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Sheep and Goat Production Systems in Ilu Abba Bora Zone of Oromia Regional State, Ethiopia: Feeding and Management Strategies

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Abstract: The study was conducted in Bacho, Mettu and Darimu Districts of Ilu Abba Bora Zone of the Oromia Regional State to assess traditional small ruminant (sheep and goat) production system and identify production constraints. A single-visit-multiple-subject formal survey technique was used to collect data from 270 households (90 from each district). Mixed crop-livestock production system was found to be the dominant farming system in the study area. The overall average landholding per household was 2.11 hectare. The mean landholding per household in Darimu district was significantly ($P<0.05$) less than those of Bacho and Mettu districts. The overall average holding of sheep and goats per household was 4.8 and 4.0 respectively. There was no variation in number of small ruminants per household between the three districts ($P>0.05$). Small ruminants were kept predominantly as source of income generation. The major feed resources were natural pasture, road and riverside grazing and crop aftermaths. The major feeding systems was grazing during dry season and tethering during wet season. Almost all respondents provided night shelter for their small ruminants, in adjacent to main family house (46%), in a separate shed purpose-made for sheep and goat (42%) and in the main family house with some sort of partition (12%). Parasitic infestation, disease and feed shortage were the major constraints to the development of small ruminant production in study area.

Key words: Goats · Sheep · Feeding · Small Ruminants · Disease · Trypanosomosis

INTRODUCTION

Almost all the Ethiopian rural population is involved in animal husbandry as a source of draft power, transportation, food, family income, employment opportunity and related farming inputs such as fertilizer [1].

In Ethiopia, small ruminants (sheep and goats) are important components of the livestock sub-sector and mainly kept as source of family income, meat, milk, food and wool by small holder farmers throughout the country [2]. At the farm level small ruminants serve as investment and insurance due to high fertility, short generation interval, small feed requirement and adaptability to harsh environment conditions [3]. It is estimated that about 1,078,000 sheep and 1,128,000 goats are annually used for domestic meat consumption.

Sheep and goats provide about 12% of the total livestock products consumed and 48% of the family income generated at farm level. In Ethiopia, sheep and goats are accountable for about 25% of the domestic meat consumption and 58% of the national annual hide and skin production [4]. The sheep enterprise in the Ethiopian highland crop and livestock system is the most important form of investment and cash income and provides social security in bad crop years [5].

However, little is known about the existing small ruminant production systems and constraints and opportunities associated with small ruminant production in the Ilu Aba Bora Zone. Understanding the existing production systems and identification of prevailing problems in the study area are vital to devise appropriate development interventions to improve sheep and goat production in the study area. Therefore, the aim of this study was to assess the small ruminant production system and to identify production constraints in Bacho, Darimu and Mettu districts of Ilu Abba Bora Zone of Oromia Regional State, Ethiopia.

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MATERIALS AND METHODS

Study Area: The study was conducted in Bacho, Mettu and Darimu districts of the Ilu Abba Bora Zone of the Oromia Regional State, South Western Ethiopia. Ilu Abba Bora Zone is one of the 18 administrative zones in Oromia Regional State found in the south-western part of the country. The zone has 1.6 million ha of land of which 10% is high land, 67% is medium and 23% is low land. The altitude of the zone ranges from 500-2575 meter above sea level. Ilu Abba Bora zone has 24 districts of which 2 are urban, 12 and 10 are characterized coffee livestock and cereal grain livestock based mixed farming system respectively. There are two major rainy seasons (short and long) and the annual precipitation of the zone ranges between 1500 and 2200mm [6].

Ilu Abba Bora zone has relatively high forest coverage and Eutric Vertisols, Humic alisols and Humic Nitosols are the dominant soil types in the zone [6]. Human population of the zone is estimated to be about 1.6 million of which 88% is rural. The major cash crops grown in the coffee-livestock based faming system include coffee, chat, spies and fruits whereas; the major food crops grown include Tiff, Maize, Sorghum, Barley, Wheat and pulses that are widely used in livestock based farming system [6].

Sampling Procedure: Systematic stratified sampling technique was used to select the study districts. The three districts were systematically stratified into three regions based on altitude variations viz. Darimu (low), Mettu (medium) and Bach (high) altitude, respectively. A total of 270 households, 90 from each district were randomly selected.

