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Research Article

Husbandry and Breeding Practices of Indigenous Cattle Breed in Borana Zone of Oromia Regional State, Ethiopia

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Abstract

The study was conducted in Dire, Golbo, Gomole, Melbe, and Woyama grazing land escapes of Boran Zone, Oromia Regional State, Ethiopia, from September 2021 to June 2023 to, assess the traditional farming and breeding practices of the pastoralists in the study area. Field studies and collection of data were carried out through semi-structured questionnaires, focus group discussions, key informants, observations, and linear body measurements of sample cattle and secondary data collection from different sources. A total of 360 households were randomly selected and interviewed. The majority of respondents reported that the type of farming activity was pastoralist i.e. their livelihood depended almost on livestock production, Even though crop farming practices are an increasing trend. Despite being primarily used for beef, the majority of Borana cattle were used for milk and income purposes. According to this finding, the mean milk yield of Borana cattle was 0.30 ±0.18 and 1.50 ±0.78 litter per day in dry and wet seasons respectively. The mean milk output of Borana cattle cattle during the dry and rainy seasons was, respectively, 0.30 ±0.18 and 1.50 ±0.78 litter per day. The average age at first calving and calving interval were 5.05 ±0.24 and 2.25 ±0.33, respectively, whereas the mean for the age of sexual maturity for males and females was 5.20 ±0.34 and 4.04 ±1.80, respectively. The major selection criteria for both breeding female and bull were body size, body conformation, and coat color. According to the majority of respondents, uncontrolled seasonal natural mating was the sort of mating that was practiced. In general, the result of the current finding showed that there was a lower productive and reproductive performance as well as lower for most quantitate measurements from previous work done within the same areas of study. Therefore, traits milk yield growth in males and associated traits like adaptation and reproductive performances need to be incorporated in designing a breeding program for the improvement of Borana cattle.

Keywords

Breeding Practices, Husbandry, Cattle, Breed, Borana Zone

1. Introduction

In Ethiopia's arid agro-ecologies, pastoralism and agro-pastoralism are the predominant land-use systems based on livestock production. Together with each other, they account for 50% of the country's 114 million livestock, of which

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40% are cattle, 52% are sheep, 56% are goats, and 100% are camels [1].

The distribution and survival of cattle populations across the different agro-ecology of the country provide various use options to the smallholder farmers and pastoral communities. Milk, meat, income and other social functions are the main purposes for which cattle are kept for [2]. However, the productivity of these local cattle are low due to absence of genetic improvement interventions, low level of inputs, traditional husbandry practice as well as high environmental stress on which they are inhabited [3].

The Ethiopian Boran breed is one of the cattle breeds widely used in Ethiopia. The breed is well adapted to semi-arid tropical conditions, has a high degree of heat tolerance, is tolerant to many of the diseases prevailing in the tropics and has the ability to survive long periods of feed and water shortage [4]. These properties have genetic basis and have been acquired by natural and human selection over generations. They are all essential for successful animal production in the tropics. While only their superior beef production potential has been the focus of research in many tropical countries, much less has been devoted to look into their beef and milk production attributes in Ethiopia. Hence, the potential for both beef and milk production is poorly developed. However, the breed has been used as the preferred dam breed in most of the dairy cattle crossbreeding studies over the last decades. The Dida Tuyera station under the Oromia Agricultural Research Institute in the Borana rangelands is the only place where Ethiopian Boran pure breeding program is undertaken. Unfortunately, the Dida Tuyera station station doesn't have clear breeding objectives. The challenge for breeders in Ethiopia is to identify which breeding objective the breed has to be developed for, and design appropriate strategies for sustainable genetic improvement of the breed, without sacrificing its adaptation qualities [5].

Borana pastoralists are dealing with different types of livestock management practices like herd mobility, herd splitting, feeding and watering, and breeding which have direct and/or indirect influence on the productivity regardless of the variation in the magnitude and intensity [6]. Therefore, this study was designed with the following objectives.

Objectives:

1) To assess the traditional farming and breeding Practices of indigenous cattle breed at their native habitat.
2) To know productive and reproductive performance of indigenous Cattle Breed at their native habitat.

2. Material and Method

2.1. Study Area

The study was carried out in five grazing land escapes (Dire, Golbo, Gomole and Woyama) in the Borana, Oromia Regional State, Ethiopia, from September 2021 to June 2023. The Borena Zone is located in the Southern portion of Oromia Regional State at 3°26' - 6°32' N latitude to 36°43' - 40°46' E longitude [7].

