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Characterization of Production Systems and Breeding Objectives of Indigenous Goat Populations in Anfillo and Sibu Sire Districts of Western Oromia

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Abstract

A study was conducted to characterize sheep production systems and breeding objectives of native goat populations in the Qellem and East Wallaga zones of western Oromia. A semi-structured questionnaire and focus groups were used to collect data from 135 goat-producing households. The average number of goats within a flock was 8.86±2.56. Goats were primarily raised to generate income and for meat production. The average age of males and females at first service was 7.10±0.83 and 7.88±0.54 months, respectively. For the first kidding and kidding interval, the total mean ages were 13.15±0.71 and 7.55±0.72 months, respectively. The most popular feed source was natural pasture. Rainwater and rivers were important sources of water during the rainy and dry seasons, respectively. The majority of goat producers of 72.6% herd their flock separately, mingling with others in shared grazing areas. Challenges to sheep production included diseases, seasonal feed shortages, and predators. Body conformation, growth rate, coat color for breeding bucks, twinning ability, growth rate, and age at first kidding for breeding females were the preferred breeding objectives. In conclusion, any genetic improvement shall take into account the identified breeding objectives with due attention to the significant bottlenecks identified.

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INTRODUCTION

According to the 2021 livestock census, Ethiopia is home to over 52.5 million goats, with the Oromia region accounting for roughly 16% of the country's indigenous goat population (CSA, 2021). Goats are a major contributor to Ethiopia's economy and the livelihoods of farmers generally (Shegaw & Elias, 2022). They are raised to generate cash for emergencies, school fees, purchase of agricultural inputs like improved seeds and fertilizer, and other household needs (Hagos, 2017). Goats are raised in big flocks in the semi-arid and dry lowlands of Ethiopia to produce milk and meat as well as for monetary benefits. They are raised as livestock and a source of income in the highlands in crop-livestock production systems with relatively small flock numbers (Zewdie & Welday, 2015).

A thorough understanding of breeding objectives and the underlying production settings is necessary for the successful implementation of a genetic improvement program. That means, in order to create an

efficient genetic improvement program that engages the livestock-producing community; one must first determine the relative importance of breeding objective traits in conjunction with the existing production conditions (Woldu et al., 2016). Numerous researches have been conducted in Ethiopia with the aim of identifying the aims and objective attributes of goat breeding (Amare et al., 2021; Sheriff et al., 2024). Indigenous goats play multiple roles and provide owners with tangible and intangible benefits. However, goat producers in different production systems may have different breeding goals. It is obvious that the existing production system is the primary factor guiding the production and breeding objectives. In the Horro Guduru Wallaga zone, for example, some of the major breeding objectives for goats were litter size, growth rate, age at first kidding for does. In the same zone, growth rate, appearance, and coat color type are the major attributes for breeding bucks selection (Seid et al., 2015). On the other hand, in the pastoral and agro-pastoral areas of the Afar region, the breeding objectives of goats reported were fast growth, milk yield, twining capacity, disease resistance, and long-distance trekking (Amare et al., 2021). Nevertheless, when one closely examines the Afar region's dry-arid conditions—where seasonal feed scarcity is severe—one finds that the production system is unable to sustain multiple births. Thus, breeding goals for livestock keepers in general and goat keepers in particular need to be identified with great attention. The objective of the current study was to identify the production systems and breeding objectives of indigenous goats in the Anfillo and Sibu Sire districts of western Ethiopia.

