DOI: https://doi.org/10.20372/afnr.v4i1.1718
ISSN: 2520-7687 (Print) and 3005-7515 (Online)
Journal of Agriculture, Food and Natural Resources
J. Agric. Food Nat. Resour. Jan-Apr 2026, 4(1):01-08
Journal Home page: https://journals.wgu.edu.et

Original Research

Assessment of genetic improvement strategies, breeding practices, and production objectives of goat production in North Ari District, South Omo Zone, Southern Ethiopia

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Abstract

The study was conducted in the North Ari district south Omo zone, Southern Ethiopia. The study aimed to identify the production objectives of goats, the breeding practices employed, and the traits that farmers preferred. Data were collected from 160 households through semi- structured and structured questionnaires, focal group discussions, and secondary sources. The data were analyzed using SPSS version 29. Income generation was first as productive objectives, followed by milk, meat, wealth saving, culture, and skin respectively. Coat color, body conformation, and body size were the most preferred traits in breeding bucks. In contrast, twining ability, body size, frequent kidding, fast growth rate, milk productions were most preferred traits in breeding does in the study area. Among the farmers 59.4% used uncontrolled mating systems, 24.0% used natural control, and 16.6% used partially control in the district. Neighbors (59.4%) were the primary source of breeding bucks in the research area, followed by respondents' own breeding bucks (37.5%) and communal bucks (1.9%). Goat health challenges identified in the study area were foot rot (30.6%), contagious ecthyma (29.4%), and goat pox (18.8%). Response rate was 100% and non-respose rate was 0%. Farmers used flock and reproductive parameters informally to inform mating and selection decisions. From the current study, it could be concluded that the methods of genetic improvement, breeding practice, and trait preference of farmers in the study area were traditional. Therefore, further investigation should be undertaken to improve the genetic makeup of indigenous goat breeds.

Article Information

Article History:

Received: 22-08- 2025

Revised: 22-03-2026

Accepted: 17-04-2026

Keywords:

Breeding practice

Genetic Improvement

North Ari district

Trait Preference

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INTRODUCTION

Ethiopia possesses a diversity of genetic resources for cattle that are suitable for a variety of agro-ecologies. Among livestock species, goats make significant socioeconomic contributions: they provide food and nutrition security, generate cash from the sale of animals and their products (skins, meat, milk), produce manure for household use, and serve intangible functions as investments, savings, and emergency insurance (Kosgey, 2004). Goats are particularly valuable for subsistence farmers because they are well suited to tough and marginal environments, can utilize low-quality fodder, withstand severe weather, adapt quickly to intensive production systems, and efficiently convert feed into nutritious milk and meat (Ogah, 2010).

Despite these advantages, goats and other small ruminants remain underutilized and poorly understood in tropical areas. Their productivity is extremely low, with an average carcass weight of 8–10 kg per animal, accounting for only 16.8% of total ruminant output—figures that are 50–75% lower than those of neighboring countries with much smaller goat populations (ESGPIP, 2008). The annual meat production per goat is estimated at only 3–3.5 kg, a result of low productivity and inadequate management practices (Degen, 2007).

Ethiopia is home to eight genetically varied goat breeds (Tesfaye, 2004), widely distributed across agro-ecologies ranging from arid lowlands to humid highlands, and raised under pastoral, agro-pastoral, and mixed farming systems (Abegaz and Awgichew, 2008; Tesfaye, 2010). With an estimated national goat population of 32.74 million (CSA, 2017), Ethiopia ranks among Africa's leading countries in goat numbers. Goat production requires relatively low inputs and is suitable for resource-poor farmers due to goats' broad feeding habits, strong adaptive ability, low maintenance cost, short reproductive cycle, and capacity to thrive in harsh environments (Silanikove, 2000). Beyond meat, milk, and skin, goats also contribute to household income diversification, employment creation, nutritional improvement, risk reduction during crop failure (Peacock, 2005), and, in some communities, medicinal value for children.

Nevertheless, goat productivity in Ethiopia remains low due to several constraints, including premature slaughtering, absence of accessible information on breeding practices, lack of good management, and

disease spread (FAO, 2010). Sustainable utilization of indigenous goat genetic resources requires comprehensive, up-to-date knowledge of farmers' breeding practices, management systems, and preferred traits (Kosgey *et al*., 2006).

