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Breeding Practices, Flock Structure and Reproductive Performance of Begait Sheep in Ethiopia

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Abstract: This study was conducted to observe the breeding management practices, reproductive performance and flock structure of Begait sheep breed. It was made by selecting 126 households found from two districts in the western zone of Tigray regional state, Ethiopia. An exploratory survey was undertaken to understand traditional management practices, flock structure and reproductive performances of Begait sheep in Setit Humera and Kafta Humera of Ethiopia. Semi-structured questionnaires, recording and monitoring their performance and field observations were employed. Begait sheep breed has as long and thin tailed (up to 50-cm long), with muscular body, short and smooth hair and polled for both male and female sexes. Sheep were ranked as the first important livestock species (80.8% in Setit Humera and 82.7% in Kafta Humera) followed by cattle. The overall mean ± standard deviation of flock size of Begait sheep was 7.7±8.4 lambs (both male and female of less than 6 months), 2.1±4.5 ram lambs (males from 6 to 12 months), 5.7±9.9 ewe lambs (females from 6 to 12 months), 2.3±1.7 breeding rams (males above 12 months), 25.4±27.7 breeding ewe (females above 12 months) and 0.1±0.3 castrated males. The overall age at first service of the breed was 5.1±1.0 for males and 6.4±1.0 months for females, respectively. The overall average age at first lambing of the breed was 11.3±1.3 months. Sustainable livestock breeding programs targeting smallholder farmers need to incorporate the existing management practices, flock structure and reproductive performance of the breed.

Key words: Begait Sheep · Management Practices · Reproductive Performance

INTRODUCTION

Sheep are the species with the highest number of recorded breeds, contributing 25% to the total mammalian breeds [1]. Sheep have been traditionally farmed to take as advantage of natural resources non- usable by other species, in geographic areas with hard environmental conditions. They have special features like efficient utilization of marginal and small plot of land, short generation length, high reproductive rate, low risk of investment and more production per unit of investment as compared with cattle [2, 3]. Sheep are widely distributed, from arid semi-desert to humid rainforest regions and represent 28.9% of the total population of the ruminant livestock in the Tropics and sub Tropics [4]. Ethiopia can be considered as a center of livestock diversity: it is a route of sheep migration from Asia into Africa and has diverse traditional sheep breeds spread across diverse ecology, communities and production systems [5]. It is the home for at least nine breeds and 14 traditional sheep populations [6] with estimated 30.6 million heads [7].

Locally available sheep breeds in Ethiopia are the result of many generations of human and natural selection predominantly for survival under the prevailing fluctuating feed scarcity, disease challenges and harsh environment are highly adapted to low-input systems [8]. They are associated with the small-scale poor livestock keepers and serve as living banks for their owners [9]. Furthermore, they have multipurpose role as source of income, meat, skin, manure, coarse wool and serve as also as means of risk avoidance during crop failure especially where land productivity is low [10, 11]. The ownership of

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small ruminants is regarded as a safe investment for the family as well as to gain social prestige within the community. They are sold to meet compelling family financial obligations or slaughtered for consumption at home or festivals [12]. However, their productivity is low as compared to temperate breeds [13]. This is due to different factors such as poor understanding of production system, poor nutrition, prevalence of disease, lack of appropriate breed and breeding strategies. Therefore, poor grazing and low quality feeds of energy and protein leads to under nourishment and low productivity. To meet the growing domestic demand for meat as well as potential export markets, the present matured breeding practices and reproductive performance of the sheep has to be improved. Therefore, the objective of this study was to assess the traditional breeding management practices, reproductive performances as well as flock structures of Begait sheep breed at smallholder farmers' level in two districts of western Tigray, Ethiopia.

MATERIALS AND METHODS

Study Sites: The study was conducted in two districts (Setit Humera and Kafta Humera) of the western zone Tigray, Ethiopia (Figure 1), which are located 1500 km from Addis Ababa to the north and 252 Km North West of Gondar. It was conducted within an altitude range of 560 meter above sea level to 1849 meter above sea level. The mean maximum temperature varied from 33°C to 41.7°C, while the mean minimum temperature varied from 17.5°C to 22.2°C. The rainfall in the area was irregular and ranges from 448.8 mm to 1102.5 mm in which 80 to 85% of the rainfall is receiving during the summer/rainy season. Generally climate is characterized by distinct dry (October to May) and wet seasons (June to September).

Data Collection Methods and Procedures: The survey and field observation were conducted in two sites in Setit Humera and three sites in Kafta Humera. Study areas were selected based on sheep population and access of infrastructure. A total of 126 households (52 in Setit Humera and 74 in Kafta Humera) were randomly selected for the interview within the selected sites. Semi-structured questionnaires, participatory rural appraisal (PRA) together with a focused group discussion, field observation and monitoring reproductive performance were employed to dig up the required information.

Date Analysis: The SPSS statistical computer software [14] was used to analyze the data from the questionnaire and observed reproductive performance of Begait sheep. Chi-square test was used when required to assess statistical significances. Indices were calculated to provide ranking of feed and grazing management and sheep diseases.