MATERIALS AND METHODS

The current study was carried out in the Anfillo and Sibu districts of Qellam and East Wallaga Zones of western Oromia, Ethiopia (Figure 1). Anfillo district is situated about 694 km from Addis Ababa in the west direction. Geographically it is located between 8°30′ to 8°48′ N latitude and 34°40′ to 34°59’E longitude. The minimum and maximum annual temperatures of the district are 15ºC and 29ºC, respectively. The mean annual rainfall of the Anfillo district ranges from 1453 to 2074 mm. Anfillo district has three agroecologies: highland (32.64%), midland (25.75%) and lowland (41.61%). Mixed crop-livestock production is the major production system of the district. Coffee makes up roughly 55.2% of all crops planted in the district, making it the most important crop grown there. The elevation of the Anfillo district ranges from 500 to 3470 meters above sea level (m.a.s.l.). The district has 371,373 total livestock heads, of which approximately 84,084 are cattle, 61,709 sheep, 42,100 goats, 6,360 horses, and 177,120 poultry (ALFDO, 2022 unpublished data). Roughly 11.34% of the district's overall livestock population consists of goats.

Sibu Sire district is roughly 278 kilometers far from Addis Ababa to the west and is one of the 17 districts of the East Wallaga zone. Geographically, it lies between 8°16' and 10°16 N latitudes and 36°47' and 37°0 E longitudes. The district's annual minimum and maximum temperatures are 20˚C and 26˚C, respectively. Three agroecological zones define it: lowland (15%), midland (83%), and highland (2%). A mixed-crop/livestock system is the main mode of production in the Sibu Sire district. Maize is the main crop farmed in the district. The location falls between 800 and 2750 meters above sea level (m.a.s.l.).

Roughly 114,865 people are living in the district (58720 men and 56145 women). The Sibu Sire District Office of Agricultural Development (SSLFDO, 2022, unpublished data) estimates that there are roughly 626,190 animals in the district overall. Of these, the estimated numbers for cattle, sheep, goats, equines, and chickens are 324,674, 45,895, 33,498, 32,348, and 189,775, respectively. Roughly 5.35 % of the district's overall livestock population consists of goats.

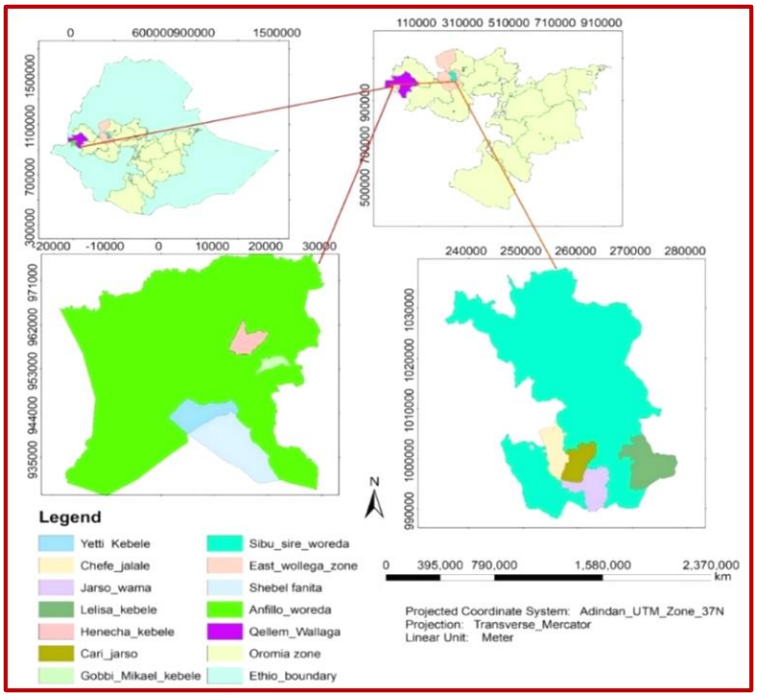

Figure 1. *Map of the study areas*

Data collection

Individual interviews, focus groups, secondary data sources, and field observations were used to gather the data. Eight peasant associations (PAs) were deliberately chosen from both districts (four PAs from each district) based on their potential for goat production. A total of 135 households were used for the work, to select households with at least three adult goats for the questionnaire survey. Information from goat owners was gathered using a semi-structured questionnaire. Additionally, a focus group discussion (FGD) was used to confirm the data gathered from the questionnaire survey. Participants in the focus group discussion (FGD) were believed to be enlightened about the history of goat farming as well as the current and historical social and economic conditions in the region. Elders, development workers, and technicians in animal health made up the FGD.

