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Livestock rearers socio-economic status, feed resources, feeding and management practices in Gurez valley of Kashmir

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ABSTRACT

The study was undertaken to assess the socio-economic status of animal rearers, available feed resources and feeding and management practices of livestock at different zones in Gurez valley of Kashmir. A baseline survey was conducted to obtain the information in three arbitrary zones, viz. lower, middle and upper Gurez. The study was carried out in three villages in each zone where seven farmer families per village were selected randomly for the study. A total of 63 households owning livestock were interviewed using a pre-tested structured questionnaire and through direct observation. Majority of the farmers' families was joint (94%), fell under middle age category (41%), had small land holdings (37%) and was predominantly illiterate (28%) but all categorised under Schedule Tribe. Animal husbandry (20%) was the major occupation after household (31%). Monthly income level was adequate. Among different livestock species reared, small ruminants (sheep and goat) were predominant (55%) although the productivity was low. Almost all the farm produce was consumed locally. Maize stover and forest grass hay were the main sources of dry roughages, while natural grazing was the main and important green forage source during summers. Concentrates were mainly home-made (87%) prepared without the use of oilcakes. The chemical composition of the available feed resources were within the normal ranges. The animals were left for grazing during summers with no concentrate supplementations (81%); however were offered lopped tree foliage (92%). During winters, livestock were completely stall fed primarily on crop residues with no or little concentrate mixture supplementation (86%) being offered only to lactating or pregnant animals. Majority of the farmers (94%) did not supplement the diet of animals with mineral mixture. Semi-migratory (89%) and stationary (11%) were the two types of animal production system being practiced. All the farmers (100%) had kacha close type of houses for their animals, mainly as part of human dwellings (94%). Animal stockings within the sheds were mostly mixed (89%) with little provision for proper ventilation (9%) and no (0%) regular bedding and drainage arrangements. Sanitary conditions of majority of the livestock farmers were poor with below average technical knowledge about livestock farming (67%). From results of this study, it could be concluded that to ensure sustainable livestock production in the surveyed area, technological, technical and institutional innovations would be vital to overcome the constraints of feed/fodder scarcity and lack of scientific knowledge.

Keywords: Feeds, Gurez, Livestock, Management, Practices

Livestock form the backbone of agriculture system practiced in the hills and mountains (Singh and Bohra 2005). Under hill agro-ecologies, most of the community livelihood activities revolve around livestock. However, in any livestock development programme, feeding has a crucial role to play for optimum expression of genetic potential in addition to its major contribution (60–70%) towards total cost of livestock production. Proper feeding, i.e. the availability of adequate nutrients is affected by the season, cropping pattern, land holding capacity of farmers and topographical conditions (Shukla *et al.* 2011). In general, livestock feeding and management practices depend to a great extent on socio-economic status of farmers which has relevance for application of scientific animal rearing skills to ensure optimum production.

A typical example of such agro-pastoral production system being practiced in India's North Western high Himalayan region is in Gurez—a sub-valley of picturesque Kashmir valley. The existence of vast natural resources in the region provides congenial conditions for livestock based production system; however, several factors lead to lower productivity making livestock enterprise less remunerative

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Fig. 1. Local livestock being reared in Gurez valley.

for the farmers. Understanding such linked factors is important in order to identify appropriate research and development interventions to enhance health and performance of livestock. However, there is no such work done in Gurez valley to plan technical and institutional interventions. With this background, a study was undertaken to assess the socio-economic status of animal owners, available livestock feed resources with feeding systems and existing management practices followed in Gurez valley.

MATERIALS AND METHODS

Study area: The study was carried out in Gurez valley, one of three tehsils of district Bandipore in Kashmir located at a distance of around 130 km from Srinagar city, the summer capital of the state of Jammu and Kashmir, India. Gurez is situated in the far north at 34° 25¢ North latitude and 74° 38¢ East longitude across the famous Razdan pass at an altitude 11,672 ft above mean sea level. The Gurez valley extends over an area of 362.88 km^2 in the form of pastures, meadows and forests accounting for more than 93% of the total geographical area. The tehsil shares its borders with Drass (Kargil, Ladhak) in the East, Kupwara district in the West, Pakistan Occupied Kashmir (PoK) in North and North-West and Bandipore tehsil towards South, and thus entire valley has a strategic importance from defense point of view.

