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Survey on housing practices of buffaloes owners in Patan district of Gujarat, India

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Abstract
A field study was undertaken to find out the shelter management practices followed by the farmers of Patan district of the North Gujarat region. Five talukas were randomly selected for the study viz., Patan, Siddhpur, Chanasma, Harij and Santalpur. Three villages were selected from each taluka and from each village 10 respondents who reared buffalo either alone or mixed with cattle were selected by using a multistage random sampling technique. The analysis revealed that 34 % farmers keep their buffaloes in the shed under tree and in a loose house. Majority of buffalo shelter (63.20%) constructed in the north-south orientation. Majority (83.33%) of the respondents tied their buffaloes during the whole day and night time. Maximum (53.33%) respondents kept dairy buffaloes with their own dwelling. Majority of the respondents used iron sheets and thatched material as a roof (66.98% and 17.93%) & supported by iron poles (64.15%) and more than half a (58.50%) of them had single sloped roof. About 86.00 % respondents had an earthen floor with wooden assisted temporary manger (41.33%). Only 3.33% respondents had storage room facility. 56% respondents provided lighting facility in the buffalo shed. Only 2.67% respondents provided facility of ceiling fan respectively in buffalo sheds for ameliorating heat stress. Maximum proportion (80.67%) of respondents provided water manually to the buffaloes. Only 23.33% respondent's stored manure in pit and majority (90.00%) of farmers made manure storage near to buffalo shelter by making the heap of dung. About 6.67 percent respondents had their own breeding trevis for buffaloes.
Respondents of Patan, Siddhpur and Chanasma talukas were more advanced in adopting buffalo management practices like pucca floor, pucca manger, lighting facility, floor width, iron sheet roof, iron poles for roof support. The respondents of Santalpur and Harij talukas were poor in adopting buffalo management practices, due to more illiteracy, marginal and small farmers and more trends for extensive system of buffalo rearing.

Keywords: mahesana buffalo, housing practices, Patan district, Gujarat

Introduction
Animal husbandry plays a prominent role in the rural economy in supplementing the income of rural households, particularly for landless labourers and small and marginal farmers. Milk and milk products are widely accepted form of animal protein in the diet of Indian people. During last five year plan, several measures have been initiated by the Government to increase the productivity of livestock, which has resulted in a significant increase in the milk production to the level of 121.54 million Tonnes (FAO, 2012) as compared to 17 million Tonnes in 1950-51 (FAO, 2006) [1]. India has about 190.9 millions cattle and 108.7 millions buffalo population (19th census, 2012).
Gujarat is a leading state in milk production and marketing in India and the total milk production of Gujarat state is 98.17 lakh tonnes and Patan district shares 3.98 lakh tonnes in 2011-12 (29th survey report of Gujarat state).
Buffaloes are well adapted to the hot and humid climate of India and play a distinct role in improving the rural economy which is primarily based on agricultural production systems. Livestock housing conditions and all animal husbandry practices exert a considerable influence on animal behaviour, health and production. Integrating various aspects such as improved housing, nutrition, breeding and milking together are known to produce remarkable improvements in growth, reproduction and production performance. In planning and designing of suitable housing accommodation for dairy cattle, consideration should be given to the comfort and health of the animals along with economic use of labour for various dairy farm operations like feeding, cleaning, milking and maintenance of farm sanitation etc.

Shelter system for animals is one of the important requirements for better production. Significant effect of housing on milk production has been reported (Thirumurugan and Saseendran, 2006) [10]. In India scientific housing of animals has been practically ignored in the past, except in few organized government farms. Loose housing system for dairy cattle and buffaloes has been advocated by research workers. This system has proved quite suitable and economical for tropical climate. But here sufficient modifications are also required for different regions and seasons of the country.

Inadequate housing system, overcrowding and uncomfortable conditions have detrimental effects on animal's feeding, milking behavior and production which may be a greater cause of economic loss to the farmer.

Most of the information available on dairy animal shelter management in rural area is based on assumptions, casual observations, experience and reports of some specialist and professional workers. This is not adequate to serve as the basis on which valid guidelines for introducing scientific shelter management practices for improvements of dairy animals can be framed.