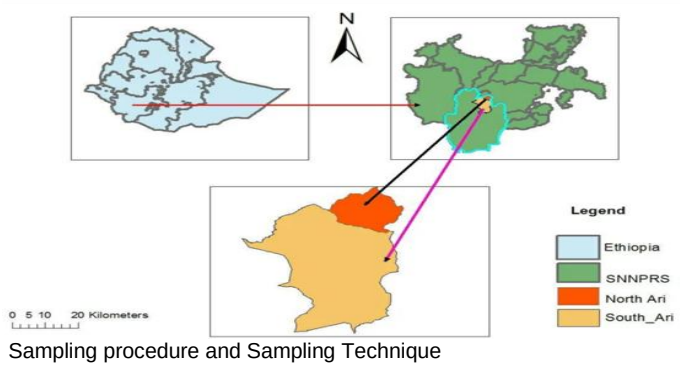
In the South Omo Zone, specifically the North Ari district, no prior research has been conducted to identify existing breeding practices, sustainable genetic improvement strategies, or farmers' trait preferences. This district offers an advantageous location with reasonably easy access to transportation, facilitating field data collection while still reflecting the larger Ari Zone goat-keeping populations. North Ari combines high livestock potential, diverse management systems, and active market participation features that make it an excellent setting for studying goat production methods, farmer preferences, and related issues, in contrast to other goat-producing regions in southern Ethiopia. Data collected at this level can illustrate regional variations in production constraints and practices. Moreover, analysis at the kebele level can help identify differences in flock size, breeding procedures, selection criteria, reproductive performance, and key restrictions such as disease, feed shortage, and water access variations expected due to differences in ecology market access, and resource availability among kebeles. Such kebele-level analysis would strengthen overall findings by highlighting local variation and encouraging more targeted interventions.

The lack of baseline information on these aspects hinders the development of suitable breeding and management strategies to increase goat output in the district. Therefore, this study was carried out in the North Ari district of South Omo Zone, southern Ethiopia, to investigate sustainable methods for genetic improvement, breeding practices, production goals, as well as the potentials and constraints of goat production in the area.

RESEARCH METHODOLOGY

Description of the study area

North Ari district is located in the SNNP region's South Omo Zone. Gelila Town, the district's administrative center, is situated 602 kilometers southwest of the nation's capital. Basketo Special district and Geze Gofa district in the north, Oyda and Ubba-Debretsehay district in the east, and Debub Ari district in the southwest form the district's boundaries. North Ari district is 60,040 hectares in total land area. The four agro-climatic zones that make up the district are dega (50.28%), woina dega (8.32%), kolla (37.14%), and wurch (4.26%). The district experiences average yearly temperatures between 11°C and 22°C and rainfall between 400 mm and 2600 mm. Above sea level, the elevation ranges from 900 to 3,200 meters. According to data from the North Ari Woreda Agricultural Office, the Woreda's total population is estimated to be 84,607 (41,457 males and 43,150 females) (CSA, 2007).



Sampling procedure and Sampling Technique

A multistage sampling technique was employed. First, four kebeles (Sefara, Hamaresha, Arfaro, and Malorasha) were randomly selected from North Ari District. The kebeles differ in agroecology, livestock density, and management, affecting goat production; kebele-level data reveal variations in practices and constraints, and farmers are generally willing to prioritize productivity over coat color when selecting bucks. In the second stage, Peasant Associations (PAs) within each selected kebele were identified to facilitate household listing; however, PAs were not considered as sampling units in the final sample size determination. Finally, simple random sampling was used to select goat-keeping families determined by the size of each kebele's population. 160 households in all took part of the study. The sample size was determined using the formula suggested by Arsham (2005).

$N=\frac{0.25}{SE}$; $N=\frac{0.25}{(0.03953)2} \approx 160$.

