dehydration and, in severe cases, heat stroke. Inadequate knowledge among dairy farmers about the geographic impacts on dairy farming may put dairy cows' welfare at stake. This implies that improving dairy cows' welfare will enhance performance [4, 5].

Providing better welfare (e.g., good housing, freedom, health, social interaction) for dairy cows may lead to higher milk production. However, many dairy farmers are unaware of the welfare issues dairy cows face, despite high production levels. Examples of welfare issues in dairy cows are lameness [6], mastitis [7], unsanitary practices (e.g., dirty hands at milking), spatial limitation (e.g., crowded barn), improper handling (e.g., hitting), and restriction from expression of natural behaviors [e.g., grazing, social interaction; 8]. Thus, poor welfare can negatively affect milk production and, in turn, the economic aspects of dairy farming [9]. Several studies have reported that dairy cows with better welfare exhibit improved production performance [10]. For example, allowing cows to be nursed before and after milk collection yields more saleable milk than milked cows alone [10]. Furthermore, nursed cows have better udder health than milked cows [11]. Compared with other methods, allowing dairy cows to graze is associated with a lower incidence of lameness [6] and mastitis [7]. Mastitis can likely be reduced by maintaining a clean environment [12]. Dairy cows that are handled humanely on the farm produce more milk and have better affective states. Dairy cows that are accustomed to socializing with conspecifics exhibit more positive affective states and freely express their social behavior. In summary, healthy, comfortable, and well-managed dairy cows have better longevity and, thus, have better welfare. To achieve these, dairy farmers must be aware of their cows' welfare. However, this is sometimes neglected in the countryside as dairy farmers focus more on reducing production costs, thereby impairing the dairy cows' welfare. Therefore, this study was conducted to obtain baseline data and assess the welfare status of dairy cows using animal- and resource-based indicators in small-hold dairy systems in Camarines Sur, Philippines. Since this study is pioneering in Region 5, Philippines, the findings will serve as benchmark data for future studies, policy formulation, and educating dairy farmers on improving the welfare and productivity of their dairy cows.

2. Materials and Methods

2.1 Indicators of Dairy Cow Welfare

Dairy cow welfare was assessed using on-farm welfare indicators developed by [13]. The on-farm welfare indicators used were animal- and resource-based, following the Welfare Quality Protocol® for dairy cattle. For the animal-based indicators, the following criteria were assessed: absence of prolonged hunger, absence of injuries, absence of disease, comfort during rest, and expression of behaviors. For the resource-based indicators, the following criteria were assessed: ease of movement and absence of prolonged thirst. Some criteria measures were added, excluded, or modified based on the dairy farm setting in Camarines Sur. For the animal-based indicators, additional forage and supplements were offered [14]. The following measures for comfort during resting, such as the time needed to lie down, animals colliding with housing equipment during lying down, and animals lying partly or completely outside the lying area, have been excluded from the Welfare Quality Protocol® for dairy cattle. Measures of disease absence, such as milk somatic cell count, mortality, dystocia, and downer cows, were excluded. Lastly, for the expression of social behaviors, avoidance distance and qualitative behavior assessment were excluded from the assessment. For the resource-based indicators, cows tied in stalls were added under the criterion of ease of movement [15]. Additionally, measures for comfort and protection against adverse weather (e.g., provision of housing, roofs, partitions, concrete floors, and bedding materials) were added [16, 17]. The measure for the functioning of water points was modified to include dairy cows having access to water. These changes were tailored to fit the existing resources on the farm and dairy farmers' practices in Camarines Sur [18].

2.2 Farm Selection and Location

The dairy farms visited were randomly selected based on dairy farmers' willingness to participate, the presence of dairy cows on the farm, and the area accessibility. Thus, from 21 dairy farms listed, 16 participated and were assessed from Naga City (4) and municipalities of Goa (2), Ocampo (2), Pili (1), Tigaon (3), and Sagñay (4), Camarines Sur, Philippines (Fig. 1). Dairy farmers raised crosses between Holstein-Friesian and Sahiwal, and between Holstein-Friesian and Jersey for milk production and environmental adaptability. They have several years of experience, regardless of the number of cows they raise; therefore, they have developed skills in dairy farming.