Materials and Method

The present study was carried out in the villages of patan districts of Gujarat state. It was selected due to the presence of a large number of buffaloes, buffalo rearing farmers, familiarity of researcher with the area and local language and their ability to cover a larger area within stipulated time. Five talukas from patan viz Patan, Siddhpur, Chanasma, Harij and Santalpur were selected and from each selected taluka 3 villages were chosen randomly. In each village 10 farmers were selected. Thus, samples of 150 buffalo owners were selected for the study. While selecting respondents due cares was taken to ensure that they were evenly distributed in the village and were a true representative of animal management practices prevailing in the area. The selected respondents were interviewed personally and information was collected with the help of predesigned questionnaire the variables under study were selected on the basis of an extensive review of literature related to the topic of research and consultation with experts. The data with regards of housing management as well as the constraints in adoption of management practices involved were also collected. All the data were classified and tabulated carefully while compiling the information.

Statistical analysis of the data

Collected data were compiled, tabulated and analyzed using appropriate statistical tools and techniques like percentage, mean, frequency and standard deviation were calculated.

Results and very descriptive concise the text

- **Type of house**

It was observed that 34.00 % farmers are keeping their buffaloes in a loose house with full front wall and half side walls with a roof. Farmers tie their buffaloes under shed with roof without walls and under tree at different time were 34.00 %. Farmers with no provision of shed, kept their buffaloes either under tree or in open during different time of day were 29.33 %. Majority of this category were from medium or marginal farmers. Closed type of house with walls on all four sides was negligible (2.66%) in the district. Trend in different type of buffalo housing was significantly differed among talukas. However, trend for tying the buffaloes either in loose house or under shed and under tree was better adopted in Harij, Patan and Chanasma talukas in the district. Siddhpur and Santalpur talukas had a notable proportion of farmers did not provide shelter to their buffaloes. These findings more or less similar to Patel (2004) [5]. In Banaskantha district majority of farmers (71.00%) provided shelters to their buffaloes (Gelot (2012) [2]. Similar trend was also observed in Patan district (56.00%). Contrary to Sabapara *et al*. (2010) [7], who reported that 98.00% respondents kept the animals in a closed house in Vansada taluka of Navsari district may be due to heavy rainfall. Srivastava and Promila, (1983) also recorded that maximum respondents kept their animals in closed type of house. This difference might be due to environmental conditions that prevailed in different locations. The result was in contrast with Sargara (2007) [8] as he reported that 72.67 % respondents kept their animals under tree and in open in Kutch district of the North West Gujarat region.

Placement of buffaloes

It was revealed that an equal number of farmers (34.00%) tied their buffaloes under the shed or under shed + under tree in the district while 29.33 % farmers tied their buffaloes either under tree or in open area under the sky. In Banaskantha district more numbers of farmers provided Loose house and shed+ under tree to their buffaloes Gelot (2012) [2]. However numbers of owner kept their buffaloes in open or under trees were lower (28.00%) in Banaskantha district as compared to Patan district (29.33%). It was a good practice to tie the buffaloes at different places for better health of animals. Placement of buffaloes was differed significantly among taluka.

Time of tying

The respondents tied their buffaloes during the whole day and night time (83.33%) followed by during night time only (16.67%) and no tying (0.00%). Trend for time of tying differed significantly among talukas. Among the taluka, farmers tied their animals during whole time was more or less similar with different talukas, except Santalpur, where 70% buffaloes were tied during the night only. It is not a desirable practice to tie animal's whole time as it leads to overgrowth of hooves and digestive problems. Overgrowth of hooves was also observed in buffaloes during the survey. The result was in accordance with Kharadi *et al*. (2006). Similar finding have in Banaskantha district where 79.33% owners tied their buffalo during whole time Gelot (2012) [2]. The result was in contrast with Vinod and BabuRao (2003) [11].

