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REGULAR ARTICLES

Traditional goat husbandry practice under pastoral systems in South Omo zone, southern Ethiopia

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Abstract This study was carried out to describe goat production system under pastoralists' management in three districts of South Omo zone, southern Ethiopia. The districts were Benatsemay, Hamer, and Dasenech. Questionnaires were developed and used to collect data regarding pastoralists' management practices and production system of goats. A total of 180 households were interviewed to capture relevant information. Data collected through questionnaires were subjected to statistical analysis to generate descriptive statistics. Ranking was explained by calculating indexes. The primary purpose of raising goats was for social prestige in Benatsemay and Hamer but for milk production in Dasenech. Body size was the primary preference in Benatsemay and Hamer while milk yield was preferred most in Dasenech. Rangeland grazing was the major feed source in the study area in both dry and wet seasons. Pond and river were the common sources of water reported by farmers in the study districts but inadequate and poor quality. Disease prevalence was the top major constraint in goat husbandry in the three districts.

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Introduction

Goats are kept in all agro-ecological zones in Africa (Payne and Wilson 1999). In the arid zone proper, goats are relatively much more numerous than cattle and frequently more numerous than sheep, whereas cattle are more numerous than sheep and goats in semi-arid, sub-humid, humid zones, and highlands (Silanikove 2000). In pastoral and agro-pastoral production systems, found in arid and semi-arid agro–ecological zones, goats are kept by nearly all pastoralists, often in mixed flocks with sheep, freely grazing or browsing in the rangelands. Arid and semi-arid zones comprise 55% of the area of sub-Saharan Africa, supporting 50–60% of the livestock and 40% of the people in that area (Silanikove 2000). Ethiopia is endowed with abundant livestock genetic resources of varied and diversified genetic pools with specific adaptations to a wide range of agro-ecologies. Farm animals as a whole are an integral part of the country's agricultural system and are raised in both the highland and lowland areas (Tesfaye 2010). The goat population of Ethiopia ranks high in both Africa and the world. According to CSA (2013), the number of goats reported in the country is estimated to be about 24.06 million from which 71.06% are females and 28.94% are males. In South Omo zone, management of goats were not studied and documented. Understanding the traditional practices prior to applying any development strategy is relevant. Identification of goat production constraints helps to design management strategy at least to minimize the effects applied on goat production. The objective of this study is to characterize management systems and identification of

constraints that hinder goat production in pastoral areas of South Omo zone.

Materials and methods

Study site

This study was conducted in South Omo zone which is found in Southern Nation and Nationalities Peoples Regional State (SNNPR) and situated in the southern part between 4° 27′–60° 26′ N latitude and 34° 57′–37° 49′ E longitude. Jinka, the capital of South Omo zone, is 750 km from the capital city of the country (Addis Ababa). South Omo zone has a total area of 2,241,731.598 ha. Out of this, 11.63% is cultivated, 37.4% is fertile and can be cultivated, 13.01% is used for grazing, 16.25% of the area is covered by trees and bushes, and the other 21.72% is covered with grasses and shrubs which can be used for grazing. Sixty percent of the zone area falls in the arid and semi-arid category of the agro-ecological zone and 34.4% of the area is classified under arid area. The amount of average annual rainfall of the area falls between 400 and 1600mm, and the average annual temperature reaches 20 °C. The zone has eight districts of which six (Malie, Benatsemay, Hamer Nayngatom, Salamago, and Dasenech) are categorized under pastoral areas. The study was conducted in three districts of the pastoral areas, Benatsemay, Hamer, and Dasenech.

Study design and data collection

Information was taken from zonal Pastoralist and Farmers Agricultural Office in terms of goat production potential areas. Three study districts (Benetsemay, Hamer, and Dasenech) were selected based on the goat production potential. Moreover, three kebeles were selected from each sample district based up on the size of goat population obtained from the respective district's Pastoralists Agricultural Office. A multistage purposive sampling technique was used. Twenty households from each kebele were sampled by using simple random sampling, and totally, 180 households (60 per district, 20 per kebele) were taken for questionnaire on production system or animal husbandry practices which include the management of animals, watering and feeding, housing, livestock feed resource availability and utilization, and constraints of goat production.