Data analysis

Descriptive statistics was employed to analyze the questionnaire data using the Statistical Package for Social Sciences (SPSS version 20, 2011).Index also constructed to compute ranking. The index was calculated as follows,

$$Index = \sum \frac{[(3 \times NHR1^{st}) + (2 \times NHR2^{nd}) + (3 \times NHR3^{rd})] of\ particular\ valued\ variable}{[(3 \times NHR1^{st}) + (2 \times NHR2^{nd}) + (3 \times NHR3^{rd})] of\ all\ qualitative\ variables\ condidered}$$

Here, NHR is denoted as the Number of Households Ranked

RESULTS AND DISCUSSION

Goat flock size and structure

Table 1 shows goats' flock size and structure by age and sex composition for both districts. The mean number of goats per family in the Anfillo and Sibu sire districts was 9.13±2.47 and 8.58±2.65, respectively. Breeding does makeup roughly 39.43% of the flocks in the study districts, with young breeding females (15.05%) coming in second in both districts. This result is consistent with that of Sheriff et al. (2019), who found that breeding does older than a year made up approximately 36.7% of the total flocks, with kids under six months (male and female) making up roughly 23.7%. The presence of young females in large numbers is important to have enough replacement stock.

Table 1

Goat flock structures (mean ± SD) and proportions of goats in Anfillo and Sibu Sire districts

Flock structure	District					
	Anfillo (N=66)		Sibu Sire (N=69)		Overall (N=135)	
	Mean ± SD	%	Mean ± SD	%	Mean ± SD	%
Mean flock size	9.13(2.47)	52.70	8.58±2.65	47.30	8.86±2.56	100.00
Female kids <6-month	1.30±0.81	14.28	1.23±1.10	14.31	1.26±0.95	14.23
Male kids <6-month	1.07±0.91	11.70	1.14±1.03	13.25	1.10±0.96	12.50
Male 6 months to 1 year	0.71±1.11	7.80	0 .89±0.87	10.42	0.8±0.90	9.11
Female 6 months to 1 year	1.43±1.05	15.70	1.23±1.22	14.31	1.33±1.13	15.05
Female/doe >1 year	3.93±1.72	43.01	3.08±1.14	35.86	3.51±1.42	39.43
Male/buck >1 year	0.54±0.79	5.80	0. 68±.88	7.95	0.61±0.83	6.87
Castrates	0.22±0.51	2.40	0 .33±.61	3.90	0.27±0.56	3.15

N=number of goats; SD=standard deviation

Male goat proportions were lower in all age groups in the current research locations than female goat proportions. This could be because male goats were either slaughtered at home during celebrations and other festivities, or they were sold early. Commonly farmers mainly choose male goats for marketing when they need money, and they also slaughter them for various festivals. The respondents stated that castration was not a frequent procedure in the areas under investigation. This is mostly because intact young male goats have a high market demand, thus they are marketed early. However, Seid et al. (2015) observed that owners castrate their goats at a younger age in order to fatten and control them, suggesting that managing intact male goats is more difficult than castrates. In addition to management, matured intact goats have an

offensive odor and do not have market demand.

Purpose of keeping goats

Table 2 lists the main goals of goat rearing in the research sites. With an index score of 0.45, the main goal of goat husbandry in both regions was to generate cash. According to the respondents, money earned from the sale of goats is utilized for emergency situations, clothing purchases, school fees, and other household needs. They are also used to purchase agricultural inputs like improved seeds and fertilizer. This result is consistent with studies conducted on native goats in the Horro Guduru Wollega Zone and the Bati and Borana areas, respectively, by Gatew et al. (2017) and Seid et al. (2015). In both districts, the second-ranked breeding purpose for goat production was meat production, with an index value of 0.33. Similarly, the primary motivation for keeping goats, according to Seid et al. (2015), was to generate cash, which was followed by the need for meat for domestic consumption. With an index value of 0.18, manure output ranked third among the breeding objectives for goat production in the present study areas. The respondents stated that in order to increase soil fertility, goat dung is either used alone or in combination with other livestock manures.

