



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; SP-11(4): 1020-1025  
© 2022 TPI  
[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 01-02-2022  
Accepted: 03-03-2022

#### Shridhar

PG Scholar, Department of LPM, Veterinary College Bidar, KVAFSU, Bidar, Karnataka, India

#### Vivek M Patil

Associate Professor, Head, Department of LPM, Veterinary College Bengaluru, KVAFSU, Bengaluru, Karnataka, India

#### Prashant G Waghmare

Associate Professor, Department of LFC, Veterinary College Bidar, KVAFSU, Bidar, Karnataka, India

#### Satish Chandra Biradar

Associate Professor, Head, Department of LPM, Veterinary College Bidar, KVAFSU, Bidar, Karnataka, India

#### Channappagouda Biradar

Assistant Professor, Head, BRIC, KVAFSU, Bidar, Karnataka, India

#### Prakashkumar Rathod

Assistant Professor, Head, LRIC (Deoni), KVAFSU, Bidar, Karnataka, India

#### Corresponding Author

#### Vivek M Patil

Associate Professor, Head, Department of LPM, Veterinary College Bengaluru, KVAFSU, Bengaluru, Karnataka, India

## Sheep production practices in North Karnataka

**Shridhar, Vivek M Patil, Prashant G Waghmare, Satish Chandra Biradar, Channappagouda Biradar and Prakashkumar Rathod**

#### Abstract

The study was undertaken to document the existing sheep management practices in Bidar district of North Karnataka, India. The management practices were recorded by means of personal interview using a structured schedule and a multistage stratified sampling procedure. A total of 150 respondents from Bidar district formed the study group. A large proportion of the shepherds had closed (96.7%) and kutch type shed and 72.0% farmers used GI sheet roofing with 57.2% farmers using cement pole supports. The average height, length and width of the shed was 8.28, 20.17 and 12.35 feet, respectively. All the farmers practiced grazing in all seasons with migration less than 50 km distance. Deworming and vaccination were the major health practices followed by shepherds. Most of them sold their male lambs at the age of about 6-12 months.

**Keywords:** Sheep, production practices, management, Karnataka

#### Introduction

India is rich in livestock resources and ranks third in the world in sheep population. Sheep provide livelihood to landless and marginal farmers, and the impoverished shepherds have considerable room for economic progress. It is an essential component of the dry land farming system. They are very well adapted to the harsh climate, long migration, resistance against tropical diseases, poor nutrition, poor water quality and shortage of drinking water.

According to 20<sup>th</sup> Livestock Census 2019<sup>[4]</sup>, India has 74.26 million sheep, which accounts for 13.8% of total farm animals. Total sheep population has increased by 14.13% over previous Livestock Census 2012. The indigenous/non-descript sheep are 70.17 million, an increase of 14.5 per cent over the previous Census. Nearly 1/4<sup>th</sup> of India's sheep population is in Telangana state (19.1 million), followed by Andhra Pradesh (17.6 million), Karnataka (11.05 million), and Rajasthan (7.9 million).

Even though sheep rearing is an important husbandry practice in many places, farmers are still facing problems in sheep rearing in terms of management, feeding, reproductive problems and marketing. Common ways of marketing sheep are through local shandies or markets, direct sale to the consumers at farm level and sale through middlemen due to which farmers get lower than expected price<sup>[1]</sup>.

With this background, a detailed study of sheep husbandry practices associated with profitable sheep rearing in Bidar district of Northern Karnataka was taken up.

#### Materials and Methods

The present study was conducted in Bidar district situated in Karnataka State. Geographically, it resembles the crown of the state occupying its north-eastern corner, and lies between 17°35' and 18°25' North latitude and 76°42' and 77°39' East longitude. Bidar district has an area of 5448 square kilometres and is bounded by Maharashtra on the north-west, Telangana on the east, and Gulbarga of Karnataka on the south. The sheep population of district is 85,948, comprising five talukas - Bidar 12,174, Humnabad 8,970, Basavakalyan 11,818, Aurad 40,928 and Bhalki 12,058.

The district experiences semi-arid climate with extreme summer; the dust storms and severe heat waves are common in the district between April and May. Coldest months are December and January. The temperature varies between 20 °C and 42 °C. The summer season in Bidar starts in the first week of March and lasts until mid-June. This is followed by southwest monsoon which continues till late September and from September to end of January is winter.

