

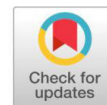
## Housing Practices and Housing Facilities in Gaushalas

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### Abstract

The present investigation was carried out to study the “Housing Practices and housing facilities in Gaushalas of Haryana”. The data from 30 Gaushalas of Haryana were collected during the period started from April, 2017 to February, 2018 through interview using a structured questionnaire and by on site observation. These 30 Gaushalas were divided into three categories based on the number of animals present in Gaushalas as small (100-500 animals), medium (501-1000 animals) and large size Gaushalas (>1000 animals). The data were collected and analyzed on existing housing facilities like availability of floor space, type and height of roof, type of floors, microclimate protection measures and feeding and watering space availability of different categories of cattle i. e. milch cows, calves and heifers, unproductive cows and bulls and bullocks are maintained in Gaushalas. Findings of the availability of floor space (sq ft) per milch cows and heifers was significantly ( $P < 0.05$ ) higher in medium and large Gaushalas as compared to small Gaushalas. The different floor types inside the shed were concrete (36.67%), brick-on-edge (30%) and concrete + brick-on-edge (33.33%), while in open paddock brick-on-edge (53.33%) kachha (16.67), concrete + brick-on-edge (13.33) and kachha + brick-on-edge (13.33%) floors. The roofing materials used in Gaushalas were asbestos + RCC (40.00 %), RCC+ G I sheets (23.33%), RCC (16.67%). It could be concluded that the housing practices and housing facilities were better in large Gaushalas as compared to small and medium Gaushalas.

**Keywords:** housing, Gaushalas, floor space, water troughs, manger length

### Introduction

As per 19<sup>th</sup> livestock census (2012) there are 8.12 lakhs of indigenous cattle in Haryana, of which 3.06 lakhs (37.7 %) are kept in 408 Gaushalas. Gaushalas are the protective shelters for cows and they also provide rescue to the cattle destined for illegal slaughter. Main functions of the Gaushalas are secure shelter for ownerless and stray cattle, prevent road accidents and crop damage, and prevent premature death of stray cattle due to the consumption of polythene bags having food left overthrown in open

by the households. It minimizes the chances of illegal transport or export of stray cattle by cattle smugglers for slaughter purposes and provides a suitable place for accommodating cattle seized from cattle smugglers. Proper housing, which is conducive to good health, comfort and protection from inclement weather. The adverse effects of the situation among the large numbers of privately maintained animals are especially manifest in dairy animals. A series of standards is, therefore, being prepared to provide guidelines and help in meeting the requirements of various categories of dairy enterprises. The cattle shed should be widely located, properly oriented, constructed, spaced out and grouped. The selection of site and planning should receive special attention. The Bureau of Indian Standards [1] [5-18]. New Delhi, has brought out some specifications on space requirements and construction details for cattle and buffalo farms of different sizes. Khupse [2] revealed that, the housing practices adopted in the majority

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of cases were unhygienic, unhealthy and were not according to the recommendations. A large number of animals are confined in small houses under stress conditions. It is necessary that the situation with regard to their current status is known so that strategies to bring about improvement in their upkeep is suggested keeping this background in view the present study was undertaken with the following specific objectives: To study the existing, housing practices of cattle in Gaushalas.

## Materials and Methods

The present study was conducted in Gaushalas in Haryana (India). Haryana has a very good genetic potential of animals such as cattle (Haryana) and buffalo (Murrah and Nili ravi) etc. As per 19<sup>th</sup> (2012) Livestock Census, the indigenous cattle population in Haryana is 8.12 lakhs out of which 3.06 lakhs (37.70 %) are present in 420 Gaushalas. Out of 420 Gaushalas only 30 Gaushalas (in 10 district which represents 82 percent of the total Gaushalas present in Haryana) were selected (by stratified random sampling) and these 30 Gaushalas were divided in to three groups on the basis of number of animals present in Gaushala, the animal numbers ranges from 100-500 are categorize as small-size Gaushala (n=10), while 501-1000 animals and >1000 animals are categorised as medium (n=10) and large size Gaushala (n=10). Various categories of cattle i. e. milch cows, calves and heifers, unproductive cows and bulls and bullocks were maintained in the selected Gaushalas. The number of cattle in the study was 34,279, whereas 3483 in small size Gaushalas, 7831 in medium-size Gaushalas and 22965 in large size Gaushalas respectively. The Gaushala with less than 100 animals are in not included in the study. The districts which included in the study are Sirsa, Hisar, Fatehabad, Bhiwani, Jind, Sonipat, Kurukshetra, Karnal, Kaithal and Panipat. The data for the study was collected during April, 2017 to February, 2018 from the Gaushalas through interview using a structured questionnaire and onsite observation at the Gaushalas.