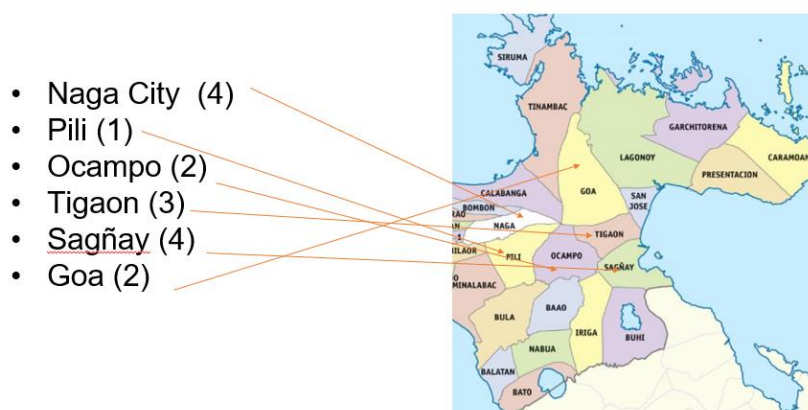


Figure 1. Location of the dairy farms visited in Camarines Sur, Philippines

2.3 Assessment of Animal- and Resource-based Indicators

Dairy farmers were informed of the objectives and purpose of this study, and their consent was obtained before participation. The data were gathered through on-farm visits and assessments from January to February, 2021. Assessment was performed when the dairy cattle were fed to ensure they were active. During the assessment, animals were approached only in the presence and with the consent of the dairy farmers. The animal-based indicators were assessed by observing dairy cows at a distance, undisturbed. Each welfare criterion (e.g., absence of injuries) has measures assessed (e.g., % of farms with lame cows) on the farm. The total population of dairy cows was 125 (average/farm: 7.8, median: 7.5, mode: 8). For dairy farms with fewer dairy cows (e.g., ≤ 10), the total enumeration approach was employed. For dairy farms with more dairy cows (e.g., ≥ 10), 50-75% of the population was assessed. This was employed because sub-sampling for small herds is not statistically appropriate due to the risk of sampling error and reduced representativeness. This was consistent with the recommendations of the Welfare Quality® Assessment Protocol to assess all animals in small herds [13]. The resource-based indicators were assessed through visual inspection of the housing systems and other on-farm resources. Since the data were binary (Yes/No) at the herd level, welfare measures were expressed as percentages [13]. Since the dairy cow population varies and the objective of this study was to benchmark dairy cows' welfare in Camarines Sur, a herd-level assessment was conducted. This was implemented to minimize stress during individual dairy cow assessments and to prevent interruptions by dairy farmers that could result in incomplete data collection [18]. Also, the herd-level assessment was performed to save time and resources in data collection and to minimize disturbance to dairy farmers' routines [19]. Additionally, the welfare status of dairy cows reflects the management practices employed by dairy farmers, thereby providing an assessment of herd-level housing, feeding, and hygiene systems [18]. A single observer assessed the animal- and resource-based indicators in the farms visited. The number of dairy farms visited and assessed daily varies (1-3) depending on inter-farm distance, accessibility, and dairy farmers' availability upon confirmation.

2.4 Institutional Animal Care and Use Committee Application

This study obtained approval from the Institutional Animal Care and Use Committee (IACUC) at the Central Bicol State University and Agriculture, San Jose, Pili, Camarines Sur, Philippines, which was granted exemption due to the non-invasive nature of the procedures, which included (1) visual observation of lesions; and (2) minimal handling of dairy cattle. Additionally, no dairy cattle or humans were harmed during the conduct of this study.

3. Results and Discussion

3.1 Absence of Prolonged Hunger

The measures for the animal-based indicators were presented in Table 1. All dairy farmers provide extra forage and concentrate to their dairy cows in addition to the basal feed. Although not measured (i.e., variable in amounts and frequency), the vast and available local vegetation [e.g., mixed grasses and legumes (*sakati*), corn stover] on the farm provides a sufficient source for cocktail forage supply. For concentrate supplements, complete feeds, and rice bran, supplementation was variable when available in variable amounts. Because dairy cows produce milk, they require increased nutrient intake to meet higher metabolic demands. Supplemental feeding prevents mobilization of body reserves, which can lead to emaciation, reduced lactation period, and delayed reproductive performance. This has resulted in the majority of farms visited having dairy cows with regular body condition. Additional forage provision supplies neutral detergent fiber, enhancing rumen function by cud chewing (20). Consequently, saliva production increases, serving as a rumen pH buffer, reducing the risk of acidosis (20, 21). Increased forage intake by dairy cows enhances cellulolytic microbial diversity and fiber digestion efficiency (21). Thereby, improving nutrient availability and contributing to better body condition in dairy cows as observed in this study. In Tanzania, Uganda, and Ethiopia, smallholder dairy farmers reported improved milk production and farm sustainability when additional feed was provided to dairy cows [14, 22, 23]. Therefore, the dietary requirements of dairy cows must be satisfied to prevent hunger, sustain a healthy rumen environment, and for optimum body conformation and milk yield.

Table 1. Animal-based indicator of dairy cow welfare in Camarines Sur.

Welfare Criteria	Yes	No
Absence of Prolonged Hunger		
% of farms offer extra forage and supplements to dairy cows	100	0
% of farms with cows having a regular body condition	87	13
Absence of Injuries		
% of farms with lame cows	13	87
% of farms with cows having integument alterations	20	80
Absence of Disease		
% of farms with cows coughing	7	93
% of farms with cows having nasal discharge	0	100
% of farms with cows having ocular discharge	0	100
% of farms with cows having vulval discharge	0	100
% of farms with cows having hampered breathing	7	93
% of farms with cows having diarrhea	7	93
% of farms with mastitis prevalence	13	87
Comfort Around Resting		
% of farms with cows having clean udders	73	27
% of farms with cows having clean flanks/upper legs	93	7
% of farms with cows having clean lower legs	73	27
Expression of Social Behavior		
% of farms with dairy cows show agonistic behavior	0	100

3.2 Absence of Injuries

The majority of the dairy farms visited (87%) had no dairy cows with lameness, while 13% had dairy cows that were partially lame. No dairy cows with severe lameness were observed during the visit. The low incidence of lameness can be attributed to the benefits provided by loafing and pasture areas (see Table 2). Additionally, providing bedding materials can reduce leg pressure, making lying and standing easier and more comfortable. Exercise may enhance hoof health and leg integrity, thereby improving dairy cows' welfare [24]. Lameness due to leg pain and injury causes discomfort in many dairy cows and is a major animal welfare concern. When dairy cows are lamed, the expression of animal behavior, such as lying down, feeding, cud chewing, reproduction, and interaction with conspecifics, is interfered with [25]. Discomfort can also negatively affect rumination and estrus, thereby lowering social and reproductive behaviors in dairy cows [26]. In Thailand, a researcher observed that lame dairy cows have poor reproductive performance (e.g., ovarian function), reduced time at feeding and feed intake, and reduced milk synthesis [26-28]. Several studies reported that lameness can reduce milk yield (approx. 0.5 -1.5 kg/day), consequently impacting the economics of dairying [6, 28]. Additionally, 80% of the dairy farms visited have dairy cows with no integumentary alterations, whereas only 20% have on-body parts, which cause pain and discomfort [29]. Providing sufficient space (e.g., loafing and pasture areas) for dairy cows enables them to exercise and avoid collisions with sharp edges, which may lead to skin bruises or abrasions. In developing countries, integumentary alterations in dairy cows are associated with poor husbandry practices and biological environmental stressors (e.g., infectious diseases), particularly in resource-limited operations [30]. Therefore, dairy farmers should improve management practices (e.g., by providing spatial allowance) to prevent lameness and integumentary alterations despite economic constraints.

