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BREEDING OBJECTIVES, SELECTION CRITERIA AND BREEDING SYSTEM OF INDIGENOUS GOAT TYPES IN BALE ZONE, OROMIA, ETHIOPIA

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Abstract

The study was undertaken in bale zone to assess farmer's selective breeding objectives, trait preferences, selection criteria and breeding system October 2012 to November 2013. A purposive and multistage sampling technique was applied for selection of 3 district and 9 kebeles. Then 360 households were selected by using simple random sampling techniques after the list of pastoralist having goats was identified. Statistical analysis system version 9.1 was used for analysis of data. Indices, effective population size and rate of inbreeding were calculated on average each respondent holds about 14 goats. Milk production is the main reason of goat keeping in the study area. Appearance is the first rank as selection criteria for male and female in all studies area. About 47.8% of the respondents have their own buck. The main use of breeding buck in the study area was for mating purpose (76.2%). Mean estimate of effective population size and mean rate of inbreeding was 2.43 and 0.21, respectively when a household flock is herded alone and under random mating. Therefore, any breed improvement strategies that are intended to be implemented in the study area and else- where should consider the traditional breeding practices and breeding objectives of the community.

Keywords: Bale Zone, Breeding Objectives, Breeding System, Indigenous Goat Types, Selection Criteria

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Introduction

Goats are one of the small size domesticated ruminants, which have served humankind earlier and longer than cattle and sheep (Devendra and Burns, 1983). It kept for the production of milk, meat and wool, particularly in arid and mountainous countries. It plays an important socioeconomic role in rural areas for generating income and as a banking system (Mamabolo and Webb, 2005). It can inhabit a wide range of environments, extending from tropical to cool temperate climates (Zelalem and Fletcher, 1993). The small body size, broad feeding habits, adaptation to unfavorable environmental conditions and their short reproductive cycle provide goats with comparative advantage over other species to suit the circumstances of especially resource poor livestock keepers (Umeta *et al*., 2011a). Goats are browsers and highly selective feeders and had a strategy that enables them to thrive and produce even when feed resources, except bushes and shrubs, appear to be non-existent. Thus, the presence of goats in mixed species grazing systems can lead to a more efficient use of the natural resource base and add flexibility to the management of livestock. This characteristic is especially desirable in fragile environments (Hirpa and Abebe, 2008); successful improvement programs, compatibility of the genotypes with the farmers' breeding objectives and the production systems are crucial (Tibbo, 2006). The diversity in gene pool and influence of varied climatic conditions have given rise to different local populations of goats which are repositories of unique genes that should be conserved for local and international future benefits (Adebambo, 2004). According to Groeneveld *et al*. (2010), identifying and understanding a unique genetic resource in a particular region and the development and proper use of the associated diversity is a global responsibility.

Design of sustainable genetic improvement schemes under smallholder situations requires indigenous knowledge on traditional breeding practices which is structured differently from scientific knowledge (Mbuku *et al*., 2006). Lack of such knowledge leads to the setting up of unrealistic breeding goals and the consequence of which can put in danger the conservation of indigenous animal genetic resources (Zewdu *et al* ., 2006). Pastoralists/smallholder farmers have very valuable knowledge about animal management and desirable traits but less knowledge on how genes are transmitted to the next generation and how to use information from

relatives (Mbuku *et al.*, 2006). Currently, community based genetic improvement strategies are being advocated for pastoral production (Kahi *et al.*, 2005). These strategies would require a good understanding of the community's indigenous knowledge of their animals. Despite the importance of knowing the communities breeding practices, their trait preference (selection criteria), breeding objectives and herding practices such information is scanty for indigenous goats in the study area. Therefore, this research was under taken to assess farmer's selective breeding objectives, trait preferences and breeding system in Bale zone.

Materials and Methods

Description of the study area

The study was conducted in three districts (Mada Walabu, Sawena and Rayitu) of Bale zone of Oromia Regional states during October 2012 to November 2013 (Fig.1).

Data collection method

Group and individual discussions with key informants and district officials were done to have an overview about the overall agricultural production system in general and goat production subsystem in particular. In addition, information on main uses and special attributes of the breed was collected from the goat owner through utilizing designed questionnaire and group discussion (with extension workers, developmental agents (DA) and model farmers). Farmer selection criteria, breeding objectives, breeding system, goat reproductive performance including reproductive problems were assessed using questionnaire.