Statistical analyses

Data that were collected through questionnaire were described by descriptive statistics using Statistical Analysis System (SAS, 2008). Ranking of traits in goat production was described by calculating indexes.

Result

Livestock composition

The first three major livestock species from ruminant animals in the Benatsemay and Hamer were goat, cattle, and sheep. Beehives and chicken were also next to ruminant animals and lastly donkeys. The average flock size of goat was 54.70 in Benatsemay, 63.15 in Hamer, and 37.12 in Dasenech, respectively (Table 1).

Relative importance of livestock species

Cattle were the most important animals that play a great role in the livelihood of pastoralists throughout all districts as indicated by higher index value. Cattle have various uses in the life of pastoralists such as a source of food in day to day life commonly milk, meat, butter, and sometimes blood during the time of starvation (drought). In addition, they are major source of income (selling as live animal or selling their products). In this study, it was found that goats were next to cattle in terms of their importance in pastoralist's livelihood (Table 2). Livestock are core to pastoral livelihoods and pastoral identity, and livestock and livestock products contribute significantly as a food source and are usually the main source of income in pastoral livelihoods. Sheep, goats, cattle, camels, and donkeys are the predominant holdings (Judith and Steven 2008).

Goat flock structure

Goat flock structures in the study area by their sex and age category are presented in Table 3. The overall mean of goat flock size was 17.56 for breeding doe above 1 year, 6.54 for breeding buck above 1 year, and 3.66 for castrated males. Significant differences between districts were detected in goat flock structures except castrated and bucks older than 1 year.

Purpose of keeping goat

Purposes of keeping goat flock based on their ranking are presented in Table 7. Goats are mainly kept for the purpose of getting social prestige in Benatsemay and Hamer districts. Owning large number of livestock brings respect and high social value within the society. Since the lives of pastoralists are highly linked with livestock, they use them for different purposes in the social life. For instance, livestock particularly cattle and goats are offered as a bridewealth to the girls' family during wedding.

Trait preferences

In Benatsemay district, size (index = 0.35), disease resistance (index = 0.20), and growth rate (index = 0.13) were among the

Table 1 Mean flock structure of livestock

Livestock species		Benatsemay ($N = 60$) Mean ± SE	Hamer ($N = 60$) Mean ± SE	Dasenech ($N = 60$) Mean ± SE	Overall ($N = 180$) Mean ± SE
Cattle	*	37.47 ± 3.54^{ab}	28.03 ± 2.89^{b}	59.57 ± 11.92^{a}	41.69 ± 4.35
Goat	*	54.70 ± 5.91^{ab}	63.15 ± 5.98^{a}	37.12 ± 6.27^{b}	51.66 ± 3.57
Sheep	Ns	7.20 ± 0.83	12.45 ± 1.91	16.22 ± 5.25	11.96 ± 1.89
Donkey	*	0.55 ± 0.15^{b}	0^{b}	1.17 ± 0.26^{a}	0.57 ± 0.10
Chicken	*	19.23 ± 0.82^{a}	6.57 ± 1.04^{b}	4.88 ± 0.67^{b}	10.23 ± 0.69
Beehive	*	28.40 ± 2.19^{a}	11.58 ± 1.20^{b}	0.03 ± 0.02^{c}	13.34 ± 1.20

N number of households, *SE* standard error

Different superscript letters on the same row are significantly different ($P < 0.05$); Ns = non-significant ($P > 0.05$); *significant at 0.05

top rated preferred traits in their order of importance by the respondents (Table 8). In Hamer however, size (index = 0.43), milk (index = 0.19), and color (index = 0.1) were among the top rated traits considered for improvement intervention. On the contrary, milk was preferred at first, disease tolerance, and drought tolerance preferred second and third top rated traits, respectively, in Dasenech.

