

EVALUATION OF BUFFALO FARMS IN TERMS OF BIOSECURITY AND ANIMAL WELFARE

Hatice Çat^{ORCID}, Orhan Ermetin^{ORCID}✉

Received on October 25, 2024

Presented by H. Najdenski, Member of BAS, on December 17, 2024

Abstract

This study was carried out in Yozgat province, with 728 female buffalos on 71 farms, to reveal the current status of buffalo farms in terms of biosecurity and animal welfare through face-to-face surveys, observations, and measurements. In the study, a protocol developed by the ANI (Animal Needs Index) 35L and Welfare Quality[®] protocol system used in cattle was applied to evaluate the conformity of the structures and equipment of buffalo farms to animal welfare criteria, and female animals in the farms were scored individually. In barn cleaning, it was observed that 18.3% were dirty, 69% were moderately clean, and 12.6% were clean. Similar rates were also seen in cleaning the floor, feeding area, water drinking area, lying area, milking area, and equipment used. In the study, while the rates of animals with dirty udder, dirty hind leg, and dirty hind part were calculated as 47.66%, 48.94%, and 51.03% in farms with 5–10 animals, these rates were calculated as 50.07%, 51.53% and 52.01%, in farms with 11–20 animals, and 37.52%, 43.83% and 43.24% in farms with more than 21 animals. As a result, in buffalo farms in Yozgat province, generally appropriate welfare conditions are not provided according to ANI (Animal Needs Index) 35L and the Welfare Quality[®] welfare measurement method. The reasons for this can be listed as lack of education, small, closed, and tied structures of farms, farming methods carried out together with cattle farming, and insufficient importance given to buffalos' feeding and care conditions.

Key words: buffalo, biosecurity, animal welfare, ANI 35L/2000, welfare quality[®] (2009) protocol

<https://doi.org/10.7546/CRABS.2025.02.17>

Introduction. Buffalos can adapt to different environmental conditions, reduce breeding costs by converting low-quality feed into meat and milk, and resist diseases [1]. Buffalo breeding is especially concentrated in Asia, with India leading with 109.7 million, Pakistan with 41.2 million, and China with 27.2 million buffalo. Turkey ranks 20th in the world rankings as of 2020 and has the highest number of buffalo in Europe after Italy [2]. Buffalo milk provides butter and cheese production efficiency since it contains more fat, protein, and dry matter than cow's milk. It also highlights its low cholesterol and high vitamin E content [3]. Despite the interest in buffalo milk and meat products in Turkey, there is a decrease in the number of buffalo. Buffalo breeding is generally carried out in rural areas using traditional methods, and market-oriented production styles are not created. In addition, a sustainable breeding model has not been developed.

Biosecurity is essential for controlling infectious diseases, encompassing farm management and health practices to minimize herd disease risk. It enhances animal welfare, productivity, food safety, and reduces treatment costs. Key measures include eliminating pathogens, boosting immunity, maintaining hygiene, and employing skilled personnel [4].

Biosecurity and biological risk management in modern farming provide an effective barrier against potential threats [5]. The disease risk depends on the number of animals, species, contact between herds, and the combination of preventive measures [6]. However, neglecting biosecurity plans can lead to economic losses and long quarantine processes. Diseases can be transmitted to animals through direct contact or indirectly through infected objects or live vectors. Therefore, simple biosecurity measures are very important to prevent epidemics' spread.

Animal welfare refers to the quality of life of animals, encompassing health, behaviour, care practices, and ethical considerations [7]. It aligns with the values of husbandry systems, supporting sustainable production. Welfare depends on the ability to cope with environmental challenges and requires a peaceful environment, closely tied to well-being and health [8]. Assessing welfare involves species-specific protocols and farm-level monitoring, as environmental and management factors directly impact welfare [9,10].

Material and methods. This study evaluated the biosecurity and animal welfare status of buffalo breeding farms in Yozgat province. Through face-to-face surveys, observations, and measurements, 71 farms were determined from 175 buffalo breeders, with at least five female buffalo who volunteered for the study. It was determined that the farms examined had a total of 1277 head of buffalo (female, male, and calves), and 728 female buffalo were evaluated according to the welfare criteria.

In this study, a method adapted from the ANI 35L protocol used in cattle was applied to evaluate the compliance of the structures and equipment of buffalo farms with the animal welfare criteria. The farms were visited, and the cleanliness of the barn, floor, feeding and drinking areas, and the milking area and equipment

status were evaluated according to seven parameters according to the protocol developed by BARTUSSEK et al. [11].