Data analysis

All the collected data were double-checked for any types of errors occurred during data collection while in the field and on-spot corrections were made accordingly. All data were coded and recorded in Microsoft excel sheet. Descriptive statistics were employed to summarize and describe categorical variables.

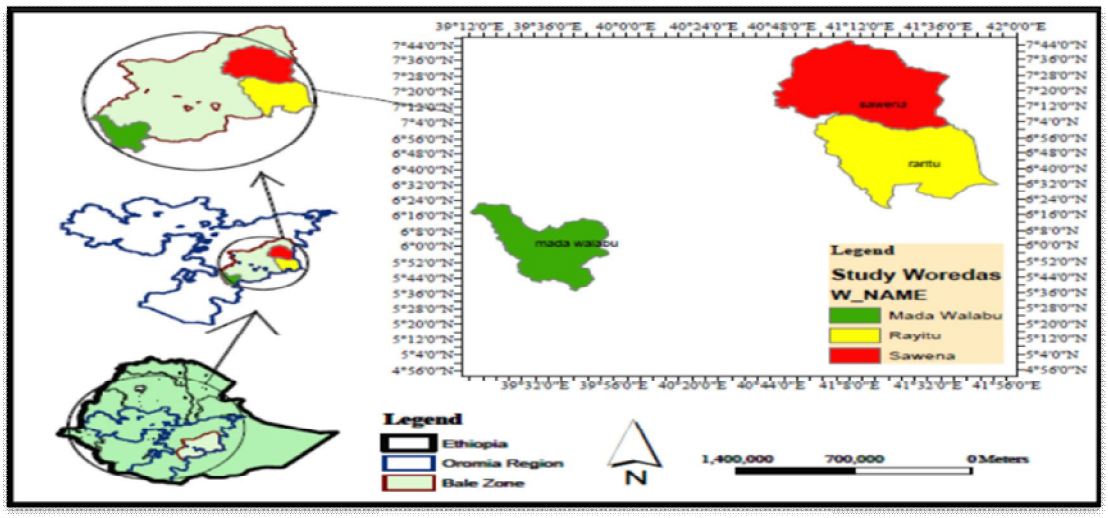

Fig. 1. Map of the study area

Sample size and sampling techniques

The researcher conducted a rapid field survey prior to the actual survey work to locate the distribution of goat, their production and reproduction system. Purposive and multistage sampling techniques were applied with the main objective to select the study district. Depending on the information gathered from group discussion, agriculture and rural development office experts and development agents, three districts were selected; three *peasant associations* (PA) were also selected from each district based on the distribution of goat population. Accordingly, 360 households (120 from each district) were sampled using simple random sampling technique.

Qualitative data from individual observation were analyzed following the frequency procedures of SAS (2008) version 9.2. Chi-square test was employed to test the assumption of equal proportion between the categorical variables. Indices were calculated to provide ranking the reason of keeping goats, selection criteria for male and female. Furthermore, rate of inbreeding was calculated in the population. Effective population size for a randomly mated population was calculated using the following formula of Falconer and Mackay (1996). The rate of inbreeding (ΔF) was calculated from Ne as $\Delta F=\frac{1}{2Ne}$

$Ne=\frac{4(Nm\times Nf)}{Nm+Nf}$

Where, Ne= effective population size
Nm = number of breeding male population
Nf = number of breeding female population

Indices were calculated using formula:

I= index : Index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual reason (attribute) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall reason.