160 of the 160 households addressed completed the interview, for a response rate of:

The response rate should have been reported as:

$$\text{Response Rate (\%)} = \frac{\textbf{Number of completed interviews}}{160} \text{x100}$$

$$\text{Response Rate} = \frac{160}{160}\text{x100=100\%}$$

The zero non-participating families were absent over several visits. Four PAs from the kebeles with the largest goat population were purposefully chosen based on goat population size and transport accessibility because their basic characteristics were similar to those of the participants, so nonresponse bias was deemed minimal and its reliability could have been evaluated after the questionnaire was pretested. Simple random selection was used to identify 40 goat-owning households from each chosen PA ,as result there were 160 households in the sample.

Data Collection

Ethical consideration was requested from the relevant local governing bodies and community leaders prior to data collection. The objective of this research was explained to the respondents, and their participation was completely voluntary. Questionnaire interviews, participatory evaluations, and observation were used to gather both qualitative and quantitative data. The majority of the questionnaire was closed-ended and concentrated on household demographics, composition, factors of animal health, and breeding techniques. The goal of the study and the area in the district where goats predominate were discussed with the district experts of the livestock and fishery resource office and the farmers' representatives prior to selecting the survey areas. This was followed by the identification of possible peasant associations and villages. The purpose of the questionnaire was to gather broad data on the main structural characteristics that farmers use to evaluate their goats' potential for producing meat, skin, and milk. Semi-structured questionnaires were used to evaluate breeding practices, trait preference, and the rank of conformation features in selection criteria. Additionally, any new information gaps were filled through group discussions. PAs extension workers participated in four open group discussions that took place at specific locations . Each group, which has ten to twelve members, is made up of men and female farmers who are purposefully chosen according on how well-versed they are in their PAs goat resources. The questionnaires would include questions about the respondents' socioeconomic backgrounds, the reasons they kept goats, the purposes of the animals, the size and composition of flocks, breeding methods, and the selection criteria for swapping out breeding females and males. The production goals and selection criteria for breeding males and females were first listed by respondents, who were then asked to rank them from most important to least significant. We used both primary and secondary data. A semi-

structured questionnaire and observations were used to gather primary data from sampled respondents. The livestock and fishery resource office in the study district provided secondary data. Additionally, a community engagement was planned to raise awareness of the monitoring activity.

Questionnaire Administration and Group Discussion

Before being delivered, a semi-structured questionnaire was developed, pre-tested, and rearranged, restructured, and corrected in accordance with respondent perception and the study's goal. A group of enumerators who had been assigned, trained, and closely supervised by the researchers delivered the questionnaire in order to specifically choose household heads. Details about the farmers' socioeconomic status, trait preferences, selection criteria, disease prevalence and resistance, regular breeding procedures, breeding goals, genetic improvement strategies and browsing characteristics.

Data Management and Analysis

The study's questionnaire data was coded, checked for errors, and then input into the computer for additional analysis. Interviews using a semi-structured questionnaire were used to gather information about the home characteristics of the sampled goat flock owners, the types and breeds of goats kept, the flock structure, and each goat age category. Standard ethical research guidelines were followed in conducting the study. Prior to data collection, permission was obtained from community leaders and authorized local administrative authorities.

The data was coded once accuracy and consistency were confirmed. All numeric data were entered into the Microsoft Office Excel spreadsheet, 2019, while all coded qualitative data were entered and analyzed using SPSS, version 29. Outlier screening took place before the main analysis of data. Using the approach indicated by Musa et al. (2006), indicators were computed to examine the ranking of the reasons for maintaining goats, the criteria for choosing breeding male goats (buck), and the selection criteria for does:

$$\text{Index} = \frac{5R1 + 4R2 + 3R3 + 2R4 + 1R5}{\sum(5R1 + 4R2 + 3R3 + 2R4 + 1R5)}$$

where:
R1R_1R1 = number of respondents ranking the trait 1st
R2R_2R2 = number ranking it 2nd
R3R_3R3 = number ranking it 3rd
R4R_4R4 = number ranking it 4th
R5R_5R5 = number ranking it 5th