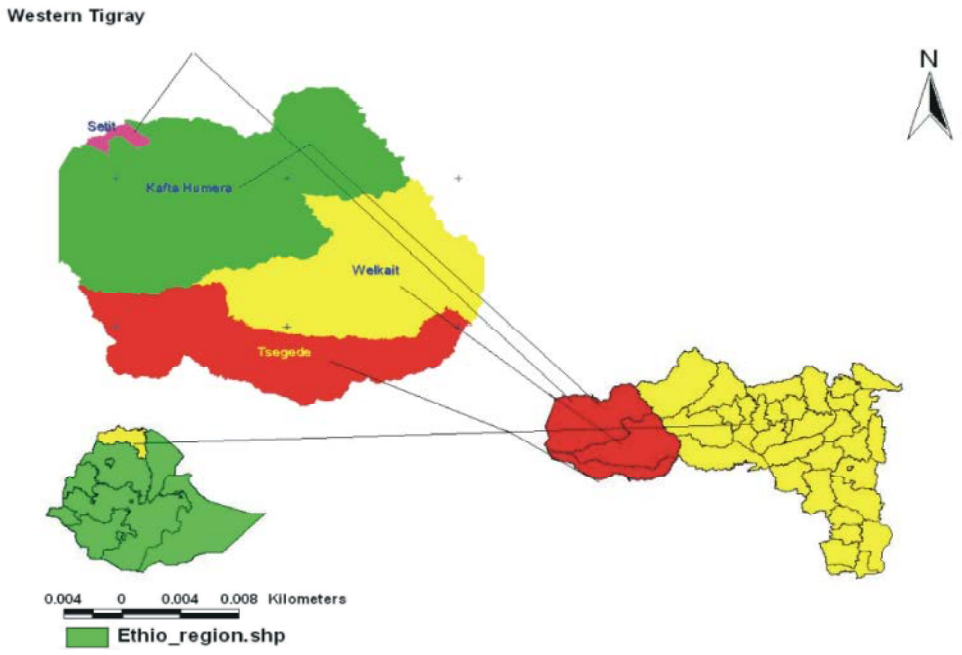

Fig. 1: Map of the western Tigray

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of Households: Detailed household general characteristics are presented in Table 1. The age of respondents were ranged from 31 to 74 years with a mean of 47.12±7.38 years for Setit Humera and ranged from 31 to 69 years with a mean age of 45.85± 6.95 years for Kafta Humera district, respectively. The Average family size obtained in Setit humera (7.52±1.44) was close to Horro (7.3±2.47) but, lower than Adiyo Kaka (8.6±4.46) was reported by Zewdu Edea [15]. On the other hand family size in Kafta Humera (6.30±1.65) was close to Afar family size (6.24) [16] and lower than the Horro and Adiyo Kaka. Figures obtained for both districts in this study were higher than the average value of the national level (5.2) [17]. The study revealed that the majority of the households in both study sites were headed by males (86.5% for Setit Humera and 87.5% for Kafta Humera). The remaining proportion of the households was headed by females. Female headed household in this particular study indicated that the husband had died or divorced.

About 9.6% of household heads in Setit Humera and 48.7% in Kafta Humera were literate (Able to read and write from religious school and/or from adult education). About 67.3% and 21.2% in Setit Humera had a primary and secondary education level, respectively. Whereas in Kafta Humera 40.5% and 2.7% of the respondents were primary and secondary schools, respectively. In contrast to the two districts, in Setit Humera about 1.9% of the respondents were professionals. In Kafta Humera, about 8.1% of the respondents were illiterate. In contrast to the study reports, higher proportion of illiterate (79.4%) and lower level of primary (2.4%) were reported in Jeldessa, Mudianeno and Goladeg [18]. Better educational background obtained in Setit Humera smallholder farmers might have good potential for adoption of improved technologies and facilitate performance and pedigree recording in livestock. Training and capacity building of Kafta Humera smallholder farmers is also mandatory and essential input for the success of sheep breeding strategies and other development interventions.

Livestock Holdings and Ranking of Livestock Species According to Their Importance: The average reported livestock possessions are presented in Table 2. Respondents in Kafta Humera had significantly ($P< 0.01$) higher number of sheep, goat and chickens than Setit Humera. But, there was no significant difference ($P> 0.05$) between the two districts in donkey holding.

Sheep were ranked as the first (80.8% in Setit Humera and 82.7% in Kafta Humera) important livestock species followed by cattle and goats (Table 3). The usual reasons for ranking sheep as the most important species was that, besides of sheep served as immediate source of income, have short generation interval, require low initial capital and high prolificacy, they were easily managed by all age classes of the family, efficient feed grazers and attractive price of cross-border market. In the study districts, both livestock and crop production are the main preferred farming activities with a percentage value of 84.6 and 97.3, respectively. In Setit Humera, out of the 52 farmers interviewed, about 78.8% respondents reported that crop production was as their main source of food for home consumption and about 57.7% of respondents indicated that both crop and livestock production was their main source of income. Similarly, in Kafta Humera about 60.2% respondents reported that crop production was as their main source of food for home consumption and 60.8% respondents indicated that both crop and livestock production was their main source of income (Table 4).

Sheep Flock Structure: The mean (± standard deviation) of flock size of Begait sheep flock in Setit Humera was 6.77±9.13 lambs (Both male and female of less than 6 months of age), 2.06±5.39 male lambs (Males from 6 to 12 months age), 5.06±10.35 female lambs (Females from 6 to 12 months age), 1.50±0.98 breeding rams (Males above 12 months age), 20.98±25.13 breeding ewe (Females above 12 months age) and 0.04±0.19 castrated males. The corresponding values for Kafta Humera were 8.42±7.78, 2.09±3.73, 6.14±9.62, 2.85±1.93, 28.51±29.09 and 0.12±0.40, respectively. In Setit Humera, the breeding ewes were taken the major portion (57.6%) followed by lambs (18.6%) and ewe lambs (13.9%). Similarly, in Kafta Humera breeding ewes were dominant (59.2%) followed by lambs (29.5%) and ewe lambs (21.5%).