### Housing and other facilities

System of housing and availability of floor space: Actual measurement of floor space in open and covered area and visual examination of the system of housing. Type and height of roof: Actual measurement of the height of the sheds and observation of the roofing materials used. Type of floors: Actual on-site observation of the

type of floors in both open as well as covered areas. Microclimate protection measures inside animal houses and other practices for protection against heat and cold stress: Actual observations of microclimate protection measures used and by the interviewing the Gaushala owner. Feeding and watering space availability, feeding and watering systems with frequency: Actual measurements of the feeding and watering space available per animal and examination of feeding and watering system and frequency on the day of visit.

## Result and Discussion

### Housing Practices

Gaushala cattle require shelter for protection and comfort in order to remain healthy. The cattle in Gaushalas are to be protected from high and low temperatures, direct sunlight, heavy rainfall, high humidity, strong winds, ecto-parasites and endo-parasites.

### Floor space

#### Floor space for Milch cows

The mean values of floor space per milch cow in small, medium and large Gaushalas are presented in table 1. The mean values of covered, open and total floor space per milch cows in small, medium, and large Gaushalas were  $21.08 \pm 1.63$ ,  $34.38 \pm 5.34$  and  $55.46 \pm 6.97$ ;  $33.50 \pm 3.20$ ,  $106.09 \pm 26.47$  and  $139.59 \pm 29.67$ ;  $38.2 \pm 3.32$ ,  $92.16 \pm 11.24$  and  $130.36 \pm 14.56$  sq ft respectively, whereas the overall total floor space per milch cow was  $108.47 \pm 17.07$  sq ft. In the present study, it was found that the mean value of covered floor space per milch cows in medium and large Gaushalas were significantly ( $P < 0.01$ ) higher than the mean value of covered floor space per milch cows in small Gaushalas. However, there was no significant ( $P < 0.05$ ) difference between the mean value of covered floor space per milch cows in medium and large Gaushalas. It was also found that the total floor space per milch cow in small Gaushalas ( $55.46 \pm 6.97$  sqft) was found lesser (47.18 %) than the minimum floor space required given by BIS (i.e. 105 sq ft) where as in medium and large Gaushalas ( $139 \pm 29.67$  and  $130.36 \pm 14.56$ ) it was 32.94% and 24.15% higher than the minimum floor space recommended by BIS (IS 6027, 1986).

### Floor space of Calves

The mean values of covered, open and total floor space per calf in small, medium and large Gaushalas were  $12.09 \pm 1.78$ ,  $32.50 \pm 6.29$  and  $44.59 \pm 8.07$ ;  $16.74 \pm 3.32$ ,  $27.57 \pm 5.34$  and  $44.31 \pm 8.66$ ;  $18.38 \pm 2.41$ ,  $22.99 \pm 4.22$  and  $41.37 \pm 6.63$  sq ft, respectively, whereas the overall total floor space per calf was  $43.42 \pm 7.78$  sq ft (Table 1). There was no significant ( $P < 0.05$ ) difference of floor space per calf among small, medium, and large Gaushalas. Results of the total floor space per calves in small, medium and large Gaushalas was 0.91, 1.53 and 8.07 percent, respectively lower than the minimum floor space recommended by BIS [1].

### Floor space of Heifers

The mean values of covered, open and total floor space per heifer in small, medium and large Gaushalas were  $17.41 \pm 4.57$ ,  $29.85 \pm 1.14$  and  $47.26 \pm 5.71$ ;  $20.39 \pm 1.85$ ,  $64.28 \pm 13.71$  and  $84.67 \pm 15.56$ ;  $24.04 \pm 3.03$ ,  $53.73 \pm 13.57$  and  $77.77 \pm 16.6$  sq ft respectively, whereas the overall total floor space per heifer was  $69.90 \pm 12.62$  sq ft (Table 1). The mean values of total floor space per heifer in medium and large Gaushalas were significantly ( $P < 0.05$ ) higher than the mean values of total floor space per heifer in small Gaushalas. Results of the total floor space per heifer in small Gaushalas was 32.49 percent lower and in medium and large Gaushalas was 20.96 and 11.10 percent, respectively higher than the minimum floor space recommended by BIS [1].

### Floor space of Bulls and Bullocks

The mean values of covered, open and total floor space per bull and bullock in small, medium and large Gaushalas were  $24.18 \pm 3.97$ ,  $51.85 \pm 12.20$  and  $76.03 \pm 16.17$ ;  $21.65 \pm 5.97$ ,  $56.47 \pm 20.10$  and  $78.12 \pm 26.06$ ;  $27.91 \pm 3.61$ ,  $61.12 \pm 9.03$  and  $89.03 \pm 12.64$  sq ft, respectively, whereas the overall total floor space per bull and bullock was  $81.06 \pm 18.29$  sq ft (Table 1). There was no significant ( $P < 0.05$ ) difference among small, medium, and large Gaushalas. Results of the total floor space per bulls and bullocks in small, medium and large Gaushalas was 27.59, 25.60 and 15.21 percent, respectively lower than the minimum floor space recommended by BIS [1].