Data Collection and Analytical Technique: Before conducting the formal survey, group discussion was made with key informants such as elders and experts in the respective Office of Zonal and District Agriculture and Rural Development to have an overview about small ruminant production system in the study areas. A single-visit-multiple-subject formal survey technique [7] was used to interview the household heads using structured questionnaire. The questionnaire was pre-tested and modified as necessary. Finally the formal survey was conducted by trained enumerators under close supervision and participation of the researcher. Data was obtained on the socio-economic characteristic of households, landholding, small ruminant ownership, reasons for keeping small ruminants, flock size and structure feed resources, types of rearing system, diseases, housing and major constraints. For secondary information data was obtained from Office of the Agricultural and Rural Development Office and the Department of Livestock Development. The quantitative and qualitative data was coded and analyzed using the means and frequency procedures of Statistical Package for Social Sciences (SPSS version 16). Chi-square test was used to examine differences between levels of significance of different quantitative variables among districts and analysis of variance (ANOVA) using the general linear model procedure of SPSS. Least Significant Difference (LSD) test was made for mean separation, when there was significant deference among districts.

RESULTS AND DISCUSSION

Household Characteristics: The majority (96%) of respondents in the study area were male table 1. About 35 and 65% of respondents were Muslim and Christian, respectively. The mean family size was 6.29 members/household and was higher than the results reported by Belay *et al*. [8]. Out of the mean family size, the majority of the respondents (3.21) were within the age group of 0-14 years, whereas 0.13 of the respondents were within the age group of > 65 years indicating that the more active working force of the respondents is about 2.95. on The average education levels of the interviewed farmers were about 2.45 illiterate, while 2.21 and 1.68 had primary (1-6 grades) and high school (7-12 grades) education, respectively.

Land Holding and Land Use System: The average landholding was 2.11 hectare (ha) table 2. About 3.8% of the respondents were landless. There was no significant difference between Bacho and Metu districts in mean landholding. The mean landholding of Darimu district was significantly ($P<0.05$) less than those of Bacho and Mettu districts. The overall mean landholding per household in this study was slightly higher than the 1.93 ha reported by Belete [9] for Gomma District and lower than that of the Bahir Dar and Mecha Woredas (2.7 ha) reported by Asaminew and Eyassu [10]. A large proportion (1.08 ha) of the landholding was allocated for cereal production.

Livestock Holding: The livestock holding of the study districts is shown in table 3. Cattle are the most predominant species of livestock owned,

Table 1: Characteristics of The Respondents Households in the study area

	Districts				
households	Bacho	Mettu	Darimu	Overall	Sig
Number	90	90	90	270	
Sex					
Male	91.1	97.8	98.9	95.9	
Female	8.9	2.2	1.1	4.1	
Religion					
Muslim	36.7	25.6	43.3	35.2	
Orthodox Christian	41.1	40.0	14.4	31.9	
Protestant Christian	22.2	34.4	41.1	32.6	
Jehovah Witness	0	0	1	0.3	
family size	6.28	7.03	5.59	6.29	
Level of education					
Illiterate	1.72±1.16	3.17±2.02 ^{b}	2.47±1.40 ^{c}	2.45±1.67	0.000
Grade 1-6	2.29±1.44	2.19±1.20	2.14±1.17	2.21±1.27	0.739
Grade 7-12	2.29±1.95	1.53±1.23 ^{b}	0.93±1.25 ^{c}	1.59±1.61	0.000
Higher education	0.04±0.25	0.11±0.38	0.12±0.50	0.09±0.38	0.323

Superscripts with different letters across the rows differ significantly ($p<0.05$)

Table 2: Average land holding (ha) and land use pattern in the study areas

	Districts				
Land use	Bacho	Mettu	Darimu	Overall	Sign
Total land holding	2.27±0.14^{a}	2.43± 0.12^{a}	1.62± 0.0^{b}	2.11± 0.07	0.000
Land for cereal crops	1.14± 0.09	0.99± 0.06	1.12± 0.05	1.08±0.04	0.193
Land for coffee	0.74± 0.05^{a}	0.93± 0.06^{b}	0.27± 0.03^{c}	0.64±0.03	0.000
Land for fruit and spices	0.04±0.01^{a}	0.66±0.009^{b}	0.01±0.004^{c}	0.04±0.005	0.000
Private pasture/ *kalo*	0.127± 0.03^{a}	0.271±0.02^{b}	0.11± 0.02^{a}	0.22±0.01	0.004
Forest land	0.05±0.02^{a}	0.11± 0.05^{b}	0.10±0.02^{b}	0.12± 0.02	0.000