**Sampling design:** A multistage stratified random sampling was adopted to select the talukas, villages and respondents for the present study. The first stage of selection involved choosing all the five major talukas viz. Bidar, Aurad, Bhalki, Basavakalyan and Humnabad based on larger sheep population as per 2019 Livestock Census and consultations with officials of the Department of Animal Husbandry and Veterinary Services. In the second stage of selection, three representative hoblis were selected from each taluka. In the next stage, two villages were selected from each hobli after consultation with field staff of the Animal Husbandry department. In the final stage of selection, sheep farmers were selected at random from each village for collection of information regarding the existing management practices and identification of the constraints faced in sheep rearing. Five sheep farmers from each village were identified based on their sheep stock position with help of Veterinary officers of Department of Animal Husbandry and Veterinary Services. Detailed information on production system and husbandry practices were collected using structured pretested interview schedule. A total of 150 respondents from Bidar district formed the study group.

### Data collection and analysis

Relevant variables to study the sheep rearing practices were selected based on the pilot survey conducted in a non-sampling area and discussion with experts. This formed the basis for developing the schedule of enquiry. The schedule of enquiry was pre-tested and appropriate modifications in the construction and sequence of questions were made. The structured and pre-tested interview schedule were filled on the spot by personal observations and face-to-face interview with sheep owners. Parameters studied included housing practices, feeding and grazing practices, migratory practices, health care practices and marketing practices. Livestock shed dimensions were recorded using a metal tape. Data on various parameters was collected from the survey conducted during the period from May – December 2021. Comparison of numerical data was done using ANOVA and that of ordinal data was done using the chi square test.

## Results and Discussion

### Housing practices

The housing practices followed by sheep farmers are

presented in Table 1. A large proportion of the shepherds had closed type of shed (96.7 per cent) followed by open type of shed (3.3 per cent). Majority of the sheep sheds were located adjacent (98.0 per cent) of the owner's house, followed by within compound (0.7 per cent) and at farm (1.3 per cent). Similar findings have been reported by [15]. All the respondents had kutcha type of shed. These were found to be in line with other reports [8, 11, 20, 23] and in contrast with [24] who reported that 100 per cent were pucca type houses. Most of the sheds were constructed with GI sheet or thatched roof material as it was perceived to be economically feasible and readily available. (72.0 per cent) followed by thatch (24.7 per cent) and no roof (3.3 per cent). The roof height at highest point was found to be  $8.28 \pm 0.081$  feet, whereas that at the lowest point was found to be  $7.52 \pm 0.082$  feet. The major material used for supporting roof was cement pole (57.2 per cent), followed by wood (41.4 per cent) and stone (1.4 per cent). These findings were in line with [10] who reported that majority of the shepherds used wood as roof support material. None of the respondents had ventilators in their sheep shed; the farmers justified this as the animals were taken out for grazing during day hours and were housed indoors only at night during cooler hours. Similar findings were reported by [11]. Stone was the most commonly used (96.6 per cent) material for construction of the walls, followed by wood (3.4 per cent). None of the respondents had plastered shed walls and basement. Average wall height was  $7.99 \pm 0.100$  feet. All the respondents used mud flooring; this was not conducive to hygienic management of the flock. No one used dung, stone, brick, cement or slatted flooring. Drainage in the form of mud channel was most common, while stone and cement drains were not used.

The average length and width of the shed was found to be  $20.17 \pm 0.30$  and  $12.35 \pm 0.18$  feet, respectively. Bidar taluka had highest shed dimensions with average of about  $22.81 \pm 0.888$  feet length and  $14.59 \pm 0.59$  feet width. None of the respondents in the study area used any type of feed managers like wooden log, stone, cement pole, metal and constructed. The respondents provided water to their flock only during grazing and were found to clean the shed only once in a day, which was found to be adequate. None of them practised whitewashing and disinfectant application in their shed.