Results and Discussion

Flock size and structure

From the total, 4975 goats obtained from 360 household, male accounted about 32.42% of the flock of which about 56% were suckling male and the number decrease as the age increase. There were no significant difference between districts in goat flock size and structure ($p>0.05$) except mature male ($p<0.05$) which are higher in Mada Walabu district. This was similar with the work of Kebede *et al*. (2011), which reported the percent of male in the flock were 30.7% in Shalla and ATJK. This indicates that male goats were culled or sold at young age most probably before weaning. The ratio of female goats and mature female goats in the flock are 67.58% and 43.2%, respectively. The finding was in contrast with the work of Kebede *et al*. (2011) in which the matured female constituted about 67% of the total flock in Shalla and ATJK districts. In the study area, the ratio of male to female and the ratio of mature male to mature female was 1:2.08 and 1:8.4, respectively. The ratio of matured male to matured female in this finding was higher as compared with the report of Nigatu (1994) (1:19) for Ethiopia and Eritrea goats in pastoral flock, Tesfaye (2009) (1:13.4) in Metema and Sisay *et al*., (2006) (1:30-50) in Shinile and Jijiga. In contrast, the result of this finding was lower as compared to the report of Grum (2010) and Endeshaw (2007) who reported the ratio of buck to doe was 1:5 and 1:4, respectively.

Table1. Average number of goat with respective age group in the study area

Goat age group	Total goats		Mada Walabu	Rayitu	Sawena	Overall mean
	No	%	mean± SE	mean± SE	mean± SE	Mean ± SE
Suckling male kid	907	18.2	2.58±0.13[a]	2.41±0.14[a]	2.57±0.15[a]	2.5±0.14
Suckling female kid	736	14.8	2.32±0.13[a]	1.94±0.13[a]	1.9±0.15[a]	2.1±0.13
Weaned male kid	453	9.1	1.35±0.10[a]	1.20±0.11[a]	1.23±0.11[a]	1.26±0.10
Weaned female kid	477	9.6	1.41±0.13[a]	1.28±0.13[a]	1.32±0.13[a]	1.34±0.13
Matured male(> year)	256	5.1	1.12±0.13[a]	0.36±0.06[b]	0.6±0.08[b]	0.7±0.09
Matured female(> year)	2145	43.2	5.88±0.23[a]	5.73±0.17[a]	6.31±0.28[a]	6.0±0.22
Castrated	1	0.02	0.01±0.01[a]	0.00±0.00[a]	0.00±0.00[a]	0.03±0.01

No = number of goats; SE= standard error;
Means with the same letter within the same row and class are not significantly different at p (0.05)

Purposes of keeping goats

Worldwide, different goat breeds produce variety of products, including milk, meat and fiber (Galal, 2005). In the study area, goats are kept as source of milk, cash and meat for home consumption, manure, insurance against emergency, wealthy and dowry. According to the respondents, goat milk is believed to have medicinal value for children and contribute more for the well-being of a human baby. This quality of goat milk was related with their feeding behavior (goats browsed different browse species). Knowledge of reasons for keeping animals is a prerequisite for deriving operational breeding goals (Jaitner *et al*., 2001).

The farmers in Mada Walabu and Sawena district were rearing their goats mainly for milk, cash income and meat with an index of 0.45, 0.32 and 0.21 for Mada Walabu and 0.44, 0.36 and 0.20 for Sawena district, respectively. The finding was in agreement with report of Umeta *et al*. (2011a) farmers in Arsi Negelle district, which rear their goats for milk, cash income and meat in order of importance. The primary purpose of keeping goat in Rayitu district was for cash income followed by milk and meat in that order of an index 0.39, 0.37 and 0.21, respectively which was in agreement with the report of Gebeyehu *et al*. (2013) for farmers in Adami Tulu, Arsi Negelle and Fentale district. The overall purpose of goat rearing in the study area is milk for home consumption. It was in agreement with the report of Tabbaa and Al-Atiyat, (2009) in which majority of farmers (84%) in Jordan emphasized on breeding goats for milk production. The report of Kebede *et al*. (2011) is also in agreement with this finding, where farmers of shala and ATJK district rear their goats mainly for milk and meat purpose. Ethiopian goats in the lowlands are highly valued and reared mainly for milk and meat production (Awgichew and Abegaz, 2008). On the contrary, the report of Legesse *et al*. (2008) in Kofele and Adilo district and Umeta *et al*. (2011b) in ATJK and Fentale district shows that goats were primary reared for income generation. Function like skin and manure received relatively low ranking among the reasons of keeping goats in the study area.