Sampling procedure: For the study, imaginarily the Gurez was divided into three zones, viz. lower Gurez (Bagtoor belt), middle/central Gurez (main Gurez valley) and upper Gurez (Tulail belt). The study was carried out in three villages in each zone (Koragbal, Tarbal and Kanzalwan in Lower Gurez; Achoora, Churwan and Dawar in Middle Gurez; Sheikpora, Badoab and Burnoi in Upper Gurez), selected on the basis where the livestock population was the highest. In each village, seven farmer families were selected randomly for the study.

Data collection: A single-visit-multiple-subjects formal survey technique (ILCA 1990) was used to collect data through household interviews by the authors using a pre-tested, structured questionnaires and personal observation. The questionnaire was prepared in accordance with objectives of the study before collection of data and validated against field conditions. The selected livestock owning households (63 in total) from the aforementioned sites were interviewed during summer season (September) to collect the information on various socio-economic characteristics of the respondents, feed availability, feeding pattern, grazing and management practices and productive performance of the animals.

Chemical analysis: The samples of feed/fodder offered to the animals were collected from each household, composited and chemically analyzed for proximate composition as per AOAC (2005), fibre fractions as per Van Soest *et al.* (1991), major macro-minerals (calcium-Ca, phosphorus-P) as per Talapatra *et al.* (1948), magnesium (Mg) by colorimetric method (Jackson 1987), and trace minerals (copper-Cu, zinc-Zn and iron-Fe) by Atomic Absorption Spectrophotometer (GBC SensAA, GBC Scientific Equipment, Inc, Australia). Macronutrient content (nutritive value) of the available feed resources was also calculated. Digestible crude protein (DCP) content was calculated from digestibility coefficient values given by Ranjhan (2003), while total digestible nutrient (TDN) values were estimated using the equations reported by Martin (1985) and Chandler (1990). Metabolisable energy (ME) content was determined from TDN as per equation given by NRC (1989).

Statistical analysis: The analysis of the data was performed by using test statistics one-way ANOVA for quantitative data and chi-square test for nominal data. These tests were two sided and were referenced for P value for their significance. Any P value less than 0.05 ($P<0.05$) was taken to be statistically significant. The analysis of the data was carried out by using statistical software program SPSS (version 20.0) for Windows (SPSS Inc., Chicago, Illinois, USA).

RESULTS AND DISCUSSION

Farmer's socio-economic status: The data of socio-economic characteristics of respondents in the study area are presented in Table 1. Majority ($P<0.05$) of the farmers' families in all the surveyed zones of Gurez were joint with the family size of more than 5 depicting the typical Indian joint family system. Lack of industrialisation, no access to mass media due to security reasons, and little or no government efforts towards controlling the birth rate contributed to the present situation. The major portion of the livestock farmers (39 to 43%) of different zones were in the middle age category, while 30% of the farmers were in the young age. This age pattern of animal rearers pertains to summer season during which the survey was carried out; however, it changes altogether during winters when majority of the young and middle aged men migrate to the plains for employment/labour and livestock rearing is entirely carried out by old aged men and women folk.

After household (31%), the main stay of population in Gurez was animal husbandry (20%) as the major occupation, highlighting the importance of livestock component in the household economy. The region is not industrially developed, animal rearing and labour in projects of security agencies were the major means of the people's livelihood. The role played by animal husbandry is very significant and suggest its viability under the prevailing agro-ecological conditions. People prefer to work in

Table 1. Socio-economic status of livestock farmers in surveyed areas of Gurez valley