Table 1: Distribution of the buffalo owners according to housing practices (n=150)

S. No	Particulars	Patan	Siddhpur	Chanasma	Harij	Santalpur	Total	Chi Square Value
1	**Animal House**							
	Loose house	10 (33.33)	12 (40.00)	17 (56.67)	10 (33.33)	2 (6.66)	51 (34.00)	89.63**
	Shed + under tree	9 (30.00)	10 (33.33)	9 (30.00)	9 (30.00)	14 (46.67)	51 (34.00)	
	Open/ under tree	8 (26.67)	7 (23.34)	4 (13.33)	11 (36.67)	14 (46.67)	44 (29.33)	
	Closed	3 (10.00)	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)	4 (2.67)	
2	**Type of animal house**							

	Loose house	10 (33.33)	12 (40.00)	17 (56.67)	10 (33.33)	2 (6.66)	51 (34.00)	26.58**
	Shed + under tree	9 (30.00)	10 (33.33)	9 (30.00)	9 (30.00)	14 (46.67)	51 (34.00)	
	Open/ under tree	8 (26.67)	7 (23.34)	4 (13.33)	11 (36.67)	14 (46.67)	44 (29.33)	
	Closed	3 (10.00)	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)	4 (2.67)	
3	**Time of tying**							
	North – South	14 (63.64)	14 (60.87)	15 (50.70)	16 (84.21)	8 (50.00)	67 (63.20)	5.20
	East – West	8 (36.36)	9 (39.13)	11 (42.30)	3 (15.79)	8 (50.00)	39 (36.80)	
4	**Location of Buffalo Dwelling**							
	With human dwelling	14 (46.67)	15 (50.00)	13 (43.33)	12 (40.00)	26 (86.67)	80 (53.33)	30.93**
	On field	0 (0.00)	0 (0.00)	0 (0.00)	3 (10.00)	3 (10.00)	6 (4.00)	
	Periphery of village	16 (53.33)	15 (50.00)	17 (56.67)	15 (50.00)	1 (3.33)	64 (42.67)	
5	**Direction of House**							
	North – South	14 (63.64)	14 (60.87)	15 (50.70)	16 (84.21)	8 (50.00)	67 (63.20)	5.20
	East – West	8 (36.36)	9 (39.13)	11 (42.30)	3 (15.79)	8 (50.00)	39 (36.80)	
6	**Location of Buffalo Dwelling**							
	With human dwelling	14 (46.67)	15 (50.00)	13 (43.33)	12 (40.00)	26 (86.67)	80 (53.33)	30.93**
	On field	0 (0.00)	0 (0.00)	0 (0.00)	3 (10.00)	3 (10.00)	6 (4.00)	
	Periphery of village	16 (53.33)	15 (50.00)	17 (56.67)	15 (50.00)	1 (3.33)	64 (42.67)	
7	**Type of Roof**							
	R.C.C	3 (13.64)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (2.83)	43.75**
	Iron sheet	15 (68.18)	18 (78.26)	19 (73.07)	14 (73.69)	5 (31.25)	71 (66.98)	
	Asbestos sheet	4 (18.18)	2 (8.70)	5 (19.23)	2 (10.52)	0 (0.00)	13 (12.26)	
	Thatched shed	0 (0.00)	3 (13.04)	2 (7.70)	3 (15.79)	11 (68.75)	19 (17.93)	
8	**Features of Roof**							
	Single slope roof	13 (59.09)	12 (52.17)	15 (57.70)	10 (52.64)	12 (75.00)	62 (58.50)	5.20
	Flat roof	7 (31.81)	7 (30.43)	8 (30.77)	9 (47.36)	3 (18.75)	34 (32.07)	
	Double slope roof	2 (9.10)	4 (17.40)	3 (11.53)	0 (00.00)	1 (6.25)	10 (9.43)	
9	**Floor In Buffalo Shelter**							
	Kachcha	20 (66.67)	27 (90.00)	26 (86.67)	26 (86.67)	30(100.00)	129 (86.00)	14.61**