The value obtained in the study districts were higher than the value reported for Menz sheep which ranges from 41.4% to 49% [12]. In Setit Humera, the proportion of breeding rams and castrates were 4.1% and close to 0.0%, respectively. Whereas in Kafta Humera with the exception of castrates (0.0%) the proportion of breeding rams (5.9%) were relatively higher than Setit Humera. The ratios of breeding ram to ewes were 1:13.9 in Setit Humera and 1:10 Kafta Humera, respectively. The breeding ram to ewe ratio obtained for Setit Humera (1:13.9) and Kafta Humera (1.10) was higher than the Menz sheep (1:8.3) and Gumuz sheep (1:6.7) reported by Tesfaye Getachew [16] and Solomon Abegaz [19] respectively, but, lower than the Afar sheep

Table 1: Socio-economic characteristics of households

	Setit Humera (N = 52)	Kafta Humera (N = 74)	Overall (N = 126)
Descriptor	Mean ±SD	Mean ±SD	Mean ±SD
Age of Respondents	47.12± 7.38	45.85± 6.95	46.48±7.17
Family size	7.52± 1.44	6.30 ± 1.65	6.91±1.54
Sex of HH head	Percent	Percent	Percent
Male	86.5	87.5	87.0
Female	13.5	12.5	13.0
Educational level	Percent	Percent	Percent
Illiterate	-	8.1	4.05
Writing and reading	9.6	48.7	29.1
Primary	67.3	40.5	53.9
Secondary	21.2	2.7	11.95
Professional	1.9	-	0.95

N = number of respondents, SD = standard deviation

Table 2: Mean ± SD of the livestock holdings per households in the study area

Animals species	Setit Humera (N=74)	Kafta Humera (N=52)	Overall (N=126)
Sheep	10.75±6.19[b]	18.16±25.98[a]	14.45±16.85
Cattle	5.54±6.68[a]	4.49±5.57[b]	5.01±6.12
Goats	3.17±2.94[b]	6.03±5.81[a]	4.60±4.87
Chickens	3.38±3.44[b]	4.80±5.45[a]	4.09±4.44
Donkeys	1.67±0.73[a]	1.69±0.79[a]	1.68±0.77

N= number of respondents, SD= standard deviation

Table 3: Ranked livestock species according to their importance (%)

	Setit Humera				Kafta Humera			
Species	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Cattle	9.6	82.7	7.7	0.31	21.3	54.7	24.0	0.38
Sheep	80.8	19.2	-	0.45	82.7	17.3	-	0.54
Goats	3.8	21.2	75.0	0.21	4.0	32.0	64.0	0.27
Chickens	-	-	11.5	0.02	-	-	-	-
Donkeys	-	-	5.8	0.01	-	-	5.3	0.01

Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular species of livestock divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all species

Table 4: Percentage of respondents farming activities (%)

	Setit Humera		Kafta Humera		Over all	
Activities	N	%	N	%	N	%
Farming activities						
Livestock farming only	8	15.4	2	2.7	10	7.9
Crop farming only	-	-	-	-	-	-
Livestock and crop farming	44	84.6	72	97.3	116	92.1
Overall	52	100.0	74	100.0	126	100.0
Farming activities for home consumption						
Livestock farming only	1	1.9	11	14.9	12	9.5
Crop farming only	41	78.8	49	66.2	90	71.4
Livestock and crop farming	10	19.2	14	18.9	24	19.0
Overall	52	100.0	74	100.0	126	100.0
Farming activities for income generation						
Livestock farming only	5	9.6	10	13.5	15	11.9
Crop farming only	17	32.7	19	25.7	34	28.6
Livestock and crop farming	30	57.7	45	60.8	75	59.5
Overall	52	100.0	74	100.0	126	100.0

N= number of respondents

Table 5: Flock size and structures in the study areas

	Setit Humera			Kafta humera			Overall
Categories	N	Mean ± SD	Range	N	Mean ± SD	Range	Mean ± SD
Lambs less than 6 month	352	6.77±9.13	0-20	623	8.42±7.78	0-31	7.59±8.45
Males greater than one year (intact)	78	1.50±0 .98	0-4	211	2.85±1.93	0-7	2.17±1.45
Females greater than one year	1091	20.98±25.13	2-122	2110	28.51±29.09	3-170	24.74±27.11
Males b/n 6 month and one year	107	2.06±5.39	0-31	155	2.09± 3.73	0-17	2.08±4.46
Females b/n 6 month and one year	263	5.06±10.35	0-31	454	6.14±9.62	0-49	5.60±9.98
Castrates	2	0.04± 0.19	0-1	9	0.12± 0.40	0-2	0.08±0.29

N= number of respondents, SD= standard deviation

Table 6: Percentage of households that indicated population trends of major livestock species for the last ten years in the study area

Species	Setit Humera	Kafta Humera	Overall
Cattle			
Decreasing	71.2	79.7	75.4
Increasing	-	2.7	1.35
Stable	28.8	17.6	23.2
*N	52	74	126
Sheep			
Decreasing	80.8	27.0	53.9
Increasing	19.2	73.0	46.1
Stable	-	-	-
*N	52	74	126
Goats			
Decreasing	92.3	86.5	89.4
Increasing	7.7	13.5	10.6
Stable	-	-	-
*N	52	74	126

*N = Number of households

(1:17.4) reported by Tesfaye Getachew [16]. The larger flock size investigated in this study considered as important factor in applying within breed selection at the household level. It is also a vital approach for designing breeding scheme applicable to the whole village level. In the study districts, lower numbers of young rams were obtained as compared to young ewe lambs because their breeding objective was to get income, due to this young rams were marketed at their earlier age. This showed that, relatively fast growth and good quality rams were used for breeding only in rare circumstances, rather they are meant for sale at earlier age. However, if they were not sold at early age they can be kept for breeding purpose, castrated and fattened for sale according to their order of importance.

Status of Livestock Population: The perception of households on the population status of livestock species for the last ten years in the study area are summarized in Table 6. Overall on the basis of proportion of respondents, the decline in number was highest for goats (89.4%), followed by cattle (75.4%) and sheep (53.9%). The possible reasons reported by respondents for this trend were mainly rangeland degradation, increase crop cultivation, shortage of feed and water, growth of human population, frequent occurrence of disease, area closure and drought. Similar reasons were reported by Zewdu Edea [15] and Belay Kassa *et al*. [20]. Contrary to this, Solomon Abegaz [19] indicated that the population of livestock was increasing in Metema Woreda. It was related to the increasing human population due to resettlement, availability of extensive grazing land and attractive price for livestock due to cross-border market.