2.2. Site Selection and Sampling Techniques

After a series of discussions, a multistage sampling technique was employed in gathering information on the purpose of keeping cattle, reproduction and production performance, husbandry practices. The first stage involved selecting all five types of grazing land escapes from the Borana zone. In the second stage from each grazing land escape two districts were selected from each of five grazing types purposively, based on the cattle population and security problem-free districts. Accordingly, two PAs were selected from each district randomly. In the third stage, each of the PA's eighteen cattle owner households was selected systematically. This led to the selection of 360 households based on cattle ownership and based on identified ethnic groups. Finally, semi-structured questionnaires were administered to capture data.

3. Results and Discussion

3.1. Types of Farming Activity, Herd Migration, and Reason for Migration

The majority of respondents (86%) reported that the type of their farming activity was pastoralist i.e. their livelihood depended almost solely on livestock production. The pastoralists migrate (move) with their herd from one grazing land to another during the dry season and drought for searching of feed and water (80%) it is locally termed a shift from 'warra to forra'. About 20% of respondents indicated that the migration was only for searching for feed (Table 1).

3.2. Trends of Crop Farming, Private Grazing Land, and Communal Grazing Land

Trends of crop farming, grazing land, and communal grazing land with their respective reasons are shown in (Table 1). According to the current study, the majority of respondents (87%) show that crop farming practices are an increasing trend. The main reasons for the increasing trend were food security and population increment with settlements. Moreover, the trend of private grazing land was decreasing trend. The main reasons for the decrease were human population increment (48%) and expansion of crop farming (32%) followed by bush encroachment (20%). Group discussion and respondents also indicated that communal grazing land (Kalo) was an increasing trend. The main causes of increment were government policy (38%) towards encouraging to use of communal grazing land as a means of feed conservation during dry season as well as increments in human population and settlements (33%) followed by crop farm expansion (29%). In general, though as grazing land as a whole is at a

decreasing trend, communal grazing land (Kalo) was at an increasing trend relative to private grazing land.

Table 1. *Types of farming activity, herd migration, trends of crop farming, private grazing land, and communal grazing land (Kalo) with their reason (%) in the study areas.*

Variables	Categories	All sample size (N=360)		Chi2 test	P-value
		Frequency	Percentage (%)		
Farming system	Pastoral system	310	86	42.62	0.001
	Agro- Pastoralist	50	14		
Is there herd migration	Yes	360	100		
Reason for migration	For only feed	288	80	40.07	0.002
	For feed + water	72	20		
Trends of crop farming	Increasing	313	87	61.05	0.002
	Decreasing	18	5		
	Stable	29	8	4.383	
Reason for increasing crop farming	For food security	187	52		0.802
	Population increment + settlement	173	48		
Trends of private grazing land	Decreasing	360	100		
Reason for decreasing private grazing land	Population increment + settlement	173	48	38.025	0.005
	Expansion of crop farming	115	32		
	Bush encroachment	72	20		
Trends of communal grazing land (kalo)	Increasing	324	90	61.032	0.001
	Decreasing	7	2		
	Stable	29	8		
Reason for increasing communal grazing land (kalo)	Population increment + settlement	119	33	8.372	0.509
	Expansion of crop farming	104	29		
	Government policy	137	38		

3.3. Purpose of Keeping Cattle

The purpose of keeping cattle in the study area is summarized in Table 2. Cattle provide draught power for cultivation, milk, income generation for the family, as well as wealthy status, prestige, and manure. Even though the primary purpose of Borana breed cattle was for beef, the results of this survey revealed that the primary and secondary purposes of keeping cattle were for milk (96%) and income is female while for income is both female and male cattle. This is mostly in agreement with the use of Begayit cattle whose main purpose was for milk production followed by use as a breeding animal and source of income [8].

Table 2. Purpose of keeping cattle (%) in the study area.

Purpose of keeping cattle	Dire (n=65)	Golbo (n=22)	Gomole (n=90)	Melbe (n=78)	Woyama (n=105)	Overall (N=360)	Rank
Milk	96.7	97.2	93.7	95.17	96.68	95.74	1st
Income	91	65	97.5	92.17	90.83	89.78	2nd
Meat	37.7	67.5	16.68	20.82	45.84	34.40	3rd
Wealthy Status	28.18	37.5	26.5	41.67	62.49	39.46	4th
Plough	28.18	7.5	41.66	50.01	12.51	30.25	5th
Ceremony	8.29	15	4.17	20.82	16.68	12.77	6th

3.4. Cattle Husbandry Practices in the Study Area

3.4.1. Feed and Feed Resources

The major feed resources for cattle in the study areas in the dry and rainy seasons are summarized in Table 3. Almost all respondents (99%) reported that the major feed resource during the wet season was natural pasture followed by salt (94%). This agreed with major feed in the wet season of Moyale [9]. Survey and focused group discussion also revealed that overall feed in the dry season were standing hay (kalo) (66%) tree branches (49%), acacia pods (48%), crop residue (22%), salt (21%) and concentrated feed (i.e is wheat bran) (15%).

