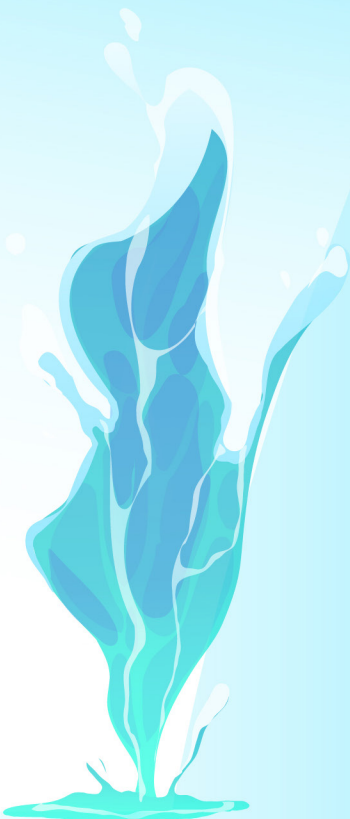




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## Welfare Status of Transport Camels in and Around Jigjiga Town, Somali Regional State, Ethiopia

Fosiya Hussein<sup>1\*</sup>, Yoseph Legesse<sup>2</sup>, Kownin Abdimahad<sup>3</sup>, Abdimawlid Ali Ismail<sup>1</sup>

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### ABSTRACT

This study was conducted from April to December 2021 to assess the welfare status of transport camels and evaluate community awareness and perceptions regarding camel welfare in the Fafan Zone of the Somali Region, Ethiopia. A total of 384 camels were examined for welfare issues, and 132 camel owners were interviewed. Most respondents were illiterate females with an average age of  $37.44 \pm 5.9$  years, originating from Shabelay, Harawo, and Danbal areas. All participants owned and used their camels for transport, primarily for carrying wood, charcoal, and other goods. Camels typically transported around eight sacks of charcoal or an average load of  $60.23 \pm 13.27$  kg. Rope and sticks were commonly used to guide and control the animals. Camel transport occurred twice a week, with animals walking 6–10 hours per day on both footpaths and vehicle roads. Body condition scoring showed 15.1% of camels were in good condition, 52.6% medium, and 32.3% poor. Physical examination revealed a wound prevalence of 52.3%, mainly affecting the back, chest, legs, and neck. Ticks were present on 53.4% of the camels. While most owners allowed their camels to rest at least once during long journeys, others did not. Traditional remedies were predominantly used to treat injuries; few sought veterinary services, while some relied on self-healing. The study found that camel welfare awareness among owners was very low. Despite this, some indigenous practices were applied to reduce stress, such as using protective saddles, feeding and watering before transport, resting during long trips, and training camels for better cooperation. Common challenges faced included long travel distances, lack of feed and water, poor market access, and road disruptions. Overall, the findings highlight the limited understanding and attention given to camel welfare and management practices. To improve the welfare and productivity of transport camels, it is recommended that government agencies promote awareness through mass education, extension programs, training, and advisory services.

### INTRODUCTION

More than 35 million camels are estimated to exist globally, with approximately 90% comprising the one-humped camel (*Camelus dromedarius*), which thrives in arid and semi-arid climates (FAO, 2018; El-Agamy, 2006). These dromedaries are multifunctional animals, valued for their milk and meat production, and utilized for transportation, labor, and as financial and social assets for millions (Wilson, 1998; Farah *et al.*, 2007; Mehari *et al.*, 2007). Africa accounts for over 80% of the global camel population, with Sudan, Somalia, Ethiopia, and Kenya collectively holding 60% of this population (Faye, 2015). In Ethiopia, camel husbandry plays a significant role in the livestock systems of the arid and semi-arid lowlands. The country hosts around 8.14 million dromedaries (CSA, 2021), predominantly managed by pastoral and agro-pastoral communities in the Somali, Afar, and Oromia regions (Tadesse *et al.*, 2014; Legesse *et al.*, 2018). Although milk production remains the principal purpose of camel rearing, camels are also important for meat, transport, income generation, draught power, and sociocultural functions (Wilson, 1998; Eyassu, 2009; Semeneew *et al.*, 2013; Mirkena *et al.*, 2018). Moreover, live

camels are exported to neighboring and Middle Eastern countries such as Egypt, Djibouti, Somalia, Libya, Saudi Arabia, the United Arab Emirates, and Yemen. Between 2008 and 2017, Ethiopia exported 688,021 camels (Gebregziabher & Sileshi, 2019; Gezahegn, 2019).