	Pucca	10 (33.33)	3 (10.00)	4 (13.33)	4 (13.33)	0 (0.00)	21 (14.00)	
10	**Slope In Floor**							
	With slope	17 (56.67)	18 (46.67)	13 (53.33)	16 (56.67)	15 (50.00)	81 (54.00)	1.97
	Without slope	13 (43.33)	12 (53.33)	17 (46.67)	14 (43.33)	15 (50.00)	69 (44.00)	
11	**Type of Pillar/ Pole For Roof**							
	Iron pole	19 (86.36)	16 (69.57)	15 (57.70)	13 (68.43)	5 (31.25)	68 (64.15)	33.77**
	Wooden pole	0 (0.00)	3 (13.04)	2 (7.69)	4 (21.05)	8 (50.00)	17 (16.03)	
	Cement Pole	3 (13.64)	4 (17.39)	9 (34.61)	2 (10.52)	3 (18.75)	21 (18.82)	
12	**Storage Room Facility For Fodder and Concentrate**							
	With storage room	2 (6.67)	1 (3.33)	2 (6.67)	0 (0.00)	0 (0.00)	5 (3.33)	4.13
	Without storage room	28 (93.33)	29 (96.67)	28 (93.33)	30 (100.00)	30 (100.00)	145 (96.67)	
13	**Type of Manger**							
	Without manger	8 (26.67)	7 (23.33)	4 (13.33)	7 (23.33)	14 (46.67)	40 (26.67)	16.17**
	Pucca	13 (43.33)	11 (36.67)	12 (40.00)	10 (33.33)	2 (6.67)	48 (32.00)	
	Wooden assisted	9 (30.00)	12 (40.00)	14 (46.67)	13 (43.33)	14 (46.67)	62 (41.33)	
14	**Partition In Standing Place**							
	Without partition	19 (63.33)	10 (33.33)	15 (50.00)	24 (80.00)	29 (96.67)	99 (66.00)	29.94**
	Iron pipe/ Wooden pegs/ Others	11 (36.67)	18 (60.00)	15 (50.00)	6 (20.00)	1 (3.33)	51 (34.00)	
15	**Drainage Channel**							
	With drainage channel	3 (10.00)	2 (6.67)	2 (6.67	2 (6.67)	0 (0.00)	9 (6.00)	3.43
	Without drainage channel	27 (90.00)	28 (93.33)	28 (93.33)	28 (93.33)	30 (100.00)	141 (94.00)	
16	**Lighting Facility**							
	Bulb	16 (53.33)	21 (70.00)	8 (26.67)	10 (33.33)	7 (23.33)	62 (41.33)	58.69**
	Tube Light	2 (6.67)	2 (6.67)	15 (50.00)	3 (10.00)	0 (0.00)	22 (14.67)	
	No Light	12 (40.00)	7 (23.33)	7 (23.33)	17 (56.67)	23 (76.67)	66 (44.00)	
17	**Source of Water**							
	Manually	24 (80.00)	23 (76.67)	25 (83.33)	26 (86.67)	23 (76.67)	121 (80.67)	4.07
	Community water trough	6 (20.00)	7 (23.33)	5 (16.67)	4 (13.33)	7 (23.33)	29 (19.33)	
18	**Type of Manure Storage**							
	Heap	20 (66.67)	20 (66.67)	18 (60.00)	22 (73.33)	25 (83.33)	115 (76.67)	4.44
	Pit	10 (33.33)	10 (33.33)	12 (40.00)	8 (26.67)	5 (16.67)	35 (23.33)	
19	**Location of Manure Storage**							
	Adjacent to animal shelter	30 (100.00)	26 (86.67)	27 (90.00)	25 (83.33)	27 (90.00)	135(90.00)	5.18
	Distant	0(0.00)	4 (13.33)	3(10.00)	5(16.67)	3 (10.00)	15 (10.00)	
20	**Breeding Trevis**							
	With trevis	3(10.00)	2(6.67)	1(3.33)	2(6.67)	2(6.67)	10(6.67)	1.07
	Without trevis	27 (90.00)	28(93.33)	29(96.67)	28(93.33)	28(93.33)	140(93.33)	
21	**Facility of Ceiling Fan**							
	With ceiling fan	3 (10.00)	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)	4 (2.67)	8.73