Feed source and grazing practice

Feed source and grazing methods practiced among the three districts during dry and wet seasons are presented in Table 4. Rangeland grazing was the major and the common feed source across all districts in the study area in dry season as well as in wet season of the year. Private grazing shares small parts of feed sources during both seasons in Hamer and Benatsemay. Pastoralists in Dasenech totally relied on range grazing in wet season of the year while during dry season, they offer goats with crop residue and crop aftermath especially from sorghum crop.

Grazing was practiced without sex and age separation except kids which were usually separated until they grow strong enough to browse in the wild. This result is in agreement with Mahilet (2012) who stated that goats are usually grazing mixed with sheep and there is no sex and age separation during grazing. However, kids were separately herded around the backyard and tethered until they are able to walk and graze properly, and Tesfaye (2010) reported that kids were separately herded in Jidokombolcha and Shala districts.

Water source and watering

The major water source in Benatsemay was pond which 53.33% of the people used, whereas in Hamer, the percentage of people using both pond and river as a source of water were 46.6% (Table 5). Pastoralists in Dasenech mainly (81.67%) used river as a source of water, the river Omo which flows year round. This result is in agreement with Mahilet (2012) who reported that the major source of water for Hararghe highland goat was a river in eastern Hararghe. Watering of goat flock in the study area usually is carried out by bringing goat flocks to water points. Water is not sufficient for livestock in the study area especially in Benatsemay and Hamer due to various reasons. Pastoralists in these two districts reported too little watering points and disappearance during dry season as the core reasons for insufficient water. However, in Dasenech,

Table 2 Ranking indices indicating livestock species kept by Benatsemay, Hamer, and Dasenech pastoralists

Livestock	Benatsemay				Hamer				Dasenech			
	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index
Cattle	50	10	–	0.47	41	14	1	0.43	55	5	–	0.52
Goat	10	50	–	0.36	19	41	0	0.39	5	55	–	0.37
Sheep	–	–	31	0.09	–	2	31	0.1	–	–	35	0.10
Chicken	–	–	3	0.01	–	–	2	0.01	–	–	3	0.01
Bee	–	–	26	0.07	–	–	24	0.07	–	–	–	0.00

Index = sum of (3 X livestock species ranked first + 2 X livestock species ranked second + 1 X livestock species ranked third) given for each livestock species in a given district divided by sum of (3 X all livestock species ranked first + 2 X all livestock species ranked second + 1 X all livestock species ranked third) for a given district

R1 first rank, *R2* second rank, *R3* third rank

Table 3 Goat flock structure

Goat flock		Benatsemay ($N = 60$)		Hamer ($N = 60$)		Dasenech ($N = 60$)		Overall ($N = 180$)	
Structure		Mean ± SE	%	Mean ± SE	%	Mean ± SE	%	Mean ± SE	%
Doe (>12 months)	*	17.78 ± 2.03^{b}	32.56	26.45 ± 2.62^{a}	41.35	14.45 ± 2.50^{b}	38.76	17.56 ± 1.43	35.16
Buck (>12 months)	NS	7.83 ± 1.39	14.34	7.12 ± 0.75	11.13	4.68 ± 0.83	12.55	6.54 ± 0.60	13.09
Castrated	NS	3.72 ± 0.49	6.81	4.12 ± 0.54	6.44	3.15 ± 0.45	8.45	3.66 ± 0.29	7.33
Young buck (6–12 months)	*	7.68 ± 0.74^{a}	14.06	6.37 ± 0.63^{ab}	9.96	4.00 ± 0.82^{b}	10.73	6.02 ± 0.44	12.05
Young doe (6–12 months)	*	8.43 ± 0.92^{a}	15.44	7.63 ± 0.75^{ab}	11.23	4.78 ± 0.95^{b}	12.82	6.95 ± 0.52	13.91
Kids (<6 months)	*	9.17 ± 0.75^{ab}	16.79	12.27 ± 1.13^{a}	19.18	6.22 ± 1.02^{b}	16.68	9.22 ± 0.59	18.46

