American Journal of Zoology
2025, Vol. 8, No. 2, pp. 43-49
https://doi.org/10.11648/j.ajz.20250802.14

Research Article

Assessment of Goat Husbandry Practices and Milk Production Performance in Borana Zone, Southern Oromia, Ethiopia

Beshir Hussien[1, 2, *], Adem Kumbe[1], Anaf Onate[1], Birhanu Bekele[1]

[1]Oromia Agricultural Research Institute, Yabello Pastoral and Dryland Agriculture Research Center, Yabello, Ethiopia
[2]Oromia Agricultural Research Institute, Adami Tulu Research Center, Batu Ethiopia, Ethiopia

Abstracts

Goats play a crucial role in mitigating environmental risks due to their unique adaptation to arid and semi-arid environments. This study was aimed to generate organized information based on household survey and flock monitoring to assess goat husbandry practices and evaluate goats' milk yield respectively. About 180 households of goat owner were selected and interviewed. A total of 266 lactating goats with different parity were monitored to evaluate milk yield. The main purpose of raising goats in the study area was primarily to generate cash for purchasing food items to fulfill immediate family needs. The selection of breeding males was largely done by considering the characters like body size, pedigree, and growth rate and coat color. The overall goat milk yields on average were 0.37 ± 0.01 L/day. The average milk yields of goats were higher (0.57 ± 0.01L/day) during kidding the wet season than those were kidded during the dry season (0.24 ± 0.01L/day). The indigenous goats have indeed a lower milk yield than the improved goat breeds. Therefore, more emphasis on improvement of the feeding practice and breeding program needs to be placed on the improvement of the productive and reproductive performance of goats.

Keywords

Husbandry, Borana, Goat, Milk, Production Performance

1. Introduction

The country's livestock is abundant in the pastoral and agro-pastoral regions, accounting for 28% of cattle, 26% sheep, 66% goats, and nearly 100% of camels. Goats are widely reared in pastoral/agro-pastoral production systems and distributed across different agro-ecological zones of Ethiopia. Approximately, 75% of the goat population of the country is found in the lowlands [1]. In this system, goat has a very important role in mitigating environmental risk due to their unique adaptation to arid and semi- arid areas. Goats in lowland are primarily used for milk and meat productions for home consumption. In pastoral and agro-pastoral community dairy goat production has multi-dimensional advantages especially safe the community through food security and combating malnutrition, income generation through sale of milk, milk products and live animals as well as others benefits such as environmental protection. Local goats are highly

*Corresponding author: beshirhussein02@gmail.com (Beshir Hussien)

Received: 28 April 2025; **Accepted:** 16 May 2025; **Published:** 25 June 2025

valued animal species in Ethiopia, where milk plays a significant role in the diet and provides a source of revenue for livestock owners. Goat milk is consuming anywhere it is produced, frequently when it is still fresh. The majority of smallholder farmers and pastoralists in rural Ethiopia are often resource poor, which means they cannot afford to purchase cattle and produce meat, milk, or even the products on a regular basis [2].

The research results indicated that the goat production accounts for 16.7% of milk consumed in the country [3] and daily milk yield (DMY) of indigenous goats range between 0.3 and 0.45 kg. There is also report confirming that DMY of most indigenous goats in their natural habitat is about half a kg. However, there is a good potential to increase the DMY to about 1 kg through improved management system and relatively higher DMY is produced from the lowland goats as compared to the highland goats [4]. Therefore, future characterization endeavors should give more emphasis to lowland goats to improve their milk production potential and for dairy goat breed development. Therefore, this study was under taken to assess goat husbandry practices, milk production potential and utilization in the study area, Borana zone.

2. Material and Methods

The study was conducted in Yabello, Arero, Dhas, Dubuluk, Dillo, and Elweye districts of Borana zone, Oromia Regional state. The districts are in arid and semi- arid agro-ecology where pastoralist is the predominant production system. The annual temperature in the area range 25-35C°. The average annual rainfall range from 500 to 600 mm [5]. The rainfall distribution is bimodal, but erratic and unreliable in distribution. The main rainy season (*Ganna*) extends from March to May whereas the short rainy season (*Hagaya*) lasts from October to November.

2.1. Research Design

The study was conducted in two parts; briefly, household survey and on-farm monitoring of local goats. For the first part, a single-visit formal survey method was followed to gather the data focusing on assessing goat husbandry and breeding practices while second part dealt with evaluating on farm milk yield.