For animal health and welfare, female animals were evaluated individually using the Welfare Quality® protocol [12]. In the welfare assessment, nine parameters were considered: body condition, cleanliness of the udders and legs, skin changes, nasal, eye, vulva discharges, and diarrhea. Two people did all observational assessments, while barn measurements were made with equipment.

To determine the distribution of animal welfare values, the farms were divided into three groups according to the number of female animals they had: 5–10, 11–20, and more than 20. The data were analyzed using the Shapiro–Wilk normality, Levene homogeneity, and Kruskal–Wallis H tests.

Findings and discussion. Biosecurity precautions. Table 1 shows biosecurity practices in farms.

As seen in Table 1, it was determined that 84.5% of the breeders in the study did not know the meaning of biosecurity and did not fully take biosecurity measures in their farms. It was determined that all of the farms examined in the study had closed barns, and it was reported that most buffalo farms in Amasya province (92.8%) were similarly closed [13]. It was also determined that the buffalos were tied in barns in all the farms examined and that many welfare parameters of the tied animals could not be evaluated. Similar findings were revealed by ŞEKER et al. [14] in the Muş province, where 97.5% of the breeders raised their animals tied and 2.5% in a free system. In the study, it was observed that the necessary tests were not performed when importing animals from outside the farms, quarantine measures were not taken, male and female breeding stock was generally provided from within the herd (93.0%), and buffalo bulls remained in the herd throughout the year (94.4%). It has been determined that animal shelters are generally in the farmhouse's courtyard (64.8%) and that the method of protecting feed raw materials from birds, cats, dogs, and insects is protected in a closed area (53.5%) without taking special precautions.

In the current study, although shelters are mostly in the courtyard, providing ease of maintenance and security, this situation threatens the breeders' living standards and health conditions.

The possibility of the emergence and spread of the disease is affected by a combination of factors such as the number of animals, species or breed, contact between herds, and preventive measures. Strengthening biosecurity measures is seen as one of the most effective methods to prevent diseases from entering farms and to prevent the spread of existing infections. Taking animals from outside to the herd without quarantine and keeping the young ones together with adult animals poses serious risks, especially for young animals with low immunity [15].

Distribution of animal welfare values. In the ANI 35L method, parameters related to the shelter structure and management practices of the farms are mainly evaluated. This method questions the extent to which the environment in

T a b l e 1

Biosecurity measures and shelter management practices in farms

Questions	Parameters	<i>n</i>	%
Do you know what biosecurity is?	Yes	11	15.5
	No	60	84.5
Biosecurity measures taken	Quarantine	31	43.7
	Avoiding communal pasture use	14	19.7
	Keeping records and monitoring health records	9	12.7
	Controlled entry and exit to the farm	12	16.9
	Taking precautions when visiting neighbouring farms	5	7
Wearing special work clothing on the farm	Yes	9	12.7
	No	62	87.3
The presence of security cameras on the farm	Yes	14	19.7
	No	57	80.3
How do you provide breeding bulls (buffalo males)?	From own herd	66	93
	From animal market	4	5.6
	From neighbouring herds	1	1.4
How do you provide breeding buffalo cows (females)?	From own herd	68	95.8
	From animal market	3	4.2
Criteria when buying animals externally	By talking with the seller	25	35.2
	I inspect the buffalo personally	46	64.8
Do you conduct tests after purchasing animals?	Yes	1	1.4
	No	70	98.6
Reasons for not conducting tests	I do conduct tests	1	1.4
	I do not believe it is beneficial	16	22.5
	I do not know what the tests are	23	32.4
	It was never recommended to me	1	1.4
	Tests are too expensive	30	42.3
Do you quarantine purchased animals?	Yes	24	33.8
	No	18	25.4
	Sometimes	23	32.4
	Never	6	8.5
Do you keep regular health records?	Yes	24	33.8
	No	47	66.2
Are your farm boundaries secure?	Yes	68	95.8
	No	3	4.2
How do you protect feed from birds, cats, dogs, and insects?	No special precautions	28	39.4
	Stored indoors	38	53.5
	Proper storage	1	1.4
	Proper storage with regular cleaning and inspection	4	5.6
How long do males stay with the herd?	30 days	1	1.4
	60 days	3	4.2
	All year round	67	94.4
Location of shelters	Under the farmhouse	7	9.9
	In the courtyard	46	64.8
	Separated from the farmhouse	18	25.4

which the animal lives provides welfare rather than animal-focused parameters. However, the use of animal parameters to determine the effect of environmental factors on the animals is recommended by many researchers in assessing the level of welfare [16].