Superscripts with different letters across the rows differ significantly ($p<0.05$)

Table 3: Mean (± SD) livestock species per household in the study areas

	Districts				
Animal species	Bacho	Mettu	Darimu	Over all	Sig
Cattle herd	9.91±3.15^{a}	8.92±2.97^{a}	6.61±2.57^{b}	7.53	0.000
Sheep flock	4.15±2.04	5.32±2.31	4.78±2.19	4.8	0.312
Goat flock	4.16±2.04	4.08±2.02	3.71±1.93	3.99	0.253
Horses	0.99±0.99^{a}	0.49±0.70^{b}	0.10±0.32^{c}	0.53	0.000
Donkey	0.04±0.22^{a}	0.31±0.56^{b}	0.22±0.49^{b}	0.19	0.000
Mule	0.06±0.35	0.01±0.105	0.03±0.18	0.03	0.445
Chicken	4.54±2.73	5.12±2.37	4.96±2.79	4.87	0.319

SD=standard deviation; Superscripts with different letters across the rows differ significantly ($p<0.05$)

Table 4: Size and structure of small ruminant in the study area (mean ±SD)

	Districts				
Animal species	Bacho	Mettu	Darimu	Overall	Sig.
Goats	4.16	4.08	3.71	3.99	
Female kids < 6 mo.	0.78 ± 1.42	0.76±0.78	0.72±0.98	0.75±1.09	0.943
Male kids < 6 mo.	0.61±0.80	0.62±0.79	0.58±0.78	0.60±0.79	0.926
Male kids 6-12 mo.	0.39± 0.93	0.18 ± 0.44	0.41± 0.69	0.32 ± 0.72	0.055
Female kids 6-12 mo.	0.51± 0.96[a]	0.27± 0.61[b]	0.66 ± 0.89[a]	0.48 ± 0.85	0.008
Does	1.49±1.47	1.40±0.98	1.20 ± 1.05	1.36 ± 1.19	0.249
Bucks	0.21± 0.46[a]	0.54 ± 0.58[b]	0.16±0.42[a]	0.30±0.52	0.000
Castrates	0.17± 0.46[a]	0.31± 0.53[b]	0.02±0.15[c]	0.17 ± 0.43	0.000
Sheep	4.15	5.32	4.78	4.8	
Female lamb < 6 mo.	0.71± 0.84	0.72±0.82	0.93±1.05	0.79±0.91	0.184
Male lambs < 6 mo.	0.64±0.62	0.96 ± 0.99	0.80±0.97	0.80 ±. 89	0.062
Male lamb 6-12 mo.	0.46±0.88	0.39±0.76	0.49±0.81	0.44±0.81	0.705
Female lambs 6-12 mo.	0.3±0.64	0.5 ± 0.81	0.58±0.90	0.46±0.80	0.054
Ewes	1.63±1.07	1.76 ± 1.19	1.73 ± 1.3	1.71± 1.19	0.765
Rams	0.23±0.52[a]	0.5±0.55[b]	0.16±0.42[a]	0.29 ± 0.52	0.000
Castrates	0.18±0.67[a]	0.49±0.78[b]	0.17± 0.48[a]	0.28±0.67	0.001

Mo = month; superscripts with different letters across the rows differ significantly (p<005)

followed by sheep. The overall average cattle holding/household of the respondents was 7.53 cattle. The cattle holding was significantly lower (P<0.05) in Darimu than Bacho and Mettu districts. The number of cattle/household obtained in this study was higher than the average of 3.6 in Gomma district reported by Belete [9] and 6.0 cattle/ household in Miesso district reported by Hussen [11]. The overall mean sheep and goat number per household were 4.8 and 4.0 animals, respectively.

Sheep and Goat Size and Structure: The average sheep flock/household in the study area was 4.8 table 4. The number of sheep/household was higher in Mettu district followed by Darimu and Bacho districts, respectively. The mean number of sheep/household obtained in this study was higher than that of Gomma district reported by Belete [9], but lower than the mean of 5.0 in Alaba district reported by Tsedeke [3]. The majority of sheep structure consisted of lambs of 0 to yearlings, followed by breeding ewes. The mean number of ram and castrates was significantly higher (P<0.05) in Mettu district than that of Bacho and Darimu districts, respectively.