**Table 1:** Sheep housing practices of farmers in different talukas of Bidar district (%)

Attribute	N	Bidar	Bhalki	Aurad	Hum'bad	B'kalyan	Overall	P value
<b>Housing type</b>								
Open	5	10	0	6.7	0	0	3.3	0.082
Closed	145	90	100	93.3	100	100	96.7	0.146
<b>Housing location</b>								
Adjacent (lean-to)	147	100	93.3	96.7	100	100	98.0	
Within compound	1	0	0	3.3	0	0	0.7	
At farm	2	0	6.7	0	0	0	1.3	
<b>Shed dimensions (ft)</b>								
Length		22.81 <sup>a</sup>	20.23 <sup>b</sup>	20.32 <sup>b</sup>	19.17 <sup>b</sup>	18.57 <sup>b</sup>	20.17±0.300	0.000
Width		14.59 <sup>a</sup>	12.40 <sup>b</sup>	11.68 <sup>b</sup>	11.73 <sup>b</sup>	11.50 <sup>b</sup>	12.35±0.180	0.000
<b>Roof type</b>								
Open	5	10	0	6.7	0	0	3.3	0.004
Thatch	37	33.3	10.0	40.0	30.0	10.0	24.7	
GI sheet	108	56.7	90.0	53.3	70.0	90.0	72.0	
<b>Roof height (ft)</b>								
Highest point		7.74 <sup>c</sup>	8.21 <sup>b</sup>	8.87 <sup>a</sup>	8.28 <sup>b</sup>	8.27 <sup>b</sup>	8.28±0.081	0.001
Lowest point		6.69 <sup>c</sup>	7.38 <sup>b</sup>	8.07 <sup>a</sup>	7.60 <sup>ab</sup>	7.79 <sup>ab</sup>	7.52±0.082	0.000
<b>Roof supports</b>								

Wood	60	7.4	10.0	53.4	46.7	86.7	41.4	0.000
Stone	2	7.4	0	0	0	0	1.4	
Cement pole	83	85.2	90.0	46.4	53.3	13.3	57.2	
<b>Wall material</b>								
Stone	140	92.6	90.0	100.0	100.0	100.0	96.6	0.082
Wood	5	7.4	10.0	0	0	0	3.4	
Wall height (ft)		6.94 <sup>c</sup>	8.11 <sup>b</sup>	8.73 <sup>a</sup>	8.28 <sup>ab</sup>	7.81 <sup>b</sup>	7.99±0.100	0.000

**Note:** Means within a row bearing different superscripts differ significantly ( $P<0.05$ ).

### Feeding and grazing management practices

The feeding and grazing management practices of sheep farmers are presented in Table 2. All the respondents in the study area were found to practice only grazing system round the year. These findings were similar to those of [3, 5, 7, 9, 16, 19, 27]. Majority of the farmers (40.0 per cent) used bore well, followed by river (26.7 per cent), open well (22.0 per cent) and other water sources like pond, channel and tank (11.3 per cent). All the respondents gave water twice a day to their flock. The most preferred source of feeding for the sheep was community grazing land, as most of the sheep owners were resource-poor and landless, and they were highly dependent on community grazing land, especially prior to harvest season when other farmers did not allow them to enter their fields. Similar observations were made by [11, 16].

It was found that shepherds fed colostrum within  $2.04 \pm 0.04$  hours after the birth of the lambs, all the respondents in study

area fed milk to the lambs twice daily. It was observed that lambs were started on solid feeds at about  $4.39 \pm 0.037$  months of age and green were started at around  $3.39 \pm 0.032$  months of age.

None of the respondents fed concentrate feed to their flocks. A vast majority of the farmers (84.7 per cent) gathered green fodder, followed by cultivation (15.3 per cent), whereas 62.7 per cent of the farmers purchased dry fodder, followed by gathering (37.3 per cent). However, the sheep were allowed by other farmers to graze fallen leaves and grains and crop stubble after harvesting of crops. In many instances, sheep stayed overnight or for 2-3 days in one field, helping to clear the land early for the next crop, eat up weeds on the bunds and enrich the soil with their dung. This provided a rich source of nutrients for the sheep, and facilitated flushing of the sheep prior to breeding season.