### Floor space of Unproductive cows

The mean values of covered, open and total floor space per unproductive cow in small, medium and

large Gaushalas were  $21.36 \pm 1.89$ ,  $58.66 \pm 10.61$  and  $80.02 \pm 12.5$ ;  $23.59 \pm 3.44$ ,  $45.48 \pm 8.24$  and  $69.07 \pm 11.68$ ;  $24.14 \pm 4.21$ ,  $40.53 \pm 8.35$  and  $64.67 \pm 12.56$  sq ft, respectively, whereas overall total floor space per unproductive cow was  $81.06 \pm 18.29$  sq ft (Table 1). There was no significant ( $P < 0.05$ ) difference among small, medium, and large Gaushalas. Results of the total floor space per Unproductive cows in small, medium and large Gaushalas was 23.79, 34.22 and 38.41 percent lower than the minimum floor space recommended by BIS [1].

### Floor space of Sick / Injured cattle

The mean values of covered, open and total floor space per sick and injured cattle in medium and large Gaushalas were  $53.61 \pm 10.20$ ,  $85.22 \pm 16.70$  and  $138.83 \pm 26.9$ ;  $73.69 \pm 16.58$ ,  $64.02 \pm 11.65$  and  $137.71 \pm 28.23$  sq ft, respectively, whereas the overall total floor space per sick / injured cattle was  $138.27 \pm 27.57$  sq ft (Table 1). There was no significant ( $P < 0.05$ ) of difference among small, medium, and large Gaushalas. Results of the total floor space per sick / Injured cattle in medium Gaushalas was 0.84 percent lower and large Gaushalas was 1.64 percent higher than the minimum floor space recommended by BIS [1].

### Type of floor

Types of floor used in small, medium, and large Gaushalas are presented in table 2. The percentage of concrete, brick-on-edge and concrete + brick-on-edge floors in an inside shed of Gaushalas were 36.67, 30.00 and 33.33 percent, respectively, whereas in the open paddock the percentage of concrete, brick-on-edge, kachha, concrete + brick-on-edge and kachha + brick-on-edge were 3.33, 53.33, 16.67, 13.33 and 13.33 percent, respectively. The results indicated that the most commonly used type of floor inside shed of Gaushalas was concrete floor (36.67%) followed by concrete + brick-on-edge (33.33%) and brick-on-edge (30.00%). The percentage of brick-on-edge used in the open paddock was 53.33 percent of the Gaushalas followed by kachha (16.67%), concrete + brick on edge (13.33%), kachha + brick on edge (13.33%), and concrete 3.33 percent.

### Feeding / Manger length

#### Manger length for Milch cows

The average length of manger per milch cow in small,

**Table 1:** Total floor space (sq ft) per animal in different categories of animals in different sized Gaushalas

Sr. No.	Category	Small Gaushala			Medium Gaushala			Large Gaushala			BIS standard
		Covered space	Open space	Total (% of shortfall)	Covered space	Open space	Total (% of excess / shortfall)	Covered space	Open space	Total (% of excess / shortfall)	
1	N	5	3	-	9	5	-	10	8	-	
	Milch cows	21.08 <sup>B</sup> ±1.63 (18.46-27.50)	34.38 <sup>B</sup> ±5.34 (26.25-44.44)	55.46 ±6.97 (-47.18)	33.50 <sup>A</sup> ±3.20 (22.80-9.46)	106.09 <sup>AB</sup> ±26.47 (28.57-164.84)	139.59 ±29.67 (32.94)	38.2 <sup>A</sup> ±3.32 (25.41-55.38)	92.16 <sup>A</sup> ±11.24 (41.67-121.21)	130.36±14.56 (24.15)	105
2	N	6	3	-	9	5	-	10	9	-	-
	Calves	12.09 ±1.78 (5.56-16.67)	32.50 <sup>ab</sup> ±6.29 (20-40)	44.59 ±8.07 (-0.91)	16.74 ±3.32 (8.57-40)	27.57 <sup>b</sup> ±5.34 (10.8-43.33)	44.31 ±8.66 (-1.53)	18.38 ±2.41 (11.64-34.6)	22.99 <sup>a</sup> ±4.22 (10.91-51.43)	41.37 ±6.63 (-8.07)	45
3	N	4	3	-	7	7	-	10	8	-	-
	Heifer	17.41 ±4.57 (7.50-28.24)	29.85 ±1.14 (28.13-32.00)	47.26 ±5.71 (-32.49)	20.39 ±1.85 (12.50-26.10)	64.28 ±13.71 (14.00-104.00)	84.67 ±15.56 (20.96)	24.04 ±3.03 (12.80-40.00)	53.73 ±13.57 (12.00-120.00)	77.77 ±16.6 (11.10)	70
4	N	7	6	-	5	4	-	10	9	-	-
	Bull and bullock	24.18 ±3.97 (13.71-40.82)	51.85 ±12.20 (27.43-102.04)	76.03 ±16.17 (-27.59)	21.65 ±5.968 (8.3-43.90)	56.47 ±20.10 (21.56-114.15)	78.12 ±26.06 (-25.60)	27.91 ±3.61 (14.29-50.63)	61.12 ±9.03 (24.16-98.57)	89.03 ±12.64 (-15.21)	105
5	N	10	7	-	9	7	-	10	10	-	-
	Unproductive cattle	21.36 ±1.89 (8.79-26.30)	58.66 ±10.61 (35.53-104.48)	80.02 ±12.5 (-23.79)	23.59 ±3.44 (10.29-44.04)	45.48 ±8.24 (17.36-72.53)	69.07 ±11.68 (-34.22)	24.14 ±4.21 (10.67-46.02)	40.53 ±8.35 (11.41-84.03)	64.67 ±12.56 (-38.41)	105
6	N	-	--	-	10	4	-	10	7	-	-
	Sick / injured Animals	-	-	-	53.61 ±10.20 (22.06-112.50)	85.22 ±16.70 (44.12-121.74)	138.83 ±26.9 (-0.84)	73.69 ±16.58 (21.33-176.47)	64.02 ±11.65 (30.00-114.29)	137.71 ±28.23 (1.64)	140