	Without ceiling fan	27 (90.00)	29 (96.67)	30 (100.00)	30 (100.00)	30 (100.00)	146 (97.33)	
22	**Sprinkling/ Splashing of Water/ Bathing**							
	Sprinkling/Splashing	26 (86.67)	18 (60.00)	22 (73.33)	25 (83.33)	24 (80.00)	115 (76.67)	7.45
	No sprinkling/Splashing	4 (13.33)	12 (40.00)	8 (26.67)	5 (16.67)	6 (20.00)	35 (23.33)	

** P≤0.01 Percentages are mentioned without bracket (Frequencies are mentioned in bracket)

Direction of house

It was observed that 63.20 and 36.80 % respondents had North-South and East-West direction of buffalo sheds, respectively. Direction of the house did not differed significantly among talukas. In hot environment East-West direction of the house with 106 animal shelters is desirable to protect the animals from direct sunlight. Only 36.80% farmers adopted this direction for their animal shelter. The result was in contrast with Banaskantha district. Where 57.41 % respondents adopted East-West direction to their animal shelter Gelot (2012) [2].

Location of buffalo shelter

It was depicted from table 1 that majority of respondents (53.33%) kept buffaloes dwelling attached to human dwelling followed by a periphery of the village (42.67%) in Patan district as compared to most of the small and marginal farmers kept their animals at the periphery of village and very less respondents (4.00%) kept their buffalo at the field in Patan district at periphery of village. Majority of the medium and large farmers kept their buffaloes with their own dwelling. The trend of keeping buffaloes along the dwelling is unhygienic for human being. Trend of the location of shed was significantly (p<0.01) differed among talukas. Majority of the respondents in Chansma (56.67%) and Patan (53.33%) talukas kept their buffaloes at the periphery of village where as the majority of respondents in Santalpur (86.66%) taluka kept their buffaloes with their own dwelling. Present finding coincides with Srivastava and Promila (1983) as they observed that 82.00 % farmers kept their buffaloes in human dwellings in villages around Ludhiana city of Punjab. Kokate and Tyagi (1991) also reported that 95.50 % respondents kept animals in their houses in Thane district. The trend for keeping buffaloes at the field was better (44.00%) in Banaskantha district Gelot (2012) [2] than in Patan district (6.00%). The present findings are in contrast with Sargara (2007) [8] where 70% animals were kept in periphery of the village in Kutch district.

Types of roof

It was noticed from Table 1 that the preference of roofing material by respondents were iron sheets (66.98%) followed by thatched (17.93%) and asbestos sheets (12.26%) utilized for buffalo shelter in Patan district. Medium and large farmers utilized iron or asbestos sheet while the majority of small and marginal farmers kept their buffaloes under thatched roof. R. C. C. roofs were uncommon in the district. Preference for iron sheet and asbestos sheet as roofing material might be due to long durability, easy availability and economical to the farmers. Trend for type of roof was significantly (p<0.05) differed in talukas. Sheds with iron sheet roof was higher in Siddhpur, Chanasma, Harij and Patan talukas, while sheds with thatched roof was more in Santalpur taluka (68.75%) due to economic backwardness. During the decades number of farmers utilized iron sheet for roof was increased (66.98%) as compared to year 2004 (27.00%) reports by Patel (2004) [5] in the district. In Banaskantha the farmers utilize Iron sheet was lower (33.33%) as reported by Gelot (2012) [2] than present finding.

Features of roof

Data from the table 4.13 indicated that more than half (58.50%) of the respondents had a single slope roof on shed followed by flat (32.07%) and double slope (9.43%) roof on buffalo sheds. Features of roof were not significantly differed in talukas. However, single slope roof was maximum in Santalpur taluka (75.00%) whereas flat roof was maximum in Harij taluka (47.36%) among all the talukas. Double slope roofs was more in Siddhpur and Chanasma talukas as numbers of farmers were more with the large size herd. The finding was similar to those reported by Rathore *et al.* (2010) [6] in Churu and Gelot (2012) [2] in Banaskantha district respectively with maximum numbers of single slope roofs.