T a b l e 2

Distributions of animal welfare assessments of farms according to
ANI (Animal Needs Index) 35L protocols

	Parameters	<i>n</i>	%		Parameters	<i>n</i>	%
Barn cleaning	3- Dirty	4	5.6	Rest area cleaning	2- Dirty	1	1.4
	4- Dirty	9	12.7		3- Dirty	1	1.4
	5- Medium	38	53.5		4- Dirty	20	28.2
	6- Medium	11	15.5		5- Medium	27	38
	7- Clean	5	7		6- Medium	13	18.3
	8- Clean	4	5.6		7- Clean	5	7
Floor cleaning	3- Dirty	1	1.4	Milking area cleaning	8- Clean	3	4.2
	4- Dirty	17	23.9		9- Clean	1	1.4
	5- Medium	33	46.5		2- Dirty	1	1.4
	6- Medium	11	15.5		3- Dirty	1	1.4
	7- Clean	5	7		4- Dirty	20	28.2
	8- Clean	4	5.6		5- Medium	27	38
Feeding area cleaning	4- Dirty	8	11.3	Cleaning of other additional equipment	6- Medium	13	18.3
	5- Medium	31	43.7		7- Clean	5	7
	6- Medium	14	19.7		8- Clean	3	4.2
	7- Clean	15	21.1		9- Clean	1	1.4
	8- Clean	2	2.8		None	14	19.7
	9- Clean	1	1.4		3- Dirty	1	1.4
Cleaning of drinking water area	4- Dirty	8	11.3		4- Dirty	13	18.3
	5- Medium	28	39.4		5- Medium	23	32.4
	6- Medium	16	22.5		6- Medium	11	15.5
	7- Clean	15	21.1		7- Clean	4	5.6
	8- Clean	3	4.2		8- Clean	2	2.8
	9- Clean	1	1.4		9- Clean	3	4.2

Table 2 reveals that barn cleanliness is categorized as 18.3% dirty, 69% moderately clean, and 12.6% clean. Similar rates are observed in the cleaning of the floor, feeding area, water drinking area, lying area, milking area, and additional equipment used. All the farms where the study was conducted are closed and connected systems. Therefore, although it is stated that barn cleaning is done manually every day (88.7%), it is observed that the necessary cleaning conditions are not sufficiently met.

When welfare assessment is made with the ANI 35L system, the ANI score is calculated for the farm by adding the scores obtained from the categories of mobility, social communication, floor quality, barn climate conditions, and care, and a decision is made about the welfare level of the animals on the farm based on this score. In this study, the total scores received by the farms using the connected system reveal that these farms are unsuitable for animal welfare. In addition, the ANI method can provide information on which issues should be improved to reach the targeted welfare level [11]. The most important disadvantage of the ANI

method is that if a very high score is received in a category, the welfare level of the business can be evaluated as good even if very low scores are received from some criteria that are very important in terms of welfare [17].

The Welfare Quality[®] protocol assesses animal welfare by evaluating health, nutrition, shelter, and behaviour [18]. It incorporates environmental and resource-based criteria (e.g., farm structure, human-animal interactions) and animal-based criteria (e.g., emotions, behaviours, health) through direct observation [19]. In dairy farming, welfare is assessed using physiological, health, and behavioural parameters. KECICI et al. [20] classified 58 buffalo farms by size and evaluated them using the ANI system, finding welfare conditions favourable due to the region's suitable climate and semi-open free-stall housing. They highlighted the need to adapt ANI criteria to buffalo-specific characteristics.

In our study, 71 farms and 728 female buffalos were examined, and animals with dirty udders, animals with dirty hind legs, animals with dirty hind parts, animals with skin changes (hairless area, lesions/swelling), animals with nasal discharge, animals with eye discharge, animals with vulva discharge and animals with diarrhea were observed and marked on the questionnaire form. The farm sizes were divided into three groups with 5–10, 11–20, and more than 20 female animals. According to animal size, the dirty breast rate, dirty hind leg rate, and the rate of animals with dirty hind parts were calculated. Normality assumptions were examined using the Shapiro–Wilk normality test and variance homogeneity Levene variance homogeneity tests. As a result of the analysis, it was determined that the assumptions were met. Accordingly, one-way variance analysis was performed (Table 3).