RESULT AND DISCUSSION

Livestock possession and Classification of goats according to their age

The amount livestock animals per home varied significantly ($p < 0.05$) throughout the district. This variation may result from variations in the availability of land, the purpose of maintaining livestock, the suitability of the environment for livestock production, and the importance of animals in household livelihoods. In this investigation, there were 7.7 ± 0.5 goats on average (Table 1). This figure is less than the average of 42.21 ± 18.42 goats that Hagos *et al*. (2017) found in Western Tigray, Northern Ethiopia. The average number of breeding does was 1.52 ± 0.12, compared to 1.83 ± 0.13 for nanny children. The district's goat herd was primarily made up of nanny kids and adult female goats. The primary reason for the larger percentage of breeding does in the herd is their involvement in regular kidding, twinning, earning money, and producing replacement stock (young bucks and does) as needed by the farmers. According to Mwachero and Rege (2002), a high percentage of breeding does were a significant source of income.

In North Ari District, breeding does accounted for the largest proportion (1.89 ± 0.12), followed by nanny kids less than 6 months old (1.53 ± 0.13), breeding bucks (>1 year) (0.82 ± 0.07), goatlings (0.81 ± 0.10), doe kids (0.79 ± 0.09), buck kids (0.69 ± 0.08), bucks (0.48 ± 0.07), and castrates (0.12 ± 0.03) (Table 1). But in general, there weren't many breeding bucks in the flock. In actuality, a flock's ability to reproduce and produce offspring is determined by the ratio of breeding bucks to does. The flock structure demonstrates how goat productivity in the study area is impacted by mating control techniques limited buck numbers, buck sharing, and controlled breeding access) and informal selection factors were fertility, twinning ability, survival, and growth rate. These practices are typical of low-input agro-pastoral systems where genetic improvement is achieved through farmer selection rather than structured breeding. According to Tesfaye, 2009), the proportion of breeding does (15.3–20.7%) found in this study was less than the 30% recorded for Bench-Maji and Keffa does (Dejen, 2010), as well as less than the 46.8% and 49.2% reported for Menz breeding does and Afar does, respectively.

Table 1. Livestock possession and Classification of goats according to their age

Livestock possession	Mean±se
cattle	3.07±0.2[a]
Sheep	1.4±0.05[b]
Donkey	0.4±0.05[c]
Horse	0.1±0.03[c]
Chicken	4.6±0.4[d]
Goats	7.7±0.5[e]
Average goat flock size and structure per household	
nanny kid	1.5313±.13395
Goatilings	0.81± 0.10
casterated male	0.12±0.034
Buck	0.48±0.07
breeding doe >1year	1.89±0.12
breeding buck >1 year	0.82±0.07
buck kids0.5-1year	0.69±0.079
doe kids 0.5-1 year	0.79±.087

Se=standard errors

Purpose of keeping goats in the Study Area

The primary objective of goat ownership in the study area, according to the current study, was to generate cash (Index = 0.322, Rank 1), which is followed by milk production (0.31, Rank 2) and meat production (0.206, Rank 3). Skin production (0.06), maintaining wealth (0.168), and cultural values (0.132) were less significant goals (Table 2). This indicates that goat production is primarily focused on the market, with other sociocultural and subsistence uses. It also is consistent with According to regional Ethiopian research (Tesfaye *et al*., 2014), goats are favored in Borana pastoral areas due to their rapid rate of reproduction and capacity to generate fast income. Peacock (2005) noted that goats are regarded as an important asset for income diversification worldwide, particularly among households with limited resources in South Asia and sub-Saharan Africa.

Table 2. Aim of goat production in the study area

No.	Purpose	Ranking (1st	2nd	3rd	4th	5th	6th)	Index
1	Income generation	80.63	13.13	0	0	0	0	0.322
2	Milk production	28.75	71.25	0	0	0	0	0.31
3	Meat production	0	0	62.5	31.25	6.25	0	0.206
4	Wealth saving	0	0	25	37.5	37.5	0	0.168
5	Cultural values	0	0	0	25	75	0	0.132
6	Skin production	0	0	0	6.25	6.25	81.25	0.06