Means bearing different superscript in a row differ significantly  $P < 0.01$

medium and large Gaushalas is presented in table 3. The average length of manger per milch cow in small, medium and large Gaushalas was 73.06±6.88, 77.44±12.08 and 88.68±6.69 cm, respectively, whereas the overall average length of manger per milch cow was 79.73±8.55 cm. However there was no significant ( $P < 0.05$ ) differences of the average length of manger per milch cow among small, medium and large Gaushalas. and it was found as per the minimum length of manger recommended by BIS (IS 6027, 1986). Results of the average length of manger per milch cow in small, medium and large Gaushalas was 21.77, 29.07 and 47.80 percent, respectively higher than the minimum average length of manger recommended by BIS [1].

### Manger length for Calves

The average length of a manger per calf in small,

medium and large Gaushalas was 69.97±9.72, 55.04±8.64 and 63.34±9.82 cm, respectively, whereas the overall average length of a manger per calf was 62.78±9.40 cm (Table 3). It was found that there was no significant ( $P < 0.05$ ) of difference average length of manger per calf among small, medium and large Gaushalas. Results of the average length of manger per calf in small, medium and large Gaushalas was 74.93, 37.60 and 58.35 percent, respectively higher than the minimum average length of manger recommended by BIS [1].

### Manger length for Heifers

The average length of manger per heifer in small, medium and large Gaushalas was 55.57±12.25, 49.40±5.65 and 53.49±6 cm, respectively, whereas the overall average length of manger per heifer was 52.82±8.07 cm (Table 3). However there was no

**Table 2:** Types of floors used in different categories of Gaushalas

Sl. No.	Category of animals	Size of Gaushalas							
		Small		Medium		Large		Overall	
		Inside shed	Open pad-dock	Inside shed	Open paddock	Inside shed	Open paddock	Inside shed	Open paddock
1	Concrete	6	1	3	-	2	-	11 (36.6)	1 (3.33)
2	Brick-on-edge	2	5	4	8	3	3	9 (30)	16 (53.33)
3	Kachha	-	3	-	1	-	1	NA	5 (16.67)
4	Concrete + brick on edge	2	1	3	1	5	2	10 (33.33)	4 (13.33)
5	Kachha + brick on edge	-	-	-	-	-	4	-	4 (13.33)

\* Figures in parenthesis indicate percentage

**Table 3:** Average length of manger (cm) in different categories of animals in different sized Gaushalas

Sl. No.	Category of animals	Size of Gaushalas							BIS standard
		Small		Medium		Large		Overall	
		N	Mean±SE	N	Mean±SE	N	Mean±SE	Mean±SE	
1	Milch cows	5	73.06±6.88	9	77.44±12.08	10	88.68±6.69	79.73±8.55	60-75
2	Calves	6	69.97±9.72	9	55.04±8.64	10	63.34±9.82	62.78±9.40	40-50
3	Heifers	4	55.57±12.25	7	49.40±5.65	10	53.49±6.29	52.82±8.07	50-55
4	Bulls and bullocks	7	53.01±6.67	5	50.08±11.96	10	59.69±5.39	54.26±8.01	60-75
5	Unproductive cows	10	60.31±6.21	9	53.98±5.90	10	51.00±5.09	55.09±5.73	60-75
6	Sick / injured cattle	-	NA	10	78.65±4.65	10	75.88±3.62	77.26±4.14	60-75