The overall mean goat holding per household was 4.0 animals. The mean goat flock size/household was higher in Bacho district, but there was no significant variation between districts. Kids of 0 to yearlings of age represented the largest proportion of the goat flock, followed by breeding Does. The number of buck and castrates was significantly (P<0.05) higher in Mettu district than that of Bacho and Darimu districts, respectively.

Breeding females in both species represented proportionally higher number, followed by age groups of less than 6 months old. The number of female in both species exceeded that of male indicating that females are kept for breeding purpose, while males are either sold at early age or castrated in order to fatten for later sale with better price. For both species, the proportion of breeding females and suckling lambs/kids constituted higher number. This result is in agreement with the findings of [3, 8, 9].

Purpose of Keeping Sheep and Goats: Table 5 shows the rank of sheep and goat production objectives by the respondents. About 93% of the respondents indicated that the primary reason for keeping small ruminant was income generation. This is in agreement with that of [3, 9, 12] who reported that small ruminants are mainly kept for income generation in many parts of Ethiopia. Other reasons mentioned by respondents and their indices were saving (0.21), meat consumption (0.19), risk mitigation (0.16) and manure production (0.11). In the study area,

Table 5: Ranking of purpose of keeping small ruminants in the study area

Purpose	1st	2nd	3rd	4th	5th	Index
Income	250	12	6	2	0	0.33
Saving	5	126	89	48	2	0.21
Meat consumption	7	102	19	132	10	0.19
Risk/ benefit share	8	46	99	25	90	0.16
Manure	0	2	55	45	168	0.11
Total	270	288	268	252	270	1

Index = [(5 for rank 1) + (4 for rank 2) + (3 for rank 3) + (2 for rank4) + (1 for rank5)] divided by the sum of all weighed value of mentioned purposes by respondents.

Table 6: Percent of farmers tethering their small ruminants and reasons for tethering

	Districts				
Particulars	Bacho	Mettu	Darimu	Overall	X^2p-value
Practice of tethered of sheep and goat					
Farmers practicing of tethering	100	100	100	100	
Reasons for tethering					
To avoid crop damages	61.1	93.3	71.1	75.2	0.000
To save labor	27.8	0	0	9.3	
To protect from predators	5.6	6.7	15.6	9.3	0.000
To use marginal lands	0	0	13.3	4.4	
To control breeding	5.5	0	0	1.8	

small ruminants are also important for cultural purpose such as social heritages and sacrifice and the use of milk from small ruminants is not common. According to Thakshal and Marapana [18], goats were kept for cash, meat, milk, manure and to use in festivals.

Sources of Feed and Feeding Systems: the major sources of feed for small ruminants in the study area were natural pasture grazing and browsing on communal grazing lands, road and riverside and aftermath grazing. About 58% of the respondents utilize communal grazing lands throughout the year, whereas 37% of the respondents used either roadside or riverside grazing all the time. About 63% of the respondents used both road and riverside grazing seasonally. Riverside grazing was an important source of feed during the dry period (January/February), while crop residue and after math grazing was important during crop harvesting and trashing period (September/December). Some of the respondents had privately owned grazing natural pasture. About 50% of the respondents graze sheep and goats separately, while 47% of the respondents practice mixed grazing of sheep and goats. All the respondents practice free grazing during the dry period, whereas 80-100% of the respondents tether their animal during wet seasons and the remaining 20% practice cut-and-carry system.

Tethering is a widespread system of small ruminant management in Ilu Abba Bora Zone. About 75, 9.3, 9.3, 4.4 and 1.8% of the respondents practiced tethering for the purpose of avoiding crop and vegetation damages, saving labor, protecting from predators, using marginal land and controlling breeding during the day time. This result agrees with that of [3, 9] who reported that tethering is well practiced in Alaba and Gomma districts of Ethiopia, respectively.

Feed Shortage: According to the key informants, the dry season extends from 3- 6 months during which chronic feed shortage occurs (mid January to mid April). Feed shortage is one of the limiting factors of livestock production in the study area because of seasonal feed availability and poor quality of feeds. Animals have to walk great distances in search of fodder and water during dry seasons. The quality of available forage is low and browse species which provide higher levels of proteins and energy are sparsely grown.