3.3 Absence of Disease

The majority of the dairy farms visited had dairy cows that were free of nasal, ocular, or vulval (pus) discharges. Some dairy farms have dairy cows that were coughing, had hampered breathing, and diarrhea (7%), while 13% have mastitis. Cough, nasal and ocular discharges, and hampered breathing are commonly associated symptoms of respiratory disease in dairy cows [31]. The well-ventilated and spacious housing systems of the dairy farms visited have contributed to the low incidence of respiratory infections observed. In contrast, poor housing systems, dusty environments, and limited veterinary access due to financial constraints exacerbate respiratory infections in dairy cows in smallholder systems in developing countries [32, 33]. Consequently, coughing, nasal or ocular discharge, and impaired breathing impair normal respiration, feeding, and physiological functions and thus require urgent treatment. Dairy cows exhibiting these symptoms suffer from distress and potential respiratory infections [e.g., bovine respiratory disease; 34].

Although diarrhea is less common in dairy cows, moderate to severe cases can reduce appetite and milk production. The low diarrheal incidence can be attributed to the hygienic water management employed by dairy farmers in this study. In contrast, diarrheal prevalence in dairy cows on some farms visited may be attributed to the poorly maintained water sources. In many smallholder dairy systems in Africa and Southeast Asia, low population density, scattered housing, and frequent grazing (i.e., limited confinement) can reduce diarrheal incidence by reducing fecal-oral transmission [35]. Diarrhea can result in dehydration and electrolyte imbalance in the body due to body fluid losses from frequent watery defecation. The fluid losses include essential salts such as potassium and chloride, leading to dehydration, weakness, and depression [36]. Consequently, feed intake will decrease due to reduced appetite, thereby reducing milk production. To minimize the spread of diarrhea in the herd, dairy farmers must be knowledgeable about detecting its early signs and report immediately to the authorities for medication.

The low incidence of mastitis observed can be attributed to the cleaning of dairy cows' udders, flanks/upper legs, and lower legs, particularly at milking (see 3.4). Additionally, the provision of bedding materials by dairy farmers in this study improves body hygiene by absorbing excess moisture and reducing pathogen exposure [e.g., 37,38]. Mastitis can reduce dairy cows' mobility and appetite due to the pain in their udders [39]. The cows experience pain and discomfort, resulting in reduced milk yield and quality, long-term udder damage, and reduced fertility [40]. Poor housing conditions and unhygienic milking practices predispose cows to mastitis, leading to an increased incidence rate of 25-45% [39, 40]. Early detection by

periodic milk evaluation (e.g., California Mastitis Test) and treatment can minimize the risk of cow-to-cow transmission at the herd level. Therefore, it is important to keep dairy cows' udders healthy by maintaining a hygienic environment and by carefully handling them during milk collection.

3.4 Comfort Around Resting

The majority of the dairy farms visited have dairy cows with clean udders and (upper and lower) legs. The use of dry bedding, such as straw, absorbs excess moisture, while proper housing ventilation reduces humidity that harbors dirt [37, 38, 41]. In contrast, some dairy farms have dairy cows with dirty udders and legs, which could have contributed to the mastitis incidence reported in this study. Cows with dirty legs and flanks were the source of dirt adhering to the udders [42]. The absence of concrete flooring and adequate bedding materials in some of the dairy farms visited substantially contributed to the accumulation of dirt, thus forming unsanitary, muddy housing conditions. Factors such as poor hygiene (e.g., dirty floors and bedding), improper cleaning of the lying area, and infrequent manure removal can result in dirty flanks, legs, and udders. The accumulation of dirt in the lower limbs is associated with an increased prevalence of skin lesions and infections, predisposing dairy cows to integumentary alterations [43]. A loose housing system contributes to a higher proportion of dairy cows with clean legs, flanks, and udders [44], which have been observed on some of the dairy farms visited, particularly those with roofs, concrete flooring, and bedding materials (see Table 2). These resources keep floors dry, particularly during the rainy season or when drinking water spills. Therefore, despite the positive effects of a loose housing system on the freedom of movement and expression of the emotional state of dairy cows [44], the cleanliness of body parts must be given more weight for a healthy udder and mastitis-free herd.

3.5 Expression of Agonistic Behavior

No dairy cows were observed exhibiting agonistic behavior during the visit. The provision of additional spaces, such as loafing and pasture areas, as observed in this study, has reduced the competition for resources. A pasture area is an expansive space for dairy cows under a grazing system, limiting frequent contact and avoiding aggressive encounters [5, 45, 46]. Evidence indicates that a loafing area (e.g., 3-6 m²/cow) provides modest space, reducing restlessness associated with aggressive encounters [5]. Agonistic behavior, such as aggression, causes submissive cows to displace or flee, especially during feeding or drinking. In times of spatial conflict, dominant cows bully submissive cows for wider or preferred spatial needs. Dairy cows that are less competitive tend to receive more agonistic interactions, which limit their access to resources (e.g., feed, water, space), hence impairing their welfare [47]. At feeding and drinking time, subordinate cows are displaced, reducing their intake and leading to nutritional stress and dehydration [48]. Continued agonistic behavior in the herd increases stress levels, a negative emotional state (e.g., fear, anxiety), poorer health conditions, and reduced milk production [47]. Therefore, dairy farmers should observe and correct agonistic behaviors by providing sufficient resources (e.g., space, partitions) to reduce aggression and improve productivity.

