Research Article

On-Farm Welfare Assessment of Dairy Cattle (Friesian) in Nyala City, Sudan

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Abstract

Cattle in Sudan serves multiple purposes in agricultural systems, and producing milk is crucial for raising income and providing for domestic needs. However, there is no historical data on the assessment of cattle welfare in Sudan, especially in Nyala. The current study was carried out on 11 dairy farms with Frisian cows from January to March 2021. The primary goal of the study was to assess dairy cows' welfare issues. In this study, 155 female Friesian cows were randomly selected from the farms and examined. Data was collected by closely observing, and the following factors were evaluated: appropriate behaviors, emotional state, physical state, lameness, lesion and injury, health status, and cleanliness of the body. According to the study, the following percentages of animals were impacted: Among cows, 21.3% exhibited anxious behavior, 23.2% displayed fear, 54.2% had thin body conditions, and 27.1% had very thin body conditions. Twenty percent of cows had mildly damaged hocks, 13.5% had swollen knees without skin damage, and 11.6% had swollen knees with skin damage. Cows with dirty udders, dirty hindquarters, dirty lower legs, and dirty flanks comprised 32.3%, 52.3%, 49.7%, and 43.2% of the herd. Additionally, 69.0% of cows had ectoparasites, 28.4% had abnormal nasal discharge, 31.6% had abnormal ocular discharge, and 27.1% had hair loss. We conclude that the major welfare issues highlighted in this study include injuries, ectoparasites, unclean coats, and health status. Education and veterinary services are required to improve the well-being of the dairy cattle in the research region.

Keywords: Nyala City; Dairy Cattle; Welfare

Introduction

The Office International des Epizootic (OIE) has defined animal welfare (AW) as the general word used to describe how an individual is dealing with the circumstances in which it lives [1]. Due to its effects on human health and animal output, the welfare of dairy cows is a significant matter of public attention in most nations. Employees and farmers, in particular, must consider animals' welfare as a great opportunity to improve farming techniques and struc-

tures to develop productive services, reduce health issues and add value to farm products [2]. To assure the financial production of food and other goods in a way that does not compromise the health and welfare of the animals, good farm animal husbandry is fundamentally about providing the resources and management required [3]. For a dairy farmer to be prosperous at providing milk of good quality, the welfare criteria of dairy cows must be met [4]. An animal has fundamental requirements which are necessary for sur-

vival. Still, it also has needs for welfare, those items that, while not necessary for survival, will enhance living conditions and maybe increase output. Welfare assessment serves a variety of purposes in this context, including identifying current welfare issues, ensuring farm assurance, identifying risk factors that may contribute to a welfare issue, evaluating the effectiveness of interventions, and serving as a research tool for comparing and contrasting various production methods, environments, system integration, animal genetic markers, etc. [5].

Millions of people in developing nations benefit greatly from the production of livestock; these animals are essential to the community and culture of the impoverished, providing them with revenue, resources, and other necessities (fleece, buckskins, horns, etc.), food (milk, meat, etc.) [6], plowing in planting season and pulling carts (reference such an approach). The cows in Sudan have multifunctional roles in production systems. Milk production farms, especially in Friesian, are significant for increasing income generation and contributing to their farmers' livelihood. Most dairy farms in Nyala operate in intensive mode with a predominance of permanent tied systems, which is a constant source of mental stress and physical suffering, altering productivity, health, and welfare of cows (reference such an approach).

As long as we know, no research has been done to evaluate the welfare of dairy animals in Nyala. The primary goal of this study was to characterize problems with animal welfare in Nyala environment by assessing the welfare of Frisian cows through animal-related measures and evaluate cows' reactions to humans under the assumption that these reactions accurately reflect the human-animal relationship on these farms.

Material and Methods
Study area

The study was conducted in Nyala, the capital of South Darfur State, Sudan. Nyala is located at 2,208 feet in Darfur historical area (673 meters).

Sampling procedure

The present study was conducted over two months, from January to March 2021, on 11 dairy farms with Frisian cows. The validated European Welfare Quality protocol for dairy cattle was used to collect the data for this study and modified to some extent based on the local management system. When visiting the farm, permission was acquired from the farmer after explaining the aims of the study and assure them that their participation was optional and

that their names will be kept confidentially. If the farmer was not willing, the opportunity was given to the next willing farmer. The same approach was repeated until the period of the research sample size was reached.