2.2. Sampling Techniques

Multi-stage sampling techniques were followed to select the study area and sample size. Potential districts were determined based on information obtained from the Borena zone agriculture office and then districts were randomly selected from both pastoral and agro-pastoral area. Secondly, Kebele with more populated goat numbers were determined at the district level, and selected from each. Household from each Kebele was included by simple random sampling and then administered questionnaires.

A sample size was calculated using Yamane's (1967) formula for data collection by questionnaire in this study. Therefore, by assuming the standard error of 5% and the confidence interval of 95%, 180 householders were selected and household head had been interviewed.

$$n= N /1+ N (e)^2$$

Where: n = the sample size
N=the targeted household
e = the level of precision
1 = designates the probability of the event occurring
Therefore: $n= N /1+N (e)^2 = n= 82074/1+82074 (0.05)^2 = 180$

Therefore, 180 household respondents were used as sample for this study to gather date through questionnaire.

2.3. Data Collection Methods

Part I: Household Survey

For data collection, single-visit-multiple-subject survey methods were employed [6]. Semi-structured questionnaire prepared and pre-tested. The district was selected based on the available goat population data. Information on household socioeconomic characteristics, socio-cultural importance of goats, goat management practices, breeding system, unique adaptive character, goat feeding and watering housing system and were collected using semi-structured questionnaires.

Part II. Flock Monitoring

On the longitudinal study, flock monitoring was carried out on a total of 266 (160 during wet season and 106 during dry season) lactating goats with different parity were ear tagged and monitored from selected districts to evaluate milk yield performance. Daily milk yield parity and lactation stage with lactation length was recorded. Milk yield was collected simulating milking time and frequency of pastoral practices, and monitoring duration was managed up to 14 weeks until milk production drops. Prior to measurement date the kids were penned separately overnight. Daily milk yield was recorded by milking half of the udder while the other half-udder was suckled by the kid. Total daily milk yield was obtained through multiplying of milk yield half-udder by two using graduate cylinder.

2.4. Data Analysis

Both quantitative and qualitative data collected were coded and entered into the computer using Excel data sheet management and analyzed by SPSS version 27. Index ranking system was utilized to provide overall ranking of the purpose of keeping, selection criteria, and major production constraints of goats in the district. General Linear Model (GLM) procedures were also used to analysis the monitoring data.

Model: The effect of level of location, season and does

parity on milk yield.

$$Yijkl = \mu + Li + Sj + Pk + eijkl$$

where
Yijkl is milk yield, μ is overall mean,
Li is location (district),
Sj is season (wet and dry season)

3. Results and Discussion

3.1. Socio-demographic characteristics of households

According to the survey results (Table 1), of the 180 sampled households, or sample household heads overall, the majority of them (85.6%) were males. Agro-pastoral and pastoral, depending on their type of farming, made up the majority of participants, who were married (90.6%). Participants were drawn from Elweye, Dillo, Dubuluk, Dhas Arero, and Yabello according to their potential for producing goats.

Table 1. *Socio-demographic characteristics of sampled households.*

Categories	Variables	Frequency (%)
Sex	Male	154 (85.6)
	Female	26 (14.4)
	Total	180 (100.0)
Marital status	Married	163 (90.6)
	Unmarried	17 (9.4)
	Total	180 (100.0)
Farming activity	Pastoral	139 (77.2)
	Agropastoral	41 (22.8)
	Total	180 (100)
Districts	Yabello	36 (20)
	Elwaye	34 (18.9)
	Dubuluk	32 (17.8)
	Dhas	30 (16.7)
	Arero	20 (11.1)
	Dilo	28 (15.6)
	Total	180 (100)
Kebele	Dharito	18 (10)
	Hiddi Ale	17 (9.4)
	Did Yabello	18 (10)
	Gayo	30 (16.7)
	Lafto	32 (17.8)
	Qaxile	28 (15.6)
	E/Magaala	17 (9.4)
	Fuldohaa	10 (5.6)
	Alona	10 (5.6)
	Total	180 (100)

3.2. Livestock Holding Sizes of the Respondents

Small ruminants were common in the study area, with the mean number of sheep (1.8+9.5SD) and goats (9.2+4.82SD) reared higher when compared to the mean number of cattle (1.8+2.6SD), donkeys (0.8+0.8SD), and camels (0.4+1.2SD). Respondents showed a mean experience of 34.9+14.7 SD years in keeping small ruminants.