3.6 Ease of Movement

The measures for the resource-based indicators were presented in Table 2. All dairy farmers provide loafing and pasture areas for dairy cows. Many of the dairy farmers in this study have fewer dairy cows, thus have less competition for space. Providing a loafing area allows the cows to display a wider range of natural behaviors, such as grazing, grooming, and social interaction, and supports their physical (e.g., running, flight response, outdoor exposure) and psychological well-being (e.g., feeling of freedom) [5, 49, 50]. Additionally, loafing areas help dairy cows regulate body temperature by exposing them to sunlight or allowing them to cool down, depending on barn conditions [5, 49]. Dairy farmers practice integrated farming systems, allowing fallow and spacious lands to be utilized for grazing. These benefits are enhanced when dairy cows are allowed to run in the pasture. For instance, grazing encourages cows to walk, lie down, stand, and socialize, reducing boredom and aggression [51]. Access to pasture also lowers the risk of lameness, mastitis, hoof issues, hock lesions, uterine diseases, and death compared to confinement alone [50]. Moreover, cows feel more comfortable and relaxed with longer, synchronized lying periods, increased activity, and improved longevity [5]. Therefore, providing additional space for physical activities is essential for dairy cows' welfare.

In contrast, 33% of dairy farms use the tie-stall system, thereby limiting their dairy cows' access to outdoor space, which can lead to various welfare issues. Although the benefits of the tie-stall system were identified (e.g., saving space, preventing chasing), the primary negative impact on dairy cows' welfare is restriction of freedom of movement and the expression of natural behavior on the loose [52, 53]. Dairy cows in tie stalls cannot groom freely, choose a resting place with conspecifics, or explore their habitat [16]. Consequently, stereotypical (i.e., abnormal) behaviors such as tongue rolling, rubbing against equipment or facilities, or bar biting may be expressed, particularly when restricted (or denied) from outdoor access [15]. The risk of collision with partitions, walls, and the like is higher and can result in skin alterations/bruises, as observed in other dairy cows assessed (see Table 1). In extreme cases, the risk of lameness, injuries (e.g., foot rot, hock lesions, tail injuries), infections, mastitis, and mental welfare (e.g., frustration) increases [16]. Dairy farmers using tie-stall systems need to be informed of the welfare limitations of these systems and encouraged to promote natural behavioral expression in dairy cows. Therefore, the disadvantages of the tie-stall system outweigh its advantages, as it denies dairy cows the freedom to express their natural behavior, thereby impairing their welfare.

Table 2. Resource-based indicator of dairy cow welfare in Camarines Sur.

Welfare Criteria	Yes	No
Ease of Movement		
% of farms with loafing area	100	0
% of farms with pasture area	100	0
% of farms with cows tied in stalls	33	67
Absence of Prolonged Thirst		
% of farms provide potable water	100	0
% of farms with clean water points	73	27
% of farms with cows having access to water	100	0
Comfort and Protection from Adverse Weather		
% of farms with housing provision	67	33
% of farms providing roofs to dairy cows	73	27
% of farms providing partitions to dairy cows	67	33
% of farms providing concrete floors to dairy cows	67	33
% of farms providing bedding to dairy cows	87	13
% of farms providing grooming facilities to dairy cows	0	100

3.7 Absence of Prolonged Thirst

All the dairy farmers provide potable water accessible to dairy cows. The provision of clean, potable water by dairy farmers in this study results in higher dairy cow incidence rates without diarrhea. Milk is primarily composed of water (approximately 85-87%) and thus requires a sufficient supply for normal physiological functions. Free access to potable water hydrates dairy cows, especially during diarrhea, summer, hay feeding, or body exhaustion [54]. A study comparing herds of dairy cows with restricted and free access to drinking water showed that herds with free access to drinking water produce 1.7 L more milk/cow/day than herds of cows with restricted access to drinking water [55]. In contrast, 27% of the dairy farms have dirty water points. Consequently, dirty water points harbor pathogens that may predispose dairy cows to waterborne diseases, thereby increasing veterinary costs and shortening productivity [56]. Contaminated water points exacerbate water scarcity, which is associated with competition for water access, impairing dairy cows' feed intake, milk production, and health [57, 58]. In contrast, clean water facilities increase water intake because of the absence of unpleasant odors, tastes, and appearances. Therefore, dairy farmers should keep water points clean to ensure adequate water intake in line with their physiological needs.