Farms and animals

Data from dairy farms were collected for this investigation. The study focused on the Friesian cows, the majority of Nyala city dairy cows. About 15 dairy cattle farms located in Nyala, 11 farms were selected, and a total of 155 female cows that responded to assessment. To ensure that dairying was the major business, all selected farms had a minimum of 10 dairy cows. The sample is then taken randomly from the farms that fulfilled these criteria. All family-run farms used a similar approach for raising dairy cattle, including natural and artificial insemination, separating calves from their mothers when they were 7 to 10 days old, and feeding them by hand. The type of housing is (Intensive farming) a semi-open method, a canopy made of iron in one of the far corners to protect from the heat of the Sun and rain.

Assessment of animal welfare indicators

Dairy farms may utilize different welfare assessment methods depending on how they define animal wellbeing and what they are trying to measure. Therefore, selecting welfare indicators and measurement techniques reflects the fundamental tenets of how animal wellbeing is perceived [7]. To collect data on aspects relevant to the welfare of animals, face-to-face interviews with the farmers were conducted using a semi-closed items questionnaire. Data on farm characteristics, such as the number of dairy animals in each category, were covered in the first section of the interview (total cows, lactating cows and heifers). The direct welfare assessment criteria were discussed in the second section of the questionnaire, including BCS, physical damage, lameness, inadequate hygiene, and the most significant disease (mastitis, reproductive problems, ocular and nasal discharge, diarrhea, or other) (Table 1). The duration of the assessment of each cow was about 10 minutes, and each assessment has been performed by the three veterinarians in the same time. Farmers always had the option to offer additional details, personal observations, and clarifications to queries.

Data analysis

The data was analyzed using SPSS Version 21.0 (IBM Corporation, New York, USA). Percentage and frequency distribution were calculated. A cumulative score was given to each variable, a total of their score for each questionnaire item.

Welfare indicators	Clinical parameters	Explanation
Human-animal relationship Emotional status	Friendly/fearful Apathetic/sociable	Avoidance distance was used to assess the relationship between humans and animals which described by [23]. The respondent approached the animal slowly, and the distance was measured at the moment the animal withdrew or when they made contact. We record friendly for an animal that accepts the close touching with playing, sociable for the animal that can be approached closer than 100 cm but not touched, pathetic for animal that are dull when touched and fearful for the animal that cannot be approached closer than 200 cm.
The lesions and injury Hock join condition Knee condition Abdomen, head and ear lesion	Healthy/Mildly affected hock/Swollen hock Healthy/Swollen without and or with skin damage Absent/Present	Cows were scored using a modification of system described by [1]. During observation of the hock joint, the researcher recorded healthy condition if there was no affected, mildly affected or swollen hock. The knee condition was recorded during observation as healthy, swollen without skin damage, and swollen with skin damage caused by the land scope of the farm. Damaged skin, either in the form of a scab or a wound in the abdomen and head regions, ear damage lesions due to torn-off ear tags were observed by the researcher, and recorded as absent or present.
Body condition score	Very thin/thin/good/fat/very fat	The body condition score was based on a five-point scale. A body condition score is determined by visual inspection of the cow's rump, specifically the area bounded by the hip, pin, and tail bones [24]. The cows were viewed from the side in the tail head and loin areas and back and classified as: 0-very thin; 1-thin; 2-ideal; 3-fat and 4-obese
Lameness	Sound/Mild/Moderate/Severe	When cows were in the shed, the Data was gathered. A scale from 0 to 3 was utilized, with 0 representing normal gait, 1 representing mild lameness in the cow, 2 representing moderate lameness in the cow, and 3 indicating lameness significantly in the cow [25].
Absence of disease Orifice discharge Mastitis/Reproductive problem/Hair lost area/Cough/Hampered respiration/Diarrhea	Nasal/ocular Present/absent	The researchers observed external orifice discharge of horse if present, and recorded down of each During data collection, the owner was interviewed about the history of mastitis and reproductive problems of the animal. Then the researcher observed if any hair loss area, coughs, hampered respiration and diarrhea in the animal and recorded as present and/or absent [1].
Cleanliness	Udder/hind Quarter/lower legs flank	Cows were scored using a modification of the system described by [26]. Four different body sections of the animal were separate out and classified as clean or unclean.
External parasite	Present/absent.	If any species of parasites were found on the cow's skin or hair, the finding of ectoparasite parasites was recorded as present; otherwise, it was noted as absent [27].

Table 1: Description of the assessment of animal welfare indicators, applied on farm dairy cows.

Results

Human-animal relationship

Individual avoidance distances ranged from 0 to 2m. The percentage of animals that could be touched on the farms was only 18.1% in total of 155 cows and defined as friendly and apathetic. In contrast, 81.9% of animals avoided close touching and divided into friendly status for the animal that can be approached closer than 100 cm but not touched, and fearful for the animal that cannot be approached closer than 200 cm (Table 2).