Type of floor

Majority of buffalo shelter (86.00%) had kachcha floor. Only 14.00 % respondents had pucca floor in buffalo shelter. This might be due to the belief that animals feel comfortable during sitting and standing on kachcha floor. Trend for type of floor was significantly differed among talukas. It was observed that some farmers replaced soil bedding frequently in buffalo shed. The present finding is in accordance with previous findings (Patel, 2004; Singh *et al*, 2007 and Gelot 2012) [5, 2].

It was general observation that pucca floor was found to be better than earthen floor for animals to keep them free from worm and tick problems and also for health and hygienic milk production. The respondents under the study showed unawareness about these problems and mainly they gave weightage to earthen floor, as it remained cheap and comfortable to animals.

Slope in floor

It was observed that 54.00 % respondents had slope for drain out urine in kachcha and pucca floor. Trend for slope in floor was not significantly differed among talukas. Slope in the floor allows easy drainage of urine and prevents the dampness of house which was good for health of animals. The result of the present study was in agreement with earlier reports 2009 (Rathore *et al*, 2010, Gelot 2012) [6, 2].

Type of pillar/ pole

Polls for roof support were generally erected on posterior side of the animals in Patan district. Front side of roof generally supported by the wall. It was revealed from Table 4.16 that 64.15 % respondents used Iron poles for roof support while 19.82 % and 16.03 % respondents preferred cemented poles and wooden poles, for roof support in buffalo shed, respectively. Wooden poles generally made from heavy branches of tree which were easily and cheaply available at the farm. Trend for type of pillar was not differed significantly among talukas. However, use of iron pole was more in Patan, Siddhpur and Harij talukas while cemented pole was utilized in Chanasma taluka. Utilization of wooden pole was more in Santalpur as numbers of marginal farmers (70.00%) kept under shed or tree (46.67%) was more. The present finding was in contrast with finding of Sabapara *et al.* (2010) [7] and Gelot (2012) [2] as they report maximum utilization of wooden polls in their study areas.

Storage room facility

Data from the table 1 shown that only 3.33 % respondents had a storage room facility for the storage of fodder and concentrate whereas 96.67 % respondents had no storage room facility. The results are in accordance with Gelot (2012) [2] in Banaskantha district where (83.33%) farmers had no storage facility for fodder. This was due to storage of fodder in open either in the fashion of halo or ogali adopted by farmers. Farmers purchase limited quality (1-2 bags) of readymade concentrate (sagardan) required less space and can easily adjust with their own dwelling. Storage of fodder and concentrate in storage room prevent the wastage of fodder and saves the loss of fodder during the rainy season and also protects it from rodents. Trend for storage room was not significantly differed among talukas.

Provision and type of manger

The information collected regarding provision and type of manger was presented in. From the results, it was noticed that 73.33 % respondents made the provision of manger while 26.67 % had no manager for the buffaloes. Majority of respondents (41.33%) put a log of wood at 1 to 2 feet away from front wall at the floor and make the wooden assisted manger especially in kachcha floor. Wooden assisted temporary manger was of varying size and shape. Only 32.00 % respondents made the arrangement of pucca constructed manger. Majority of medium and large farmers had provision of pucca manger. Farmers of Patan district were more advance to adopt pucca manger (43.33%) and floor (33.33%). Provision and type of manger was significantly differed in talukas. Wooden assisted mangers were more in Chansma, Harij and Sidhapur talukas as compared to Patan taluka. Practically most of them put unchaffed fodder in manger. But for feeding of concentrates to their buffaloes, they were using various types of metal bowls observations of Modi (2003) [4] and Patel (2004) [5] were in accordance with present study. Wooden assisted manger were more in Banaskantha district (54.67%) as reported by Gelot (2012) [2] than present study (41.33%) in Patan district. Saragra (2007) [8] and Sabapara *et al.* (2010) [7] observed absence of manger under the shed in majority of respondents of Kutch and Navsari districts, respectively. The present finding was in consonance with Singh *et al.* (2007) as they observed wooden assisted manger in 43.75 % respondents of their study area of Tonk and Jhunjhunu districts of Rajasthan.