Parameter	Surveyed zones			Overall Gurez	P value
	Lower Gurez	Middle Gurez	Upper Gurez		
Family size					
Small (upto 5)	0.00[a] (0)	19.05[b] (4)	0.00[a] (0)	6.35 (4)	0.014
Large (>5)	100.00[b] (21)	80.95[a] (17)	100.00[b] (21)	93.65 (59)	
Age					
Young (upto 30 years)	29.86 (63)	32.93 (55)	27.93 (62)	30.00 (180)	0.565
Middle (31–55 years)	39.34 (83)	43.12 (72)	41.44 (92)	41.20 (247)	0.756
Old (> 55 years)	30.80 (65)	23.95 (40)	30.63 (68)	28.80 (173)	0.261
Occupation					
Labour	14.20 (30)	16.20 (27)	22.10 (49)	17.70 (106)	0.084
Animal husbandry	20.40 (43)	19.20 (32)	20.30 (45)	20.00 (120)	0.950
Agriculture	9.00 (19)	11.40 (19)	6.80 (15)	8.80 (53)	0.281
Govt. Service	11.40 (24)	15.60 (26)	9.90 (22)	12.00 (72)	0.222
Household	34.10 (72)	26.30 (44)	32.40 (72)	31.30 (188)	0.244
Others	10.90 (23)	11.40 (19)	8.60 (19)	10.20 (61)	0.600
Land holding (*Kanal/family*)					
Landless	9.52 (2)	9.52 (2)	23.81 (5)	14.29 (9)	0.311
Marginal (<1 kanal)	14.29 (3)	14.29 (3)	23.81 (5)	17.46 (11)	0.644
Small (1–4 kanal)	42.86 (9)	38.10 (8)	28.57 (6)	36.51 (23)	0.619
Medium (4–8 kanal)	28.57 (6)	28.57 (6)	19.05 (4)	25.40 (16)	0.715
Large (>8 kanal)	4.76 (1)	9.52 (2)	4.76 (1)	6.35 (4)	0.766
Livestock holding (*number/family*)					
Bovines (Cattle, Yak and their hybrids)	12.10 (43)	12.30 (30)	10.80 (49)	11.60 (122)	0.769
Equines (Horses, Mules and Ponies)	8.20 (29)	9.80 (24)	9.70 (44)	9.20 (97)	0.716
Sheep and Goat	50.80[a] (180)	51.60[a] (126)	59.80[b] (272)	54.90 (578)	0.021
Poultry (Chicken)	28.80[b] (102)	26.20[b] (64)	19.80[a] (90)	24.30 (256)	0.009
Milk production (L/animal/day)	2.07[a]±0.07	2.87[b]±0.19	2.23[a]±0.19	2.39±0.14	0.025
Milk production (L/family/day)	2.13[a]±0.09	3.07[b]±0.29	2.47[a]±0.14	2.56±0.17	0.038
Wool yield/animal/year (kg)	1.07[a]±0.03	1.03[a]±0.02	1.57[b]±0.03	1.22±0.09	<0.001

different civil services (12%) over to agriculture (9%) which remains restricted to either limited period (5–6 months only) or specific area due to mostly hill topography. In all the surveyed zones of Gurez, livestock were reared mostly by small farmers category (37%) with upto 4 kanals of land holding to support their livelihood, and only 6% of the livestock farmers were having more than 8 kanals of land. Small farm holdings might be due to fragmentation of land holding with each generation, and is the significant feature of Indian farming system (Raju *et al.* 2006).

Literacy level of livestock farmers varied non-significantly among the different surveyed zones of Gurez; however, all are categorised under Schedule Tribe. The farmers were predominantly illiterate (28%) followed by middle school educational level (16%) (Supplementary Fig. 1). The highest literacy level was post-graduation (2%) followed by graduation (7%). The educated persons prefer other avenues especially Govt. services rather than the livestock farming. These findings are in line with the reports of Susatkar *et al.* (2011). Besides livestock rearing, various farmers were involved in different other jobs too which caused variations in their monthly income level. The highest monthly income level found among the livestock farmers was ₹ 40,000 (6%) and the lowest was 10,000 (6%) with the majority of the famers had income level of 30,000 (38%) followed by 20,000 (29%) (Supplementary Fig. 2).

Livestock holdings: Among livestock holdings, small ruminants (sheep and goat) predominate and accounted alone for 55% of the total livestock population (Table 1) in the study area. The sheep were mainly of Gurez breed (Fig. 1) or the crosses of Gurez with Kashmir Merino, reared mainly by the '*Dardi*' tribe for wool and meat primarily and little milk. Goats were of bakerwal breed, reared for meat, milk and hairs. In bovines, cattle, yak and cattle×yak hybrids locally called *Zho* or *Zombo* were being reared both for milk and draught purpose. Proximity to Kargil district of Ladakh and high altitude justifies the presence of yak and its hybrids in the area. In equines, mules, ponies and local non-descript horses were kept by few households and used as pack animals for potter services. Chicken was the only poultry bird being reared for meat and egg production. Though, the livestock in Gurez were hardy and endure but were low yielder. The average milk yield/day was higher (P>0.05) in Middle Gurez compared to Lower and Upper zones, probably due to Jersey crossbred cattle being reared by few households in the region compared to dwarf local cattle (desi/zebu) reared mostly in rest of the surveyed zones. Wool yield was higher (P>0.01) in Upper than Lower