Farmers considered body appearance as a tool to improve milk and meat production. They think that certain body morphologies such as body size or conformation are related to milk and meat production. According to discussion made with focal group and key informants, farmers consider color of goats (mainly white), this was to identify breed or type of goats from other and they thought white breed have good milk and meat as well as have ability to resist in the harsh condition. Even within the same goats flock (that have the same color they look horn space; they prefer the goats that have wide horn space at the bottom).

Table 2. Purpose of goat keeping in each district and ranking of these purpose

Purpose	Districts											
	Mada Walabu				Sawena				Rayitu			
	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I
Meat	6.7	19.2	70.8	0.21	-	19.1	81.4	0.20	5	22.5	65.8	0.21
Milk	75.8	20	3.3	0.45	67.5	29.2	-	0.44	50	29.2	19.2	0.37
Cash	17.5	58.3	22.5	0.32	32.5	50	18.6	0.36	45	42.5	13.3	0.39
Skin	-	2.5	0.8	0.01	-	-	-	0.00	-	-	-	0.00
Manure	-	-	2.5	0.01	-	-	-	0.00	-	-	-	0.00
Wealth	-	-	-	0.00	-	1.7	-	0.00	-	3.3	-	0.01
insurance	-	-	-	0.00	-	-	-	0.00	-	0.8	1.7	0.01
Dowry	-	-	-	0.00	-	-	-	0.00	-	-	-	0.00
Other	-	-	-	0.00	-	-	-	0.00	-	1.7	-	0.01

R1, R2 and R3 = rank 1, 2and 3, respectively. I= index : Index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual reason (attribute) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall reason.

Selection criteria for breeding bucks

Appearance and color are selected in all of the study area as the first and second criteria, respectively. Family history was selected as the 3rd criteria in Mada Walabu and Sawena district, while testicular characteristic was selected as 3rd criteria in Rayitu districts. Selection criteria for buck and does were parallel across all the districts. The selection criteria of the traits are more subjective. The finding of Tabbaa and Al-Atiyat (2009) revealed that farmers in Jordan are using more subjective than objective selection criteria.

Table 3. Selection criteria for breeding buck in the study area

Criteria	Districts											
	Mada Walabu				Sawena				Rayitu			
	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I
Appearance	73	18	4	0.41	56	27	9	0.39	59	29	5	0.37
Color	3	52	28	0.22	18	39	20	0.25	37	33	18	0.30
Character	-	3	11	0.03	-	5	20	0.05	-	5	11	0.03
Growth	3	-	7	0.03	2	5	2	0.03	3	10	14	0.08
Prolificacy	-	-	1	0.00	-	1	1	0.01	-	-	4	0.01
testicular characteristics	4	12	19	0.09	2	12	8	0.06	4	21	18	0.11
better sexual ability	4		21	0.05	4	5	16	0.06	-	7	31	0.07
pedigree/family history	14	13	6	0.12	18	6	20	0.14	2	2	6	0.02
Others	4	7	8	0.05	-	-	4	0.01	2	-	-	0.01

R1, R2 and R3 = rank 1, 2and 3, respectively. I= index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual criteria (attribute) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall criteria.

Selection criteria for breeding does

In Mada Walabu and Rayitu districts, appearance and color took the first and the second rank and better milk yield as the 3rd criteria, respectively. However, in Sawena district appearance, better milk yield and color took the first, second and third rank, respectively. Selection by farmers implies that they try to maintain good performing animals and cull the inferior ones, but the selected does are not necessarily mated with selected bucks as they are freely roaming and grazing together with other flocks, which make mating uncontrolled.

Farmers have perception that large goats in body size and white in color were having high milk yield. They were not selecting black or red goat as they think they have no high milk yield. In the study area, goats that gave the farmers did not appreciate twin. The reason is that it creates competition between the twin kids and the person for milk. In addition, it is difficult for does to nourish two kids at the same time, since feeds were the pertinent problem in the area. This finding was in agreement with the report of Kebede *et al*. (2011) which state that twining has negative impact for farmers that mainly focus on milk production if the goat has low milk potential.