Table 2. *Number of small ruminants owned per households assessed (N=180).*

Parameters	Mean + St. Dev.
Number of cattle owned	1.8 + 2.59
Number of goats owned	9.2 + 4.82
Number of camel owned	0.39 + 1.19
Number of donkey owned	0.78 + 0.84
Number of female goat	6.8 + 2.4
Number of male goat	3.47 + 3.42
Number of dead goat	0.21 + 0.67
Number of sheep owned	4.8 + 9.46
Number of female sheep	1.5 + 8.15
Number of male sheep	1.21 + 1.82
Household size	5.77 + 1.95
Experience in shoat rearing (years)	14.68

3.2.1. Purpose of Keeping Goat

The average index of the current study indicated that goats serve pastoralists with multiple roles, primarily as income generation (index = 0.55), followed by for milk consumption (index = 0.22), meat (index = 0.18, rank) ranked 1st, 2nd, and 3rd respectively (Table 3). Similarly, study conducted by [7] reported that, Goats are kept for multiple purposes of improving smallholder livelihoods. Goat keeping primary for income generation reported in the current study was consistent with the result reported by [8] who made an investigation on the Benishangul Gumuz region and who made an investigation on

East Arsi Zone, Oromia region. The respondents revealed that goats were used as income generation due to their fast growth rate, ease of sale, and replacement under any circumstance compared to large ruminants and used to cover various expenses.

Table 3. Purpose of keeping goats in the study area.

Purpose of keeping goats	Index	Rank
Milk	0.22	2
Meat	0.18	3
Income source	0.55	1
Ceremony (Jila)	0.05	4
Manure	0.00	5

3.2.2. Housing of Goats

For the aim of managing animals and shielding them from predators, practically all pastoralists in the zone used fencing and houses. Typically, of the pastoralists surveyed, 83.9% keep their flocks in an open yard called a "Dhoqoba" at night alongside sheep or calves (80%) (figure 1) as well as kid goat house (figure 2). The acacia tree's prickly branches and timber were combined to create the dwellings intended for goat flocks. The goat home was merely cleaned once a day (54.4%), compared to three times a week (16.7%) or once a week (28.9%) by others (Table 4).

Figure 1. Adult goat houses (Dhoqqoba).

Figure 2. Kid goat houses in the study area.

Table 4. Fencing and housing practice in the Borena Zone.

Parameters	Variables	Frequency (Percentage)
Types of goat house	In the House with Family	29 (16.1)
	Open Yard (Dhoqoba)	151 (83.9)
	Total	180 (100.0)
Housed with other animals	Yes	144 (80)
	No	36 (20)
	Total	180 (100)
Cleaning practice	Daily	98 (54.4)
	Once/Week	52 (28.9)
	Three Times/Week	30 (16.7)
	Total	180 (100.0)

3.2.3. Feeding

According to respondents surveyed, there are a variety of feed options available in the zone for goats. The most popular food sources include browsing through various bushes, shrubs, tree leaves, and other vegetation (Table 5). According to the respondents, the primary sources of feed for their goats during the wet season were browsing various shrubs (index= 0.243, rank =1), tree leaves (index= 0.232; rank =2), and pasture (index= 0.20; rank =3).

Table 5. Goat feed source during wet season.

Feed source	Index	Rank
Crop residues	0.081	4
Tree branches	0.232	2
Shrub	0.243	1
Mineral	0.065	5
Pods	0.060	7
Concentrate	0.063	6
Pasture	0.20	3

During the dry season, the goats relied on tree branches and acacia pods when there were not enough natural pastures available (Table 6). The finding of [9] also indicated feeds for goats in pastoral area majorly relied on browsing of different bushes, shrubs and tree leaves as major feed sources for their goats in the dry and wet season. However, there was also a practice of feeding goats from pods of acacia trees particularly during shortage of natural pastures. Similar au-

thors were reported that grazing of goats was also reported upon the shortages of the browsing probably during the dry period.

Table 6. Goat feed source during dry season in the study area.

Feed source in dry season	Index	Rank
Crop residues	0.190	3
Tree branches	0.250	1
Shrub	0.002	7
Mineral	0.100	5
Pods	0.221	2
Concentrate	0.134	4
Pasture	0.066	6

3.2.4. Breeding Practice

Most mating was uncontrolled, and respondents said they had any influence over their goats' breeding habits. Pastoralists who were surveyed reported that 85.6% of them had their own bucks in the flock. Conversely, the remaining responders were using their neighbors' or relatives' breeding bucks. According to the respondents, the mean number of lactating goats in the study area was 5.45±2.3, while the households had roughly 3.38±1.86 breeding bucks (Table 7).

