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## RESEARCH ARTICLE

# INVESTIGATIONS AND EVALUATIONS OF CONSTRUCTION CHARACTERISTICS OF TRADITIONAL WATER BUFFALO BARNs IN ISTANBUL PROVINCE OF TURKEY REGARDING ANIMAL WELFARE

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### ABSTRACT

The aim of this study was to investigate and evaluate the construction characteristics of traditional water buffalo barns around Istanbul, considered as a pilot district in Turkey, regarding animal welfare. The research was conducted at 31 different administrations of Istanbul Water Buffalo Breeders Association. The 35.5 % of the investigated farms were small scale administrations whereas 64.5% of them were classified as medium scale. It was determined that 80.7% of the administrations were placed within the settlement areas while the remaining 19.3% were 200 to 500 m away from the settlement areas. Conducted surveys by interviewing with the farm owners face to face revealed that the existing barns were constructed through traditional methods without any technical projects. All barns were constructed in stall type and the values of inside volume, resting and walking area per animal differed from each other. These values were between 4.50 and 17.60 m<sup>3</sup>, 2.00 and 3.87 m<sup>2</sup> and 1.03 and 9.81 m<sup>2</sup>, respectively, for inside volume, resting and walking area per animal. Natural ventilation system was generally preferred but 38.7% of the barns had no vent stacks, instead, windows were used for air entrance and outgoing. The window areas for lighting changed between 0.66 and 4.80% of barns ground area, varying from barns to barns. When evaluating all these data with the climate characteristic of the district and literature, it may be concluded that neither optimum climatic environment required by the buffalos nor the animal welfare for the traditional water buffalo barns cannot be fulfilled.

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## INTRODUCTION

Barns are the structures needing special cares in designing since the animals housed in them are expensive and the product from the animals are closely related to the human health. Barns should be planned, projected and constructed according to the technical principles in order to accomplish the expected benefits. To achieve this, following three factors need to be considered:

- To provide optimum climatic, structural and social environment within the barns for the animals,
- To keep the cost of the barn at a minimum level considering its service life
- To minimize wasting time, losing energy and labour requirement.

Studies on buffalo barns are very limited in Turkey. Although water buffalos are genetically and physiologically different from the other cattle, they are categorised the same.

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For this reason, studies on the control of the climatic conditions are not conducted specifically for the water buffalo's barn systems. The aim of this study was to investigate and evaluate the construction characteristics of traditional water buffalo barns around Istanbul, considered as a pilot district in Turkey, regarding animal welfare.

## MATERIALS AND METHODS

The research was conducted at 31 different pilot administrations of Istanbul Water Buffalo Breeders Association located in Arnavutköy, a town of Istanbul in the European part of Turkey. The study area geographically located between 41°12' East Longitude and 28°44' Northern Latitudes and at 119 m altitude (MGM, 2015). The number of water buffalos in the pilot area was 4088, which was 40% of existing amount of buffalos in Istanbul (TUIK, 2015). The research was carried out as three steps: selection of the administrations, field studies and office works. In field studies, a survey was conducted to obtain detail information about the selected administration. Additionally, structural specifications and spatial position of each barn were collected through site

measurements and observation. In the office works, data collected through field studies were analysed, evaluated with the available literature and eventually suggestions were made for implementation.

## RESULTS

### Evaluation of Investigated Administrations

Water buffalos, being a value for Turkey and known as Anatolian buffalos, are intensified in the farm administrations around İstanbul. Generally, a polycultural farm are practised in the investigated administrations. The ratio of administrations breeding only buffalo was 16.2% while the ratio of administrations both breeding buffalos and plat production was 83.3%. It was seen that dairy production came forward in buffalo breeding. The administrations were generally classified as small and medium size in terms of buffalos number, 96.8% of he investigated administration (Table 1).

**Table 1. Classification of investigated administrations**

Type of administration	Number of administration	Number of buffalos	Ratio (%)
Small size	11	10-49	35.5
Medium size	19	50-200	61.3
Large size	1	>200	3.2

Breeders claimed that closeness to the residence was the primary factor in the barn placement. 93.6% of the investigated administrations located inside or around the settlement areas such as village or town (Table 2).