3.8 Comfort and Protection from Adverse Weather

The majority of the dairy farms visited have housing with roofs and concrete flooring, with partitions and beddings provided. These dairy farmers who provide these facilities value their dairy cows more in

adverse weather, thereby protecting their welfare. Housing is one of the most important investments to protect dairy cows from adverse weather. An ideal housing system should not restrict cows from expressing their normal behaviors, as it will impair their welfare [59]. Partitions in dairy cows' housing are essential because they provide each cow with a comfortable resting place, helping reduce conflict and aggression [60]. Since dairy cows rest for 12-14 hours daily, they need clean, dry, and comfortable lying areas [61]. Indicators of optimal welfare in partitions include cows resting in a comfortable position, no collisions, rising effortlessly, and exhibiting grooming behavior [62]. Moreover, sufficient space (min. 10 m²/cow) and suitable bedding materials are crucial for preventing injuries and lameness [63]. Conversely, no dairy farmers have provided grooming facilities to dairy cows. This may be attributed to economic constraints, infrastructural limitations, cultural practices, or knowledge gaps about the benefits of grooming on dairy cow welfare [64-66]. Financially constrained dairy farmers prioritize essential needs, such as feed and veterinary services, over grooming facilities for dairy cows [64, 65]. The absence of grooming facilities on the dairy farms visited reflects traditional management practices passed down through generations, in which such facilities were deemed unnecessary. Consequently, the dairy farmers involved in this study were unaware of the benefits of adopting improved care and management practices, such as installing grooming facilities. By grooming, dirt, debris, and external parasites are eliminated, thereby decreasing skin irritation and infection [4]. Furthermore, grooming has a calming effect, thereby lowering stress levels and improving immune function, feed intake, milk production, and expression of natural behaviors [4, 67]. Conversely, the absence of grooming facilities can impair dairy cows' welfare because they are unable to express natural behaviors, such as scratching and grooming [68]. Consequently, stress levels, health problems, and discomfort increase, which can later reduce milk production and shorten the dairy cows' longevity [4, 31, 67]. Although providing grooming facilities entails an additional cost for the dairy farmer, the benefits outweigh the costs, improving dairy cows' welfare.

4. Conclusions

The majority of the dairy cows assessed on the dairy farms visited have good welfare, as indicated by animal-based indicators. This is supported by a low percentage of dairy farms with ill or ill dairy cows (e.g., respiratory infection, mastitis) among the assessed dairy cows. Although the majority of dairy farmers practice sanitary measures, some should improve resource-based indicators (e.g., installing grooming facilities, providing housing, and implementing a tied-in stalls system) to enhance dairy cows' welfare. The long-term benefits of grooming facilities (e.g., removal of external parasites, calming effect) to the dairy cow welfare can outweigh the cost of investment. Similarly, providing housing can protect dairy cows from inclement weather, which may weaken their immune systems. The reported negative effects of the tie stall system compromise dairy cows' freedom to express behavior and require an effective solution (e.g., tethering, practicing a loose-housing system, policy development). For future studies, assessing the impacts of improving dairy cows' welfare on milk production and quality, their income would educate dairy farmers about its economic benefits. Given that management-based indicators can affect dairy cows' welfare, their assessment is essential to achieve a more comprehensive understanding. Since they produce dairy calves, their welfare needs to be assessed.

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References

- [1] Department of Trade and Industry (DTI). *Profile of Region 5*; Department of Trade and Industry: Makati City, Philippines, 2024.
- [2] National Economic and Development Authority (NEDA). *Bicol Regional Development Plan 2023–2025*; National Economic and Development Authority Region V: Legazpi City, Philippines, 2023.
- [3] Donaldson, S. L.; Albright, J.; Black, W. Primary social relationships and cattle behavior. In *Proceedings of the Indiana Academy of Science*; 1971; pp 345–351.
- [4] Goncu, S.; Yesil, M. I.; Yilmaz, N. The cattle grooming behavior and some problems with technological grooming instruments for cow welfare. *J. Environ. Sci. Eng.* **2019**, *8*, 190–196. <https://doi.org/10.17265/2162-5263/2019.05.005>
- [5] Crump, A.; Jenkins, K.; Bethell, E. J.; Ferris, C. P.; Arnott, G. Pasture access affects behavioral indicators of wellbeing in dairy cows. *Animals* **2019**, *9* (11), 902. <https://doi.org/10.3390/ani9110902>
- [6] Warnick, L.; Janssen, D.; Guard, C.; Gröhn, Y. The effect of lameness on milk production in dairy cows. *J. Dairy Sci.* **2001**, *84*(9), 1988–1997. [https://doi.org/10.3168/jds.S0022-0302\(01\)74642-5](https://doi.org/10.3168/jds.S0022-0302(01)74642-5)
- [7] Barkema, H.; Schukken, Y.; Lam, T.; Beiboer, M.; Wilmink, H.; Benedictus, G.; Brand, A. Incidence of clinical mastitis in dairy herds grouped in three categories by bulk milk somatic cell counts. *J. Dairy Sci.* **1998**, *81*(2), 411–419. [https://doi.org/10.3168/jds.S0022-0302\(98\)75591-2](https://doi.org/10.3168/jds.S0022-0302(98)75591-2)
- [8] Dechow, C. D.; Smith, E.; Goodling, R. The effect of management system on mortality and other welfare indicators in Pennsylvania dairy herds. *Anim. Welfare* **2011**, *20*(2), 145–158. <https://doi.org/10.1017/S0962728600002633>
- [9] Hogeveen, H.; Huijps, K.; Lam, T. Economic aspects of mastitis: New developments. *N. Z. Vet. J.* **2011**, *59*(1), 16–23. <https://doi.org/10.1080/00480169.2011.547165>
- [10] Margerison, J.; Preston, T.; Phillips, C. Restricted suckling of tropical dairy cows by their own calf or other cows' calves. *J. Anim. Sci.* **2002**, *80* (6), 1663–1670. <https://doi.org/10.2527/2002.8061663x>
- [11] Fröberg, S.; Aspegren-Güldorff, A.; Olsson, I.; Marin, B.; Berg, C.; Hernández, C.; Galina, C.; Lidfors, L.; Svennersten-Sjaunja, K. Effect of restricted suckling on milk yield, milk composition and udder health in cows and behaviour and weight gain in calves in dual-purpose cattle in the tropics. *Trop. Anim. Health Prod.* **2007**, *39*(1), 71–81. <https://doi.org/10.1007/s11250-006-4418-0>
- [12] Schreiner, D.; Ruegg, P. Relationship between udder and leg hygiene scores and subclinical mastitis. *J. Dairy Sci.* **2003**, *86*(11), 3460–3465. [https://doi.org/10.3168/jds.S0022-0302\(03\)73950-2](https://doi.org/10.3168/jds.S0022-0302(03)73950-2)
- [13] Winckler, C.; Algers, B.; Van Reenen, K.; Leruste, H.; Veissier, I.; Keeling, L. *Welfare Quality® Assessment Protocol for Cattle (Fattening Cattle, Dairy Cows, Veal Calves)*; Welfare Quality® Consortium, 2009.
- [14] Nyawira, S. S.; Mwendia, S. W.; Mwema, E.; Gonzalez-Quintero, R.; Nzogela, B.; Sila, A.; Mwilawa, A.; Kizima, J.; Paul, B. K.; Notenbaert, A. Forage crops boost the productivity and environmental sustainability of dairy farmers in southern Tanzania. *Agric. Ecosyst. Environ.* **2025**, *389*, 109649. <https://doi.org/10.1016/j.agee.2025.109649>
- [15] Popescu, S.; Borda, C.; Diugan, E. A.; Spinu, M.; Groza, I. S.; Sandru, C. D. Dairy cows welfare quality in tie-stall housing system with or without access to exercise. *Acta Vet. Scand.* **2013**, *55*(1), 43. <https://doi.org/10.1186/1751-0147-55-43>
- [16] EFSA Panel on Animal Health and Welfare; Nielsen, S. S.; Alvarez, J.; Bicout, D. J.; Calistri, P.; Canali, E.; Drewe, J. A.; Garin-Bastuji, B.; Gonzales Rojas, J. L.; Gortázar Schmidt, C.; et al. Welfare of dairy cows. *EFSA J.* **2023**, *21*(5), e07993. <https://doi.org/10.2903/j.efsa.2023.7993>
- [17] Rushen, J. *Housing and the Welfare of Dairy Cattle*; Burleigh Dodds Science Publishing: Cambridge, U.K., 2017.
- [18] de Vries, M.; Bokkers, E.; Van Schaik, G.; Botreau, R.; Engel, B.; Dijkstra, T.; De Boer, I. Evaluating results of the Welfare Quality multi-criteria evaluation model for classification of dairy cattle welfare at the herd level. *J. Dairy Sci.* **2013**, *96* (10), 6264–6273. <https://doi.org/10.3168/jds.2012-6129>
- [19] Linstädt, J.; Thöne-Reineke, C.; Merle, R. Animal-based welfare indicators for dairy cows and their validity and practicality: A systematic review of the existing literature. *Front. Vet. Sci.* **2024**, *11*, 1429097. <https://doi.org/10.3389/fvets.2024.1429097>