Table 7. Mean values of breeding bucks and lactating does in the study area.

Different Parameters	Mean	SD
Number of breeding buck/households	3.38	1.861
Number of Lactating goat/households	5.45	2.349
Lactation length of goats (months)	2.77	1.101
One buck serving (years)	3.58	1.617

A total of 68.9% of pastoralists used selection of their breeding bucks to improve the reproductive success of their animals, whereas only 26.7% used different characteristics found in their goats to choose their breeding female. The most common characteristics utilized to choose a breeding buck were body size, growth rate, body color, and pedigree. Table 8 displayed the respondents' methods for choosing goats of both sexes (Buck and Doe) for breeding purposes. the primary consideration used by respondent in selecting breeding buck were body color (index = 0.23), followed by sexual desire (libido) (index = 0.223), and body conformation (index = 0.184), while breeding does based on body conformation, color, and milk yield history rank 1st, 2nd, and 3rd, respectively.

Table 8. Goat selection practice for the breeding purpose in the study area.

Selection criteria	Female		Male	
	Index	Rank	Index	Rank
Color	0.234	2	0.237	1
Adaptability	0.079	5	0.145	4
Pedigree	0.065	7	0.094	6
Body conformation	0.302	1	0.184	3
Kidding interval	0.090	4	0	Not valued
Milk yield	0.161	3	0	Not valued
Growth rate	0.068	6	0.117	5
Sexual desire	0	Not valued	0.223	2

Index = Σ of [5× number of respondents ranked 1st+ 4× number of respondent ranked 2^{nd}+ 3× number of respondents ranked 3^{rd}+ 2× number of respondent ranked 4^{th}+ 1× number of respondents ranked 5^{th}] given for particular valued for selection criteria divided by Σ of [5× number of respondents ranked 1st+ 4× number of respondent ranked 2nd 3× number of respondents ranked 3^{rd}+ 2× number of respondent ranked 4^{th}+ 1× number of respondents ranked 5^{th}] summed for all value of selection criteria.

3.2.5. Culling and Castration

Table 9 indicates that about 79% of the research area's animals were culled because of fertility problems. They not keep all unwanted animals in the flocks for an extended period of time. The majority of pastoralists (62%) typically cull goats due to Infertility of followed by poor body when they are getting older (44%). In addition the majority of respondents (82%) indicated that selling culling is main culling method. Male goat castration was a typical practice that had to do with breeding management.

Table 9. Culling and castration practice in the study area.

Factors	Categories	Frequency (%)
Culling practice	Yes	142 (78.89)
	No	38 (21.11)
Traits of cullings	Poor body condition	24 (13.33)
	Old age	80 (44.44)
	Adaptability	12 (6.67)
	Unwanted color (black)	24 (13.33)
	Infertility	112 (62.22)
	Disease susceptibility	12 (6.67)
Culling methods	Slaughtering	15 (60)
	Selling	23 (82)
	Both	12 (38)
Age of castration (years)	1-2	18 (10.0)
	2-3	70 (38.9)
	>3	92 (51.1)

3.3. On Farm Milk Yield Performance Evaluation of Goats

The seasons of birth also had significant effects on milk yields. The average milk yields of goats was higher (0.57 ± 0.01L/day) during kidding the wet season than that were kidded during the dry season (0.24 ± 0.01L/day) (Table 10). The high amount of milk yield during the wet season was due to the effect of quantity and quality of feedstuffs provided by natural pasture and browse. This is in good agreement with the findings of [10], who confirmed that productivity of goats increase during the wet season. In addition overall milk yield had also significance (P<0.05) difference among districts. The overall goat milk yields on average were 0.37 ± 0.01 L/day. There was significant association found among the milk yields in with districts. Yabello district had a greater the overall milk yield (0.42±0.02L/day) than the other two districts. This may be related to availability of feed resources even during dry season in Yabello district than the other two districts.

Even though fourth parity shows less than the others, the influence of parity (lactation number) on daily and lactation milk outputs shows an increasing trend from first to third (Table 10). In line with multiple authors, the first parity produced the lowest milk yields, whereas the third parity produced the highest [11]. Age-related changes in the animal's body include hormonal state, metabolic activity, secretary cell function, and nutritional intake, all of which are important for the production of milk [12].