Breeding and Management Practices: Breeding and management practices are presented in Table 7. In the present studied districts, A partial control of mating was practiced in Setit Humera, majority (62.7%) of the respondents practice uncontrolled mating. The primary reason for uncontrolled mating was the use of communal grazing area whereby animals from various households of the same flock graze together, lack of awareness and insufficient of breeding rams. In Setit Humera majority (55.8%) of the respondent were given special management actives for breeding rams whereas, in Kafta Humera majority (66%) of the respondents were not given special management for breeding rams. When breeding males were not reared in their flocks, the majority of the farmers got the service from neighbors' rams (84.6% for Setit Humera and 87.2% for Kafta Humera), respectively. The majority (86.5%) of breeding rams for farmers in Setit Humera were originated from own flock and 7.7% were purchased from market of the same flock and the remaining 5.8% were rented from their partners. Similarly, in Kafta Humera, about 89.0% of the rams were born in their own flock and 5.4% were purchased from market and the remaining 5.6% were rented from their partners. On average breeding ram was kept for 2.94±0.83 with the range of 2 to 5 years in Setit Humera and 2.97±1.03 with a range of 1 to 5 years in Kafta Humera.

Inbreeding was higher in small flocks kept by smallholders and in flocks having only limited breeding rams [21]. The estimated effective population size and

Table 7: Household's response on Begait sheep breeding management

Breeding management	Setit Humera		Kafta Humera		Overall	
Mating systems	N	%	N	%	N	%
Uncontrolled	7	13.5	72	93.3	79	62.7
Partial control	45	86.5	2	2.7	47	37.3
Special management for breeding ram						
Yes	29	55.8	31	41.9	60	47.6
No	23	44.2	43	58.1	66	52.4
Purpose of keeping breeding ram						
Mating	1	1.9	2	2.7	3	2.4
Fattening	1	1.9	2	2.7	3	2.4
Selling	3	5.8	6	10.8	11	8.7
Mating and selling	41	78.8	55	74.3	96	76.2
Mating, fattening and selling	6	11.5	7	9.5	13	10.3
Source of breeding ram						
Born in the flock	45	86.5	66	89.2	111	88.1
Purchase in private	4	7.7	4	5.4	8	6.3
Rent	3	5.8	4	5.4	7	5.6
Selection breeding ram						
Yes	43	82.7	63	85.1	106	84.1
No	9	17.3	11	14.9	20	15.9
Selection breeding ewe						
Yes	36	69.2	71	95.9	107	84.9
No	16	30.8	3	4.1	19	15.1

*N= number of house holds

level of inbreeding in the study districts were 5.59 and 8.9% in Setit Humera and 10.36 and 4.8% in Kafta Humera areas, respectively. Of the total respondents (52) in Setit Humera 57.7% of the households identifies on the impact of inbreeding while, the remaining (42.3%) they do not have any background information on sheep inbreeding. On the top of this in Setit Humera, it was investigated that about 96.2% of the farmers allow rams to mate his sister and about 90.4% of the farmers do not allow ram to mate other than their ewes in that case inbreeding was practiced by most of the farmers. Similarly, in Kafta Humera 83.8% the respondents they tried to identify the significance of sheep inbreeding and it was also reported that of the total ram owners (74) about 85.1% allow rams to mate his sister. In Kafta Humera, only 23% of the farmers allow to share their ram to others. Based on the outcome of the group discussion and individual interview the respondents they tried to compare the Begait sheep with other sheep breeds especially with the Semen (Debark, Gonder) and other Tigray sheep; the Begait sheep were high heat and feed shortage tolerance, trek long distance, adaptive to their environment, have fast growth rate/reach early marketing age and they were highly demanded by the Sudanese people. So, due to the above adaptive and economic traits, the respondents were not willing to share and/or change their sheep breed. In the study districts, majority (76.2%) of the respondents were kept rams for mating and selling purpose, followed by for mating, selling and fattening (10.3%) and the remaining 8.4%, 2.4% and 2.4% was for selling, mating and fattening purposes, respectively.

Feed Resources and Grazing Management: Based on interviews made with a total of 126 farmers from Setit Humera (52) and Kafta Humera (74) districts, the main feed resource were natural pasture, fallow land, hay and crop residues. In the Setit Humera the main feed resources during the wet season were natural pasture, fallow land and crop residues with an index value of 0.50, 0.29 and 0.15, respectively. Whereas during the dry season, natural pasture (0.39) followed by crop residues (0.37 and hay (0.13) were the main available feed resources, respectively. Similar to Setit Humera, natural pasture, fallow land and crop residues were the main feed resources during the wet season with an index value of 0.50, 0.28 and 0.16, respectively whereas during the dry season's natural pasture and crop residues (0.38, 0.38) followed hay were the main available feed resources, respectively. In the study areas the availability of feed resources shows seasonality. In the two districts, crop residues from cereals (sesame, sorghum and maize) are more important feed sources especially during the dry season when grazing pasture is no more available.

Table 8: Ranked major feed resources during the dry and wet seasons in Setit Humera District

	Wet season				Dry season			
Type of Feed Resource	Rank1	Rank2	Rank3	Index	Rank1	Rank2	Rank3	Index
Natural pasture	96.2	3.8	-	0.50	65.4	19.2	15	0.39
Established pasture	-	5.8	3.8	0.03	-	-	5.8	0.01
Hay	-	-	13.5	0.02	11.5	17.3	17.3	0.13
Crop residues	-	13.5	63.5	0.15	36.5	63.5	-	0.37
Fallow land	3.8	71.2	15.4	0.29	-	-	59.6	0.09
Concentrates	-	-	3.8	0.01	-	-	1.9	0.00

Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular feed resource divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all feed resources.