Health and injuries

A cow's body condition score is a subjective evaluation of how much fat or energy it has stored. In this study majority of cows in all farms showed scores 2 and 1, which are, respectively, ideal 54.2% and thin 27.1% body condition scores (Figure 1 and Table 3). In the present study, sixty-nine percent of 155 cows had external parasites. One hundred fifty-five cows, 20% and 24.1% showed mildly affected hock joint and kneed joint swelling. In terms of le-

Variables	Frequency	Percent (%)	Cumulative Percent (%)
Emotional status			
Friendly	20 (20)	12.9 (12.9)	12.9
Fearful	36 (36)	23.2 (23.2)	36.1
Apathetic	8 (8)	5.2 (5.2)	41.3
Sociable	91 (91)	58.7 (58.7)	100.0
Total	155	100	

Table 2: Showing the result categories of human-animal relationship that has been reveal by this study.
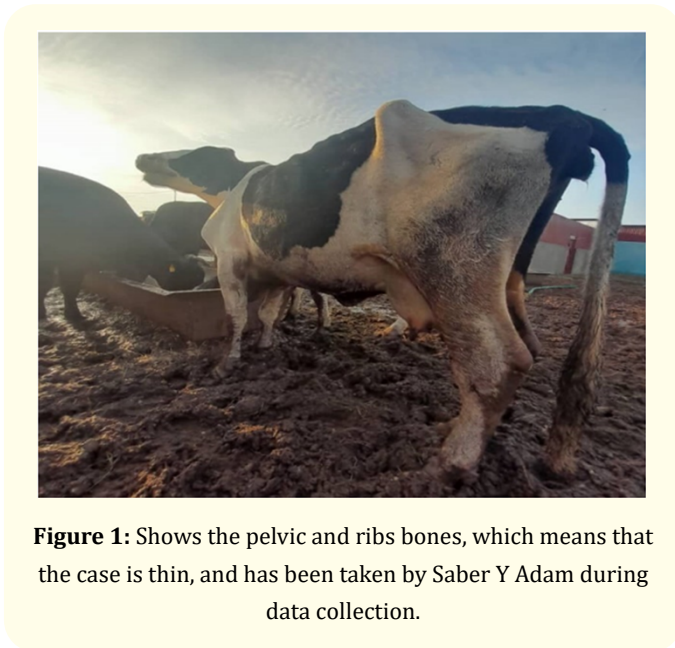
Figure 1: Shows the pelvic and ribs bones, which means that the case is thin, and has been taken by Saber Y Adam during data collection.

Variable	Frequency	Percent (%)	Cumulative Percent (%)
Body condition			
Very thin	13 (13)	8.4 (8.4)	8.4
Thin	42 (42)	27.1 (27.1)	35.5
Ideal	84 (84)	54.2 (54.2)	89.7
Fat	13 (13)	8.4 (8.4)	98.1
Very fat	3 (3)	1.9 (1.9)	100.0
Total	155	100	
Lameness			
Sound	139 (139)	89.7 (89.7)	89.7
Mild	14 (14)	9.0 (9.0)	98.7
Moderate	2 (2)	1.3 (1.3)	100.0
Total	155	100	
Hock join condition			
Healthy	117 (117)	75.5 (75.5)	75.5

Mildly affected hock	31 (31)	20.0 (20.0)	95.5
Swollen hock	7 (7)	4.5 (4.5)	100.0
Total	155	100	
Knee condition			
Swollen without skin damage	21 (21)	13.5 (13.5)	13.5
Swollen with skin damage	18 (18)	11.6 (11.6)	25.2
Healthy	116 (116)	74.8 (74.8)	100.0
Total	155	100	
Ectoparasites			
Absent	48 (48)	31.0 (31.0)	31.0
Present	107 (107)	69.0 (69.0)	100.0
Total	155	100	
Abdomen lesion			
Absent	132 (132)	85.2 (85.2)	85.2
Present	23 (23)	14.8 (14.8)	100.0
Total	155	100	
Head lesion			
Absent	135 (135)	87.1 (87.1)	87.1
Present	20 (20)	12.9 (12.9)	100.0
Total	155	100	
Ear lesion due to ear tags			
Absent	135 (135)	87.1 (87.1)	87.1
Present	20 (20)	12.9 (12.9)	100.0
Total	155	100	

Table 3: Percentage value of health and injuries that has been detected in the present study.

sions observed, the present study showed that 14.8%, 12.9%, and 12.9% of cows had abdomen, head, and ear lesions due to ear tags (Table 3).