Table 2

Purpose of keeping goats in the study areas

Purpose	Anfillo district				Sibu Sire district				Overall index
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	
Cash income	50	10	6	0.44	59	6	4	0.47	0.45
Meat	16	38	12	0.34	10	44	15	0.32	0.33
Manure	0	18	40	0.19	0	16	46	0.18	0.18
Ceremony	0	0	8	0.02	0	3	4	0.02	0.02

Reproductive performances of goats

Table 3 summarizes the goats' reproductive performances in the study areas. Significant differences (at least at $p<0.05$) were observed between districts with regard to the traits investigated. The respondents reported that the average age of does and bucks at their first service was 7.88±0.54 months and 7.10±0.83 months, respectively. This result is consistent with the 7.12 and 7.82 months that Wendimu et al. (2018) reported for male and female goats, respectively. In the Anfillo district, the mean age at first kidding (12.95±0.71 months) obtained in the current study was substantially ($P<0.05$) lower than in the Sibu Sire district (13.33±0.67) months. The most likely explanation for the variation in the average age at first kidding between the goat populations of the Anfillo and Sibu Sire districts was differences in agroecologies. In addition, the Anfillo district has more diverse browsing species, which is the preferred feed source for goats. According to Guangul (2014), goats are not as fond of natural grasslands, which are important sources of feed in the Sibu Sire district. A more favorable environment and better nutrition management are two of the key factors that accelerate puberty. Compared to the 12.4 months of age at first kidding for Western lowland goats reported by Guangul (2014), the present age at first kidding is longer.

Table 3

Mean reproductive performances of goats at Anfillo and Sibu Sire districts

Reproductive traits	Districts		Overall mean	P-value
	Anfillo (N=66)	Sibu Sire (N=69)		
Mean AFS (F)	7.78±0.55	7.98±0.51	7.88±0.54	0.028*
Mean AFS (M)	6.79±0.63	7.42±0.77	7.10±0.83	0.001***
Mean AFK	12.95±0.71	13.33±0.67	13.15±0.71	0.002**
Mean KI	7.11±0.74	7.97±0.34	7.55±0.72	0.001***
Doe's RLS	7.50±0.68	6.90±0.51	7.2±0.59	0.001***
№ of kid crops/Does/Lifetime	11.21±1.28	10.17±1.46	10.7±1.46	0.001***

*AFS(F)=Age at first service for female; AFS(M)=Age at first service for male; AFK=Age at first kidding; KI=Kidding interval; Doe's RLS=Doe's reproductive life span; *=p<0.05; **=p<0.01; ***=p<0.001*

The average kidding interval (KI) obtained in the present study was 7.55±0.72 months. The average kidding interval found in this study is consistent with the 7.83±0.13 month reported by Teshager and Wondim (2022) in the population of goats found in the Abaya and Galana districts of the South-West Ethiopia Peoples Regional State. However, it was shorter than the 8.08±0.03 month mean kidding interval reported for the indigenous goat populations of Limu Seka, Nono Benja, and Omo Nada districts of the Oromia Region (Gutu et al., 2022). Long suckling times, a lack of breeding bucks in the flocks, and poor feeding management, especially with regard to nutrition, can all lengthen the kidding interval.

In the districts of Anfillo and Sibu Sire, the average reproductive life Span for females was 7.50±0.68 and 6.90±0.51 years, respectively. The present study's overall mean reproductive lifespan falls between 7.2±2.0 and 7.9±1.9 years, which is the range reported for many indigenous goat populations (Sheriff et al., 2021). The two districts' anticipated disparities in agro-ecologies and, consequently, feeds could account for the variance in longevity between them.