Table 2. Chemical composition and nutritive value of feedstuffs (% DM basis) offered to the livestock in Gurez valley

Feedstuff	Average range of chemical composition											Nutritive value		
	Proximate composition				Fibre fractions		Minerals contents					ME (Mcal/kg)	% DCP	% TDN
	% DM	% OM	% CP	% EE	% NDF	% ADF	% Ca	% P	Cu (ppm)	Zn (ppm)	Fe (ppm)			
Dry roughages														
Oats straw	88.18±	92.47±	5.05±	1.52±	66.66±	46.23±	0.26±	0.08±	11.50±	6.50±	134.00±	2.08±	0.50±	43.24±
(N: 12,21,0=33)	0.96	0.37	0.09	0.03	0.69	0.59	0.01	0.01	1.50	0.50	9.00	0.02	0.01	0.68
Maize stover	87.44±	94.52±	4.35±	1.35±	71.46±	41.72±	0.29±	0.09±	8.67±	10.67±	82.00±	2.20±	1.09±	48.42±
(N: 21,21,21=63)	1.26	0.47	0.23	0.05	0.38	0.30	0.02	0.01	0.88	0.88	6.24	0.01	0.06	0.35
Wheat straw	90.51±	90.99±	2.27±	1.34±	76.78±	54.06±	0.26±	0.07±	5.33±	8.33±	123.67±	1.87±	0.16±	34.23±
(N: 10,9,9=28)	1.18	0.47	0.16	0.04	0.73	0.64	0.02	0.00	0.67	0.67	7.69	0.02	0.01	0.73
Millets straw	91.47±	93.68±	4.14±	0.81±	70.34±	40.12±	0.17±	0.05±	4.00±	5.33±	55.00±	2.25±	0.99±	50.27±
(N: 8,7,10=25)	1.18	0.34	0.14	0.08	0.70	0.72	0.02	0.01	0.58	0.33	8.66	0.02	0.03	0.83
Mixed forest hay	91.87±	91.11±	4.77±	1.85±	61.32±	33.38±	1.48±	0.43±	9.00±	25.67±	145.00±	2.43±	1.91±	63.30±
(N: 21,21,21=63)	0.78	0.87	0.08	0.04	0.52	0.70	0.05	0.01	1.15	2.40	14.43	0.02	0.03	0.35
Bean pods	93.19±	94.70±	6.70±	2.69±	61.25±	42.82±	0.38±	0.41±	5.33±	23.00±	71.67±	2.17±	3.02±	63.35±
(15,11,20=46)	0.69	0.22	0.20	0.13	1.89	1.11	0.02	0.01	0.33	1.53	6.01	0.03	0.09	1.29
Green roughages														
Tree foilage mix	90.44±	89.89±	13.87±	6.99±	47.72±	26.64±	2.72±	0.23±	7.33±	22.67±	165.00±	2.62±	8.04±	72.55±
(N: 21,21,10=52)	0.57	1.01	0.29	0.14	1.39	0.99	0.10	0.01	0.67	2.40	24.66	0.03	0.17	0.94
Fruit/ vegetable wastes mix	37.70±	95.93±	6.91±	1.51±	49.41±	33.52±	0.44±	0.29±	10.00±	22.33±	306.67±	2.43±	4.29±	71.40±
(N: 13,10,11=34)	1.47	0.35	0.21	0.02	0.70	0.43	0.01	0.02	1.53	2.33	35.28	0.01	0.13	0.48
Maize fodder	26.63±	89.59±	8.21±	1.80±	60.88±	36.01±	0.55±	0.40±	12.00±	35.00±	76.67±	2.36±	5.09±	63.60±
(9,13,10=32)	1.02	0.56	0.54	0.02	1.62	0.76	0.01	0.01	1.15	2.52	6.01	0.02	0.34	1.10
Pasture grass	24.09±	91.16±	15.23±	2.27±	45.16±	34.94±	0.64±	0.41±	6.33±	20.00±	56.67±	2.39±	9.90±	74.29±
(N: 21,21,21=63)	1.18	0.82	0.70	0.05	1.44	1.01	0.03	0.02	0.67	1.15	6.01	0.03	0.45	0.98
Concentrates														
Maize grain	90.85±	97.00±	7.64±	3.39±	16.19±	5.157±	0.03±	0.34±	9.67±	21.00±	48.33±	3.20±	4.20±	73.63±
(19,21,21=61)	1.03	0.24	0.28	0.07	0.55	0.12	0.00	0.01	0.88	1.53	2.03	0.00	0.15	0.26
Oats grain	91.81±	95.89±	8.69±	4.77±	36.77±	10.83±	0.10±	0.39±	5.67±	29.33±	90.33±	3.05±	5.65±	63.75±
(N: 19,20,0=39)	0.79	0.35	0.29	0.27	0.79	0.91	0.01	0.02	0.88	1.76	4.81	0.02	0.19	0.38
Wheat grain	89.12±	97.34±	9.70±	2.55±	12.96±	5.88±	0.09±	0.33±	8.67±	25.67±	74.00±	3.18±	5.82±	75.18±
(N: 15,17,13=45)	0.72	0.33	0.25	0.03	0.29	0.17	0.01	0.02	1.45	2.40	4.36	0.00	0.15	0.14
Gram	90.62±	96.13±	18.48±	4.12±	16.87±	4.36±	1.71±	2.31±	13.67±	36.33±	141.33±	3.23±	12.75±	73.30±
(N: 14,19,15=48)	0.44	0.31	0.39	0.08	0.24	0.18	0.09	0.06	0.33	1.20	7.88	0.00	0.27	0.11
Home-made concentrate	90.58±	92.74±	16.38±	4.35±	40.55±	18.24±	0.55±	0.70±	11.33±	29.33±	82.67±	2.85±	9.83±	61.94±
(N: 18,19,15=52)	0.45	0.42	0.66	0.16	0.89	0.95	0.03	0.01	0.88	2.19	5.46	0.03	0.40	0.43
Compound feed	91.20±	86.39±	11.81±	1.64±	40.14±	29.14±	1.47±	0.82±	10.67±	46.00±	127.33±	2.55±	7.09±	62.13±
(1,3,2=6)	0.73	0.95	0.79	0.03	1.03	0.50	0.09	0.01	1.76	2.31	4.06	0.01	0.47	0.50