Partition in standing place of animal

It was revealed from table 4.19 that majority (66.00%) of the respondents did not make partition in standing place. Only 34.00 % respondents had partition in standing place. Trend for provision of partition in standing place was differed significantly among talukas. Farmers of Siddhpur and Chanasma were more advanced in making partition in standing place. Partitions in standing place avoid fighting of animals for feed and space and animals can utilize their own space as per their own wills.

Provision of urine drainage

Present study revealed that only 6.00 % of respondents had provision of pucca drainage facility in buffalo shed, while remaining (94.00%) had no drainage facility and urine soaked in earthen floor of animal shed. This causes dampness and insanitary conditions due to lack of drainage and absorption of urine. The breeding of ticks was found more in floor of such situation. To avoid such a situation, some farmers practiced to change soil bedding or position of animals frequently. Trend for provision of urine drain was not significantly differed among talukas. The results were in agreement with Gelot (2012) [2]. Contrary to this Modi (2003) [4] observed high proportion (82.00%) of respondents had pucca drain in animal shed in Sabarkantha district of North Gujarat. This showed the awareness of animal owners regarding benefit of pucca drain in Sabarkantha district.

Provision of lighting facility

Majority (56.00%) of respondents made provision of lighting either by bulb or tube light in buffalo shed. However, notable proportion of respondents (44.00%) had no lighting facility in their animal sheds. Light in buffalo shed facilitates to watch on buffaloes during night especially for sick and pregnant buffaloes. Provision of lighting facility was not significantly differed in talukas. Numbers of farmers providing light in buffalo sheds were more in Siddhapur taluka (76.67%) and Chanasma taluka (76.67%).While it was least in Santalpur taluka (23.33%). Gelot (2012) [2] reported that majority (65.33%) of respondents made provision of lighting either by bulb or tube light in buffalo shed in Banaskantha district.

Source of water

It was found that 80.67 and 19.33 % respondents followed watering of buffaloes manually (with bucket) and community water trough respectively. It is good practice to provide water manually to animal for prevention of water born disease. Chance of water born disease occurrence is more in community water trough. Malik *et al.* (2005) [3] indicated that 98.00 % respondents had bore well or hand pump in their study areas of Chhattisgarh and Uttar Pradesh, respectively. Gelot (2012) [2] reported that 44% respondent in Banskantha district practice manual watering to buffalo.

Type of manure storage

It was revealed from that majority (76.67%) of the respondents did not make manure pits and store the manure by heap (Irregular in shape) method. Due to heap method of storage, disintegration of leftover could not be there and quality and quantity of manure ruined. Only 23.33 % respondents had manure pits for storage of manure. Type of manure storage did not significantly differ among talukas. The present finding was in contrast to Sinha *et al.* (2009) [9]. Gelot (2012) [2] also reported, that majority of buffalo owners (93.33%) followed heap method of manure storage in Banaskantha district.

Location of manure storage

It was observed that majority (90.00%) of the respondents made manure storage near to animal sheds while 10.00 % respondents had manure storage away from the buffalo shed. It was good practice to store the manure away from animal shed to prevent the occurrence and spread of diseases through fly and insects. Trend for location of manure storage was not significantly differed in talukas. In Banaskantha district majority of respondents (62.00%) made manure storage at animal dwelling however numbers of respondents were less or (93/150) as reported by Gelot (2012) [2] than in present finding (135/150) in Patan district.

Keeping of breeding trevis

It was found that very low proportion of (6.67%) of

respondents kept their own breeding trevis. Although community trevis availed by dairy co-operative or Government agency at a particular place in village. Breeding trevis helps in easy handling of buffaloes during artificial insemination or natural service or for the treatment of sick animals. Trend of keeping breeding did not differ significantly among talukas. Similar results were found in Banaskantha district (Gelot 2012) [2] as only 9.33% respondents had breeding trevis.

Provision of ceiling fan

It was observed that only 2.67 % respondents provide the facility of ceiling fans, to ameliorate the heat stress to buffaloes. This might be due to the high cost of fans and electricity and not affordable for marginal or small farmers provision of ceiling fans significantly ($p<0.01$) differed in talukas. Among the talukas, some farmers had ceiling fans in animal sheds in Patan and Siddhpur as compared to other talukas and they were large farmers.

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