Absence of disease

In the present study, the percentage of mastitis, hair loss area, and orifices discharge in farms is high, about 22.3%, 27.1% and 60%, respectively. In the history of reproduction of each animal, about 16.8% of 155 cows had reproductive problems (Table 4).

Body cleanness

In the present study, the majority of animals showed dirty conditions in different parts of the body. About 32.3%, 52.3%, 49.7%, and 43.2% of cows showed dirty udder, hind Quarter, lower legs and flank (Figure 2 and Table 5).

Variable	Frequency	Percent (%)	Cumulative Percent (%)
Mastitis			
Absent	122 (122)	78.7 (78.7)	78.7
Present	33 (33)	21.3 (21.3)	100.0
Total	155	100	
Hair lost area			
Absent	113 (113)	72.9 (72.9)	72.9
Present	42 (42)	27.1 (27.1)	100.0
Total	155	100	
Nasal Discharge			
Absent	111 (111)	71.6 (71.6)	71.6
Present	44 (44)	28.4 (28.4)	100.0
Total	155	100	
Ocular discharge			
Absent	106	68.4 (68.4)	68.4
Present	49	31.6 (31.6)	100.0
Total	155	100	
Cough			
Absent	138 (138)	89.0 (89.0)	89.0
Present	17 (17)	11.0 (11.0)	100.0
Total	155	100	
Reproductive problem			
Absent	129 (129)	83.2 (83.2)	83.2
Present	26 (26)	16.8 (16.8)	100.0
Total	155	100	
Diarrhea			
Absent	141 (141)	91.0 (91.0)	91.0
Present	14 (14)	9.0 (9.0)	100.0
Total	155	100	

Table 4: Revealed percentage value of cows according to absence of disease like signs.
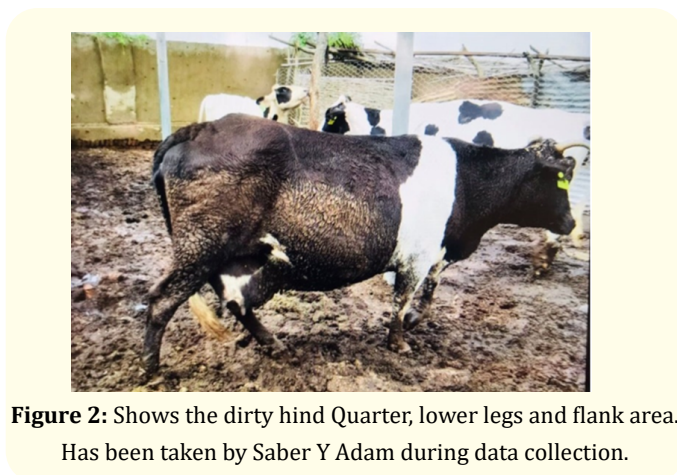
Figure 2: Shows the dirty hind Quarter, lower legs and flank area. Has been taken by Saber Y Adam during data collection.

Variable	Frequency	Percent (%)	Cumulative Percent (%)
Dirty udder			
Absent	105 (105)	67.7 (67.7)	67.7
Present	50 (50)	32.3 (32.3)	100.0
Total	155	100	
Dirty hind Quarter			
Absent	74 (74)	47.7 (47.7)	47.7
Present	81 (81)	52.3 (52.3)	100.0
Total	155	100	
Dirty lower legs			
Absent	78	50.3 (50.3)	50.3
Present	77	49.7 (49.7)	100.0
Total	155	100	
Dirty flank			
Absent	88	56.8 (56.8)	56.8
Present	67	43.2 (43.2)	100.0
Total	155	100	

Table 5: Percentage values for various bodily regions of cows based on how clean they are.

Discussion

One of the main economic activities on which the poorest populations rely for food and revenue is livestock rearing. Additionally, it is crucial to guard against climate-related vulnerability and risk for populations whose survival depends heavily on rain-fed agriculture [8]. However, farmers can use farm-level animal welfare assessments as a consultative tool, as a data source for legislation, and as a part of customer quality assurance programs [9]. The primary objective of this study was to identify welfare issues affecting dairy cattle and determine whether indicators relate to performance efficiency and welfare measures.

The result of this study suggested that 23.2% of cows showed fearful behavior, while 58.7% of cows in a total of 11 dairy farms showed social behavior. Additionally, the stockperson's behavior and the animals' dread of humans are significantly influenced by the stockperson's attitude toward interacting with farm animals [10].