Despite the importance of camel production, recurring droughts and rangeland degradation continue to challenge livestock productivity (Biffa and Chaka, 2002). Climate change is an undeniable reality with far-reaching effects (FAO, 2009). According to Ben Salem *et al.* (2011), camels are uniquely suited to withstand emerging threats such as environmental stress, global warming, land degradation, and competition over feed and water. Ethiopian studies have also confirmed the resilience of camels compared to other livestock under changing climatic conditions (Zelalem *et al.*, 2009; MOA, 2013; Megersa *et al.*, 2014). As climate challenges intensify, camel production may increasingly replace other forms of agriculture and livestock rearing in arid African regions (Jones & Thornton, 2009; Megersa *et al.*, 2014).

This resilience is attributed to camels' distinctive physiological, anatomical, and behavioral adaptations, which allow them to cope effectively with high

<sup>1</sup> Somali Region Livestock and Agriculture Research Institute, Jigjiga, Ethiopia

<sup>2</sup> College of Veterinary Medicine, Jigjiga University, Jigjiga, Ethiopia

<sup>3</sup> Department of Animal & Range Science, College of Dryland Agriculture, Jigjiga University, Jigjiga, Ethiopia

\* Corresponding author's e-mail: [foziya4657@gmail.com](mailto:foziya4657@gmail.com)

temperatures and limited feed and water resources (Wilson, 1998; Megersa *et al.*, 2014). Their significance is growing both domestically and internationally. Once regarded solely as the “ship of the desert,” camels are now viewed as efficient producers that can be integrated into modern and intensified livestock systems (Faye, 2015). Their milk, noted for its nutritional and therapeutic qualities, is gaining popularity in global markets (Konuspayeva, 2020). Consequently, camel rearing is expanding into mid-altitude zones, accompanied by increasing scientific interest (Bediye *et al.*, 2018).

Globally, there is a rising concern about animal welfare, particularly in relation to ensuring humane and ethical treatment. While camel husbandry is expanding and its significance is widely acknowledged, attention to the welfare of camels remains limited (Padalino and Menchetti, 2021). Enhancing animal welfare not only improves animal well-being but also contributes to better health by preventing chronic stress that may weaken the immune response (Annamaria, 2015).

Transportation has emerged as a critical area where camel welfare is often compromised (Saeb *et al.*, 2010). In recognition of this, the World Organization for Animal Health has developed guidelines specifically addressing the transport of camels by land (OIE, 2019). Transporting animals, particularly live camels, often involves conditions that can lead to stress, injury, dehydration, overheating, and exhaustion (Emeash *et al.*, 2016; Padalino & Menchetti, 2021). Thus, it is essential to evaluate the welfare conditions of camels used for transportation and ensure that minimum standards are met.

In Ethiopia, camels support pastoral livelihoods by providing milk, meat, hides, and transportation. They are commonly employed to transport goods for trade, slaughter, and export purposes, often covering long distances under challenging conditions (Bediye *et al.*, 2018). In many cases, handling practices are harsh and do not align with accepted animal welfare principles (Asebe *et al.*, 2016). Transport-related stressors such as pain, fear, and physical injuries frequently occur during loading, unloading, and transit. These issues are particularly severe in pastoral regions where animals may be moved over great distances without access to water or feed (Pastrana, 2020).

Although some welfare-related studies have been conducted in Ethiopia, most have focused on cattle and small ruminants in the highland areas (Jerlstrom, 2013; Grönvall, 2013). There is a noticeable gap in the literature concerning the welfare of camels, especially in relation to compliance with basic welfare standards. In light of this, the present study aims to evaluate the welfare status of camels used for transport in Fafan Zone, Somali Regional State, Ethiopia.

## MATERIALS AND METHODS

### Description of the Study Area

This study was carried out in the Fafan Zone of the Somali Regional State (SRS) in Ethiopia. The zone comprises eleven woredas: Shebelley, Haroreys, Tullu-

Guleed, Goljano, Mula, Harawa, Harshin, Kebribeyah, Babile, Awbare, and Gursum. Jigjiga, the capital of both the zone and the region, is located approximately 620 kilometers southeast of Addis Ababa. Geographically, the Fafan Zone lies in the northern part of SRS, sharing borders with the Republic of Somalia to the east, Oromia Regional State and Erer Zone to the west, and Jerer Zone to the south. According to the 2014 Central Statistical Agency (CSA) report, the zone has a total population of 1,190,794, comprising 616,810 men and 573,984 women. The total land area is about 40,861 km<sup>2</sup>, with rangelands covering approximately 36,629 km<sup>2</sup> (LRDB, 2016). The topography is predominantly flat to gently sloping (52.6%), followed by hilly areas (31%), and steep slopes (7%). The majority of the zone, around 95%, falls under the mid-altitude agro-ecological zone, with elevations ranging from 1500 to 2300 meters above sea level (IPS, 2002). The climate is generally hot throughout the year, with average minimum and maximum temperatures of approximately 20°C and 35°C, respectively. The area experiences bimodal rainfall, with an average annual precipitation of 660 mm. The main rainy seasons are the Gu (April to June) and the Deyr (October to November), while the dry periods, locally referred to as Jilaal and Hagaa, occur from December to March and July to September, respectively (LRDB, 2016). Livelihood systems in the Fafan Zone consist of pastoralism (34.1%), agro-pastoralism (56.8%), and sedentary farming (9.1%) (Belaynesh, 2006). Out of the estimated 6.4 million camels in the Somali Region, approximately 126,911 are found in the Fafan Zone (CSA, 2021).