Table 4. Selection criteria for breeding does in the study area

	Mada Walabu				Sawena				Rayitu			
Criteria	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I
Appearance	76	13	7	0.43	60	15	10	0.36	80	14	4	0.45
Color	7	36	26	0.20	11	42	14	0.21	12	59	8	0.27
Mothering ability	-	4	11	0.03	5	3	13	0.06	-	3	5	0.02
Kid survival	-	-	4	0.007	-	4	8	0.03	-	-	3	0.05
Kid growth	-	2	1	0.008	-	1		0.003	2	1	3	0.02
Short KI	2		3	0.015	-	4	7	0.024	-	-	6	0.01
Twining ability	-	-	7	0.012	-	-	4	0.006	-	2	2	0.01
Better milk yield	11	28	22	0.18	21	18	36	0.22	4	20	62	0.19
Family history	4	12	12	0.08	6	16	11	0.10	2	2	7	0.03
Others (horn)	-	6	8	0.03	-	-	-	0.0	-	-	-	0 .0

R1, R2 and R3 = rank 1, 2 and 3, respectively. I= index : Index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual criteria (attribute) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall criteria; KI= Kidding intervals

Farmers opine differently for different attributes of goats but preferred attributes that were mostly quantitative in nature and economically important (Abdul Waheed, 2011). Farmers in the study area mainly depend on economical traits like milk yield and disease resistant and color which have influence on economic traits (milk). Farmers in Mada Walabu Sawena and Rayitu were focus on quantitative traits, resistant and beauty traits, respectively.

Table 5. Traits preference of goats in the study area

	Districts											
Traits	Mada walabu				Sawena				Rayitu			
	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I
Milk yield	91	26	60	0.55	30	23	9	0.20	6	20	82	0.20
Disease resistance	8	24	5	0.10	51	20	8	0.28	30	10	20	0.19
Coat color	21	30	27	0.21	20	20	22	0.17	44	51	16	0.33
Feed shortage resistance	-	30	10	0.09	10	20	30	0.14	10	15	-	0.09
Adaptability	-	4	3	0.01	9	20	40	0.15	10	-	-	0.05
Reproduction rate	-	-	5	0.01	-	2	5	0.01	-	12	-	0.03
Longevity	-	6	5	0.02	-	10	-	0.03	-	5	2	0.02
Horn structure	-	-	5	0.01	-	5	6	0.02	20	7	-	0.09

R1, R2 and R3 = rank 1, 2 and 3, respectively. I= index : Index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual traits) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall traits.

Breeding system in the study area

In the study area, about 47.8% of the respondents have their own buck. Among household having their own buck, the main source of their breeding buck was born in the flock (89%) followed by purchased from the market (9.3%) and gift from the relatives (1.7%). This finding was in agreement with the report of Kebede *et al*. (2011) the source of buck for farmers of Shala district was born in flock (82%). The average buck holding per household in Mada Walabu (1.1) is higher than Rayitu (0.47) and Sawena (0.6) districts ($p<0.05$. The main use of breeding buck in the study area was for mating purpose (76.2%) followed by social culture (13.9%) and for fattening (9.9%). About 93% of the respondents in the study area did not make special management for buck. Household who have no their own buck have used neighbor buck (53.2%), communal grazing area (37.2%) and unknown (9.6%) to mate their does. In the study area, about 87.2% and 82.8% of the respondents practice selection of males and females goats, respectively.

Majority of the respondents in the study area were practicing uncontrolled mating (98.9%). The finding was in consonance with the report of Gizaw *et al*. (2010) where in Metema district about 97% of the respondent uses uncontrolled breeding. The main reason of uncontrolled mating was lack of awareness about the effect of inbreeding (56.1%) followed by communal grazing (35.9%). Uncontrolled mating was associated with the parturition distributed throughout the year. An advantage of uncontrolled mating is that it allows all year round breeding. Uncontrolled mating and communal grazing are expected to result in sever inbreeding in the flock. About 71.9% of the respondents were able to identify the sire of their kids. The main identification method are identifying the male that the does herd and housed and similarity with the existing breeding male in the flock.