Table 9: Ranked major feed resources during the dry and wet seasons in Kafta Humera District

	Wet season				Dry season			
Type of Feed Resource	Rank1	Rank2	Rank3	Index	Rank1	Rank2	Rank3	Index
Natural pasture	95.9	4.1	-	0.50	58.1	27.0	14.9	0.38
Established pasture	-	5.4	2.7	0.02	-	-	5.4	0.01
Hay	-	-	12.2	0.02	10.8	17.6	21.6	0.14
Crop residues	-	14.9	64.9	0.16	44.6	55.4	-	0.38
Fallow land	4.1	70.3	16.2	0.28	-	-	55.4	0.09
Concentrates	-	-	4.1	0.01	-	-	2.7	0.00

Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular feed resource divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all feed resources

The use of crop residues as sources of feed for sheep was more frequently reported in both districts and crop residues like bare sesame, sorghum and maize straws were used during the dry season. In addition to natural pasture, supplementary feeding of animals was practiced both in dry and rainy seasons in both areas. Feed supplementations during the dry season were reported 73.1% and 40.5% of the farmers in Setit Humera and Kafta Humera districts, respectively. The low percentage of supplementary feed in Kafta Humera is due to the possession large communal grazing lands. The major supplementary feeds identified were grains (Sorghum and maize), non-conventional feeds like *Atella* of *Tella,* which are the byproducts of locally made beverages. The use of common salt as supplement for sheep was well recognized and practiced by majority of farmers in the study sites. The same practice was reported around Metema areas by Gumuz sheep keepers [19] and in Jimma [22]. But, none of the respondents reported the use of conventional feed supplements and improve forages. So, to alleviate the existing feed shortage there is needed to look in to efficient utilization of the existing resources which could include conservation of crop residues. Introduction of improved forages in to the existing system is one of the options but, so far no attempts have been done especially in Setit Humera. In the study areas, sheep generally grazed for 7.08 hours and 8.42 hours a day in Setit Humera during dry and wet season, respectively. The corresponding results for Kafta Humera district were 9.34 hours and 7.7 hours for dry and rainy season, respectively. Further, reducing sheep population and grazing hours were extended during dry seasons as strategy to cope with feed shortage. Longer grazing hours of 10 hours to 11 hours were reported in Lallo-Mama district of central Ethiopia [12]. According to Berhanu Belay [22] an average grazing of 9 hours were in Jimma areas of Southern Ethiopia.

Management with respect to feeding or grazing feed resources was much more same for dry and rainy or cropping seasons. During the rainy and dry seasons the majority (94.2%) of sheep owners in Setit Humera were herded their animals. Similarly, in Kafta Humera (94.6%) were herded their animals (Table 10 and 11).The main reasons for practicing this were since the area is an Ethio-Sudan border paramount livestock (Especially sheep) were exported illegally so, herding relatively secure stock against theft and protect from predation or extreme weather condition. Even though in a diminutive way tethering was practiced in the study districts to protect sheep theft, to avoid crop damage and to use the limited grazing properly. Similar management practices were identified in south western Ethiopia by Berhanu Belay [22] and Workneh Ayalew [23] in densely populated parts of southern Ethiopia.

Table 10: Ranked Management systems practiced by owners with respect to grazing an season in Setit humera (%)

	Wet season				Dry season			
Grazing management	Rank1	Rank2	Rank3	Index	Rank1	Rank2	Rank3	Index
Free grazing	5.8	78.8	13.5	0.36	1.9	78.8	17.3	0.29
Herded	94.2	-	5.8	0.55	94.2	5.8	-	0.48
Paddock	-	-	32.7	0.06	-	-	34.6	0.06
Tethering	-	9.6	42.3	0.12	5.8	5.8	30.8	0.10
Zero grazing	-	13.5	-	0.10	-	7.7	21.2	0.07

Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular managements systems divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all respondents managements systems

Table 11: Ranked Management systems practiced by owners with respect to grazing and season in Kafta humera (%)

	Wet season				Dry season			
Grazing management	Rank1	Rank2	Rank3	Index	Rank1	Rank2	Rank3	Index
Free grazing	5.4	79.7	12.2	0.31	2.7	79.7	14.9	0.30
Herded	94.6	-	5.4	0.49	94.6	-	5.4	0.50
Paddock	-	1.4	35.1	0.06	-	1.4	35.1	0.06
Tethering	-	10.8	40.5	0.10	5.4	6.8	29.7	0.07
Zero grazing	-	4.1	14.9	0.04	-	4.1	24.3	0.07

Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for particular managements systems divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all respondents managements systems.

Fig. 2: Begait sheep grazing in fallow land

Fig. 3: Begait sheep tethered in their back yard

Fig. 4: Begait sheep in their communal grazing land

Table 12: Watering point in the study districts in different seasons (%)

	Setit Humera		Kafta Humera		Overall	
Watering point	N	%	N	%	N	%
Wet season						
Watered at home	-	-	-	-	-	-
Watered at less than 1 km	45	86.5	60	86.5	109	86.5
Between 1 and 5 km	7	13.5	10	13.5	17	13.5
Between 6 and 10 km	-	-	-	-	-	-
Greater than 10 km	-	-	-	-	-	-
Dry season						
Watered at home	21	40.4	8	10.8	29	23.0
Watered at less than 1 km	7	13.5	3	4.1	10	7.9
Between 1 and 5 km	13	25.0	50	67.6	63	50.0
Between 6 and 10 km	11	21.2	13	17.8	24	19.0
Greater than 10 km	-	-	-	-	-	-

*N= number of households, Km= kilometre

Table 13: Seasonal watering frequency and availability of water in the study areas