Mating Systems and Identification Practices

Mating systems

Hand mating: This technique allows for controlled reproduction by choosing the buck for the doe and mating them. One benefit of this approach is that it makes it possible to record the precise breeding date. However, it takes a lot of work because the manager must correctly identify the doe. In heat and aid in mating. This study was comparable to that of Rebecca and Steve (2019), who noted that some people refer to "hand breeding" when they hold the doe in their hands so the buck can mount her. *Pen mating:* Pen mating reduces labor needs by enabling the male to identify females in heat within a small group, but it also makes precise breeding dates less predictable. In order to enhance mating, a buck or buck is placed in an enclosure with does or does. Compared to hand breeding, it requires a lot less work. One drawback of pen breeding is that the day of breeding record is less certain. The most common system is flock mating, which offers free mate choice but leads to uncontrolled mating. As studied by Tonamo (2015) reported a similar case in the Essera district, where natural mating was the most common and familiar, and a higher percentage of mating was uncontrolled. Another study supports Ahmed's (2013) findings that the majority of farmers in the Oromia region's Horro Guduru Wollega zone used an uncontrolled mating technique. The reason for uncontrolled mating, as reported by respondents, was either mixed grazing of the goat flock or lack of awareness of the demerits of uncontrolled mating

Goat Identification Practices

Identifications of the goats by households in the study area was indicated in Table 3. Respondent identified them mostly by coat color (76.9%) followed by naming (9.4%) and ear piercing (9.4%) and a combination method (4.4%). Farmers did not prefer black coat color and tended to prioritize productivity traits, such as faster growth or higher milk yield During the focus group discussion, the respondents confirmed that identification is largely based on coat patterns, unique behaviors, physical markings, and traditional ear notching. This result was similar to that of (Netsanet, 2016), who stated that physical appearance and conventional marking such as naming, coat color, edge cutting, or ear piercing are typical techniques of identification. However, naming a person using this method typically reflects unique maternal heritage traits rather than personal traits.

Table 3. Mating System, Breeding Practices, and Identification methods

Descriptor	Percentage of respondents
Mating system in goats	
Pen Mating	36.90
Hand Mating	25.00
Flock Mating	38.10
Total	100
Breeding practices	
Controlled	24.00
Uncontrolled	59.40
Partially controlled	16.60
Total	100
Reason for uncontrolled mating	
Common grazing area	18.10
Lack of awareness	38.80
Lack of breeding buck	6.20
Combination of all reason	36.90
Total	100.00
Goat identification system	
Naming	9.40
coat color	76.90
cutting/piercing	9.40
Combination of all	4.40%
Total	100.00%

Breeding Buck Sources and its Management Practices

Of the goat keepers in the study district who were interviewed, 95% were permitted to let their bucks mate with their neighbors, whereas 5% were not. The primary source of breeding buck in the research area was neighbors (59.4%), followed by own buck (37.5%), communal (1.9%), and unidentified sources (1.3%) (Table 4). Breed variances, the availability of browsing trees and shrubs, favorable environmental circumstances for goat farming, and the presence of breeding males in the flock for females could all contribute to the variation. Inbreeding in the district may also be poorly documented (Alemayehu, 2004; Tesfaye, 2004; Peacock, 2005). This finding was similar with (Abdella, 2021) who reported that the respondents used neighbor' buck, purchased from neighbor and communal for mating in East Este district in South Gondar Zone, northwestern Ethiopia. This finding is contrary to the report of Mohammed (2020), who indicated that among households owning their own breeding buck, the major source was bucks born within the flock (70.6%), followed by those purchased from the market (29.4%). The study further revealed a significant association between districts, particularly between Ancher and Gemechis districts in Eastern Ethiopia.

Table 4. Breeding Buck Source and Its Management

Source of variables	**Frequency**	**Percent**
Do you allow your buck to serve other than yours?		
Yes	146	95
No	14	5
Total	160	100
Source of breeding bucks	Frequency	Percent
Own male/buck/	60	37.5
Neighbor	95	59.4
Communal	3	1.9
Unknown	2	1.3
Total	160	100