N number of households, SE standard error

Different superscript letters on the same row are significantly different ($P < 0.05$); Ns = non-significant ($P > 0.05$); *significant at 0.05

the level of insufficiency was low because the main source of water was river, which flows year-round.

Housing system

Three types of housing systems were identified in the study area (Table 11). Majority of the respondents in Benatsemay and Hamer district provide separated corrals that have a rudimentary roof, which is thought to protect goat flock from rain. In these two districts, corrals that were tied with the living house were observed. Proportions of respondents who use fence enclosure were 23.33% each in Hamer and Benatsemay.

Constraints of goat production

The major constraints of goat production in the study areas are presented in Table 6. In the study area, disease ranked first in all districts with an index of 0.497, 0.492, and 0.422, respectively, for Benatsemay, Hamer, and Dasenech. Scarcity of water was ranked second in Benatsemay, whereas feed shortage and drought together ranked second in Hamer. The occurrence of drought in Dasenech was more frequent (higher index value) when compared to Hamer, even though it got the second ranking. In Benatsemay, drought was ranked the third constraint for goat production while genotype was mentioned as the third goat production constraint in Hamer. Feed shortage in Dasenech had the third position among major constraints, and this was related to shortage of rainfall.

Table 4 Feed sources during dry and wet seasons

Feed sources	Benatsemay		Hamer		Dasenech	
	D.S. Index	W.S. Index	D.S. Index	W.S. Index	D.S. Index	W.S. Index
Rangeland grazing	0.747	0.79	0.62	0.882	0.76	1.00
Private grazing	0.216	0.21	0.33	0.088	0.00	0.00
Fallow land	0.033	0.00	0.02	0.025	0.00	0.00
Crop residue	0.004	0.00	0.03	0.005	0.16	0.00
Crop aftermath	0.000	0.00	0.00	0.000	0.08	0.00

D.S. dry season, *W.S.* wet season

Index = sum of (3 X feed source ranked first + 2 X feed source ranked second + 1 X feed source ranked third) for each feed source in a given district divided by sum of (3 X all feed sources ranked first + 2 X all feed sources ranked second + 1 X all feed sources ranked third) in a given district

Table 5 Sources and quality of water

	Benatsemay *N* (%)	Hamer *N* (%)	Dasenech *N* (%)
Sources of water			
River	– (–)	20 (33.33)[a]	49 (81.67)
Pond	32 (53.33)	8 (13.33)	10 (16.67)
Pond and river	25 (41.67)	28 (46.67)	1 (1.67)
Pond and pipe water	3 (5)	4 (6.67)	– (–)
Sufficiency			
Yes	8 (13.33)	34 (56.67)	49 (81.67)
No	52 (86.67)	26 (43.33)	11 (18.33)
Water quality (dry season)	Index	Index	Index
Clean	0.067	0.147	0.026
Muddy	0.358	0.247	0.497
Salty	0.156	0.167	0.117
Smelly	0.419	0.439	0.36
Water quality (wet season)			
Clean	0.217	0.061	0.034
Muddy	0.428	0.494	0.563
Salty	0.211	0.203	0.100
Smelly	0.144	0.242	0.303