	Setit Humera		Kafta Humera		Overall	
Frequency of watering	N	%	N	%	N	%
Wet season						
Freely available	8	15.4	15	20.3	23	18.3
Once a day	44	84.6	59	79.7	103	81.7
Once in 2 days	-	-	-	-	-	-
Once in 3 days	-	-	-	-	-	-
Dry season						
Freely available	2	3.8	5	6.8	7	5.6
Once a day	50	96.2	59	93.2	119	96.4
Once in 2 days	-	-	-	-	-	-
Once in 3 days	-	-	-	-	-	-

*N= number of households

Water Sources and Availability: The main sources and availability of water are present in Table 12 and 13. In the study areas sheep and goats were usually herded together for watering and feeding. According to respondents, the major source of water during the wet and dry seasons were rivers and rainwater (35.7%) and bore hole and natural ponds (29.4%), respectively. The distances to watering points varied during the dry and wet seasons. Of the total (126) respondents 50% trek their animals between 1 and 5 km in search of water during the dry season, but during the wet season the distance was reduced to less than 1 km (86.5%; Table 12). As shown in Table 13, during the wet and dry seasons, 81.7% and 96.4% sheep was watered once a day,

Table 14: Reported housing of sheep in the study areas.

	Setit Humera		Kafta Humera		Overall	
Type housing	*N	%	*N	%	*N	%
Wet season						
Pen constructed						
Separate house (Grass, wood)	37	71.2	49	66.2	86	68.3
Veranda	15	28.8	25	33.8	40	31.7
Dry season						
Pen constructed						
Without roof (wood,)	45	86.5	64	86.5	109	86.5
Yard	7	13.5	10	13.5	17	13.5
Sheep housed together with other livestock						
Yes	-	-	-	-	-	-
No	52	100.0	74	100.0	126	100.0
Lambs housed with adults						
Yes	29	55.8	43	58.1	72	57.1
No	23	44.2	31	41.9	54	42.9

*N= number of households

Fig. 5: Sheep house (Wet season)

respectively. Only 18.3% and 5.6% watered adlibitum especially, lambs and male animals. In the study districts, watering is more frequent as compared to similar studies such as watering once in two to three days in the lowlands of Dire Dawa area [24].

Housing of Sheep: Good housing system can determine good productivity by reducing stress, disease hazards and making management easier. In the study districts, housing of sheep differs between wet season and dry seasons. During the wet season farmers was used roof houses made of grasses and plastics and whereas during dry season sheep was housed without roof on their yard and veranda. Tables 14 indicated that during the dry season 86.5% and 13.5% of the respondents were housed their sheep in pen constructed without roof and in the yard, respectively. Similarly, during the wet season sheep were housed in separate house in roof constructed (68.3%) (Grass and wood) and veranda (31.7%), respectively. In the study districts, sheep were housed (100%) separately (From cattle and equines) and 57.1% and 49.2% of the lambs were housed with adults and in separate house, respectively.

Sheep Marketing: According the respondents response, sheep were sold mainly to the local traders, consumers and to lesser extent to other farmers. Even though in a diminutive way selling to cope with the existing feed shortage or disease problems, farmers usually prefer to sell their sheep during holidays and festivals. In the study

Fig. 6: Sheep Housing (Dry season)

Table 15: Summary on Mean±SD marketing and culling age of Begait sheep in the study districts

Marketing	Setit Humera	Kafta humera	Overall
N	52	74	126
Market age of males (month)	6.33±0.94[a]	6.09±1.35[a]	6.26±1.14
Market age of females (month)	8.54±1.78[a]	8.28±1.64[a]	8.41±1.71
Culling age for males (Yrs.)	4.0±0.71[a]	4.05±0.72[a]	4.03±0.72
Culling age for females (Yrs.)	7.52±2.23[a]	7.38±2.13[a]	7.45±2.18

districts, it was noted that there was no organized form of marketing system. It was reported that better price was fetched during holidays such as Ethiopian New Year, Christmas and Easter. The agreements on the present pricing system practiced by a long bargaining between sellers and buyers leaves greater opportunities for benefiting the middlemen. Information on market price, supply, grades and standards were not available to farmers. Some of the problems associated with sheep marketing was: seasonality of demand, long distance trekking and lack of feeding and watering facilities along the trekking roads, lack of market information and absence of transportation facilities. There were no responsible bodies who supply farmers with updated market information. As reported by Seleka [25] appropriate market incentives are necessary drives for genetic improvement. Though market was not mentioned as the top constraint across the study sites, improving of marketing facilities would enable farmers to get better prices for their animals more than what they were getting. The study revealed that, there was no significance difference (P>0.05) at marketing and culling age between districts. Overall, females were sold at the age of 8.41±1.71 months whereas males were sold at 6.26±1.16 months. Accordingly, males were sold at early age as compared to their females counter parts. The study revealed that, marketing age of male Begait sheep (6.26±1.16 months) was lower than Bonga (10.3 months) and Horro male sheep (7.3 months), respectively, as reported by Zewdu Edea [15]. However, the overall marketing age of female Begait sheep was close to the overall marketing age of Bonga and Horro (8.2±3.4 month). In the study districts, majority of the respondents (88.9%) revealed that they sold sheep primarily to meet their cash need and the remaining (11.1%) sold sheep as a means of both cash needed and to cull unwanted animals.