Selection Types and Ways used for Genetic Improvement

According to respondents the main selection types of goats in the study area were Pedigree (37.5%) individual performance (31.9%) Relative selection (23.1%) and progeny (7.5%) (Table 5). Respondents responded that the selection types of goats during breeding, as well as buying from the market was made as per the performances of ancestors which gives full information on pedigrees, individual performances, collateral relatives and their off springs. The pedigree Information was obtained by asking them to identify animals whose parents or relatives had desirable traits. Instead, pedigree selection was assessed entirely through farmers' recall and indigenous knowledge. Respondents identified superior breeding animals based on their knowledge of parental performance, observable family traits, and community experience over generations. No written pedigree records or formal documentation were presented by households; therefore, the information relied on memory-based reporting and local breeding knowledge systems. Long-term increase in desired qualities results from breeders' consistent selection of superior animals across generations, which is known as genetic gain. According to Bourdon (2000), a variety of information sources, such as individual performance, pedigree, relations, and progeny data, can be used to improve selection accuracy. Similarly, Solomon and Kassahun (2011) who reported that the significance of integrating data from many sources when choosing animals. Goats are actually chosen according to their own performance, their ancestry, and the performance of family members like full and half-sibs. Usually, selection is carried out within groups of animals bred in the same conditions and of comparable ages. In general, heritability, selection intensity, and generation interval all influence genetic advancement.

Table 5. Goats genetic improvement ways and types.

Genetic improvement ways	**Percent**
Selection	100
Crossbreeding	0
Selection types	
By progeny testing	7.5
Pedigree	37.5
Collateral relative selection	23.1
individual performance	31.9
Total	100.0

Selection Criteria of Breeding Bucks

Table 6 presents the selection criteria for breeding bucks. The results indicate that a crucial and vital part of goat production is choosing exceptional breeding bucks. Buck selection continues to be the dominant force behind genetic improvement within the herd, even if careful doe selection also helps to increase flock output. The findings also demonstrate that while coat color is still a significant initial selection criterion, producers take other factors into account. This change is indicative of a movement toward more evidence-based selection techniques meant to enhance flock performance as an entire. As reported by several authors, key selection criteria for breeding bucks include coat color or pattern, body conformation, growth rate, and libido (Zergaw *et al*., 2016). Similarly, Amsale and Tariku (2022) found that physical appearance traits such as bright eyes, broad shoulders, compact body, and short, thick necks are the primary factors used in buck selection. Coat color is also widely recognized as an important selection criterion, largely due to its socio-cultural significance among livestock keepers (Woldeyohannes, 2020).

Table 6. Criteria to Select Breeding Males (Buck)

S.no.	**Variables**	**North Ari District**						
		1st	2nd	3rd	4th	5th	6th(rank)	Index
1	Color /appearance	81.7	15	3.3	0	0	0	0.27
2	Body Conformation	13.3	81.7	5	0	0	0	0.24
3	Testicular character	3.3	5	91.7	0	0	0	0.19
4	Growth rate	0	0	0	86.7	6.7	6.6	0.13
5	Parental history	0	0	0	6.7	45	48.3	0.07
6	Horn shape	0	0	0	5	50	45	0.08

Rank=1st,2nd,3rd,4th,5th,6th,7th,8th

Selection Criteria of Does

Table 7 shows the respondents' preferred traits in the North Ari District. The top five desirable features were twinning ability, body size, frequent kidding, rapid growth rate, and milk output. This is consistent with Netsanet's (2016) findings showing in the Konso and Meta-Robi districts, twinning ability, body size, and frequent kidding were important factors in doe selection. According to FGD data, selection is also influenced by coat color, with white, pink, red, and gray being preferred and black being less chosen because of its lower market value. However, according to Robertshaw (2006), black goats are thought to be more resilient to cold weather because of their superior heat abs

Table 7. Selection Criteria of Does

No.	**Criteria/traits**	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th (rank)**	**Index**
1	Twining Ability	68.7	31.2	0	0	0	0	0	0	0.205
2	Body Size	37.5	62.5	0	0	0	0	0	0	0.196
3	Frequent kidding	0	0	75	18.7	3.125	3.12	0	0	0.150
4	Fast Growth rate	0	0	0	68.7	31.25	0	0	0	0.125
5	Browsing Ability	0	0	0	0	6.25	6.2	62.5	12.5	0.075
6	Age at 1st kidding	0	0	0	0	6.25	81.2	12.5	0	0.078
7	Mothering ability	0	0	0	0	68.75	12.5	12.5	6.25	0.09
8	milk production	0	0	0	0	6.25	84.4	9.4	0	0.079