### Study Design

This is a cross-sectional study design conducted to assess the welfare status of transport camels by using semi-structured questionnaire administered to camel owners and critical evaluation of key welfare indicators in the camels. The study was conducted in Jigjiga town, Fafan zone of Somali Regional State, from April to December 2021.

### Study Animals

The study animals included camels (*Camelus dromedarius*) with different age, sex, and body condition categories that were used to transport different materials from different woredas of Fafan zone to Jigjiga town.

### Sampling Technique and Sample Size Determination

Loaded camels enter Jigjiga town through, Shebelley, Awbere, Tuli-Guled routes. Accordingly, relevant data was collected along these major routes, in residential villages and in market areas. To determine the prevalence of welfare gaps, the sample size of camels was calculated by using the formula proposed by Thrusfield (2007):

$$N = \frac{Z^2 \cdot P_{\text{exp}} \cdot (1 - P_{\text{exp}})}{D^2}$$

Where:

N= the required sample size

1.96<sup>2</sup> = the value of Z at 95% confidence level  
 P<sub>exp</sub> = expected prevalence (=50%)  
 D = desired absolute precision level at 95% confidence interval (=0.05)  
 Since there was no previous work done in this area, the expected prevalence remains 50%. Accordingly, a total of 384 camels were subjected to sample collection. Despite the proposed plan to interview 120 camel owners, to get complete data of 384 camels, 132 owners were interviewed.

**Data Collection Methods**

Primary data was collected by using semi-structured questionnaire administered to camel owners and physical inspection of camels based on checklist of welfare indicators. Such data include demographic characteristics of the households (sex, age, educational level, origin, occupation, etc.) and key camel characteristics (sex, age, body conduction score, load type, etc.). Body condition score (BCS) was assessed on a scale of 3 categories (poor, medium and good) described by Robinson (2010). Welfare related information (working hours per day/ per week, presence of wounds, ticks, housing, transportation stress, access to feed and water, etc.) were systematically collected by physical observation and a checklist. The same checklist was used to capture the awareness of camel owners about camel welfare.

**Data Management and Analysis**

The collected data were entered into Microsoft Excel sheet and analyzed by using the Statistical Package for Social Sciences (SPSS), Version 21. Descriptive statistics such as tables, means, frequency distribution, percentages were used for data analyses and presentation.

**RESULTS AND DISCUSSION**

**Demographic Characteristics of the Respondents**

Among the 132 camel owners interviewed 94 (71.2%) were women and 38 (28.8%) were men. The mean age of respondents was 37.44±6.34 years, with range falling between 26 to 56 years. While the majority of the respondents (89.4%) did not receive any formal education, the remaining (10.6%) could read and write (Table 1). The interviewed camel owners were originated from Shabelley (48.5%), Harawo (31.8%) and Danbal (19.7%). All respondents loaded their own camels, there were no rented camels. Furthermore, all respondents were agro-pastoralists. The role of education is obvious in affecting household income, technology adoption, demography, health and the whole socio-economic status of the family as well as cited by Kerealem (2005). Similarly, Wendimu (2013) reported a higher proportion of illiteracy and religious school education for Gode and Adadile districts of Somali region. Majority of the respondents were illiterate indicating that their level of knowledge & awareness was limited.

**Table 1:** Sex, educational level, occupation, and woreda of respondents

Variables	Category	Frequency (N=132)	Percent
Sex	Male	38	28.8
	Female	94	71.2
Age (mean±SD)	37.44±6.34 years		
Educational level	Illiterate	118	89.4
	Literate	14	10.6
Origin (woreda)	Shabelley	64	48.5
	Harawo	42	31.8
	Danbal	26	19.7

**Characteristics of Transport Animals**

All of the 384 transport camels assessed were males, with an average age ranging from 8 to 16 years. Based on the body condition scoring scale by Robinson (2010), more than half (52.6%) of the camels had a medium body condition, while 32.3% had poor and 15.1% had good body condition scores.