N number of households

[a] Catchment filled with sand which had underground water

Table 6 Goat production constraints

	Benatsemay				Hamer				Dasenech			
Constraints	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index
Disease	59	1	0	0.497	57	3	0	0.492	46	4	6	0.422
Feed shortage	0	10	26	0.128	2	20	13	0.164	7	9	17	0.156
Scarcity of water	1	26	18	0.203	0	0	3	0.008	1	6	4	0.053
Market problem	0	0	0	0.000	0	0	7	0.019	0	0	0	0.000
Predator	0	0	1	0.003	0	0	3	0.008	0	1	2	0.011
Genotype	0	4	3	0.030	0	15	9	0.108	0	6	10	0.061
Input	0	0	0	0.000	0	1	4	0.017	0	0	3	0.008
Extension	0	0	2	0.006	0	0	3	0.008	0	0	1	0.003
Drought	0	19	10	0.133	1	19	18	0.164	6	32	17	0.275
Theft	0	0	0	0.000	0	2	0	0.011	0	2	0	0.011

Index = sum of (3 X constraint ranked first + 2 X constraint ranked second + 1 X constraint ranked third) for each constraint in a given district divided by sum of (3 X all constraint ranked first + 2 X all constraint ranked second + 1 X all constraint ranked third) for a given district

Discussion

There was a significant difference between districts in livestock holding except sheep (Table 1). The mean flock size of goat in Benatsemay did not significantly differ from the other two districts, but the mean flock size of goat in Hamer was significantly higher than Dasenech. The mean flock size of goats was higher when compared with other livestock species except for Dasenech, where cattle were dominant over the others. The average flock size of goats in the present study highly surpasses the average flock size of goats reported by FARM_AFRICA (1996) for the same breed. Large herd sizes perform two critical functions for pastoralists. Firstly, they allow pastoralists to meet needs while maintaining productive assets (through a mixture of milk sale and consumption and animal sales). Secondly, large herds act as insurance for surviving droughts (Judith and Steven 2008). Pastoralists in Hamer district kept significantly large proportion (41.35%) of female goats when compared with Benatsemay (32.56%) and Dasenech (38.76%). Generally, pastoralists in all study districts kept large proportions of female goats than male goats (Table 3), and this is in agreement with the results of Grum (2010) who reported for Dire Dawa.

The average ratio between buck and doe excluding castrated bucks was accordingly 1:3, lower than that of Wilson and Murayi (1988) who reported ratios of between1:4 and 1:6 for small ruminants in traditional livestock production systems of Africa. Kids less than 6 months of age took the second position in terms of overall proportion (18.46%) from the entire goat flock composition next to does greater than 1 year old. Comparing between districts, goat keepers in Hamer possessed significantly large proportions (19.18%) of kids than Dasenech. This is due to high proportion of does which are greater than 1 year of age.

During cultural ceremonies and social festivals, large numbers of livestock (mainly goats) were slaughtered; hence, they keep large number of goats during such public events. However, the primary purpose of raising goats in Dasenech was for the need of milk, striving to fulfill their nutritional requirements from goat milk (Table 7). This result is similar to the report of Tesfaye (2010) who indicated that the most important purpose of goat production in Adami Tulu and Shalla was mainly for their contribution to the diets of farmers in the form of milk. Saving was the secondary purpose of goat keepers in Benatsemay and Hamer for emergency cases except in Dasenech. Similar result was obtained in eastern Hararghe as reported by Mahilet (2012).

The current finding is also in agreement with Ouma et al. (2004) who reported milk yield, coat color, adaptability, and body size as the main focus trait preferences for African pastoralists. Breeding objectives are those characteristics to be improved and should be set on future requirements (Holst 1999); hence, traits preferred by pastoralists in this case were an indication of future improvement of highly preferred traits by designing suitable breeding program with desired breeding objectives (Table 8).