Goat Production and Management

Feed Resources

The primary feed sources for animals in the study areas are listed in Table 4. Throughout the year, the primary source of feed in both districts was natural pastures or communal grazing lands. During the dry season, crop residues and crop aftermath came in second and third, respectively. On the other hand, hay and improved forages were reported to be the second and third most important feed sources during the wet season. Though there were small differences in their index values, the most important feed sources in the study areas were, in general, natural pasture, improved forage, hay, crop residues, and concentrate. Neme (2016), who conducted a survey study in the highland, midland, and lowland agro-ecologies in the Ada Barga and Ejere districts of West Shewa Zone, discovered that shoat mostly consume natural pasture throughout the rainy and dry seasons. There are more thorny bushes and shrubs on pasture land in the Anfillo district than in the Sibu Sire area, which may protect the goats from starvation during the dry season.

Table 4

Feed resources available during dry season and wet season in the study areas

Feed resources and season.	Districts							
	Anfillo				Sibu Sire			
Dry season	Rank			Index	Rank			Index
	1st	2nd	3rd		1st	2nd	3rd	
NP/CGL	40	20	6	0.42	28	39	2	0.39
Crop after math	0	21	24	0.16	9	9	22	0.17
Crop residues	26	23	17	0.35	25	21	15	0.32
Improved forage	0	0	5	0.012	3	0	15	0.06
Hay	0	0	4	0.01	2	0	7	0.03
Concentrate	0	2	10	0.035	2	0	8	0.03
Wet season								
NP/CGL	48	8	10	0.43	50	16	3	0.45
Improved forage	10	36	20	0.31	14	28	27	0.31
Concentrate	0	3	8	0.03	0	8	10	0.06
Hay	5	10	16	0.13	5	10	17	0.12
Crop residues	3	9	12	0.1	0	7	12	0.06

NP/CGL=Natural pasture/communal grazing land

Water Sources and Watering Frequencies

In the current study, seasonal differences in water supply and watering frequency were noted. The main water sources are listed in Table 5. Goats utilize water from rainfall (53.5%), rivers (31.6%), and springs (14.7%), in that order, primarily during the rainy season. Conversely, during the dry season, rivers (54.7%), water wells (41.5%), and springs (3.8%) constituted the primary water sources. Neme (2016) also reported that during the rainy season, rainfall and river water constituted the two primary sources. About 60% of respondents claimed that goats-

-have unlimited access to water throughout the day since rainwater is accessible during the rainy season. In other words, farmers do not need to take goats to water sources like rivers because they use rainwater. In confirmation of this, a significant number of respondents (approximately 38%) stated that goats are watered every other day or every three days due to the availability of rainwater. Approximately 62.2%, 31.9%, and 5.9% of re spondents, respectively, indicated that goats are watered once a day, once every two days, and once every three days during the dry season.

Table 5

Water Sources and watering frequencies (%) in the districts

Source of water in the wet season	Anfillo N(%)	Sibu Sire N(%)	Overall N(%)
River	15(22.7)	28(40.6)	43(31.6)
Rainwater	42(63.6)	30(43.5)	72(53.5)
Spring	9(13.6)	11(15.9)	20(14.7)
Source of water in the dry season			
River	35(53)	39(56.5)	74(54.7)
Water well	27(40.9)	29(42)	56(41.5)
Spring	4(6.1)	1(1.5)	5(3.8)
Watering frequency in the wet season			
Freely available	40(60.6)	45(65.2)	85(62.9)
Once a day	10(15.1)	7(10.1)	17(12.6)
Once in 2 days	16(24.2)	17(24.6)	33(24.4)
Watering frequency in the dry season			
Once a day	41(62.1)	43(62.3)	84(62.2)
Once in 2 days	22(33.3)	21(30.4)	43(31.9)
Once in 3 days	3(4.5)	5(7.2)	8(5.9)