**Table 2:** Feeding practices adopted by sheep farmers in different talukas of Bidar district (%)

Attribute	N	Bidar	Bhalki	Aurad	Hum'bad	B'kalyan	Overall	P value
<b>Water source</b>								
Open well	33	16.7	20.0	16.7	23.3	33.3	22.0	0.088
Bore well	60	16.7	46.7	16.7	70.0	50.0	40.0	
River	40	33.3	33.3	66.7	0.0	0.0	26.7	
Other	17	33.3	0.0	0.0	6.7	16.7	11.3	
<b>Lamb feeding</b>								
Colostrum feeding after birth (hrs)	150	2.03 <sup>b</sup>	2.63 <sup>a</sup>	1.97 <sup>b</sup>	1.57 <sup>c</sup>	2.02 <sup>b</sup>	2.04±0.04	0.000
Colostrum feeding (times/day)	150	2.00 <sup>b</sup>	2.13 <sup>a</sup>	2.00 <sup>b</sup>	2.03 <sup>b</sup>	2.00 <sup>b</sup>	2.03±0.01	0.013
Milk feeding (times/day)	150	2.00 <sup>b</sup>	2.17 <sup>a</sup>	2.03 <sup>b</sup>	2.00 <sup>b</sup>	2.07 <sup>ab</sup>	2.05±0.01	0.022
Age at start of solid feeding (mths)	150	4.52 <sup>a</sup>	4.13 <sup>b</sup>	4.47 <sup>a</sup>	4.37 <sup>a</sup>	4.48 <sup>a</sup>	4.39±0.03	0.005
Age at start of greens feeding (mths)	150	3.30	3.37	3.50	3.38	3.42	3.39±0.03	0.382
<b>Feed sources-Green</b>								
Cultivated	23	0	60.0	16.7	0	0	15.3	0.000
Gathered	127	100	40.0	83.3	100	100	84.7	
Purchased	0	0	0	0	0	0	0	
<b>Feed sources-Dry</b>								
Cultivated	0	0	0	0	0	0	0	0.000
Gathered	56	100	13.3	23.3	20.0	30.0	37.3	
Purchased	94	0	86.7	76.7	80.0	70.0	62.7	

**Note:** Means within a row bearing different superscripts differ significantly ( $P<0.05$ ).

### Migratory practices

All the respondents in the study area practiced migration regularly. A large proportion of the farmers (97.3 per cent) travelled an average distance of less than 50 km, followed by 50 to 100 km (2.7 per cent). These findings were in line with [2, 12, 13, 14, 17, 18, 21]. In contrast, [25] reported that short term migration of sheep was practised by only 23 per cent of farmers in Rajasthan. None of the farmers in the study area practiced inter-district or long-range migration, indicating that there was adequate feed resource in the vicinity of their homes. It was observed in study area that majority of the shepherds were paid approximately Rs. 800 per day to keep their flock (approximate flock size 200-250) in agriculture land for soil enrichment.

### Health care practices

The health care practices followed by sheep farmers are presented in Table 3. In the study area it was observed that deworming and vaccination were the major health care practices followed by the shepherds. Majority of the respondents immunized their flock against PPR in the months of May-June and for ET in the months of July-August. Absolute majority of sheep farmers dewormed their stock using oral anthelmintics but the differences were seen with respect to schedule of usage as well as the frequency of deworming. Lambs were dewormed regularly  $3.85 \pm 0.056$  times per year and adults  $2.84 \pm 0.061$  times per year. All the respondents in the study area depended on the advice from veterinarians with respect to anthelmintic dosage. [26] Reported 100 per cent vaccination in sheep but no practices of

dipping and spraying was noticed and similar findings were noticed in the present study. In contrast, [15] reported that Ganjam sheep farmers of Orissa did not follow any deworming or vaccination schedule for their flocks.

None of the respondents followed routine disinfection of the sheds; they were willing to use disinfectants only when there was outbreak of certain diseases. The major health care provider was the veterinarian indicating that the access to health centres was easy due to high number of veterinary care centers established by the Government. The annual veterinary

expenses incurred were recorded in the study and it was found that on an average each sheep farmer spent Rs 183.4 ± 2.192 for each adult sheep and Rs 61.1 ± 1.401 for each lamb. It was observed that majority (91.3 per cent) of the farmers did not know the importance of post mortem examination in disease diagnosis. These findings were similar to those of [6] who reported that sheep farmers spent more than 3.0 per cent of the total variable cost on purchase of medicines, especially anthelmintics.