Table 6. Buck management and its selection practices in the study area

Parameters	District						Over all	
	MadaWalabu		Sawena		Rayitu			
Do you have breeding buck	N	%	N	%	N	%	N	%
Yes	80	66.67	52	43.3	40	33.3	172	47.8
No	40	33.33	68	56.7	80	66.7	188	52.2
Source of breeding buck								
Born in the flock	72	90	44	84.6	37	92.5	153	89
Purchased from market	7	8.8	6	11.5	3	7.5	16	9.3
Gift from relatives	1	1.3	2	3.9	-	-	3	1.7
Do you make special mgt buck								
Yes	9	11.5	3	5.8	-	-	12	7.0
No	71	88.8	49	94.2	40	100	160	93.0
Purpose of keeping breeding buck								
Mating	60	75	40	76.9	31	77.5	131	76.2
Social culture	12	15	8	15.4	4	10	24	13.9
For fattening	8	10	4	7.7	5	12.5	17	9.9
If didn't have buck, how do you mate								
Neighbor buck	20	50	41	60.3	39	48.8	100	53.2
Communal grazing	15	38.5	23	34.9	32	40	70	37.2
Unknown	5	12.8	4	6	9	11.2	18	9.6
Do you practice selection of (M)								
Yes	107	89.2	100	83.3	107	89.2	314	87.2
No	13	10.8	20	16.7	13	10.8	46	12.8
Do you practice selection of (F)								
Yes	100	83.33	102	85	96	80	298	82.8
No	20	16.67	18	15	24	20	62	17.2
Identification mechanisms								
color of goats	19	15.8	6	5	1	0.8	26	7.2
Individual characteristics	35	29.2	3	2.5	15	12.5	53	14.7
Unique marks on the goats	4	3.3	46	38.3	87	72.5	137	38.1
By observation	62	51.7	65	54.2	17	14.2	144	40

M= male; F= female

Table 7. Types of mating practiced in the study area

Parameters	MadaWalabu		Sawena		Rayitu		Overall	
	N	%	N	%	N	%	N	%
Types of mating								
Natural mating(SB)	4	3.33	0	0	0	0	4	1.1
Natural mating(USB)	116	96.67	120	100	120	100	356	98.9
Reason of uncontrolled mating								
Goats graze together	32	27.3	39	32.8	57	47.5	128	35.9
Lack of awareness effect of(I)	78	66.7	71	59.7	51	42.5	200	56.1
Insufficient number of buck	3	2.6	8	6.7	12	10	23	6.4
Shortage of grazing land	4	3.4	2	1.8			6	1.6
Do you identify sire of kids?								
Yes	93	77.5	82	68.3	84	70	259	71.9
No	27	22.5	38	31.7	36	30	101	28.5
Do you allow your buck mate								
His mother								
Yes	116	96.7	108	90	117	97.5	341	94.7
No	4	3.3	12	10	3	2.5	19	5.3
his daughter								
Yes	116	96.7	108	90	117	97.5	341	94.7
No	4	3.3	12	10	3	2.5	19	5.3
his sister								
Yes	116	96.7	108	90	117	97.5	341	94.7
No	4	3.3	12	10	3	2.5	19	5.3
Do you allow your buck to served other								
Yes	116	96.7	108	90	117	97.5	341	94.7
No	4	3.3	12	10	3	2.5	19	5.3
Do you allow your does to be served by others								
Yes	116	96.7	108	90	120	100	344	95.6
No	4	3.3	12	10	-	-	16	4.4

N= number of respondents; I= inbreeding, SB= selective buck, USB= unselective buck

The average numbers of breeding buck were 1.09, 0.6 and 0.47 for Mada Walabu, Sawena and Rayitu districts, respectively. Farmers in Mada Walabu district have higher average number of breeding buck as compared to the others. Farmers in the study area select male and female goats at age of 11.45 and 12.12 month, respectively. Males were selected earlier than females. This indicates that males usually selected based on morphological characteristics while females were based on productive traits like milk yield, kid mortality, kid growth and kidding interval.