Housing Management

Table 6 illustrates the various housing types and materials used for the construction of goats' houses in the study areas. The majority of respondents in the Anfillo district (75.8%) keep their goats in "gaadaa," or houses built attached to family homes. "Gaadaa" refers to the enclosure where goats are kept in Afan Oromo. On the other hand, the majority of respondents (72.5%) from the Sibu Sire district stated that goats are kept in a separate house just constructed for them

Table 6

Goat housing management of the study areas

Type of houses	District			
	Anfillo N (%)	Sibu Sire N (%)	Overall	X^2 Value
In family house	10(15.2)	8(11.6)	18(13.3)	
Separate house with roof	6(9.1)	50(72.5)	56(41.5)	59.691***
in adjacent to family house	50(75.8)	11(15.9)	61(45.2)	
Housing materials for floor				
Wood	18(27.3)	5(7.2)	23(17)	10.181NS
stone concrete	2(3)	5(7.2)	7(5.2)	
Earth	46(69.7)	59(85.6)	105(77.8)	
Housing materials for roof				
Iron sheets	46(69.7)	37(53.6)	83(61.5)	7.628*
Grass/Bushes	12(18.2)	10(14.5)	22(16.3)	
Plastic cover	8(12.1)	22(31.9)	30(22.2)	
Housing materials for wall				
Wood	100	100	100	

In the current investigation, flooring was made of three distinct materials. The most prevalent flooring types were earthen floors (77.8%), timber floors (17%), and concrete floors (5.2%), Richer families are the ones who typically utilize concrete and wooden flooring. Although the most popular kind of flooring is earthen, cleaning it can be challenging, especially in the wet season. Logs or wood are the most typical materials used to build walls. Iron sheets are used for roofing, according to the majority of respondents (61.5%), followed by plastic roofing (22.2%) and grass-thatched roofing (16.3%).

Herding Practice of Goats

Herding goats is mostly done to keep them safe from predators and to protect them from crop damage when they browse in natural grazing areas. In the current study, owners herd their flocks separately, together with sheep, together with calves, and together with cattle. The majority of respondents (43.47%) reported that goat owners keep their flocks separately (Table 7). According to Gatew et al. (2017), some goat farmers in the Wallo Zone's Bati, Siti, and Borana districts herd their flocks alongside those of their neighbors, while other goat producers herd their flocks apart. Except at the watering station, flocks belonging to different owners might not have the opportunity to mix in this situation. Separate herding would probably make it more difficult to apply community-based genetic improvement and could lead to inbreeding.

Table 7

Herding practice of goats in the study areas

Herding goat with	Districts			X^2 value
	Anfillo	Sibu Sire	Overall	
	N (%)	N (%)	N (%)	10.060*
Calves	16(24.2)	12(17.4)	28(20.7)	
Cattle	2(3)	10(14.4)	12(8.7)	
Herd separately	22(33.3)	37(53.65)	59(43.47)	
Sheep	26(39.4)	10(14.5)	36(26.9)	
Ways of herding goat				0.544ns
Own flock separate	46(69.7)	52(75.4)	98(72.6)	
Mixing with other flocks	20(30.3)	17(24.6)	37(27.4)	

*X^2=Chi-square; *=significant at (p<0.05); ns=non-significant (p>0.05)*

Goat disease and health management

According to the responders, CCPP, sheep and goat pox, ectoparasites, fascioliasis, infectious eczyma/orf, and pasteurellosis were the most common diseases in the study areas (Table 8). With index values of 0.38, 0.19, and 0.2, respectively, CCPP, sheep and goat pox, and ectoparasites were noted as some of the most prevalent illnesses that caused goat deaths in the Anfillo district. According to group discussions conducted in the Anfillo district, the main cause for the medication shortage was the areas' inaccessibility (i.e., security issues). Herbal remedies, such as those derived from the plant known as "*Anfaaree*" in Afan Oromo, are frequently utilized, particularly for the treatment of eye worm illness. After being

chopped and combined with water, the leaf is applied to the ill goat's eyes. Moreover, owners use a knife and needle to remove ectoparasites like "*jigger*," also referred to as "*Muujalee*" in Afan Oromo and usually affecting goats' feet.