- [20] Van Saun, R. Nutritional Requirements of Dairy Cattle. In *MSD Veterinary Manual*; MSD Animal Health: Rahway, NJ, USA, 2024.
- [21] Ramos, S. C.; Jeong, C. D.; Mamuad, L. L.; Kim, S. H.; Kang, S. H.; Kim, E. T.; Cho, Y. I.; Lee, S. S.; Lee, S. S. Diet transition from high-forage to high-concentrate alters rumen bacterial community composition, epithelial transcriptomes and ruminal fermentation parameters in dairy cows. *Animals* **2021**, *11*(3), 838. <https://doi.org/10.3390/ani11030838>
- [22] Bezabih, M.; Adie, A. *Cultivated Forages Boost Production and Income for Dairy Farmers in Bishoftu District, Ethiopia*; 2024.
- [23] Herforth, N.; Tirivanhu, P.; Ewell, H.; Miethbauer, T.; Nawrotzki, R. Appetite for forages? The adoption and multidimensional impacts of improved forage grasses in Uganda. *Front. Sustain. Food Syst.* **2025**, *9*, 1585410. <https://doi.org/10.3389/fsufs.2025.1585410>
- [24] Black, R.; Van Amstel, S.; Krawczel, P. Effect of prepartum exercise, pasture turnout, or total confinement on hoof health. *J. Dairy Sci.* **2017**, *100*(10), 8338–8346. <https://doi.org/10.3168/jds.2016-12082>
- [25] Cook, N.; Hess, J.; Foy, M.; Bennett, T.; Brotzman, R. Management characteristics, lameness, and body injuries of dairy cattle housed in high-performance dairy herds in Wisconsin. *J. Dairy Sci.* **2016**, *99*(7), 5879–5891. <https://doi.org/10.3168/jds.2016-10956>
- [26] Whay, H. R.; Shearer, J. K. The impact of lameness on welfare of the dairy cow. *Vet. Clin. North Am. Food Anim. Pract.* **2017**, *33*(2), 153–164. <https://doi.org/10.1016/j.cvfa.2017.02.008>
- [27] Tsousis, G.; Boscós, C.; Praxitelous, A. The negative impact of lameness on dairy cow reproduction. *Reprod. Domest. Anim.* **2022**, *57* (Suppl. 5), 33–39. <https://doi.org/10.1111/rda.14210>
- [28] Prasomsri, P. Effect of lameness on daily milk yield in dairy cow. *Thai J. Vet. Med.* **2022**, *52*(4), 679–687. <https://doi.org/10.56808/2985-1130.3263>
- [29] Alrhoun, M.; Zanon, T.; Pouloupoulou, I.; Katzenberger, K.; Gauly, M. Associated risk factors for skin alterations in dairy cattle kept on small-scale mountain farms. *PLoS One* **2023**, *18*(8), e0285394. <https://doi.org/10.1371/journal.pone.0285394>
- [30] Davies, F. G. Lumpy skin disease of cattle: A growing problem in Africa and the Near East. *World Anim. Rev.* **1991**, *68*(3), 37–42.
- [31] World Organisation for Animal Health (WOAH). *Terrestrial Animal Health Code*; WOA: Paris, France, 2018.
- [32] Gorden, P. J.; Plummer, P. Control, management, and prevention of bovine respiratory disease in dairy calves and cows. *Vet. Clin. North Am. Food Anim. Pract.* **2010**, *26*(2), 243–259. <https://doi.org/10.1016/j.cvfa.2010.03.004>
- [33] Massi, R. P.; Lunardi, M.; Alfieri, A. F.; Alfieri, A. A. Neglected bacterial infections associated with bovine respiratory disease in lactating cows from high-yielding dairy cattle herds. *Braz. J. Microbiol.* **2023**, *54*(4), 3275–3281. <https://doi.org/10.1007/s42770-023-01165-1>
- [34] Molina, F. M.; Marín, C. C. P.; Moreno, L. M.; Buendía, E. I. A.; Marín, D. C. P. Welfare Quality® for dairy cows: Towards a sensor-based assessment. *J. Dairy Res.* **2020**, *87*(S1), 28–33. <https://doi.org/10.1017/S002202992000045X>
- [35] Zirra-Shallangwa, B.; González Gordon, L.; Hernandez-Castro, L. E.; Cook, E. A. J.; Bronsvort, B. M. de C.; Kelly, R. F. The epidemiology of bovine viral diarrhea virus in low- and middle-income countries: A systematic review and meta-analysis. *Front. Vet. Sci.* **2022**, *9*, 947515. <https://doi.org/10.3389/fvets.2022.947515>
- [36] MSD Veterinary Manual. *Intestinal Diseases in Cattle*; Merck & Co., Inc.: Rahway, NJ, USA, 2025.
- [37] Food and Agriculture Organization of the United Nations (FAO); International Dairy Federation (IDF). *Guide to Good Dairy Farming Practice*; Animal Production and Health Guidelines No. 8; FAO: Rome, Italy, 2011.
- [38] Smith, K.; Hogan, J. Bedding's contribution to mastitis in dairy cows. In *Dairy Housing and Equipment Systems: Managing and Planning for Profitability*; Natural Resource, Agriculture, and Engineering Service: Ithaca, NY, 2000; pp 265–270.
- [39] Mainau, E.; Temple, D.; Manteca, X. Welfare issues related to mastitis in dairy cows. *Farm Anim. Welfare Educ. Cent.* **2014**, *10*(2).