Fruit/ vegetable wastes—aerial parts and discarded/damaged crops.

and Middle Gurez. Almost all the farm produce was consumed locally. Overall, animal husbandry scenario is of subsistence level with little or no technological intervention. (Khan *et al.* 2013).

Livestock feeds available: The available major feed resources in the study area along with their chemical composition (% dry matter basis) are shown in Table 2. Maize stover and forest grass hay were the main sources of dry roughages in the ration of animals, while pasture grasses in natural grazing was the main and important green forage source for livestock during summers as responded by all the farmers (100%). The farmers cultivated only maize as green fodder during summers to store the surplus for feeding the animals during long winters; although tree foliage (92% of the respondents) and some kitchen (vegetable/fruit) wastes were also used for feeding animals. Some of the farmers even fed pods of legume beans as part of dry roughage source. Concentrates were mainly home-made (87% of the respondents) and prepared from ingredients available with the farmers, namely maize grains, wheat or oats grains and whole gram without following any specific proportion for mixing but the criteria was only their availability at home. None of the farmers in the study area used oilcake for preparing the home-made concentrate mixture. Compound feed was rarely used for feeding the animals only by few farmers (13%). The chemical composition of the available feed resources were within the normal ranges as prescribed for Indian feeds and fodders (ICAR 2013) with slight variations which might be due to differences in geographical location, environment, method and stage of harvesting etc.