**Types of Loads and Weights of Commodities Transported by Camels**

Table 2 shows that agro-pastoralists in the study area used camels to transport firewood, charcoal, and other household commodities. Specifically, 48.4% and 37% of the camels were used to carry firewood and charcoal,

respectively. The average weight of loads carried by camels was 60.23 ± 13.27 kg. Similarly, Eyasu (2009) and Yohannes *et al.* (2007) reported that camels are commonly used to transport goods and mobile houses during seasonal migrations in search of feed and water. Tefera and Abebe (2012) also indicated that camels possess high endurance and can carry up to 205 ± 50 kg of salt without food or water, transporting loads from an altitude of 116 meters below sea level in the Afar Depression (from the town of Berahle to Mekelle). In addition, Selamawit (2015) reported that a young camel can carry about 84 kg of salt blocks, a medium-sized camel 112 kg, and an adult camel up to 154 kg.

**Table 2:** Type of load and estimated weight of load transported by camels

Variables	Category	Frequency (N=384)	Percent
Type of load	Wood	186	48.4%
	Charcoal	142	37.0%
	Other commodities	56	14.6%
Estimated weight of load	60.23±13.27kg		

**Duration of Daily and Weekly Working Hours for Transport Camels**

Regarding the duration of working hours per day, the majority of respondents (44.7%) reported that their camels traveled for 6 to 10 hours to reach the Jigjiga market. Additionally, 25.8% estimated the travel time

to be less than 6 hours, while 29.5% indicated it took more than 10 hours. Furthermore, more than 75% of the respondents used their camels for transportation only once or twice per week (Table 3). This reflects the challenging conditions and difficulties agro-pastoralists face in reaching the market area.

**Table 3:** Duration of daily and weekly working hours of transport camels

Variables	Category	Frequency (N=132)	Percent
Working hours/day	< 6 hours	34	25.8%
	6-10 hours	59	44.7%
	> 10 hours	39	29.5%
Working days/week	1 days/week	58	44%
	2 days/week	44	33.3%
	3 days/week	18	13.6%
	>3 days/week	12	9.1%

**Road Conditions and Guiding Tools Utilized in Camel Transportation**

Loaded camels are introduced to Jigjiga town through Shebellay, Awbere and Tuli-Guled routes by using vehicle roads and or foot routes. Most (39.4%) of the agro-pastoralists involved in this study employed both foot and vehicle roads. About 34.8% and 25.8% of the respondents used foot and vehicle roads respectively (Table 4). Bediye *et al.* (2018) cited that in Ethiopia, camels are mainly transported to carry goods, for marketing, slaughter and

export, and that camels moved for domestic purposes are transported on foot.

Agro-pastoralists monitor and guide the movement of camels by using different tools. Fifty-three percent and 47% of the respondents in this study used ropes and sticks respectively (Table 4). The ropes and sticks were used to hit, frighten and speed up the movement of their camels, and also to direct them in the right direction. Both hitting and frightening camels are against the freedom of camels; however, they don't seem to cause serious welfare violation.

**Table 4:** Road type and guiding material used for transport camels

Factor	Response	Frequency (N=132)	Percent
Type of road	Foot road	46	34.8
	Vehicle road	34	25.8
	Both foot & vehicle road)	52	39.4
		<b>Frequency (N=384)</b>	
Guiding material	Stick	183	47.7
	Rope	201	52.3

**Traditional Welfare Mechanisms Employed During the Transportation of Camels**

Due to their unique morphological, behavioral, and physiological adaptive mechanisms, camels are highly tolerant of drought, feed and water scarcity, as well as long-distance transportation (Wilson, 1998; Megersa *et al.*, 2014). Agro-pastoralists are well aware of these qualities. Nevertheless, they practice certain indigenous stress-reduction mechanisms to ensure the welfare of transport camels. These practices include the use of

protective saddles, provision of feed and water before transportation, allowing camels to rest during long journeys, and training camels to respond to commands.

According to the findings of the present study, more than 70% of the respondents reported that they provided either feed alone or both feed and water before loading their camels for transportation (Table 5). Agro-pastoralists also allowed transport camels to rest at water points, browse lands, and after unloading in town. About 60% of the respondents reported allowing their animals to rest at least

once during transportation. Furthermore, camel owners used protective saddles, locally called koore, which are placed over the hump of camels. These saddles are traditionally made from two inverted forks of a tree connected by two wooden crossbars on each side of the hump. Sometimes, a third diagonal crossbar is added for additional stability. The inside of the inverted V-shape is padded down and padded with materials such as cloth, sacking, cotton waste, sponge mattresses, or grass and hay (Fig. 1). This is similar to the saddle known as Koa used by the Afar people, as cited by Tefera and Abebe (2012). Another stress-reduction mechanism practiced by agropastoralists is the use of traditional vocal commands known as “juu-ohoo” or “sit-down-get-up” commands.