- [40] Cheng, W. N.; Han, S. G. Bovine mastitis: Risk factors, therapeutic strategies, and alternative treatments—A review. *Asian-Australas. J. Anim. Sci.* **2020**, *33*(11), 1699–1713. <https://doi.org/10.5713/ajas.20.0156>
- [41] Wolfe, T.; Vasseur, E.; DeVries, T.; Bergeron, R. Effects of alternative deep bedding options on dairy cow preference, lying behavior, cleanliness, and teat end contamination. *J. Dairy Sci.* **2018**, *101*(1), 530–536. <https://doi.org/10.3168/jds.2016-12358>
- [42] Neja, W.; Bogucki, M.; Jankowska, M.; Sawa, A. Effect of cow cleanliness in different housing systems on somatic cell count in milk. *Acta Vet. Brno* **2016**, *85*(1), 55–61. <https://doi.org/10.2754/avb201685010055>
- [43] Schenkenfelder, J.; Winckler, C. To meet or not to meet welfare outcome thresholds: A case-control study in dairy cow herds. *Animal* **2022**, *16*(3), 100461. <https://doi.org/10.1016/j.animal.2022.100461>
- [44] Ostojić Andrić, D.; Hristov, S.; Zlatanović, Z.; Nikšić, D.; Pajić, M.; Petrović Caro, V.; Stanojković, A. Dairy cows' welfare quality in relation to housing system. *Large Anim. Rev.* **2022**, *28*, 265–272.
- [45] Crump, A.; Jenkins, K.; Bethell, E. J.; Ferris, C. P.; Kabboush, H.; Weller, J.; Arnott, G. Optimism and pasture access in dairy cows. *Sci. Rep.* **2021**, *11*(1), 4882. <https://doi.org/10.1038/s41598-021-84371-x>
- [46] Smid, A.-M. C.; Weary, D. M.; von Keyserlingk, M. A. The influence of different types of outdoor access on dairy cattle behavior. *Front. Vet. Sci.* **2020**, *7*, 257. <https://doi.org/10.3389/fvets.2020.00257>
- [47] Krahn, J.; Foris, B.; Sheng, K.; Weary, D. M.; von Keyserlingk, M. A. Effects of group size on agonistic interactions in dairy cows: A descriptive study. *Animal* **2024**, *18*(3), 101083. <https://doi.org/10.1016/j.animal.2024.101083>
- [48] Foris, B.; Thompson, A.; von Keyserlingk, M. A.; Melzer, N.; Weary, D. M. Automatic detection of feeding- and drinking-related agonistic behavior and dominance in dairy cows. *J. Dairy Sci.* **2019**, *102*(10), 9176–9186. <https://doi.org/10.3168/jds.2019-16697>
- [49] Haskell, M. J.; Masłowska, K.; Bell, D. J.; Roberts, D. J.; Langford, F. M. The effect of a view to the surroundings and microclimate variables on use of a loafing area in housed dairy cattle. *Appl. Anim. Behav. Sci.* **2013**, *147*(1–2), 28–33. <https://doi.org/10.1016/j.applanim.2013.04.016>
- [50] Pasture for Life Association (PFLA). *The Animal Welfare and Environmental Benefits of Pasture for Life Farming*; Pasture for Life Association: U.K., 2018.
- [51] Langford, F. M.; Bell, D. J.; Nevison, I. M.; Tolkamp, B. J.; Roberts, D. J.; Haskell, M. J. What type of loafing areas do housed dairy cattle prefer? *Appl. Anim. Behav. Sci.* **2021**, *245*, 105511. <https://doi.org/10.1016/j.applanim.2021.105511>
- [52] Beaver, A.; Weary, D. M.; von Keyserlingk, M. A. Invited review: The welfare of dairy cattle housed in tie-stalls compared to less-restrictive housing types: A systematic review. *J. Dairy Sci.* **2021**, *104*(9), 9383–9417. <https://doi.org/10.3168/jds.2020-19609>
- [53] Robbins, J. A.; Roberts, C.; Weary, D. M.; Franks, B.; von Keyserlingk, M. A. Factors influencing public support for dairy tie-stall housing in the United States. *PLoS One* **2019**, *14*(5), e0216544. <https://doi.org/10.1371/journal.pone.0216544>
- [54] Golher, D.; Patel, B.; Bhoite, S.; Syed, M.; Panchbhai, G.; Thirumurugan, P. Factors influencing water intake in dairy cows: A review. *Int. J. Biometeorol.* **2021**, *65*, 617–625. <https://doi.org/10.1007/s00484-020-02038-0>
- [55] Daros, R. R.; Bran, J. A.; Hötzel, M. J.; von Keyserlingk, M. A. Readily available water access is associated with greater milk production in grazing dairy herds. *Animals* **2019**, *9*(2), 48. <https://doi.org/10.3390/ani9020048>
- [56] Crossley, R.; Bokkers, E.; Browne, N.; Sugrue, K.; Kennedy, E.; Conneely, M. Risk factors associated with indicators of dairy cow welfare during the housing period in Irish spring-calving hybrid pasture-based systems. *Prev. Vet. Med.* **2022**, *208*, 105760. <https://doi.org/10.1016/j.prevetmed.2022.105760>
- [57] Robertson, J. Water: The good, the bad, and the ugly. *Vet. Ireland J.* **2019**, *9*(12).
- [58] Popescu, S.; Borda, C.; Diugan, E. A.; Niculae, M.; Stefan, R.; Sandru, C. D. The effect of the housing system on the welfare quality of dairy cows. *Ital. J. Anim. Sci.* **2014**, *13*(1), 2940. <https://doi.org/10.4081/ijas.2014.2940>
- [59] Phillips, C.; Beerda, B.; Knierim, U.; Waiblinger, S.; Lidfors, L.; Krohn, C.; Canali, E.; Valk, H.; Veissier, I.; Hopster, H. A review of the impact of housing on dairy cow behaviour, health and welfare. In