**Table 3:** Health care practices adopted by sheep farmers in different talukas of Bidar district (%)

Attribute	N	Bidar	Bhalki	Aurad	Hum'bad	B'kalyan	Overall	P value
<b>Deworming frequency (times/yr)</b>								
Lamb		3.67 <sup>b</sup>	4.17 <sup>a</sup>	3.87 <sup>ab</sup>	3.63 <sup>b</sup>	3.90 <sup>ab</sup>	3.85 ± 0.056	0.017
Adult		3.98 <sup>a</sup>	2.73 <sup>b</sup>	2.53 <sup>b</sup>	2.47 <sup>c</sup>	2.47 <sup>c</sup>	2.84 ± 0.061	0.000
<b>Veterinary expenses (Rs/yr)</b>								
Adult		179.33 <sup>bc</sup>	171.67 <sup>c</sup>	195.33 <sup>a</sup>	186.33 <sup>ab</sup>	184.33 <sup>abc</sup>	183.40 ± 2.19	0.011
Lamb		71.33 <sup>a</sup>	53.17 <sup>c</sup>	63.67 <sup>ab</sup>	55.67 <sup>bc</sup>	61.67 <sup>b</sup>	61.10 ± 1.40	0.000
<b>Post-mortem examination</b>								
Yes	13	16.7	10.0	16.7	0	0	8.7	0.031
No	137	83.3	90.0	83.3	100	100	91.3	

**Note:** Means within a row bearing different superscripts differ significantly ( $P < 0.05$ ).

### Marketing practices

The marketing practices followed by sheep farmers are presented in Table 4. It was observed that shepherds in the study area covered an average distance of about 28.27 ± 1.067 km to reach one of the preferred market places to sell or buy their sheep. It was noticed that 73.3 per cent of the farmers travelled an average distance of more than 20 km to market their animals.

A vast majority of the farmers felt that the best time to buy sheep is the month of April (54 per cent), followed by March (30.7 per cent), February (8.0 per cent) and May (7.3 per cent). Major proportion of the farmers were interested to sell their sheep in the months of October (61.3 per cent), followed by September (30 per cent) and November (8.7 per cent).

The market price of the various sheep products was analysed in the study area and it was observed that average market price of the ram was Rs 18206 ± 117.31, ewe was Rs 12023.3 ± 64.73, ram lamb was 5073 ± 27.73 and ewe lamb was 4200 ± 274.49, respectively. The average sale price of the mutton

was found to be Rs. 591.67 ± 3.18 per kg.

A majority of the respondents (93.3 per cent) preferred to sell their male lambs at the age of 6 to 12 months, while the rest preferred sale at more than 12 months of age.

For transportation, majority of the farmers (94.7 per cent) used three-wheelers to reach preferred market places to buy or sell their products, followed by 4.0 per cent farmers who used two-wheeler and 1.3 per cent who reached the market by walking.

Low level of marketing tactics and knowledge of sheep farmers was highly exploited by the middleman and thus they were denied a fair price for their stock. Majority of them perceived sheep marketing to be stressful, labour intensive aspect of sheep production with non-remunerative returns as reported by [22]. [1] Was of the opinion that Mecheri sheep farmers of Kannur district were efficient in marketing strategies but agreed to the fact that the market was unorganized and middleman dominated.

**Table 4:** Marketing practices followed by sheep farmers in different talukas of Bidar district (%)

Attribute	N	Bidar	Bhalki	Aurad	Hum'bad	B'kalyan	Overall	P value
Distance to market (km)	150	19.17 <sup>c</sup>	20.67 <sup>c</sup>	36.67 <sup>b</sup>	42.17 <sup>a</sup>	22.67 <sup>c</sup>	28.27 ± 1.062	0.000
<b>Distance to market</b>								
<10 km	20	33.3	33.3	0	0	0	13.3	0.000
10 to 20 km	20	33.3	0	0	0	33.3	13.3	
> 20 km	110	33.3	66.7	100.0	100.0	66.7	73.3	
<b>Best time to buy sheep</b>								
February	12	0	0	33.3	0	0	8.0	0.000
March	46	0	20.0	43.3	46.7	43.3	30.7	
April	83	100.0	43.3	23.3	53.3	50.0	54.0	
May	11	0	36.7	0	0	0	7.3	
<b>Best time to sell sheep</b>								
September	45	0	10.0	36.7	53.3	50.0	30.0	0.000
October	92	100.0	46.7	63.3	46.7	50.0	61.3	
November	13	0	43.3	0	0	0	8.7	
<b>Market price (Rs)</b>								
Ram	150	19000 <sup>a</sup>	17616 <sup>c</sup>	17716 <sup>c</sup>	17816 <sup>c</sup>	18883 <sup>a</sup>	18206.67 ± 117	0.000
Ewe	150	12366 <sup>a</sup>	11766 <sup>b</sup>	11633 <sup>b</sup>	11983 <sup>b</sup>	12367 <sup>a</sup>	12023.30 ± 64	0.000
Ram-lamb	150	5000 <sup>bc</sup>	4866 <sup>c</sup>	4966 <sup>c</sup>	5183 <sup>b</sup>	5350 <sup>a</sup>	5073.33 ± 27.73	0.000
Ewe-lamb	150	5366	3867	3800	3950	4016	4200.00 ± 274.49	0.335