Table 8

Major goat disease in the study areas

Major goat diseases	Local Name	Districts								
		Anfillo				Sibu sire				
		R1	R2	R3	Index	R1	R2	R3	Index	Overall index
CCPP	-	26	18	20	0.38	0	0	3	0.007	0.19
Sheep and goat pox	Mammadeessaa	14	9	17	0.19	0	4	4	0.03	0.11
PPR	Maariyyee	0	6	4	0.03	0	3	6	0.03	0.03
Pasteurellosis	Gororsiisaa	6	2	10	0.08	16	7	15	0.19	0.13
Fascioliasis	-	0	3	0	0.01	29	21	12	0.34	0.17
Brucellosis	-	3	4	0	0.04	2	6	2	0.05	0.04
Ectoparasites	Silmii, muujalee, ciniifitafkii	2	16	10	0.2	4	7	10	0.08	0.14
Contagious Eczyma/Orf	Mandarraa	2	4	3	0.04	12	11	13	0.18	0.11
Phelsia eye worm	Dhukkubbii ija	3	4	2	0.04	6	10	4	0.1	0.07

CCPP= Contagious Caprine Pleuro Pneumonia; PPR= Pest des Petit Ruminants

Goats Production Constraints

Some of the most significant obstacles to goat production in the areas under consideration are listed in Table 9. Disease, a lack of fodder, and predators were placed first, second, and third in the Anfillo district, respectively. Neme (2016), who also listed disease as the top barrier to small ruminant production in the lowland, midland, and highland agro-ecologies in the west Shewa zone's Ejere and Ada barga districts, concurs with the current report. In the Anfillo district, tigers, hyenas, foxes, and monkeys were the main goat predators, according to focus group discussions.

Table 9

Major goat production constraints in the study areas

Constraints	Anfillo district				Sibu Sire district				Overall Index
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	
Feed shortage	20	9	13	0.23	26	23	20	0.34	0.28
Disease	23	19	20	0.32	20	24	15	0.30	0.31
Water shortage	4	8	6	0.08	10	6	12	0.13	0.14
Market problem	9	10	12	0.15	9	12	8	0.14	0.14
Predator	10	14	10	0.17	4	0	6	0.05	0.11
Genotype	0	6	10	0.05	0	4	8	0.04	0.04

Major Objective Traits for Breeding Does

Table 10 lists the breeding objective traits for the production of goats in both study locations. Identifying breeding objectives are the initial stage in developing genetic improvement techniques is desirable characteristics that farmers would like to enhance (Seid et al., 2017). Numerous techniques, including production system studies, hypothetical choice experiments, own flock rating, and group ranking experiments, can be used to identify breeding goal features and preferences of shoat owners (Duguma et al., 2011; Mirkena et al., 2011). In the current study, twinning ability, growth rate, and age at first kidding were ranked 1st, 2nd, and 3rd, respectively for breeding does, with index values of 0.36, 0.27, and 0.19. The highest preference for twinning ability is an indication of goat producers' strong desire to have such potential breeding does in their flocks, which is very important to increase flock size and overall flock productivity and thus income. Seid et al. (2015) also reported that twinning rate and growth rate were the 1st and 2nd ranked objective traits for breeding goat selection in the Horro Guduru Wollega zone.

Table 10

Objective traits of does rank by owners

Attributes	Districts								
	Anfillo				SibuSire				Overall
	R1	R2	R3	Index	R1	R2	R3	Index	Index
Age at first Kidding	12	9	20	0.18	15	11	13	0.19	0.19
Twinning ability	32	23	10	0.38	30	18	16	0.35	0.36
Kidding interval	0	15	11	0.11	2	10	14	0.09	0.1
Colour type	0	5	13	0.06	6	8	7	0.10	0.08
Growth rate	22	14	12	0.26	16	22	19	0.27	0.27

Major Objective Traits for Breeding Bucks

Table 11 lists some of the main breeding aim traits for selecting breeding bucks. With index values of 0.40, 0.30, and 0.20 for body conformation, growth rate, and coat color, respectively, these three traits were the most desired for breeding buck selection.