Various reasons have been suggested by respondents for the prevailing feed shortage in the study area table 7. About 89.4% of the respondents indicated that expansion of crop and coffee cultivation was the major reasons for feed shortage in the study area. About 16, 10, 52, 15% of the respondents mentioned that

Table 7: Attributes of feed shortage in the study area (%)

	Districts				
Reasons	Bacho	Mettu	Darimu	Overall	p-value
Expanding crop production	88.1	89.7	90.5	89.4	
Decline in productivity of grazing lands	22.2	13.0	12.7	16.0	0.000
Increased animal population	14.3	7.4	9.5	10.4	0.000
settlement on grazing land	46.0	57.4	52.4	51.8	0.000
Increased human population	15.9	13.7	14.8	14.8	

Table 8: Practices of supplementation and reasons of tethering of small ruminants (%)

	Districts				
Particulars	Bacho	Mettu	Darimu	Overall	X^2p-value
Season of supplementation					
Dry season only	1.1	33.3	3.3	12.6	0.000
Wet season only	5.6	0	3.3	3	
Both dry and wet seasons	92.2	66.7	93.3	84.4	0.000
Frequency of supplementation					
Daily	2.2	0	0	0.74	
Twice a day	0	0	0	0	
Whenever available	97.8	100	100	99.26	
Practice of tethering sheep and goats					
Farmers practicing	100	100	100	100	
Reasons of tethering					
To avoid crop damages	61.1	93.3	71.1	75.2	0.000
To save labor	27.8	0	0	9.3	
To protect from predators	5.6	6.7	15.6	9.3	0.000
To use marginal lands	0	0	13.3	4.4	
To control breeding	5.5	0	0	1.8	

shrinkage and decline in productivity of grazing land, increased animal population, cultivation and settlement on grazing lands and increased human population are the reasons for feed scarcity, respectively. All the respondents mentioned that feed shortage in the study area could be alleviated through proper utilization of natural pasture, forage cultivation, conservation and proper utilization of crop residues.

Feeding Practices: Supplementary feeding of small ruminant is not common practice in the study area. Few of the respondents reported to practice the use of cereal grains particularly maize and cereal mill by-products as supplementary feed for their small ruminants occasionally. About 37% of the respondents used khat (*catha edulis*) leftover as supplementary feed all the times. The majority (63%) of respondents used grain leftovers, mill by-products, weeds, crop tillers, household scraps, local brewery wastes (*atella)* and common salt as supplementary feed.

About 12.6, 3.0 and 84.4% of the respondents reported to supplement their animals both during dry and wet season, respectively. About 99% of the respondents offer supplementation based on the availability of supplementary feeds table 8.

Resources of Drinking Water: Sources of water and frequency of watering small ruminants in the study are shown in table 10. About 62, 34 and 4% of the respondents used river, deep wells and pipe water as a major source of water, respectively indicating that there is free access to water both during wet and dry seasons in the study area. The frequency of watering was twice a day (5.9%). The frequency of watering small ruminants once a day in the dry season was significantly lower in Darimu (85.6%) than that of Bacho (92.2%) and Mettu (96.7%).

Table 9: Sources of water and frequency of watering of small ruminants in the study area (%)

	Districts				
Frequency of watering	Bacho	Mettu	Darimu	Overall	X^2 p-value
Dry season					
Once a day	92.2	96.7	85.6	91.5	0.001
Twice a day	3.3	3.3	14.4	7	0.001
Every other day	4.4	0	0	1.5	
Wet season					
Once a day	51.0	82.2	100	77.8	0.000
Twice a day	0	17.8	0	5.9	
Every other day	40.0	0	0	13.3	
Water resource (dry season)					
River	55.6	61.1	68.9	61.8	0.000
Deep well	44.4	38.9	21.0	34.1	0.000
Pipe water	0	0	12.2	4.1	
Water sources (wet season)					
Rain water	100	100	87.8	95.9	0.000
Deep well	0	0	0	0	
Pipe water	0	0	12.2	4.1	

Table 10: Housing types and reasons for housing small ruminant by of respondents (%)

	Districts				
Particulars	Bacho	Mettu	Darimu	Overall	X^2 p-value
Housing system					
Family house	4.4	16.7	16.7	12.6	0.000
Partition adjoined to family house	32.2	40.0	65.6	45.9	0.000
Separated shed	63.3	43.3	17.8	41.5	0.000
Ways of confining sheep and goats					
Sheep alone	13.3	30.0	34.4	25.9	0.004
Goat alone	37.8	20.0	22.2	26.7	0.004
Sheep and Goat	48.9	50.0	43.3	47.4	0.004
Reasons for providing shelter					
Protect from unfavourable condition	4.4	13.3	5.6	7.8	0.025
Protect from predators	54.4	50.0	68.9	57.8	0.025
Provide convenient climatic condition	41.1	36.7	24.4	34.1	0.025

The frequency of watering small ruminants every other day was more experienced in Bacho district 4.4% in the dry season and 40% in wet seasons than the other districts which show that Bacho district is situated at high altitude.