Disease and Health Management: Diseases can be defined as any deviation from health [26]. In spite of the numerical and economic importance of small ruminants in developing countries', productivity is generally low owing to inadequate feed resources, poor management and diseases. Losses from diseases alone reduce productivity by 50–60% [27]. One of the main problems faced by African smallholder farmers in controlling diseases of small ruminants is lack of adequate veterinary services. These services are often provided by government agencies which lack of facilities for

Table 16: Ranking of sheep diseases in the study areas

		Respondents			
Local name	Common name	Rank1	Rank2	Rank3	Index
Mieta Begie	Ovine pasteurellosis	15.9	66.7	17.7	0.21
Abek	Mange	61.1	23	15.1	0.28
Enfrir	Sheep pox	19	15.9	50	0.15
Megerem	Anthrax	0.8	2.4	5.6	0.01
Gdamawi tsgetegna	External parasite	21.4	29.4	32.5	0.16
Wshtawi tsgetegna	Internal parasite	4.0	31.0	42.9	0.12
Slm	Trypanomiasis	2.4	12.7	37.3	0.07

Table 17: Reproductive performances of Begait sheep breed

	Setit Humera			Kafta Humera			Overall
Character	Min	Max.	Mean±SD	Min.	Max.	Mean±SD	Mean±SD
Age at first service of male (Month	3	6	5.06±0.85	3	8	5.18±1.16	5.12±1.00
Age at service of female (Month)	4	8	6.17±1.12	5	9	6.53±0.94	6.35±1.03
Age at first lambing (Month)	9	13	11.33±1.23	5	8	11.35±1.37	11.34±1.30
Average lambing interval (Month)	4	6	6.65±1.70	9	14	6. 93±1.43	6.79±1.56
Reproductive life span of female (Yrs.)	5	13	7.67±1.95	5	13	7.76±1.80	7.71±1.87
Lifespan lamb crop (Number)	10	23	14.73±3.88	9	20	14.35±3.18	14.54±3.53
Litter size	1	2	1.33±0.47	1	2	1.34±0.47	1.33±0.47
Twining rate (Percent)	20	78	52.40±15.80	15	75	51.47±14.53	51.93±15.16

Min= minimum, max=maximum, Yrs. = years, SD= standard deviation

surveillance and diagnosis of diseases and are unable to maintain adequate vaccine supply/production [27]. As indicated in Table 16; farmers in the study area identified the major sheep diseases. Mange, Ovine Pasteurellosis, external parasites and sheep pox were the major sheep diseases affecting productivity with an index value of 0.28, 0.21, 0.16 and 0.15, respectively. In the study districts, most of the farmers were used modern drugs from government clinics and open markets. In both districts, some farmers reported that they sometimes were used traditional treatments (Branding around the neck and the flank) for sheep affected by different diseases which shows swellings such as anthrax. This practice is not supported by science rather vaccination and consulting veterinarian. To alleviate these constraints veterinary services need to be strengthened in both governmental and private organizations.

Reproductive Performances of Begait Sheep: Puberty in the ewe lamb is the point in which she first exhibits estrus. From the point of farmers, puberty is the age at first service. Results revealed that age at first mating for both sexes was not fixed and sheep were left to nature to reproduce. Reproductive performance of Begait sheep are summarized in Table 17. The study revealed that, there was no significance difference (P>0.05) between the districts on the reproductive performance of the breed. The overall age at first service of the breed was 5.12±1.04 for males and 6.35±1.03 months for females, respectively. The age at first service in this study districts seem to be lower than that reported (10 months) previously in traditional systems for Menz sheep [28] and the Gumuz sheep (7.21±1.75 months) [19]. The overall average age at first lambing of the Begait sheep was 11.34± 1.30 months. The mean age at first lambing of the Begait sheep was shorter than the Menz sheep (16.5 months) reported by Gautsch [29] 15-22 months for the same breed by [12] and also 470.10±106.60 days for the same breed reported by [16] and 14.9±3.1 and 13.3±1.7 months were reported for Bonga and Horro sheep breeds by Zewdu Edea [15] respectively. This could be attributed to the unique character, breed difference or environmental difference and environmental adaptability of the Begait sheep. So, the Begait sheep breed perform relatively better than most indigenous breeds and this is an opportunity for the upcoming breeding strategy as greater population turnover and more rapid genetic progress could be obtained. The average lambing interval for the Begait sheep was 6.79±1.55 months with a range of 5 to 9 months. It appears that this value is close to what had been reported for Gumuz sheep (6.64±1.13) by Solomon Abegaz [19]. However, it is shorter than what had been reported for BHS Sheep (10.46±2.58 by Fekerte Ferew [30]. The shortest lambing interval generally occurs in

Table 18: Respondents ranked lambing patterns in the study areas

	Setit Humera				Kafta Humera			
Lambing pattern	Rankk1	Rank2	Rank3	Index	Rankk1	Rank2	Rank3	Index
January	-	-	5.4	0.01	-	-	5.8	0.01
February	-	5.4	-	0.02	-	5.8	-	0.02
March	5.4	-	-	0.03	5.8	-	-	0.03
April	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-
June	9.5	13.5	33.8	0.14	5.8	13.5	28.8	0.12
July	58.1	14.5	4.1	0.33	61.5	17.3	3.8	0.35
August	9.5	32.4	25.7	0.19	7.7	26.9	30.8	0.17
September	5.4	9.5	-	0.05	3.8	7.7	-	0.04
October	8.1	-	-	0.04	-	5.8	7.7	0.03
November	-	9.5	20.3	0.06	-	9.6	23.1	0.07
December	20.3	9.9	5.4	0.13	23.1	15.4	5.8	0.17

traditional systems where uncontrolled breeding is the norm. According to Wilson and Murayi [31] report a longer lambing interval for on station managed long fat-tailed sheep in Rwanda than most of the intervals reported from African traditional systems where controlled breeding was not practiced. Therefore, to achieve such optimum reproductive performances the prevailing feeding, housing and breeding regime needs to be adequate enough throughout the year. The average reproductive life span of Begait sheep was 7.71±1.86 year with a range of 5 to 13 years. This value was close to the report for the Horro and Bonga ewes were 7.9±3.1 years and 7.4±2.7 years [15] respectively. Long term reproductive performance (Long living, high fertility, ability to produce more offspring) of dams should be given more importance in selection programs.