Mobility of pastoralists towards places of good pastures in search of feed for their livestock was more common during dry season of the year. Mostly in this case, cattle were the first to be taken to other areas unless the problem was more severe where cattle, goat, and sheep are taken together by some selected family members who had a capacity of herding them and able to go long journeys. Commonly, women and their children did not take part in the journey; they remained in their original settlements. Pastoralists in Hamer and Benatsemay practice this type of mobility more commonly during the times where there was feed shortages nearby their surroundings. However, in Dasenech, mobility of pastoralists was more

Table 7 Purposes of keeping goats

Purpose	Benatsemay				Hamer				Dasenech			
	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index
Market	6	2	15	0.10	–	9	2	0.08	1	3	11	0.06
Meat	3	8	24	0.14	2	7	12	0.09	2	1	10	0.05
Milk	–	4	9	0.05	4	4	30	0.14	33	20	7	0.40
Saving	8	33	9	0.28	28	17	3	0.34	3	11	25	0.16
Social prestige	43	13	1	0.43	26	23	3	0.35	21	25	7	0.33

Index = sum of (3 X purpose of keeping goat ranked first + 2 X purpose of keeping goat ranked second + 1 X purpose of keeping goat ranked third) for each purpose in a given district divided by sum of (3 X all purposes of keeping goat ranked first + 2 X all purposes of keeping goat ranked second + 1 X purposes of keeping goat ranked third) in a given district

R1 first rank, *R2* second rank, *R3* third rank

frequent than the two districts which is related to the slight nomadic nature of pastoralists and very high temperature in the area.

During wet seasons, the proportions of respondents who practiced herding were 81.67, 86.67, and 88.33%, respectively, for Benatsemay, Hamer, and Dasenech (Table 9). The proportion of pastoralists who practiced herding during dry season were greater when compared to wet season, which is probably because there were no sufficient feed sources in the areas where they commonly browse so as to assign goats to areas that had better bush encroachments. Mostly, goats were herded by mixed with sheep commonly year round while goats were mixed with both cattle and sheep mainly in wet season of the year where feed were more available.

The water offered for livestock (goat) in Hamer and Benatsemay had bad smell during dry season. Since in these areas pond was the major source of water, it is contaminated by livestock's feces and urine because it is open access to livestock entrance. The large number of livestock and little volume of water magnify the problem especially during dry season. However, water source (pond) was filled with a new runoff during wet season; hence, now, the main problem is muddiness of the water. Respondents in Dasenech rated muddy first, in opposite to Hamer and Benatsemay; hence, the major water source was Omo river which had disturbed water throughout the year (Table 5).

All respondents (100%) in Benatsemay reported that they water goat flock especially adults once a day during wet as well as in dry season (Table 10). There was no large difference on watering frequency of adults and kids during wet season except for Hamer, but only 80% of the respondents offer water for kids once a day in dry season in Benatsemay. Large proportions (90%) of pastoralists in Dasenech provide water twice a day for kids during dry season; the area is the hottest when compared to the other districts in this study, and common milking of does for human consumption reduces

Table 8 Trait preference of pastoralists

Traits	Benatsemay				Hamer				Dasenech			
	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index
Size	36	8	2	0.35	48	5	1	0.43	1	1	2	0.02
Color	0	2	0	0.01	3	14	1	0.10	0	0	0	0.00
Horn	0	1	1	0.01	0	3	15	0.06	0	0	0	0.00
Heat tolerance	4	8	5	0.09	0	1	1	0.01	0	0	3	0.01
Milk	0	4	5	0.04	5	22	10	0.19	50	8	0	0.46
Meat	1	1	2	0.03	1	0	2	0.01	0	2	0	0.01
Growth rate	9	9	3	0.13	0	6	19	0.09	0	8	0	0.04
Walk long distance	0	0	3	0.01	0	0	0	0.00	0	0	0	0.00
Longevity	0	6	4	0.04	0	0	4	0.01	0	2	2	0.02
Disease tolerance	9	15	16	0.20	2	7	4	0.07	6	25	20	0.25
Drought tolerance	1	6	19	0.09	1	2	3	0.03	3	14	30	0.19