NA= Data not available

**Table 4:** Average length of water trough (cm) in different categories of animals in different sized Gaushalas

Sl. No.	Category of animals	Size of Gaushalas						
		Small		Medium		Large		Overall
		N	Mean±SE	N	Mean±SE	N	Mean±SE	Mean±SE
1	Milch cows	5	7.82±1.59	7	10.04±1.0	10	8.41±0.89	8.76±1.19
2	Calves	5	8.47±1.50	6	6.70±2.08	10	5.84±0.53	7.00±1.37
3	Heifers	4	6.10±2.55	7	4.01±0.51	10	3.40±0.56	4.51±1.21
4	Bulls and bullocks	6	3.37 <sup>b</sup> ±0.63	5	4.10 <sup>ab</sup> ±1.12	10	4.62 <sup>a</sup> ±0.30	4.03±0.68
5	Unproductive cows	10	3.17 <sup>b</sup> ±0.89	9	3.75 <sup>ab</sup> ±0.91	10	4.37 <sup>a</sup> ±0.36	3.76±0.72
6	Sick / injured cattle	-	NA	7	18.55±1.89	9	20.54±5.64	18.92±3.00

NA= Data not available

significant ( $P < 0.05$ ) differences of an average length of manger per heifer among small, medium and large Gaushalas. Results of the average length of manger per heifer in small and large Gaushalas was 11.14, 6.98 percent, respectively higher than and medium Gaushalas was 1.20 percent lower than the minimum average length of manger recommended by BIS [1].

### Manger length for Bulls and Bullocks

The average length of manger per bull and bullock in small, medium and large Gaushalas was 53.01±6.67, 50.08±11.96 and 59.69±5.39 cm, respectively, whereas the overall average length of manger per bull and

bullock was  $54.26 \pm 8.01$  cm (Table 3). It was found that there was no significant ( $P < 0.05$ ) difference of the average length of manger per bull and bullock among small, medium and large Gaushalas. Results of the average length of manger per bull and bullock in small, medium and large Gaushalas was 11.65, 16.53 and 0.52 percent, respectively lower than the minimum average length of manger recommended by BIS [1].

### **Manger length for Unproductive cows**

The average length of a manger per unproductive cow in small, medium and large Gaushalas was  $60.31 \pm 6.21$ ,  $53.98 \pm 5.90$  and  $51.00 \pm 5.09$  cm, respectively, whereas the overall average length of manger per unproductive cow was  $55.09 \pm 5.73$  cm (Table 3). Even then there was no significant ( $P < 0.05$ ) differences of an average length of manger per unproductive cows among small, medium and large Gaushalas. Results of the average length of manger per unproductive cow in small Gaushalas was 0.52 percent higher than and in medium and large Gaushalas was 10.03 and 15.00 percent, respectively lower than the minimum average length of manger recommended by BIS [1].

### **Manger length for Sick / Injured cattle**

The average length of manger per sick / injured cattle in medium and large Gaushalas was  $78.65 \pm 4.65$  and  $75.88 \pm 3.62$  cm, respectively, whereas the overall average length of manger per sick-injured cattle was  $77.26 \pm 4.14$  cm (Table 3). It was found that there was no significant ( $P < 0.05$ ) difference of average length of manger per sick / injured cattle between medium and large Gaushalas. Results of the average length of manger per sick / injured cattle in medium and large Gaushalas was 31.08 and 26.47 percent, respectively higher than the minimum average length of manger recommended by BIS [1].

### **Length of Water trough**

#### **Length of water trough for Milch cows**

The average length of water trough per milch cow in small, medium and large Gaushalas is presented in table 4. The average length of water trough per milch cow in small, medium and large Gaushalas was  $7.82 \pm 1.59$ ,  $10.04 \pm 1.07$  and  $8.41 \pm 0.89$  cm, respectively, whereas the overall average length of water trough per milch cow was  $8.76 \pm 1.19$  cm. It was found that there was no significant ( $P < 0.05$ ) differences of the

average length of water trough per milch cow among small, medium and large Gaushalas, Results of the average length of water trough per milch cow in small, medium and large Gaushalas was 30.33, 67.33 and 40.17 percent, respectively higher than the minimum average length of water trough recommended by BIS [1].

#### **Length of water trough for Calves**

The average length of water trough per calf in small, medium and large Gaushalas was  $8.47 \pm 1.50$ ,  $6.70 \pm 2.08$  and  $5.84 \pm 0.53$  cm, respectively, whereas the overall average length of water trough per calf was  $7.00 \pm 1.37$  cm (Table 4). However, there was no significant ( $P < 0.05$ ) differences of an average length of water trough per calf among small, medium and large Gaushalas. Results of the average length of water trough per calf in small, medium and large Gaushalas was 111.15, 67.50 and 46.00 percent, respectively higher than the minimum average length of water trough recommended by BIS [1].