Table 10. Average goats milk yield in the study area.

Variables	Number	Mean	Std. Err
Milk yield (L/day)	266	0.37	0.011
Districts		***	
Dubuluk	78	0.32b	0.02
Elweye	95	0.38b	0.02
Yabello	93	0.42a	0.02
Season		***	
Wet	106	0.57a	0.01
Dry	160	0.24b	0.01
Parity		NS	
1	71	0.35	0.02
2	65	0.39	0.02
3	43	0.41	0.03
4	87	0.36	0.02
>5	-	-	-

4. Conclusion and Recommendations

The small ruminant production among pastoralists largest types of animals raised in the Borena zone on recent information. The main purpose of raising goats in the study area was primarily to generate cash for purchasing food items to fulfill immediate family needs. The principal feed sources of goats were browses of various shrubs, bushes, and tree leaves and acacia species both during wet and dry season. The selection of breeding males was largely done by considering the characters like body size, pedigree, growth rate and coat color. Therefore, as recommendations:

1) Feed shortage was a critical problem in, especially during dry season. Therefore, feed supplementation, especially concentrate feed, should be included to improve milk yield of lactating goats.
2) Fast growth (as source income) and milk yield traits can be identified as the two most important traits of Borana cattle. Therefore, more emphasis on breeding

program needs to be placed on the improvement of the productive and reproductive performance of goats.

Abbreviations

DMY Dry Matter Yield
GLM General Linear Model
SD Standard Deviation
SPSS Statistical Package for Social Study

Author Contributions

Beshir Hussien: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Software, Supervision, Validation, Writing – original draft, Writing – review & editing

Adem Kumbe: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Tibbo, M., 2006. Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopia highlands. PhD dissertation. Department of Animal Breeding and Genetics, Faculty of Veterinary Medicine and Animal Sciences, Swedish University of Agricultural Science (SLU), Uppsala, Sweden. 74p.

[2] Tsedey A., Zelalem Yi., Ajebu N and Haile W. 2015. Utilization and quality of goat milk in Hadiya zone, Southern Ethiopia.

[3] Tsedeke Kocho, 2007. Production and marketing systems of sheep and goats in Alaba, Southern Ethiopia. An MSc Thesis, Hawasa University, Ethiopia.

[4] Dereje T, Mengistu U, Getachew A and Yoseph M, 2015. A review of productive and reproductive characteristics of indigenous goats in Ethiopia.

[5] Coppock, D. L. 1994. The Borana plateau of southern Ethiopia: synthesis of pastoral research development and changes, 1980-90. ILCA (International Livestock Centre for Africa): Addis Ababa, Ethiopia.

[6] ILCA (International Livestock Center for Africa). 1990. ILCA annual report andprogram highlights. Addis Ababa, Ethiopia.

[7] H. D. Wodajo, B. A. Gemeda, W. Kinati, A. A. Mulem, A. van Eerdewijk, B. Wieland, Contribution of small ruminants to food security for Ethiopian smallholder Farmers, Small Rumin. Res. (2020) Pp1–10, https://doi.org/10.1016/j.smallrumres.106064.

[8] S. Oumer, A. Kefyalew, H. Aynalem, Morphological characterization of Arab and Oromo goats in northwestern Ethiopia: implications for community-based breeding programs, East African Journal of Agriculture and Forestry 10 (2021) 49. https://doi.org/10.1186/s40066-021-00322-9

[9] Hagos Abraham, Solomon Gizaw, and Mengistu Urge. 2017. Livestock Research for Rural Development 29 (12) 2017 Guide for preparation of papers LRRD Newsletter Citation of this paper. Livestock research for rural development. Vol. 29(12).

[10] Tesfaye, A. and Tamir, B., 2015. Assessment of goat production and marketing practices, constraints and opportunities in Yabello District of Borana Zone, Southern Ethiopia. *International Journal of Innovative Research and Development*, *4*(11), pp. 2278-0211.

[11] Carnicella et al., 2008, D. Carnicella, M. Dario, M. C. C. Ayres, V. Laudadio, C. DarioShort communication: The effect of diet, parity, year and number of kids on milk yield and milk composition in Maltese goat.

[12] Abdel-Rahman, I., H. Dirar and M. Osman, 2009. Microbiological and biochemicalchanges and sensory evaluation of camel milk fermented by selective bacterial starter cultures. *African Journal of food Science,* 10 (6): 398-405.