When Table 3 is examined, the dirty udder rate, dirty hind leg rate, and the rate of animals with dirty back parts in farms with 5–10 animals were calculated as 47.66%, 48.94%, and 51.03%, respectively, in farms with 11–20 animals, this rate was calculated as 50.07%, 51.53%, and 52.01%. As a result of the analysis, no statistically significant difference was found in terms of the size of the farm in terms of the dirty udder rate, dirty hind leg rate, and the rate of animals with dirty back parts ($P > 0.05$). Since the assumptions were not met as a result of

T a b l e 3

Comparison results of dirty udder rate, dirty hind leg rate, and dirty back parts rate of animals according to farm size

Variables	Farm size			SEM	P-value
	5–10	11–20	≥ 21		
<i>n</i>	53	11	7		
Dirty udder rate (%)	47.66	50.07	37.52	2.69	0.486
Dirty hind leg rate (%)	48.94	51.53	43.83	2.57	0.766
Dirty back parts rate (%)	51.03	52.01	43.24	2.65	0.669

SEM: Standard error of the mean

T a b l e 4

Comparison results for some undesirable health problems in buffalos according to farm sizes

Variables	Group	<i>n</i>	Mean	SE	Med	Min	Max	<i>P</i> -value
Skin rash	5–10	53	46.93	5.17	44.44	0.00	100.00	0.658
	11–20	11	49.47	8.59	42.11	15.38	100.00	
	≥ 21	7	33.68	11.55	23.33	13.64	100.00	
Nasal discharge	5–10	53	6.80	1.04	0.00	0.00	20.00	0.980
	11–20	11	5.71	0.70	5.26	0.00	9.09	
	≥ 21	7	5.99	0.91	4.55	4.00	10.00	
Eye discharge	5–10	53	1.03 ^a	0.45	0.00	0.00	12.50	0.001
	11–20	11	2.58 ^b	1.13	0.00	0.00	10.00	
	≥ 21	7	5.36 ^b	1.54	6.67	0.00	10.00	
Vulva discharge	5–10	53	0.00 ^a	0.00	0.00	0.00	0.00	0.002
	11–20	11	1.06 ^b	0.72	0.00	0.00	6.67	
	≥ 21	7	1.19 ^b	0.79	0.00	0.00	5.00	
Diarrhea	5–10	53	0.00 ^a	0.00	0.00	0.00	0.00	< 0.001
	11–20	11	1.99 ^b	1.08	0.00	0.00	10.00	
	≥ 21	7	4.91 ^b	1.52	4.17	0.00	10.00	

^{a,b,c}Differences between means marked with different letters in the same column are statistically significant.

the Shapiro–Wilk normality test for the rates of skin rash, nasal discharge, eye discharge, vulva discharge, and diarrhea of the animals in the farms according to the size of the farm, comparisons were made with the Kruskal–Wallis H test. Dunn’s multiple comparison test was used to determine the differences between the groups in the variables where differences were found (Table 4).

An examination of Table 4 revealed that the difference in farm size did not have a statistically significant effect on skin rash and nasal discharge ($P > 0.05$). However, eye discharge was more prevalent in farms with 11–20 animals and 21 or more animals, whereas only 1% of eye discharge was observed in farms with 5–10 animals. Regarding vulva discharge, none was found in farms with 5–10 animals, while it was present at a rate of 1% in the other farms. Similarly, the diarrhea rate was higher in farms with 11–20 animals and above compared to those with 5–10 animals.

Conclusions and suggestions. Biosecurity is crucial for herd health and productivity but is often overlooked on livestock farms. Understanding biosecurity status is vital for emergency planning, controlling endemic diseases, and identifying improvement areas. Key measures include vaccination, health protection, regular checks, clean farms, and breeder training. Biosecurity practices vary by region due to differences in disease prevalence and traditions, highlighting the need for regional studies. These practices are also linked to animal welfare, as clean shelters with proper temperature, ventilation, lighting, and space reduce animal stress.

This study evaluated biosecurity and animal welfare in buffalo breeding, and studies on this subject in buffalo breeding are quite insufficient. It would be useful to create a database of welfare scores in buffalo breeding for various countries and regions using the ANI (Animal Needs Index) 35L system and Welfare Quality® (2009) criteria and for this infrastructure to guide farmer training activities.

Acknowledgment. This study was conducted as part of Hatice Çat's MSc thesis.

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Department of Animal Science, Faculty of Agriculture, Yozgat Bozok University, Yozgat 66900, Türkiye

*e-mails: hcat4270@gmail.com (<https://orcid.org/0000-0001-8579-9269>),
orhan.ermetin@yobu.edu.tr (<https://orcid.org/0000-0002-3404-0452>)*