Animal feeding practices: The feeding practices followed by the livestock farmer in the study area are summarised in Table 3. During summer season, majority of the farmers (81%) simply left the animals for grazing in the community forests (5%) and/or meadows (95%) for 8–10 h, where pasture grasses forms their main diet with no concentrate supplementations being carried out. Instead, most of the farmers (92%) offered tree foliage as supplemental feed to the animals. Poplus leaves happened to be the most common and abundant tree foliage for livestock. Tree foliages were offered less commonly as browse (28%) and mostly as loppings (100%) or preserved the same in various ways for feeding during lean winter season. It was also observed that farmers (28%) in the study area made use of locally available agro-industrial by-products (like wastes of potatoes, the main cash crop of Gurez) as supplemental feed resources for livestock particularly during lean season. Due to very harsh climatic conditions during winter (long deadly season that lasts for some six months from November to

Table 3. Feeding practices followed by livestock farmers in Gurez valley

Variable		Surveyed zones			Overall Gurez	P value
		Lower Gurez	Middle Gurez	Upper Gurez		
Feeding pattern	Stall (during winter)	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	1.000
	Semi-stall	14.30 (3)	33.3 (7)	9.50 (2)	19.00 (12)	0.115
	Grazing	85.70 (18)	66.70 (14)	90.50 (19)	81.00 (51)	
Grazing season	Summer grazing	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	1.000
	Winter grazing	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	
Pasture status	Owned	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	–
	Community	0.00^{a} (0)	14.30^{b} (3)	0.00^{a} (0)	4.80 (3)	0.043
	Govt. Land	100.00^{b} (21)	85.70^{a} (18)	100.00^{b} (21)	95.20 (60)	
Practice of top foliage supplementation	Yes	100.00^{b} (21)	100.00^{b} (21)	76.20^{a} (16)	92.10 (58)	0.004
	No	0.00^{a} (0)	0.00^{a} (0)	23.80^{b} (5)	7.90 (5)	
Available top fodders	Poplus	52.90 (18)	55.30 (21)	41.70 (10)	51.00 (49)	0.559
	Salix	41.20^{b} (14)	39.50^{b} (15)	0.00^{a} (0)	30.20 (29)	0.001
	Others	5.90^{a} (2)	5.30^{a} (2)	58.30^{b} (14)	18.80 (18)	<0.001
Pattern of top fodder feeding	Browsing	30.00 (9)	16.00 (4)	36.40 (12)	28.40 (25)	0.228
	Lopping	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	
Practice of concentrate	Yes	85.70^{b} (18)	100.00^{b} (21)	71.40^{a} (15)	85.70 (54)	0.030
	No	14.30^{b} (3)	0.00^{a} (0)	28.60^{b} (6)	14.30 (9)	
Types of supplements used	Oilcakes	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	–
	Cereal grains	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	1.000
	Agro-indus trial By-products	27.80 (15)	20.80 (11)	35.70 (20)	28.20 (46)	0.221
	concentrate mix	33.30 (18)	39.60 (21)	26.80 (15)	33.10 (54)	0.363
Type of concentrate fed	Home-made	89.50 (17)	81.00 (17)	93.30 (14)	87.30 (48)	0.513
	Compound feed	10.50 (2)	19.00 (4)	6.70 (1)	12.70 (7)	
Use of mineral mixture	Yes	0.00 (0)	14.30 (3)	4.80 (1)	6.30 (4)	0.154
	No	100.00 (21)	85.70 (18)	95.20 (20)	93.70 (59)	

April during which the temperature even falls as low as –20°C and land route remains completely closed), the livestock were completely stall fed primarily raised on crop residues available with the farmer and concentrate mixture being offered (86%) only to lactating animals or to those which are in advanced stage of pregnancy. On an average, only 6% of the farmers that too in Middle and Upper Gurez only supplemented the diet of animals with mineral mixture. These results are in accordance with the earlier findings of Das *et al.* (2002) who reported that the Indian livestock are mainly maintained on grazing with little or no access to mineral supplements. All these factors not only leads to deterioration of health and poor body score condition of livestock, but also lower productivity making livestock enterprise less remunerative for the owners.