Since camels are large and forceful animals, pastoralists have developed indigenous ways to command them during loading, unloading, and movement. Almost all respondents reported using similar vocal commands to make camels sit or stand. To make a loaded camel sit in sternal recumbency, a loop of rope is passed over the mandible, and the mouth rope is pulled forward and downward. Simultaneously, a light stroke is applied to the knee while loudly saying “Juu-Juu.” The camel then sits down in sternal recumbency. When the rope is pulled upward and the command sound changes to “ohoo-ohoo,” the camel stands up. Tefera and Abebe (2012) also described a similar restraining method used to bring camels into sternal recumbency by applying the same steps until the animal is fully recumbent.

**Table 5:** Indigenous stress-reduction mechanisms for transport camels

Mechanism	Response	Frequency (N=132)	Percent
Preparations before transportation	Give feed	48	36.4
	Give water	17	12.9
	Give feed and water	46	34.8
	Give nothing	21	15.9
Resting camels during transportation	Yes	78	59.1%
	No	54	40.9%



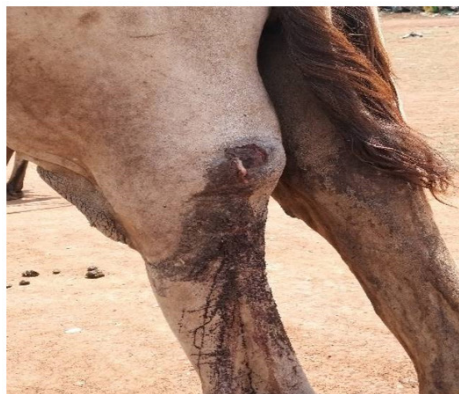
**Figure 1:** The V-shaped saddle used for transporting items on camels

**Health Welfare**

**Wounds**

Among the 384 camels subjected to physical inspection, 201 were found positive for wounds with the prevalence

rate of 52.3%. Different sized wounds were observed over different parts of the body, mainly on the back, chest, legs and the neck animals (Fig. 2).



**Figure 2:** Camels with wounds

### Tick infestation

From the 384 camels, 205 harbored ticks, thus with tick infestation rate of 53.4%. Similarly, Jabir *et al.* (2017) found that tick infestation (28.5%) was the most common ecto-parasites of the camels in Dire Dawa Administration Council, Eastern Ethiopia. As cited by Hasan and Agonafir (2018), it is well known that ticks cause severe economic losses either by transmitting a variety of diseases or affects the health and productivity of animals. As cited by Mohsen *et al.* (2013) the main effect of tick infestation in one humped camel is mild to severe anemia, loss of appetite, leading to a reduction in growth rate and decreased productivity. Additionally, ticks are responsible for direct damage to the camels through their feeding habits, damage to udders, teats and scrotum, myiasis due to infestation of damaged sites by maggots and secondary microbial infections.

### Health Service Delivery

Agro-pastoralists obtain camel health service from different sources. According to the present findings 35.6% of the respondents get the service from government veterinary clinics. While about 47% of the respondents get the service from local doctors, the remaining 17.4% leave camels to heal by themselves. Similarly, Lamuka *et al.* (2017) stated that the treatment of camels and other livestock is mostly done by pastoralists themselves (45.8%), and also by CBAHWs (16.7%) or traditional animal health service providers (TAHSP) (15.3%) but very few remaining government veterinary officers (12.5%). Provision of veterinary clinical services from private professional veterinary officers is minimal (9.7%), indicating that private veterinary practice has not taken root in the ASALS. This indicates that their provision of government veterinary clinics was limited and private

**Table 6:** Type of load and estimated weight of load transported by camels

Variables	Category	Frequency (N=132)	Percent
Care of sick/injury animal	Take to veterinary clinic	47	35.6
	Traditional medications	62	47.0
	Leave to self-healing	23	17.4

professional veterinary services has not taken root.

### Feeding and Watering of Transport Camels

The major feed resources of camels in the study area were browse trees, shrubs, and crop residue. The major feed resources of camels in the study area were browse trees, shrubs, and crop residue. Several studies (Bekele & Kibebew, 2002; Tefera & Abebe, 2012; Mirkena *et al.*, 2018) have stated that the major camel feed resources in Ethiopia are browsing trees and shrubs. During dry seasons, however, the quantity and quality of these feed resources decreases, and also (Eyasu, 2009), Individual stock ownership, communal use of open areas and seasonal migration of herds and households characterizes traditional pastoral livestock production in Ethiopia. Camel can consume poor nutritional value plant that other animal species refuse. Camels in Jigjiga and Shinile areas feed only on unimproved perennial natural vegetation of low nutritive value and they are not given supplementary feed. In regard to watering frequency, camels were given water once in a week (20%), twice a week (50.8%) and three times a week (29.2%).