#### **Length of water trough for Heifers**

The average length of water trough per heifer in small, medium and large Gaushalas was  $6.10 \pm 2.55$ ,  $4.01 \pm 0.51$  and  $3.40 \pm 0.56$  cm, respectively, whereas the overall average length of water trough per heifer was  $4.51 \pm 1.21$  cm (Table 4). Even then there was no significant ( $P < 0.05$ ) differences of average length of water trough per heifer among small, medium and large Gaushalas. Results of the average length of water trough per heifer in small Gaushalas was 22.00 percent higher than and in medium and large was 19.80 and 32.00 percent, respectively, lower than the minimum average length of water trough recommended by BIS [1].

#### **Length of water trough for Bulls and Bullocks**

The average length of water trough per bull and bullock in small, medium and large Gaushalas was  $3.37 \pm 0.63$ ,  $4.10 \pm 1.12$  and  $4.62 \pm 0.30$  cm, respectively, whereas the overall average length of water trough per bull and bullock was  $4.03 \pm 0.68$  cm (Table 4). It was found that the average length of water trough per bull and bullock in large Gaushalas was significantly ( $P < 0.05$ ) higher than the average length of water trough per bull and bullock in small Gaushala. Results of the average length of water trough per bull and bullock in small, medium and large Gaushalas was 43.83, 31.67 and 23.00 percent, respectively lower

**Table 5:** Number of sheds of flat and sloping roofs (ft) in different categories of animals in different Gaushalas

Sl. No.	Category of animals	Size of Gaushalas							
		Small		Medium		Large		Overall	
		Flat roof	Sloping roof	Flat roof	Sloping roof	Flat roof	Sloping roof	Flat roof	Sloping roof
1	Milch cows	3	2	6	3	6	4	15	9
2	Calves	-	5	5	3	6	3	11	11
3	Heifers	-	4	2	5	2	8	4	17
4	Bulls and bullocks	-	7	-	5	2	8	2	20
5	Unproductive cows	-	10	3	6	4	6	7	22
6	Sick / injured cattle	-	-	-	7	3	7	3	14

**Table 6:** Average height of flat and sloping roofs (ft) in milch cows and other cattle in different categories of Gaushalas

Sl. No.	Category of animals	Size Of Gaushalas							
		Small		Medium		Large		Overall	
		N	Mean±SE	N	Mean±SE	N	Mean±SE	Mean±SE	
<b>Flat roof</b>									
1	Milch cows	3	11.50 <sup>B</sup> ±0.50	6	13.83 <sup>A</sup> ±0.48	6	15.00 <sup>A</sup> ±0.52	13.44±0.50	
2	Other cattle	NA	NA	3	14.00±0.29	4	14.50±1.15	14.25±0.72	
<b>Sloping roof</b>									
3	Milch cows	R	2	15.75±0.75	3	16.33±4.33	4	15.25±0.95	15.78±2.01
		E	2	12.4±0.90	3	13.33±3.33	4	12.75±0.75	12.83±1.66
4	Other cattle	R	10	17.13±1.04	6	18.08±2.21	8	17.16±1.51	17.44±1.65
		E	10	13.04±0.73	6	14.18±1.69	8	14.18±1.26	13.72±1.21

Means bearing different superscript in a row differ significantly P<0.05, NA= Data not available, R = height of ridge, E = height of eaves

**Table 7 :** Type of roofing materials used by different categories of Gaushalas

Sl. No.	Category of animals	Size of Gaushalas			
		Small	Medium	Large	Overall
1	Asbestos	1	1	1	3 (10.00)
2	Reinforced cement concrete (RCC)	2	2	1	5 (16.67)
3	G. I. (Galvanized iron) sheet	1	1	-	2 (6.67)
4	Asbestos + RCC	2	3	7	12 (40.00)
5	RCC+ G. I. sheet	4	3	-	7 (23.33)
6	Asbestos + RCC + G. I. sheet	-	-	1	1 (3.33)

\* Figures in parenthesis indicate percentage

than the minimum average length of water trough recommended by BIS [1].

### Length of water trough for Unproductive cows

The average length of water trough per unproductive cow in small, medium and large Gaushalas was  $3.17\pm 0.89$ ,  $3.75\pm 0.91$  and  $4.37\pm 0.36$  cm, respectively, whereas the overall average length of water trough per unproductive cow was  $3.76\pm 0.72$  cm (Table 4). The average length of water trough per unproductive cow in large Gaushalas was significantly ( $P<0.05$ ) higher than the average length of water trough per unproductive cow in small Gaushala. Results of the average length of water trough per unproductive cow in small, medium and large Gaushalas was 47.17, 37.50 and 27.17 percent, respectively lower than the minimum average length of water trough recommended by BIS [1].