Table 11

Objective traits of bucks ranked by owners

Attributes	Districts								
	Anfillo				SibuSire				Overall
	R1	R2	R3	I	R1	R2	R3	I	Index
Body size/ conformation	32	28	6	0.39	38	20	6	0.40	0.40
Growth rate	15	22	24	0.28	17	31	19	0.31	0.30
Coat color	12	10	20	0.20	10	14	30	0.21	0.20
Libido/Sexual desire	7	6	16	0.13	4	4	14	0.08	0.10

In the current study, goat owners preferred males with larger body sizes and good body confirmation because larger males with good body conformation would fetch a premium price on the market and they would sire large-sized offspring with good body confirmation. This is because body weight has moderate heritability and thus responds to selection improvement. The findings of Sheriff et al. (2021) and the current study agree that body conformation (wide chest, long body, and upright stance), growth rate, and coat color were the most important attributes for the selection of breeding bucks. The preference or selection of farmers for a particular coat color might be associated with socio-cultural practices, market demand, disease tolerance, and environmental factors (Edea et al., 2012). In the current study, libido was less preferred. This may be due to the nature of traditional livestock production, where males and females run together the entire year round, and the importance of an individual buck's libido may not be recognized or its effect may be obscured.

CONCLUSION

The production practices and breeding objectives of indigenous goat populations in the Qellem and East Wallaga zones of western Oromia were investigated. The overall average flock size of goats was 8.86±2.56 was reported in the current study. Goats are kept mainly for income generation and meat. The mean age at first service for females and males were 7.88±0.54 and 7.10±0.83 months, respectively. The current study indicated an overall mean age of 13.15±0.71 months for the first kidding and 7.55±0.72 months for kidding interval. During the wet and dry seasons, natural pastures or communal grazing area, were the most common sources of feed. Rivers and rainwater were significant supplies of water in the dry and rainy seasons, respectively. About 27.4% of respondents reported that goat owners herd their flocks mixing with other flocks, but the majority of goat producers (72.6%) herd their own flocks individually.

In the current study, challenges to sheep production identified include diseases, seasonal feed shortages, and predators. The main breeding objectives in the current research areas were body conformation, growth rate, coat color for breeding bucks, twinning ability, growth rate, and age at first kidding for breeding females. In conclusion, it is imperative that any genetic improvement shall take into account the identified breeding objectives while also giving due consideration to the significant bottlenecks identified.

Recommendation

i. Goats are mostly kept for their meat and to generate cash. The results of this study indicate that, with improved nutrition and healthcare, the age at first service, mean age at first kidding, and kidding intervals are encouraging.

ii. The majority of goat producers (72.6%) herd their flock independently, whereas only about 27.4% of the respondents herded their flocks mixing with other flocks. This could make it challenging to organize goat producers into community-based genetic improvement. For this reason, training in awareness creation is essential for goat producers.

iii. The present investigation has identified diseases, seasonal feed shortages, and predators as obstacles to sheep production. This may necessitate providing farmers and

development personnel/service providers with capacity-building training.

iv. The primary breeding objectives for breeding bucks are body conformation, growth rate, and coat color; for breeding females, the main breeding objectives are twinning ability, growth rate, and age at first kidding. Thus, it is crucial that these be taken into account while designing improvement initiatives.

CRediT authorship contribution statement

Ayela Abera: Conceptualization, Investigation. **Ayantu Mekonnen:** Data curation, methodology. **Diriba Diba:** Visualization, Validation. **Gemeda Duguma:** Supervision, Writing – original draft, Writing –review & editing

Declaration of competing interest

The authors declare that there is no conflict of interest.

Data availability

Data will be made available on request

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