### Housing of Transport Camels

The study revealed that camel owners keep their camels mainly in open kraals mainly surrounded by thorny acacia trees. Similarly, Mirkena *et al.* (2018) cited those camels are usually kept during night in traditional kraals made of thorny bushes and tree branches around homesteads or settlements as protection from predators and thieves/raiders. These traditional kraals made up of thorny bushes are also used in Southern parts of Ethiopia as reported by Dejene (2017). However, the limitation of this type of house is that animals are exposed to the rainfall and

extreme weather conditions, especially during the severe cold winter-nights and high daily temperatures during the spring and autumn seasons.

### Level of Awareness Regarding Camel Welfare

Table 7 shows the awareness and knowledge of camels among respondents. Out of the total respondents, 32.5% had heard about camel welfare and indicated the right to provide feed and water (22.5%) and the right to receive treatment (10%). On the other hand, about 40.8% believed that camels deserve some rights, including freedom from thirst and hunger, and freedom from injury and disease. This is in line with the study conducted by Ashinde *et al.* (2017), who found that about 63.2% of donkey owners in and around Hawassa town were not aware of animal welfare. Out of the total respondents, 60% of owners were forced to use their camels while they had wounds, and about 40% of owners used their camels only after the wounds had healed. Irrespective of the type of animal, Ashinde *et al.* (2017) reported that 90.4% of owners in and around Hawassa town were forced to use their donkeys while they had wounds, and only 9.6% of owners used their donkeys after the wounds had healed.

### Challenges during Transportation

Long distances, shortage of feed and water, lack of market, and vehicle movement disruption were the most common challenges raised by camel owners during transportation as shown Figure 3. Similarly, Eyasu (2009) reported that the lack of roads and transportation facilities and the inaccessible terrain are the major problems in most pastoral areas of Somali region, Ethiopia. In addition, Teha *et al.* (2017) also reported that lack of food and

**Table 7:** Respondents' perceptions of camel welfare (N = 132)

Variables	Category	Frequency	Percent
Have you heard about camel welfare/right?	No	89	67.5
	Yes	43	32.5
If yes, list them (N=43)	The right to give feed and water	30	69.8
	The right to get treated	13	30.2
If no, do you think they deserve any right? (N=89)	Yes	54	60.5
	No	35	39.5
If yes, what will be some of these rights?	Freedom from thirst and hungry	34	63%
	Freedom from injury and disease	20	37%
	Freedom from pain and discomfort	0	0
	Freedom to express normal behavior and enough space to move	0	0
	Freedom from fear and distress	0	0
Do you use your camel while wounded? (N=132)	Yes	79	59.8%
	No	53	40.2%

water, overworking and over loading, are the main welfare problems of camel in Dire Dawa town of Ethiopia. Coffey *et al.* (2001) and Schwartzkopf-Genswein *et al.* (2016) also

reported that loading conditions, weather conditions, animal nutrition, health status, and physical condition are all factors to be considered when transporting livestock.



**Figure 3:** Transported camels disturbed by moving vehicles on the road

### CONCLUSION

Camels are essential for transportation among agro-pastoralist communities, particularly for carrying heavy loads such as wood and charcoal. Despite their importance, camels are often kept in open kraals made from thorny acacia trees, leaving them exposed to harsh environmental conditions, including extreme cold at night and high temperatures during the day. This poor management results in a high prevalence (52.3%) of wounds on various parts of the camel's body, especially the back, chest, legs, and neck. Many owners continue to use wounded camels for transport but apply indigenous stress-reduction measures such as protective saddles, offering feed and water before travel, allowing mid-journey rest periods, and training camels to follow commands willingly. Tick infestation was recorded in 53.4% of the camels, suggesting a widespread problem of ectoparasites, which could compromise animal health and reduce productivity. However, access to veterinary

services is limited, and many agro-pastoralists depend on traditional healers or let animals recover without intervention. The study concluded that camel welfare knowledge is low, and most owners pay little attention to essential husbandry practices such as feeding, housing, watering, and healthcare. To improve camel welfare, the study recommends community awareness creation through government-led education, extension services, and training programs. Development organizations should support camel owners through practical training and participatory approaches to enhance management and welfare practices.