### Length of water trough for Sick / Injured cattle

The average length of water trough length per sick / injured cattle in medium and large Gaushalas was  $18.55\pm 1.89$  and  $20.54\pm 5.64$  cm, respectively, whereas the overall average length of water trough per sick / injured cattle was  $18.92\pm 3.00$  cm (Table 4). However there was no significant ( $P<0.05$ ) differences of an average length of water trough per sick / injured cattle between medium and large Gaushalas (Table 4). Results of the average length of water trough per sick / injured cattle in medium and large Gaushalas was 209.17 and 242.33 percent, respectively lower than the minimum average length of water trough recommended by BIS [1].

### Roof height

Height means the vertical distance from the grade to the highest point of the roof surface of a flat roof and the mean level between the eaves and the ridge of a sloping roof. Two types of eaves of animal houses ie flat and sloping were observed in Gaushalas in Haryana.

### Number of animal houses with flat and sloping roof

Table 5 indicated that majority (15) of the milch cows houses with flat roof at Gaushalas of Haryana followed by calves (11), unproductive cows (7), heifers (4), sick / injured cattle (3) and bulls and bullocks (2). Table 5 also indicated that majority (22) of the bulls and bullocks houses with sloping roof followed by

unproductive cows (20), heifers (17), sick / injured cattle (14), calves (11) and milch cows (9).

### Height of flat roof (ft)

The average height of flat and sloping roof (ft) in different categories of Gaushalas is presented in Table 6. The average height of flat roof in milch cows shed in small, medium and large Gaushalas was  $11.50\pm 0.50$ ,  $13.83\pm 0.48$  and  $15.00\pm 0.52$  ft, respectively, whereas the overall average height of flat roof was  $13.44\pm 0.50$  ft. The average height of flat roof in medium and large Gaushalas was significantly ( $P<0.01$ ) higher than the average height of flat roof in small Gaushalas.

The average height of flat roof in other cows shed in medium and large Gaushalas was  $14.00\pm 0.29$  and  $14.50\pm 1.15$  ft, respectively, whereas the overall average height of flat roof was  $14.25\pm 0.72$  ft (Table 6). There was no significant ( $P<0.05$ ) difference of the average height of flat roof among small, medium and large Gaushalas.

### Height of sloping roof (ft)

The average height of sloping roof in milch cows shed in small, medium and large Gaushalas was  $15.75\pm 0.75$ ,  $16.33\pm 4.33$  and  $15.25\pm 0.95$  ft at the ridge and  $12.4\pm 0.90$ ,  $13.33\pm 3.33$  and  $12.75\pm 0.75$  ft at the height of eaves, respectively, whereas the overall average height of sloping roof was  $15.78\pm 2.01$  ft (ridge) and  $12.83\pm 1.66$  ft (height of eaves) (Table 6). However there was no significant ( $P<0.05$ ) difference of average height of sloping roof in milch cows shed among small, medium and large Gaushalas.

The average height of sloping roof of other cattle shed in small, medium and large Gaushalas were  $17.13\pm 1.04$ ,  $18.08\pm 2.21$  and  $17.16\pm 1.51$  ft at the ridge and  $13.04\pm 0.73$ ,  $14.18\pm 1.69$  and  $14.18\pm 1.26$  ft at the height of eaves, respectively, whereas the overall average height of sloping roof was  $17.44\pm 1.65$  ft (ridge) and  $13.72\pm 1.21$  ft (height of eaves) (Table 6). Even then there was no significant ( $P<0.05$ ) difference of average height of sloping roof of other cattle shed among small, medium and large Gaushalas and it was found as per the minimum height of roof required for given by BIS (i.e. 15-20ft).

### Type of roofing materials

Type of roofing materials used by different categories of Gaushalas is presented in table 7). The percentage



of asbestos, reinforced cement concrete (RCC), G. I. (Galvanized iron) sheet, asbestos + RCC, RCC+ G. I. sheet and asbestos + RCC + G. I. sheet used as a roofing materials in the shed of Gaushalas were 10.00, 16.67, 6.67, 40.00, 23.33 and 3.33 percent, respectively. The results indicated that the most commonly used roofing materials in the Gaushalas were found asbestos + RCC (40.00%) followed by RCC+ G. I. sheet (23.33%), RCC (16.67%), asbestos (10.00%), G. I. sheet (6.67%) and asbestos + RCC + G. I. sheet 3.33 percent. Contrary to these finding reported by Yogendra [3].