As a base for initial selection, ancestral information is more important in the absence of any records. On average Begait ewe delivered 14.54±3.53 lambs with a range 9 to 23 lambs per her life time. This result was higher than the result obtained for Gumuz sheep in Metema areas (13.47±1.76) [19]. The figure reported for Begait sheep is large and this will provide a base for selection of better replacement stock. Production of large number of progeny in ewe's life span provides ample scope for selection and genetic improvement. A twining rate of 52.40±15.80% for Setit Humera and 51.47±14.53 % were obtained for Kafta Humera areas, respectively with an overall of 51.93±15.16%%. No significant (P>0.05) difference was observed between the two districts regarding this trait. Overall, the litter size obtained for Begait sheep (1.33±0.47) were higher than the value of Menz sheep (1.14±0.01) under village condition [32]. The higher twining rate obtained in this study for Begait sheep is due to the reproductive potential and/or due to the suitability of the environment for the breed. According to [28] litter size was the one primary trait directly influenced by ovulation rate and controlled by genotype and environmental factors.

Lambing Pattern: In the study districts even though there was a seasonal variation in Lambing pattern, lambing occurred at any time of the year as uncontrolled mating was predominantly practiced especially in Kafta Humera (Table 18). In Setit Humera, majority of lambing occurred in July (0.33) followed by August (0.19), June (0.14) and December (0.13), respectively. Similarly, in Kafta Humera most of the lambing patterns occur in July (0.35), August and December having similar index value of 0.17, respectively. Generally, more than half of the lambing pattern of the Begait sheep in the two districts occurs during the rainy season (June to September) and spring (October to December).

Weaning Practices for Begait Sheep: Weaning is a crucial period in the management of ewes and lambs. It is the practice of removing lambs from the milk diet provided by the ewe. Early weaning allows ewes to return to breeding condition earlier and have accelerated lambing; but, creates stress to lambs and ewes. None of the respondents reported purposive weaning. Lambs were naturally weaned when the lambs could not get milk from their dam. The overall, reported average weaning ages of lambs for both districts was 1.98±0.31 months, with range of 1 to 3 months. Similar figures were obtained for Horro and Bonga sheep (1.98±0.31months) [15]. However, this value was less than what had been reported for the Gumuz sheep (3.95±0.9 months) [19]. Weaning ages of 3-4 months, which is shorter than the present result, was

Table 19: Summary reported average weaning age of Begait sheep in the study areas (%)

	Setit Humera		Kafta Humera		Overall	
Average weaning age	*N	%	*N	%	*N	%
<3months	3	5.8	4	5.4	7	5.6
3-4 months	47	90.4	67	90.5	114	90.4
5-6months	2	3.8	3	4.1	5	3.90

*N= Number of house holds

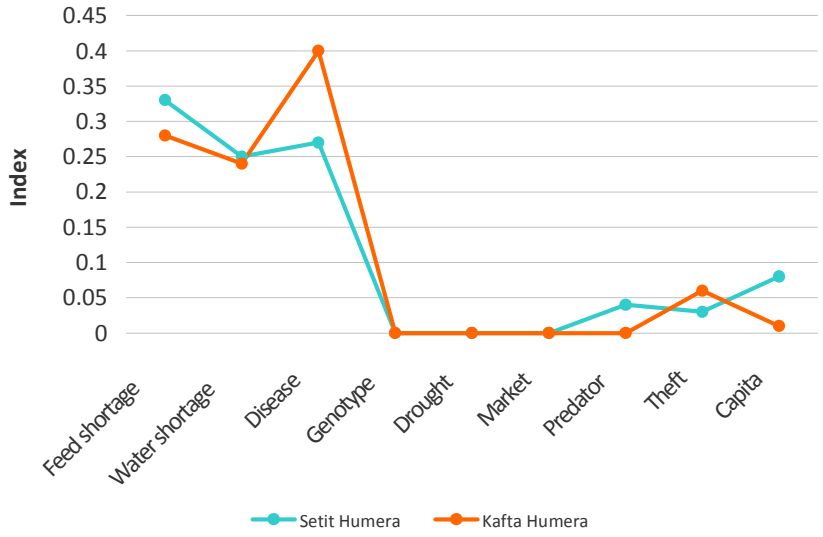

Fig. 7: Constraints of sheep production

reported for indigenous sheep breeds of Ethiopia by Tembely [33]. Weaning weight is affected by season, breed, sex and type of birth. According to Alaku [34] working on indigenous and imported sheep breeds in Sudan reported heavier and single lambs weaned earlier with greater average daily gain than lighter and twins lambs.

Constraints of Sheep Production: Good understanding of the relative importance of the different constraints is fundamental prior to initiating any genetic improvement programme [35]. Production constraints, which were defined by sheep owners in both areas, are presented in Figure 7. Feed shortage (0.33), Disease (0.27), water shortage (0.25) and capital (0.08) were the most pertinent constraints for sheep production in that order for farmers in Setit Humera. In Kafta Humera, disease, water shortage and feed shortage were ranked as first, second and third based upon their significant influence on sheep productivity with an index value of 0.40, 0.28 and 0.24, respectively. Deteriorating of communal grazing lands due to expansion of urbanization and agriculture (Especially in Setit Humera), over grazing and human population growth were the main factors for declining and shrinkage of the primarily grazing land in both districts. Additionally, Soil erosion, decline in fallow land productivity and size, deforestation, poor management of the sloppy topography were observed as the agents aggravating the feed shortage problem in Kafta Humera. Poor veterinary services and absence of transportation facilities were also identified as limiting factors in sheep production especially in Kafta Humera.

CONCLUSIONS

In the study, area there was no fixed period of breeding season. Mating usually occurred everywhere as uncontrolled breeding management is practiced. The management practices, reproductive and production performances of Begait sheep in the study area are influenced by feed shortage, disease, backward management practices. Begait sheep is identified from other breeds by its travelling long distance for searching of feed and water, large muscular body, tall ear, long and thin tailed.

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