- Livestock Housing*; Wageningen Academic Publishers: Wageningen, The Netherlands, 2013; pp 37–54. https://doi.org/10.3920/978-90-8686-771-4_02
- [60] Gaworski, M. How do we recognize the effects of dairy cattle activity in the lying area? A case study in free-stall barns. *Animals* **2025**, *15*(6), 880. <https://doi.org/10.3390/ani15060880>
- [61] Macrae, A. Housing in dairy cattle farms. In *Encyclopedia of Livestock Medicine for Large Animals and Poultry Production*; Simões, J., Ed.; Springer: Cham, Switzerland, 2024; pp 1–10. <https://doi.org/10.1007/978-3-031-52133-1>
- [62] Gieseke, D.; Lambertz, C.; Gauly, M. Effects of cubicle characteristics on animal welfare indicators in dairy cattle. *Animal* **2020**, *14*, 1934–1942. <https://doi.org/10.1017/S1751731120000609>
- [63] Witkowska, D.; Ponieważ, A. The effect of housing system on disease prevalence and productive lifespan of dairy herds—A case study. *Animals* **2022**, *12*(13), 1610. <https://doi.org/10.3390/ani12131610>
- [64] Loura, M.; Ghalawat, S.; Malik, J.; Mehla, S.; Yadav, E.; Kumar, M. Constraints faced by dairy farmers in Haryana. *Constraints* **2021**, *51*(3).
- [65] Buchan, M. S.; Lhermie, G.; Mijar, S.; Pajor, E.; Orsel, K. Individual drivers and barriers to adoption of disease control and welfare practices in dairy and beef cattle production: A scoping review. *Front. Vet. Sci.* **2023**, *10*, 1104754. <https://doi.org/10.3389/fvets.2023.1104754>
- [66] Fita, L.; Trivedi, M.; Galmessa, U. Constraints of farmers in adopting improved dairy husbandry practices: The case of Ada'a District, Oromiya State, Ethiopia. *J. Sci. Sustain. Dev.* **2013**, *1*(1), 63–70.
- [67] Li, H.; Zhang, R.; Li, H.; Yuan, H.; Zhang, R.; Ren, H.; Xiao, J.; Li, Z.; Wang, A.; Jin, Y. Effects of using mechanical brushes on the productive performance of dairy cows. *Vet. Sci.* **2024**, *11*(10), 481. <https://doi.org/10.3390/vetsci11100481>
- [68] Dickson, E. J.; Monk, J. E.; Lee, C.; McDonald, P. G.; Narayan, E.; Campbell, D. L. Loss of a grooming enrichment impacts physical, behavioural, and physiological measures of welfare in grazing beef cattle. *Animal* **2024**, *18*(3), 101091. <https://doi.org/10.1016/j.animal.2024.101091>