### Microclimatic protection measures

The microclimatic protection measures used were mainly summer protection measures ie fan (in covered area i.e. ceiling fan) and plants of trees in loafing area. The percentage of fan in small, medium and large Gaushalas having summer protection measures were 40.00, 60.00 and 90.00 percent, respectively and only 10.00 percent large Gaushalas were having shady trees in loafing area. The result indicated that the microclimatic protection measures were better in large Gaushalas (90.00%) followed by medium (60.00%) and small Gaushalas 40.00 percent. A similar finding was reported by Kapgate [4], he found that 85 percent of respondents had animal sheds in most idealistic conditions.

### Conclusion

Gaushalas are the protective shelters and secure for ownerless and stray cattle. Therefore a study conducts on the existing housing system of cattle in Gaushalas. Housing system specially 'floor space per animal', 'height of roof' and 'microclimatic protection measure during the summer season was better in medium and large Gaushalas as compared to small Gaushalas.

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### Conflicts Interest

None of the authors have any conflict of interest.

### Reference

- [1.] The Bureau of Indian standards act, 1986. Retrieved 23 December 1986.
- [2.] Khupse, T. S., Dhupal, V. P. and Nimbalkar, S. D. 1980. Adoption of improved dairy management practices. *Livestock Advisor*, 5(8): 11-14.
- [3.] Yogendra, K. (2010). Production system analysis of Haryana breed of cattle in its breeding tract. M.Sc. thesis, C.C.S.U. Meerut, U.P.
- [4.] Kapgate H.G., (1989). Study on dairy cattle management practices followed by dairyman. Ph.D. Thesis, Punjabrao Krishi Vidyapeeth, Akola (M.S.).
- [5.] Mandi, K., Subash, S., Koloi, S., Kumar, R., & Singh, N. P. (2020). Analysis of Animal Welfare Practices Adopted by Gaushalas (Cow-Shelters) in Karnataka State. *International Journal of Livestock Research*, (2), 20-29.
- [6.] Subash, S., & Mandi, K. (2022). Adoption of Animal Welfare Practices by Selected Gaushalas (Cow-Shelters) in the State of Karnataka, India. *Asian Journal of Agricultural Extension, Economics & Sociology*, 365-372.
- [7.] Bijla, S., Khalandar, S., Sharma, P., & Singh, A. (2019). An analysis of constraints faced by gaushalas in Haryana. *Economic Affairs*, 64(1), 191-195.
- [8.] Turnbull, J., & Barua, M. (2022). Living waste, living on waste: A bioeconomy of urban cows in Delhi. *Transactions of the Institute of British Geographers*.
- [9.] Kumar, T., Singh, R. V., Sharma, D., Gupta, S., Chaubey, K. K., Rawat, K. D., ... & Singh, S. V. (2014). Status of Mycobacterium avium subspecies paratuberculosis infection in an Indian Goshala housing poorly or unproductive cows suffering with clinical bovine Johne's Disease. *Adv Anim Vet Sci*, 2(5), 261-263.
- [10.] Ramanjeneya, S., Sahoo, S. C., Pathak, R., Kumar, M., Vergis, J., Malik, S. V. S., ... & Rawool, D. B. (2019). Virulence potential, biofilm formation, and antibiotic susceptibility of *Listeria monocytogenes* isolated from cattle housed in a particular gaushala (cattle shelter) and organized farm. *Foodborne Pathogens and Disease*, 16(3), 214-220.
- [11.] Ranjan, S., Bhattarai, A., & Dutta, M. (2013). Prevalence of depression among elderly people

- living in old age home in the capital city Kathmandu. *Health Renaissance*, 11(3), 213-218.
- [12.] Kennedy, Uttara, Arvind Sharma, and Clive JC Phillips. "The sheltering of unwanted cattle, experiences in India and implications for cattle industries elsewhere." *Animals* 8.5 (2018): 64.
- [13.] Sharma, A., Kennedy, U., Schuetze, C., & Phillips, C. J. (2019). The welfare of cows in Indian shelters. *Animals*, 9(4), 172.
- [14.] Sharma, A. (2020). Welfare assessment of cows in cow shelters (gaushalas) in India.
- [15.] Singh, V. P., & Khanna, S. (2021). Protecting Animals in India: A Government Perspective through History to the Present Day. *Changing Human Behaviour to Enhance Animal Welfare*, 125.
- [16.] Narayanan, Y. (2019). "Cow is a mother, mothers can do anything for their children!" Gaushalas as landscapes of anthropatriarchy and Hindu patriarchy. *Hypatia*, 34(2), 195-221.
- [17.] Sharma, A., Schuetze, C., & Phillips, C. J. (2019). Public attitudes towards cow welfare and cow shelters (gaushalas) in India. *Animals*, 9(11), 972.
- [18.] Sharma, A., Kennedy, U., & Phillips, C. (2019). A Novel Method of Assessing Floor Friction in Cowsheds and Its Association with Cow Health. *Animals*, 9(4), 120.