### REFERENCES

Asebe, G., Gelayenew, B., & Kumar, A. (2016). The general status of animal welfare in developing countries: The case of Ethiopia. *Journal of Veterinary Science and Technology*, 7, 332. <https://doi.org/10.4172/2157-7579.1000332>

- Ashinde, A., Gashaw, A., & Abdela, N. (2017). Health and welfare status of donkeys in and around Hawassa Town, Southern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 9(11), 300–312. <http://www.academicjournals.org/JVMAH>
- Bediye, S., Tilahun, S., & Kirub, A. (2018). Engaging opportunities for camel production. *Ethiopian Somali Region Pastoral and Agro-pastoral Research Institute (ESoRPARI)*.
- Bekele, T., & Kibebew, T. (2002). Camel production and productivity in eastern lowlands of Ethiopia. In *Livestock in food security – Roles and contributions* (pp. 145–161). Ethiopian Society of Animal Production.
- Ben Salem, H., Mourad, R., Narjess, L., & Mohamed-Aziz, D. (2011). Global warming and livestock in dry areas: Expected impacts, adaptation and mitigation. In H. Kheradmand (Ed.), *Climate change – Socioeconomic effects* (pp. 225–252). InTech. <https://www.intechopen.com/books/climate-change>
- Biffa, D., & Chaka, H. (2002). Camel and the changing system of Borana pastoral production. In *Proceedings of the Annual Conference of the Ethiopian Veterinary Association (EVA)* (pp. 1–8). Addis Ababa, Ethiopia.
- Coffey, K. P., Coffey, W. K., Coblenz, J. B., Humphry, W. B., & Brazle, F. K. (2001). Basic principles and economics of transportation shrink in beef cattle. *The Professional Animal Scientist*, 17(4), 247–255. [https://doi.org/10.15232/S1080-7446\(15\)31636-3](https://doi.org/10.15232/S1080-7446(15)31636-3)
- CSA (Central Statistical Agency). (2014). *Ethiopian statistical abstract*. Federal Democratic Republic of Ethiopia.
- CSA (Central Statistical Agency). (2021). Agricultural sample survey 2013 E.C. *Volume II: Report on livestock and livestock characteristics* (private peasant holdings) (pp. 39–40).
- Dejene, T.G. (2017). Husbandry practices and utilization of camel products in Borana Zone of Southern Oromia, Ethiopia. *Science Research*, 3(4), 191–197. <https://doi.org/10.17582/journal.pjz/20200227090212>
- El-Agamy, E. I. (2006). Camel milk. In Y. W. Park & G. F. W. Haenlein (Eds.), *Handbook of milk of non-bovine mammals* (pp. 297–344). Blackwell Publishing.
- Emeash, H. H., Mostafa, A. S., Karmy, M., Khalil, F., & Elhussiny, M. Z. (2016). Assessment of transportation stress in dromedary camel (*Camelus dromedarius*) by using behavioral and physiological measures. *Journal of Applied Veterinary Science*, 1(1). [https://javs.journals.ekb.eg/article\\_61827\\_41b0cbf54af34204f14e5867d0e516e0.pdf](https://javs.journals.ekb.eg/article_61827_41b0cbf54af34204f14e5867d0e516e0.pdf)
- Eyassu, S. (2009). Analysis on the contributions of and constraints to camel production in Shinile and Jijiga zones, eastern Ethiopia. *Journal of Agriculture and Environment for International Development*, 103(3), 213–224.
- FAO. (2009). The state of food and agriculture: Livestock in the balance. *Food and Agriculture Organization of the United Nations*.
- FAO. (2018). *FAO statistics 2018*. Food and Agriculture Organization of the United Nations.
- Farah, Z., Mollet, M., Younan, M., & Dahir, R. (2007). Camel dairy in Somalia: Limiting factors and development potential. *Livestock Science*, 110(1–2), 187–191.
- Faye, B. (2015). The camel today: Assets and potentials. *Antropozoologica*, 49(2), 167–176.
- Gebregziabher, G., & Sileshi, Y. (2019). The impact of live animal export on meat and meat products export in Ethiopia. *International Journal of Research – Granthaalayah*, 7(9), 162–171. <https://doi.org/10.29121/granthaalayah.v7.i9.2019.585>
- Grönvall, A. (2013). *Animal welfare in Ethiopia: Handling of cattle during transport and operations at Kera Abattoir, Addis Ababa*. [Bachelor's thesis, Swedish University of Agricultural Sciences].
- IPS (Industrial Project Service). (2002). *Resource potential assessment and project identification study in Somali Region: Agriculture resource report*.
- Jabir, T., Lishan, A., Tadesse, B., & Ayele, G. (2017). Major health and welfare problems of camels in Dire Dawa Administration Council, Eastern Ethiopia. *Researcher*, 9(4), 84–88. <http://www.sciencepub.net/researcher>
- Jerlstrom, J. (2013). *Animal welfare in Ethiopia: Transport to and handling of cattle at market in Addis Ababa and Ambo*. [Bachelor's thesis, Swedish University of Agricultural Sciences].
- Jones, P. G., & Thornton, P. K. (2009). Croppers to livestock keepers: Livelihood transitions to 2050 in Africa due to climate change. *Environmental Science & Policy*, 12(4), 427–437.
- Konuspayeva, G. S. (2020). Camel milk composition and nutritional value. In I. G. *Scientific Publishing (Ed.), Handbook of research on health and environmental benefits of camel products* (pp. 15–40). IGI Global.
- Lamuka, P. O., Njeruh, F. M., & Gitao, G. C. (2017). Camel health management and pastoralists' knowledge and information on zoonoses and food safety risks in Isiolo County, Kenya. *Pastoralism*, 7, 20. <https://doi.org/10.1186/s13570-017-0095-z>
- Legesse, Y. W., Dunn, C. D., Mauldin, M. R., Ordonez-Garza, N., Rowden, G. R., Gebre, Y. M., ... & Bradley, R. D. (2018). Morphometric and genetic variation in 8 breeds of Ethiopian camels (*Camelus dromedarius*). *Journal of Animal Science*, 96(12), 4925–4934.
- Megersa, B., Markemann, A., Angassa, A., Ogutu, J. O., Piepho, H. P., & Zárate, A. V. (2014). Livestock diversification: An adaptive strategy to climate and rangeland ecosystem changes in Southern Ethiopia. *Human Ecology*, 42(4), 509–520.
- Mehari, Y., Mekuriaw, Z., & Gebru, G. (2007). Potentials of camel production in Babilie and Kebribeyah woredas of the Jijiga Zone, Somali Region, Ethiopia. *Livestock Research for Rural Development*, 19(4).
- Mirkena, T., Walelign, E., Tewolde, N., Gari, G., Abebe, G., & Newman, S. (2018). Camel production systems in Ethiopia: A review of literature with notes on MERS-CoV risk factors. *Pastoralism*, 8(1), 30. <https://doi.org/10.1186/s13570-018-0135-3>
- MOA (Ministry of Agriculture). (2013). *Veterinary*