Rank=1st,2nd,3rd,4th,5th,6th,7th,8th

Reasons for Culling Goats

Culling was primarily used by farmers to increase profitability and output. According to Table 8, the main causes of culling were illness (30.6%), physical defects (17.5%), reproductive issues (13.8%), low productivity (13.1%), old age (12.5%), and undesirable physical appearance (12.5%). These results are consistent with Ahmed et al. (2015), who reported similar goat culling practices across Ethiopia. They found that goat owners in western Ethiopia mainly remove animals from their flocks due to reproductive problems, disease, old age, undesirable physical traits, and physical defects. Similarly, Dereje *et al*. (2013) reported that poor productivity, disease incidence, persistent poor body condition, and the combined effect of these factors were the major reasons for destocking goat flocks in West Hararghe, Eastern Ethiopia. In addition, Demissie *et al*. (2014) found that health-related problems were the primary reason for culling goats in East Gojjam Zone of Ethiopia.

Table 8. Reason of the goats culling

Parameters	Percent
Old age	12.5%
Sickness	30.6%
Reproductive problem	13.8%
Physical defect	17.5%
Unwanted physical appearance	12.5%
productive problems	13.1%
Total	100.0%

Opportunities for Goat Production

The result (Table 9) show that the main goats production opportunities were, potential for goat production (48.1 %), availability of feeds for browsing (29.4%, veterinary services (10.7%), Market access (10.6%), are similar study was revealed by Tesfaye (2009) the opportunities for goat production in Metema District of the Amhara Region were reported by previous studies to include the availability of sufficient grazing land , which is not fully utilized for crop production. In addition, increasing global demand for mutton and goat meat, driven by rising incomes and population growth, is creating expanding market opportunities for both domestic and export oriented goat production systems.

Table 9. Opportunities of Goat Production

Variables	Percentage
Availability of feeds for browsing	29.4%
Availability of improved breeds	1.2%
Market access	10.6%
Veterinary service	10.7%
The area has high potential for goat production	48.1%
Total	100%

Goats Production Constraints

Goat production is highly influenced by feed and watering shortages especially in dry season, disease and parasites, market fluctuation, high predatory, genetically less productive breed, severe water shortage and high shortage of labor. As indicated in Table 10, with regard to goats major production constraints indicated that feed shortage, watering problem, diseases problem, marketing problem and others problems, land, capital, extensions services in the district. Additionally, the respondents reported that the prevalence of marshy and swampy areas, incidence of internal parasite infestation, tsetse fly infestation areas affected goats production was one of the goats challenges in their environments. In the district feed shortage was reported due to grazing land shortage, overstocking, high population growth, cultivation and territory conflicts, and seasonal scarcity of water. Veterinary and extension services were not strongly and evenly distributed. In a similar study, Belay (2012) in the Dandi district stated that illnesses and a lack of fodder were the main obstacles to goat productivity. According to another study by Ulfina (2005), the main factors restricting goats' productivity include a lack of feed, illnesses and parasites, labor scarcity, and a lack of credit and capital. Grum (2010) also highlighted these significant limitations, with water scarcity being the primary obstacle to goat production in the regions of Jeldesa and Mudianeno. According to earlier research (Hagos *et al*., 2017), water scarcity, a lack of feed and grazing land, and insufficient veterinary care were the main issues facing small ruminant farming. These findings are consistent with the current findings.

Table 10. Goat production constraints

Parameters	Percentages
Feed and browsing area shortages	16.20%
Water shortage	14.40%
Inadequate veterinary services	28.10%
Labor shortage	0.60%
Market problem	15.00%
Theft	18.10%
Predators	6.90%
Diseases	0.60%
Total	100.00%

Common Goats Diseases

Farmers identified foot rot (30.6%), contagious ecthyma (29.4%), goat pox (18.8%), **peste des petits ruminants (PPR)** (12.5%), anthrax (5%), and other local diseases (3.8%) as common health challenges (Table 11). Focus group discussions indicated additional conditions such as diarrhea, mange, ticks, tapeworms, and enzootic ataxia. Farmers relied on both modern and traditional treatments (Mwacharo *et al*. (2005).