Housing Management: Almost all respondents provided night shelter for their small ruminants, in adjacent to main family house (46%), in a separate shed purpose-made for sheep and goat (42%) and in the main family house with some sort of partition (12%) table 10. About 58 and 42% of the respondents provide shelter to protect from predators and adverse environmental conditions. About 47% of the respondents housed sheep and goat together, whereas 53% of the respondents housed them separately. These results are in agreement with many other works [3, 9, 13-16], who reported that night time sheltering small ruminants are common in Ethiopia to protect them from predators, theft and unfavourable environmental condition.

Table 11: Percent of household responded on age of castration, criteria of selection for castration and means of castrating of small ruminants

	Districts				
Parameters	Bacho	Mettu	Darimu	Overall	X^2p-value
Castration age of sheep					
6-12 months	12.2	10	16.7	13.0	
12-18 months	78.9	62.2	64.4	68.5	0.001
18-24 months	6.8	27.8	15.7	16.7	0.001
> 24 months	0	0	3.3	1.1	
Castration age of goats	15.6	11.1	20	15.6	
6-12 months	74.4	61.1	58.9	64.8	0.001
12-18 months	6.7	27.8	17.8	17.4	0.001
18-24 months	0	0	3.3	1.1	
>24 months					
Methods of castrating males					
Burdizzo	91.1	87.8	94.4	91.1	0.29
Local method	8.9	12.2	5.6	8.9	0.29

Table 12: Major constraints reported by households in small ruminant production (%)

	Districts			
constraints	Bacho	Mettu	Darimu	Overall
Diseases and parasites	65	76.1	79.3	73.5
Feed and grazing land shortage	55.5	68.2	71.4	65.0
Water scarcity	26.9	14.2	9.5	16.9
Drought	1.5	0	0	0.5
Predators	36.5	34.9	52.3	41.2
Market problems	31.7	24.9	23.8	26.8
Lack of input	27.2	26.2	12.6	22.0
Lack of extension support	20.6	16.5	19.0	18.7
Lack of technologies	39.6	25.5	28.5	31.2
Lack of credit	19.0	17.2	17.5	17.9

Castration Practice: Majority of the respondents reported that they practice castration of their sheep and goats. About 13, 69 and 18% of the respondents reported that they castrate their animals at 6-12, 12-18 and greater than 24 months of age respectively table 11. About 91% of the respondents perform castration at Veterinary clinics with the use of "burdizzo", while the remaining respondents practice traditional method of castration. Breeding in both species is uncontrolled. Inbreeding is probably common as active rams or bucks are often the main source of replacement males.

Constraints to Small Ruminant Production: According to the respondents, there were different production constraints in the study area. Most (74%) of the respondents indicated that high prevalence of diseases and parasite infestation are the major constraints to small ruminant production in the study area. All the key informants stated that parasitism in general and Helminthiasis in particular ranks high. Tsetse fly infestation was also reported to be economically significant in the lowland districts. Feed shortage (65%) was the second major limiting factor to small ruminant production. All the respondents indicated that shortage of feed is serious in the dry season. Both disease and feed problems were reported to be more pronounced in Mettu and Darimu districts whereas, scarcity of water was reported to be more prevalent in Bacho district. Serious problem of predation was reported by respondents from Darimu district. Other constraints included market problem, inadequate inputs, lack of extension support and credit services.

CONCLUSION

In the study area, sheep and goats contribute a substantial amount to the farm household as income, meat manure and skins. They are a source of risk mitigation, security, investment, saving and socio-economic and cultural functions. However, small ruminant production was constrained by diseases and parasites, shortage of feed, predators, market problems, lack of inputs, inadequate extension services and other problems. Thus, technological intervention is very vital to alleviate the identified constraints for the improvement of smallholder sheep and goat production in the studied area.

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