- service delivery in remote areas. *Animal Health and Fisheries Resources Development Department*.
- OIE (World Organisation for Animal Health). (2019). *Terrestrial animal health code*. <https://www.oie.int/en/standard-setting/terrestrial-code/access-online/>
- Padalino, B., & Menchetti, L. (2021). The first protocol for assessing welfare of camels. *Frontiers in Veterinary Science*, 7, 631876. <https://doi.org/10.3389/fvets.2020.631876>
- Passantino, A. (2011). Welfare issues of donkey (*Equus asinus*): A checklist based on the five freedoms. *Journal für Verbraucherschutz und Lebensmittelsicherheit*, 6, 215–221. <https://doi.org/10.1007/s00003-010-0638-3>
- Pastrana, C. I., González, F. J. N., Ciani, E., Capote, C. J. B., & Bermejo, J. V. D. (2020). Effect of research impact on emerging camel husbandry, welfare and social-related awareness. *Animals*, 10(5), 780.
- Robinson, I. (2010). PET-livestock Somalia: A pictorial evaluation tool (PET) for livestock condition scoring in Somalia. AA International Ltd.
- Schwartzkopf-Genswein, K. S., Ahola, J. K., Edwards-Callaway, L. N., Hale, D. S., & Paterson, J. A. (2016). Transportation issues affecting cattle well-being and considerations for the future. *The Professional Animal Scientist*, 32(6), 707–716.
- Selamawit, T. (2015). Impact of camel transportation on pastoralist livelihoods in Ethiopia: Findings from Berahle Woreda, Afar Regional State. *IIED*. <http://pubs.iied.org/10127IIED>
- Tadesse, Y., Urge, M., Abegaz, S., Kurtu, M. Y., Kebede, K., & Dessie, T. (2014). Husbandry and breeding practices of dromedary camels among pastoral communities of Afar and Somali regional states, Ethiopia. *Journal of Agriculture and Environment for International Development*, 108(2), 167–189.
- Tefera, M., & Abebe, G. (2012). *Camel in Ethiopia*. Ethiopian Veterinary Association. ISBN: 9789994498192
- Wilson, R. T. (1998). *Camels: The tropical agriculturalist*. CTA.
- Yohannes, M., Zeleke, M., & Getachew, G. (2007). Potentials of camel production in Babilie and Kebribeyah Woredas of the Jijiga Zone, Somali Region, Ethiopia. *Livestock Research for Rural Development*, 19(4).
- Zelalem, Y., Aynalem, H., Emmanuelle, G., & Addis, A. (2009). Effect of climate change on livestock production and livelihood of pastoralists in selected pastoral areas of Borana, Ethiopia. In *Proceedings of the 17th Annual Conference of the Ethiopian Society of Animal Production* (pp. 3–21). Addis Ababa.