Sale price of mutton (Rs/kg)	150	633.30 <sup>a</sup>	605.00 <sup>b</sup>	565.00 <sup>c</sup>	579.17 <sup>c</sup>	575.83 <sup>c</sup>	591.67±3.18	0.000
<b>Age of selling male lambs</b>								
< 6 months	0	0	0	0	0	0	0	0.000
6 to 12 months	140	66.7	100.0	100.0	100.0	100.0	93.3	
> 12 months	10	33.3	0	0	0	0	6.7	
<b>Transportation of sheep</b>								
Walking	2	0	6.7	0	0	0	1.3	0.000
Two-wheeler	6	0	20.0	0	0	0	4.0	
Three-wheeler	142	100.0	73.3	100.0	100.0	100.0	94.7	

**Note:** Means within a row bearing different superscripts differ significantly ( $P < 0.05$ ).

## Conclusion

The existing traditional sheep rearing system is a zero- or very low- input and low output system which provides gainful employment and moderate income. Most of the sheep in Bidar district of North Karnataka were housed in lean-to sheds with acceptable height but poor ventilation, flooring and hygiene. Concentrate feeding was not practiced, green fodder was gathered, dry fodder was purchased, and watering was done while grazing. Migration was practiced in the post-harvest season but not beyond 100 km. There is scope for increase in birth weight and growth rates of lambs with supplementary feeding. The farmers were bearing very heavy expenditure for veterinary treatment of their flock, especially for deworming. There were significant differences in the sheep production practices among the various talukas of the district. Sheep markets in the area were conveniently located but highly unregulated. Efforts must be made to organize the sheep farmers into Farmers Producers Organizations (FPOs) so they can market their produce in a collaborative mode, thus enabling them to get a better price as well as providing them with more assured returns. They can also be connected to the large-scale app-based meat delivery chains in order to eliminate middlemen and ensure that they get a greater share of what the consumer pays. Remunerative and assured marketing channels will promote the farmers to invest more into housing, feeding, fodder production and health care, thus enabling better animal welfare and production of quality meat.