Table 8. Summary of average number of breeding buck per household and age of selection

	District (Mean±SE)			
Parameters	Mada Walabu	Sawena	Rayitu	Over all
Average no buck	1.09±0.12[a]	0.6±0.08[b]	0.47±0.08[b]	0.72±0.09
Average age of selection (M)	11.35±0.4[ab]	10.7±0.28[b]	12.3±0.39[a]	11.45±0.36
Average age of selection (f)	12.1±0.4[a]	11.7±0.44[a]	12.55±0.4[a]	12.12±0.4

M=male, f=female; SE= standard error; Means with the same letter within the same row and class are not significantly different at p (0.05)

Major breeding problems

In the study area, breeding problems are frequently observed. In Mada Walabu abortion, kid mortality, low growth rate and repeat breeding were ranked the first four breeding problems with an index of 0.27, 0.23, 0.19 and 0.15, respectively. In Sawena district, abortion and kid mortality took the first rank followed by late age at first kidding and low growth rate with an index of 0.24, 0.16 and 0.15, respectively. Similarly, in Rayitu district abortion took the first rank followed by repeat breeding, long kidding interval, and late age at first kidding with an index of 0.27, 0.22, 0.17 and 0.14, respectively. Discussion with key informants in the study area shows that abortion and kid mortality were the serious problem of goat production in the study area. The main reason of abortion of goat in the study area was related with the disease and feed related factors. Kid mortality was related with feed shortage and frequent occurrence of disease.

Table 9. Major breeding/reproductive problems

	Districts											
	Mada Walabu				Sawena				Rayitu			
Criteria	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I
Late age at first kidding	14	10	4	0.09	35	2	17	0.16	29	4	4	0.14
Long kidding interval		12	13	0.05	3	24	16	0.10	14	34	11	0.17
Repeat breeding	14	27	15	0.15	4	10	17	0.07	19	28	43	0.22
Abortion	46	18	23	0.27	30	29	25	0.24	43	25	18	0.27
Dystocia	-	-	1	0.00	-	6	3	0.02	2	6	-	0.03
Kid mortality	27	25	38	0.23	39	21	15	0.24	11	19	24	0.13
Low growth rate	19	28	26	0.19	9	28	27	0.15	2	4	20	0.05

R1, R2 and R3 = rank 1, 2and 3, respectively. I= index = sum of(3 for rank 1 + 2 for rank 2 +1 for rank3) given for an individual reason (attribute) divided by the sum of sum of(3 for rank 1 + 2 for rank 2+1 for rank 3) for overall reason.

Effective population size and rate of inbreeding

Effective population size is a measure of genetic variability within a population with large values of Ne indicating more variability and small values indicating less genetic variability (Maiwashe *et al*., 2006). In this study, the estimates of Ne were 3.76, 2.19 and 1.35 for Mada Walabu, Sawena and Rayitu district, respectively with mean estimate of 2.43 when a household flock is herded alone. Under random mating when the goat flock of a household was not mixing, the mean rate of inbreeding was 0.21. This value was in agreement with the report of Getachew (2008) who estimated a 0.20 rate of inbreeding for Afar sheep in Ethiopia. Rate of inbreeding in the study area is beyond the threshold level or maximum acceptable level (0.063) (Armstrong , 2006) which is due to small effective population size, utilization of breeding buck born within the flock for up to 8 years and uncontrolled mating practiced in the study area.

Table 10. Effective population size and rate of inbreeding of goats flock in the study area

District	When flocks are not mixed			
	Nm	Nf	Ne	ΔF
Mada Walabu	1.12	5.88	3.76	0.13
Sawena	0.60	6.31	2.19	0.23
Rayitu	0.36	5.73	1.35	0.37
Mean	0.69	5.97	2.43	0.21

Nm= number of male; Nf = number of female; Ne= effective population size; ΔF=rate of inbreeding

Conclusion

The results of this survey revealed that goats play multi-functional roles in all of study districts. Farmers have multiple breeding objectives and they considered both subjective and objective selection criteria with slightly more emphasis on morphological characteristics for buck selection than replacement doe selection. Breeding bucks are not kept by majority of smallholders in the study area. It was due to existence of buck sharing culture, communal herding and early selling of male contributed to its reduction in the flocks. Respondents practiced controlled breeding system. The main reason of control breeding is lack of awareness about effect of inbreeding (56.1%) and communal grazing (35.9%). Rate of inbreeding in the study area is beyond the threshold level or maximum acceptable level (0.063)) which is due to small effective population size, utilization of breeding buck born within the flock for up to 8 years and uncontrolled mating practiced in the study area. Therefore, any breed improvement strategies that are intended to be implemented in the study area and else- where should consider the traditional breeding practices and breeding objectives of the community

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