Animal managemental practices: Table 4 represents the animal management practices followed in the study area. Two types of production system were practiced, viz. semi-migratory (89%) and stationary (11%), while nomadic/free range/migratory system was absent in all the studied zones of Gurez. All the farmers (100%) had kacha close type of houses for their animals, mainly as part of human residential buildings (94%). These houses were mainly made up of locally available forest wood plastered with mud. Geoclimatics and topography of the region demands safe and bound shelters for human beings as well as livestock in contrast to rest of the country. Similar findings are also reported by Sabapara *et al.* (2010) for dairy animals in the tribal area of South Gujarat. During summer season, animals were kept outside the close shed at daytime for grazing in the nearby forest/meadow and kept inside the shed at night time to protect them from predators of forest region; while during winters, the animals were kept all along within the sheds. Animal stockings within the sheds were mostly mixed (89%) with little provision for proper ventilation (9%) and no (0%) regular bedding and drainage arrangements. Mangers and waterers were provided (86%) mostly outside the animal shed (93%) to keep them clean and dry, as regular

Table 4. Managemental practices followed by livestock farmers in Gurez valley

Variable		Surveyed zones			Overall Gurez	P value
		Lower Gurez	Middle Gurez	Upper Gurez		
Production system	Migratory	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	–
	Stationary	9.50 (2)	19.00 (4)	4.80 (1)	11.10 (7)	0.325
	Semi-migratory	90.50 (19)	81.00 (17)	95.20 (20)	88.90 (56)	
Availability of animal shed	Yes	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	1.000
	No	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	
Type of housing	Open	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	1.000
	Closed	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	
Housing pattern	Kacha (muddy or wooden)	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	1.000
	Pacha (concrete)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	
Animal stall	Separate	4.80 (1)	14.30 (3)	0.00 (0)	6.30 (4)	0.154
	Part of residential building	95.20 (20)	85.70 (18)	100.00 (21)	93.70 (59)	
Provision of ventilation in sheds	Inlet/outlet	90.50 (19)	86.40 (19)	95.50 (21)	90.80 (59)	0.580
	Window also	9.50 (2)	13.60 (3)	4.50 (1)	9.20 (6)	
Provision of bedding material	Regularly	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	–
	During extreme season	44.00 (11)	50.00 (14)	43.50 (10)	46.10 (35)	0.870
	During delivery	40.00 (10)	42.90 (12)	34.80 (8)	39.40 (30)	0.840
	Never	16.00 (4)	7.10 (2)	21.70 (5)	14.50 (11)	0.326
Animal stocking within shed	Separate	4.80 (1)	19.00 (4)	9.50 (2)	11.10 (7)	0.325
	Mixed	95.20 (20)	81.00 (17)	90.50 (19)	88.90 (56)	
	Males and females together	95.00 (19)	78.90 (15)	90.00 (18)	88.10 (52)	0.286
Provision of drainage within sheds	Yes	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	1.000
	No	100.00 (21)	100.00 (21)	100.00 (21)	100.00 (63)	
Provision of mangers /waterers	Yes	81.00 (17)	95.20 (20)	81.00 (17)	85.70 (54)	0.311
	No	19 (4)	4.80 (1)	19.00 (4)	14.30 (9)	
Mangers/ waterers provided at	Stall	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	–
	Within sheds	0.00 (0)	15.00 (3)	5.90 (1)	7.40 (4)	0.212
	Outside sheds	100.00 (17)	85.00 (17)	94.10 (16)	92.60 (50)	
No. of milkings/day	Once	95.20 (20)	85.70 (18)	90.50 (19)	90.50 (57)	0.575
	Twice	4.80 (1)	14.30 (3)	9.50 (2)	9.50 (6)	
Technical knowledge about livestock farming	Good	0.00 (0)	4.80 (1)	0.00 (0)	1.60 (1)	0.362
	Average	23.80 (5)	38.10 (8)	33.30 (7)	31.70 (20)	0.599
	Below average	76.20 (16)	57.10 (12)	66.70 (14)	66.70 (42)	0.424

cleaning was not done in any of the surveyed area. The provided mangers/waterers were wooden assisted temporary type of varying size and shape (Supplementary Fig. 3). Poor productivity of local hill cattle enforces majority of the owners (90%) to milk them only once in a day. Most farmers (67%) in the study area had below average technical knowledge about livestock farming, indicating lack of their awareness about scientific and/or modern livestock practices.

The socio-economic status of the livestock farmers is appreciable, though there are many constraints especially in animal feeding and housing practices. Lack of technical knowhow among the animal rearers was noticed which compel urgent need to plan, execute and evaluate a possible extension education programme on sustainable livestock rearing practices. The programme must be need based, specific to the local conditions with much flexibility and compatibility.

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