Factors that affect the interaction between humans and animals include genetic predisposition, housing conditions, experience, quality and quantity of human contact, and handling practices [11]. The welfare importance of a tense man-animal connection is explained by fearful animals being negatively impacted by repeated

human contact [12]. Consequently, animals displaying fearful behavior are frequently subjected to aversive handling because they respond improperly to the handling techniques [12]. Nevertheless, there appears to be a space for improvement because several animals displayed intense avoidance. The yield of milk (protein and fat) can increase, and the flight distance from humans can be decreased through initiatives aimed at improving stock people's attitudes and behaviors toward dairy cattle [13].

Instead of using the change in live weight, body condition scoring (BCS) is utilized to determine the energy balance, body composition, and body reserves in cattle [9]. In the current study, cows with a body condition score of 2 (54.2% ideal) were present on all farms, indicating that those animals are suitable for farmers based on their income level and are regarded as suitable for nursing dairy cows. The body condition scoring 1 of the cows in this study was (27.1% thin). Our finding in body scores agreed with a previous study that reported that about 65.5% and 24.5% of animals were in body condition scores 2 and 1[1]. The agreement of studies between the two areas might be due to the same nutrition quality in farm animals.

In modern dairy farming, lameness is an important welfare concern [14]. It denotes a painful condition and discomfort, is one of the most important welfare issues with cattle and has a detrimental effect on the welfare and production of the herd [15]. It is directly related to avoiding pain brought on by limb lesions and, in particular, hoof lesions in dairy cattle [16]. A previous result recommends that a lack of cubicles is a significant risk factor for lameness [17]. Additionally, deep bedding and a soft sleeping surface are essential for comfort and preventing lameness [18]. Most farmers have concrete floors on their farms, resulting in inflamed hock joints and knee injuries. It has been speculated that temporarily housing cows in straw yards can shrink their sole horn, which could cause sole ulcers when they are maintained on hard flooring after giving birth [19]. Our study suggested that 9%, 13.5% and 11.6% of animals had mild score lameness, knee swelling without skin damage, and knee swelling with skin damage, respectively. Our finding disagrees with a study that revealed that 59%, 19.4% and 31.2% of cows have severe lameness [15]. This disagreement might be due to differences in farm's land scope welfare standards between the areas. This study suggested that overall prevalence of ectoparasites of dairy cows was 69%. This finding was higher than the reports of Urge B [20], who reported 40.76% prevalence of ectoparasites. This difference might be due to the presence of various factors like veterinary service delivery system, feeding and management, animal husbandry practice, and variation in the geographical locations.

Because the diseases is frequently linked to unpleasant sensations like pain, discomfort, or anxiety, it might be considered a significant welfare measure. Mastitis is a serious issue for dairy cow welfare and lowers the farmer's income [21]. Many risk factors, including poor cubicle and cow cleanliness [22], breed, parity, lactation stage, amount of milk produced, teat tip-to-floor distance, housing, and milking technique, have been linked to mastitis [3]. While regular bed changes and milking parlor cleanliness may lower the risk. Our study revealed that 21.3%, 27.1% and 28.1% of cows had mastitis, hair loss area and nasal discharge, respectively. These results are in disagreement with those who found that 12.6%, 5.2%, and 12.7% of cows had mastitis, hair loss area and nasal discharge [1]. These diagreements might be due to difference in healthcare and treatment of diseased farm animals between study areas.

In this study, dirty hind limbs, udder, lower legs and flanks are most common on all farms. The cows were spending several times in the herd. Several filthy elements in the herd contributed to its filthiness, including dung, muck, and urine. The surface of the sleeping area and feeding various forms of roughage were linked to the prevalence of dirtiness [1]. Our finding revealed that about 32.3% and 43.2% of cows showed dirty udder and flanks. These were in agreement with the previous study recorded that 55.9% and 55% of cows had dirty udder and flanks, respectively [1]. This agreement might be cowed spent several times laying down on the floor with several dirty particles leading to body part dirtiness in different study locations. Unfortunately, we did not measure mortality, dystocia, time needed to lie down, water provision and the milk yield of the cows in this study because the farmers do not have records. Perhaps the reason is the negligence of the owner of the farm or the lack of supervision, or because they kept this information on us due to lack of awareness.

Conclusion

This research was conducted at the dairy farm level in Nyala City to assess the welfare issues facing dairy cows. Our study revealed that most farmers were unaware of the welfare issue connected to dairy farming. Fearful behavior, injury, the presence of external parasites, thin body conditions, and dirtiness in various body regions were the most significant problems in connection to animal welfare. Although this work only discovered animal welfare risks, it is clear that more thorough research is required to further improve the various products and housing systems across the dairy farms in the city.

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