Index = sum of (3 X trait preferred ranked first + 2 X trait preferred ranked second + 1 X trait preferred ranked third) for each preferred trait in a given district divided by sum of (3 X all trait preferred first + 2 X all trait preferred ranked second + 1 X all trait preferred ranked third) for a given district

R1 first rank, *R2* second rank, *R3* third rank

Table 9 Grazing method in the study areas

Descriptor	Benatsemay ($N = 60$)		Hamer ($N = 60$)		Dasenech ($N = 60$)		
	N	%	*N*	%	*N*	%	X^2_value
Grazing method (W.S.)							
Free grazing	11	18.33	8	13.33	7	11.67	1.00 (Ns)
Herded	49	81.67	52	86.67	53	88.33	0.17 (Ns)
Grazing method (D.S.)							
Free grazing	2	3.33	3	5	–	–	2.00 (Ns)
Herded	58	96.67	57	95	60	100	0.08 (Ns)
Herded							
Alone	18	30	26	43.33	3	5	17.40 (*)
Mixed (cattle, sheep)	42	70	34	56.67	57	95	6.15 (*)

N number of respondents, *W.S.* wet season, *D.S.* dry season

*Significant at $P < 0.05$; Ns, non-significant at $P < 0.05$

Table 10 Frequency of watering in wet and dry seasons

Descriptor	Benatsemay ($N = 60$)				Hamer ($N = 60$)				Dasenech ($N = 60$)			
	Kids		Adults		Kids		Adults		Kids		Adults	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
W.F. (dry season)												
Twice a day	8	13.33	0	0	20	33.33	2	3.33	54	90	27	45
Once a day	48	80	60	100	40	66.67	50	83.33	6	10	33	55
Once in 2 days	4	6.67	0	0	0	0	8	13.33	0	0	0	0
W.F. (wet season)												
Twice a day	0	0	0	0	0	0	0	0	3	5	2	3.33
Once a day	59	98.33	60	100	57	95	6	10	57	95	58	96.67
Once in 2 days	1	1.67	0	0	3	5	54	90	0	0	0	0

W.F. watering frequency, *N* number of households

volumes of water that is present in the milk (milk is one source of water).

Proportions of the respondents in Dasenech who used separated corral and fence enclosure were equal (Table 11). Fence enclosures were commonly built from thorny bushes, which is in agreement with Grum (2010) and FARM_AFRICA (1996). Kids were housed by small separate enclosure that is tied with the house of the main flock or within a living house. Mostly,

Table 11 Housing systems of goats

	Benatsemay ($N = 60$)		Hamer ($N = 60$)		Dasenech ($N = 60$)		
	N	%	*N*	%	*N*	%	X^2_value
Type of house							
Separated corral	43	71.67	34	56.67	30	50	2.49 (NS)
Corral tied with living house	3	5	12	20	0	0	5.40 (*)
Enclosed with fence	14	23.33	14	23.33	30	50	8.83 (*)
Resting type							
Goats alone	18	30	26	43.33	4	6.67	15.50 (*)
With sheep	42	70	34	56.67	56	93.33	5.64 (NS)

N number of households, *NS* non-significant

*Significant at $P < 0.05$

goats in the study area were rested with sheep, Grum (2010) stated similarly.

Rangeland grazing was the major feed source of goats across all districts in the study area in dry season as well as in wet season of the year. Herding goats was commonly practiced in both dry and wet seasons and goats commonly herded with sheep. The major water source in Benatsemay and Hamer was pond, and pond and river, respectively, whereas in Dasenech, river alone is the commonest. Insufficiency and poor quality of water were the main problems raised by livestock keepers in this area. Pastoralists in this area acquire large number of livestock specifically goats which was commonly associated with their social life (social prestige and bridewealth). Goats kept primarily for the purpose of getting social prestige in Hamer and Benatsemay districts and for milk production in Dasenech. Body size, milk yield, growth rate, and disease tolerance were among highly preferred traits in this area.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical standards The manuscript does not contain clinical studies or patient data.

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