## References

- Akila N. Management and marketing pattern of Mecheri sheep in Tamil Nadu. An exploratory analysis of Karur district. *Indian J Small Ruminants*. 2014;20(2):161-164.
- Arora AL, Prince LL, Mishra AK. Performance evaluation of Jaisalmeri sheep in farmers' flock. *Indian J Anim Sci*. 2007;77(8):759-762.
- Bacchu Singh, Meena GS, Meena KC, Navab Singh. Feeding and healthcare management practices adopted by sheep farmers in Karauli District of Eastern Rajasthan. *India Int J Curr Microbiol App Sci*. 2018;7(02):309-316.
- BAHS (Basic Animal Husbandry Statistics) Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Food and Food Processing Industries, Government of India, New Delhi, 2019.
- Behura NC, Parida GS, Mishra SK, Dehuri PK. Contribution of small ruminants to sustainable livelihood of villagers in Koraput district of Orissa. *Indian J of Small Ruminants*. 2009;15(1):62-67.
- Chandran PC, Verma SB, Mandal KG, Birendra Kumar and Singh RK. Distribution and management practices of Shahabadi sheep in its breeding tract of Bihar. *Indian J Anim Sci*. 2013;83(2):190-193.
- Chaturvedi OH, Tripathi MK, Mishra AS, Verma DL, Rawat PS, Jakhmola RC. Land as well as livestock holding pattern and feeding practices of livestock in Malpura Taluk of semiarid eastern Rajasthan. *Indian Journal of Small Ruminants*. 2002;8(2):143-146.
- Dineshkumar, Gurmej Singh, Anand Jain. Characterization and evaluation of 142 Muzaffarnagari sheep. *Indian J Small Ruminants*. 2006;12:48-55.
- Gopal Dass, Hariprasad. Morphological characteristics live weights and management practices of Muzzafarnagri sheep in the home tract. *Indian Journal of Small Ruminants*. 2007;13(1):27-30.
- Guruprasad. A study on husbandry practices under different production systems of sheep in Hassan district. PG Thesis Karnataka Veterinary Animal and Fisheries Sciences University Bidar, 2018.
- Kailash and Naruka K. Grazing and housing practices of sheep in Western Rajasthan. *Cibtech J Zoology*. 2015;4(1):23-25.
- Kandasamy N, Pannerselvam S, Devenran P, Thiruvankadan. Final report on survey evaluation and characterization of Coimbatore sheep breed. Department of Animal Genetics and Breeding VC & RI Namakkal, 2006.
- Krishnarao CS. Studies on the sheep production practices in Prakasm District of Andhra Pradesh. MVSc Thesis Sri Venkateswara Veterinary University Tirupati India. 2012.
- Nisha PR, Mohammed Safiullah A, Sasikala V, Saravanan KP. Migratory sheep rearing in Thanjavur district of Tamil Nadu. *Indian Journal of Small Ruminants*. 2016;22(1):134-136.
- Pattanayak GR, Patro BN, Nayak S. Survey and performance evaluation of Ganjam sheep. *Ind J Small Rumi*. 2003;9:47-49.
- Porwal K, Karim SA, Sisodia SL, Singh VK. Socio-economic survey of sheep farmers in western Rajasthan. *Indian J Small Ruminants*. 2006;12:74- 81.
- Rajanna N, Mahendar M, Ramana KV. A study on migration pattern of sheep flocks in Telangana region of Andhra Pradesh. *Journal of Research ANGRAU*. 2013;41(1):42-46.
- Rajapandi S. Distribution and management practices of Coimbatore sheep. MVSc Thesis submitted to Veterinary College and Research Institute Namakkal Tamil Nadu. 2005.
- Rao KA, Rao KS, Rao SJ, Ravi A, Anitha A. Analysis of sheep production systems: North coastal zone of Andhra Pradesh. *International J Agri Sci Vet Med*. 2013;1(3)131-144.
- Reddy PP, Vinoo R, Muralidhar M, Venkatasesaiah Ch K, Kumar A, Sudhakar K. Socio-economic status, sheep husbandry practices and morphological patterns of Macherla sheep a lesser-known sheep breed of Andhra Pradesh. *J Anim Res*. 2020;10(5):827-835.
- Saravanakumar AK. A study on the migratory pattern of Nellore sheep and their performance. MVSc Thesis

- submitted to Acharya N G Ranga Agricultural University Hyderabad Andhra Pradesh, 2003.
- 22 Senthilkumar S, Ramprabhu R, Serma Saravana Pandian A. Small ruminant marketing practices in southern Tamil Nadu: A case study. *Indian J Small Ruminants*. 2012;18(1):129-131.
  - 23 Shiva Kumara C, Reddy BS, Suresh S Patil. Small ruminant production in Karnataka State of India - An overview. *Euro J Zool Res*. 2017;5(1):28-35.
  - 24 Sridhar K. A study on temporal changes of Deccani sheep rearing in Mahabubnagar district of Telangana State. MVSc thesis PV Narsimha Rao Telangana Veterinary University Rajendranagar Hyderabad, 2017.
  - 25 Suresh A, Gupta DC, Mann JS. Farmer's management practices and economics of sheep farming in eastern semi-arid region of Rajasthan. *Indian J Anim Sci*. 2008;14(2):236-242.
  - 26 Swarnkar CP, Singh D. Questionnaire survey on sheep husbandry and worm management practices adopted by farmers in Rajasthan. *Indian J Small Ruminants*. 2010;16(2):199-209.
  - 27 Thiruvenkadan AK, Karunanithi K, Purushothaman MR. Socio-economic status of the Mecheri sheep farmers and economics of rearing under farmer's management. *Indian J Small Ruminants*. 2004;10:117-122.