**Table 2. Distance of administrations to the settlement areas**

Number of administration	Distance to the settlement area (m)	Ratio (%)
25	Inside	80.7
4	200-350	12.9
2	500-1000	6.4

On the other hand, they indicated that the probable adverse effects of animal waste from the farm administrations on human health and environment were ignored. Conducted surveys by interviewing with the farm owners face to face revealed that the existing barns were constructed through traditional methods without any technical projects. All barns of studied administrations were constructed in stall type and they were positioned in East-West direction by 58% and North-South direction by 42%. The sizes of interior volume, resting and strolling areas per buffalo in the barns differ from one administration to another. The interior volume per buffalo varied between 4.50 and 17.60 m<sup>3</sup>.

The area spared per buffalo were between 2.00 and 3.87 m<sup>2</sup> in the studied barns, which were quite inadequate regarding animal welfare. The strolling area per a grown-up buffalo was between 1.03 and 9.81 m<sup>2</sup> in the studied barns. Natural ventilation system was generally preferred but 38.7% of the barns had no vent stacks, instead, windows were used for air entrance and outgoing. The window areas for lighting changed between 0.66 and 4.80% of barns base area. 94% of the barns had artificial lightening with varying values of 0.2-2.3 Watt for each 1.0 m<sup>2</sup>

## DISCUSSION

In fact, the place of animal barns should be selected considering their properties, capacity and health protection strip obtained by a technical comity for the settlement areas (Kocaman et al., 2011). Small and medium size buffalo administrations should be converted into contemporary administrations by forming cooperatives and considering environmental health and animal welfare as a base and moved out of the settlement areas. In this context, animal administrations are suggested to be kept at least 500 m away from the settlement units (ASAE, 1996). Cayley et al. (2004) defined this distance as 1600 m

In Turkey, generally genetical and breeding studies are conducted in animal science whereas structural and climatic environmental conditions of the barns remain at the secondary level. The same situation is also true for the buffalo barns under consideration. It is suggested that single row barns are positioned in East-West direction while double or more rows ones are in North-South direction in order to benefit from natural lighth at most and well-balanced in tied stall closed barns (Balaban and Sen, 1988; Olgun, 2009). On the other hand, the most suitable barn type for the region is free or free stall barns taking the climatic conditions, animal welfare and metamorphic properties of buffalos into consideration. The size of inside volume per buffalo under ideal conditions is suggested between 15 and 18 m<sup>3</sup> in order to improve ventilation efficiency, provide sufficient fresh air and proper gas balance (Ekmekyapar, 1991). A minimum area of 4-6 m<sup>2</sup> should be spared per buffalo in the base arrangement of the barns considering all elements such as feeding path, crib, standing platform, urine canal, service path, etc. (Kocaman ve Kurc, 2013). In strolling area, a minimum area of 5-6 m<sup>2</sup>, preferably 8-12 m<sup>2</sup> should be counted per a grown-up buffalo (Bhoite, 2009).

The use of lantern type natural ventilation system makes the control of climatic environmental conditions easier. For this purpose, 1.5 m opening on the ridge should be arranged for each 1.5 m width of the base (Olgun, 2009). Lightening is an important climatic environmental condition to fulfil animal welfare and provide hygiene and high yield. Lightening was found to be inadequate in all studied barns considering the proposed value of 5.0-7.5 % for moderate climatic condition (Ekmekyapar, 1991). base area which was insufficient when compared with the suggested value between 4 and 6 W m<sup>-2</sup> (Olgun, 2009).

### Conclusions and Suggestions

Increasing animal yields within economical limits is possible not only by obtaining species capable of high yielding but also construction of barns offering optimum environmental-social conditions and properly feeding. The investigated buffalo barns were built traditionally and quite below the optimum conditions. They were generally located in or close the settlement areas. This, coupling with mismanaged waste management, led to environmental problems. For this reason, the following suggestions should be considered in either improving the existing or the future constructed barns to protect environment and animal welfare.

- Small and medium size buffalo administrations should be converted into contemporary administrations by forming cooperatives.
- A technical comity should decide the place of animal barns considering health protection strip around the settlement areas.
- The most suitable barn type for the region is free or free stall barns.
- The long axis of the barns should be in the East-West direction. However, double or more rows ones are positioned in North-South direction.
- In the barns, a minimum area of 4-6 m<sup>2</sup>, 8-12 m<sup>2</sup> and 15-18 m<sup>2</sup> should be counted for resting, strolling and interior space for each well-grown buffalos, respectively.
- The use of lantern type natural ventilation system makes the control of climatic environmental conditions easier.
- For natural illumination, window area should be adjusted to 5.0-7.5% of base area. As for the artificial illumination, 4 and 6 W m<sup>-2</sup> base area is suggested.
- Wastes from the administrations should be kept in the stores built according to the regulations and standards.

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