During the group discussion, the respondents mentioned that diarrhea occurs commonly after the end of the dry season, and that animals can die from the problem if not treated. External parasites (Mange, ticks) and internal parasite (tape worm) and enzootic ataxia, a disease with a nervous syndrome where animals experience sudden onset, head turning, and death, and as well as internal parasites, were also main health concerns.

During focus group discussions, farmers also mentioned several locally named conditions, including a neurological disorder occurring mostly during the dry season (*Rabies that caused by biting by dog*), an eye infection ('*eye clouding,* and other conditions such as *Mouth ulcers***,** *Pneumonia,* leg swelling, and fluid accumulation in the throat. These conditions were reported to cause significant production losses and may be associated with seasonal changes and poor nutrition

Key informants and community leaders stated during focus group discussions that while some farmers employed traditional therapies, the majority of farmers used modern medications from government clinics. Because they lower productivity and raise morbidity and mortality, diseases are a significant barrier to the development of the livestock sector in the tropics (Mwacharo et al., 2005). PR (pest des petits ruminants), foot rot, orf/contagious ecthyma/sore mouth, pasteurellosis, smallpox, and anthrax were the most prevalent illnesses that hindered goat productivity in the research area (Mwacharo et al., 2005). The district's Bureau of Agriculture and Rural Development offered vaccinations at seven clinics Additionally, farmers treated their animals themselves with contemporary medications obtained from open marketplaces or government clinics. Additionally, according to several farmers, veterinarians were brought in to treat their sick livestock (Hagos et al., 2017). Sissay *et al*. (2006) state that increased morbidity, mortality, abortions, stillbirths, and subclinical impacts like weight loss or decreased gains can all be signs of the impact of illnesses and parasites. The financial consequences of

managing or overcoming the impacts of disease and mortality, which significantly impair goat productivity, are another way to observe the detrimental effects of diseases and parasites.

Table 11. Common Goat Diseases in the Area

Parameters	Percent
PPR (peste des petits ruminants)	12.5%
Foot rot –lameness (mud/wet season)	30.6%
Contagious Ecthyma/Sore mouth	29.4%
goats pox	18.8%
Anthrax	5.0%
Epilepsy	3.8%
Total	100.0%

CONCLUSION

In conclusion, goat production in the district is mainly aimed at income generation, with milk, meat, wealth saving, and cultural value as additional objectives. Farmers preferred breeding animals based on coat color, body size, body conformation, twinning ability, frequent kidding, fast growth, and milk production. Culling was mainly due to sickness, reproductive problems, low productivity, old age, and undesirable appearance. However, breeding practices were largely traditional, characterized by uncontrolled mating and limited record keeping. Although the study was limited by its cross-sectional design and reliance on farmers' recall, it provides useful baseline information. The following recommendations are put forward as a result of the aforementioned results and conclusions: For the advancement of genetic conservation and the sustainable use of native goat breeds in the research area, farmers' selection criteria, breeding procedures, mating systems, and trait preference rankings should receive significant attention. To increase the genetic composition of native goat breeds, more study needs to be done. To increase the production and genetic potential of native goats in the district, a community-based, participatory breeding program with controlled mating and straightforward performance recording is advised.

ACKNOWLEDGEMENTS

First and foremost, we are grateful to the Almighty God for His power, grace, and direction during the accomplishment of this task. We also want to express our gratitude to Jinka University for providing funds for this study. We also thank the North Ari District Agricultural Office, the South Omo Zone Agricultural and Rural Development Office, and animal science specialists for their invaluable assistance. Lastly, despite the drawn-out interview process, we sincerely thank the farmers who took part in this study for their cooperation, patience, and willingness to offer crucial information.

Conflict of Interest Statement

The authors declare no conflicts of interest

Funding

This study did not receive a particular grant from any governmental and private rather Jinka university.

Data availability

The corresponding author may supply the data used to support the findings of the research upon request.

Ethical clearance

The research questionnaire and focused group discussion checklists, utilized for data collection were examined and authorized by the Jinka University College of Agriculture and Natural Resources Research and Ethical Review Committee.

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