Table 3. Major feed resources (%) during both dry and wet seasons in the study area.

Parameters'	Dire (n=65)	Golbo (n=22)	Gomole (n=90)	Melbe (n=78)	Woyama (n=105)	Overall (N=360)
Feed source in wet season						
Natural pasture	99	100	98	99	100	99.2
Salt	97	95	92	95	90.5	94
Feed source in dry season						
Standing hay (Kalo)	70	60	45.8	81.7	74.5	66.4
Tree branches	25.5	50	30.6	60	80	49.2
Acacia pods	35	45	40	54	70	48.8
Crop residue	25	-	46	30.5	8.4	22
Salt	23.5	30.6	20	16.7	15	21.2
Concentrate feed (wheat bran)	22	-	35.6	15	5	15.52

3.4.2. Water Source and Watering Frequency

Water source and watering frequency in the study area are explained in Table 4. The respondents revealed that the major water sources for their cattle were sourced from rainwater 80% while about 20% were sourced from ponds in the wet season. On the other hand the major water source during dry season were pond (60)% followed by dip well (32%) and the least was motor and hand pipe (8%).

As the respondents, the overall watering frequency of cattle was found to be (70%) any time required, (25%) once per day, and (5%) twice a day was reported in the wet season. While the overall watering frequency of cattle was found to be (77%) once per two days, (17.5%) once per three days (6%) was reported in the dry season (Table 4).

Table 4. Water source and watering frequency in wet and season for cattle in the study area.

Sources of water and watering frequency	Percent in the wet season	Percent in dry season
Source of water		
Rain water	80	-
Pond	20	60
Dip well	-	32
Motor & Hand pipe	-	8
watering frequency		
Any time required	70	-
Once a day	25	6
Twice a day	5	-
Once/ 2 days	-	76.5
Once/3 days	-	17.5

3.4.3. Housing of Cattle

All age and sex groups of cattle, except suckling calves were housed together during the night. In all five grazing land escapes pastoralists used open-fenced barns (Moonaa) that did not have roofing to shelter livestock. (Table 5).

Table 5. Housing type, culling, and castration practice in the study area.

Variables	Category	Frequency	Percent (%)	Chi2 test	P-value
Housing type	Open fenced (moonaa)	360	100		
Pastoralist use culling practice	Yes	350	97		
Reason for culling	Infertility	222	62	63.210	0.002
	Low mothering ability	50	14		
	Teat abnormality	55	15		
	Bad color (Black)	33	9		
Means of culling	By selling	330	92	65.644	0.001
	By slaughtering	30	8		
Pastoralist use castraction practice	Yes	32	9	70.112	0.001
	No	328	91		
Reason for not castrating	For high price	340	94	69.450	0.001
	For breeding	20	6		

3.4.4. Culling and Castration Practices

Reasons for culling and means of culling are shown in Table 5. Almost all of the pastoralists (98%) practiced culling of animals. The majority of respondents indicated that the major reason for culling was infertility (69%) which was followed by low mothering ability, while the least reason for culling was teat abnormal ability (mastitis) (8%) and bad coat color of cattle (6%). Most respondents (93%) explained that the means of culling was by selling (93%). This finding also showed that about 91% of respondents did not practice castration. The main reason for not castrating their bulls was to get a high price when sold. (Table 5).

3.4.5. Common Cattle Disease in the Study Area

Respondents and focus group discussion indicated that the prevalence of common diseases was explained in Table 6. According to multiple-response analysis, the most prevalent disease was CBPP followed by FMD in all districts except Melbe where Triponomiasis ranked first.

Table 6. Major prevalence of cattle diseases in the study areas.

Disease type	Dire (n=65) priority					Golbo (n=22) Priority					Gomole (90) priority				
	R1	R2	R3	I	rank	R1	R2	R3	I	rank	R1	R2	R3	I	rank
FMD	15	32	10	0.31	2	4	10	8	0.10	2	22	35	33	0.31	2
CBPP	35	10	20	0.37	1	11	3	4	0.11	1	38	20	25	0.33	1
Blackleg	4	8	23	0.13	3	2	3	4	0.04	3	18	15	11	0.18	3
Pasterolosis	4	4	4	0.06	4	1	2	3	0.03	4	7	8	12	0.09	4
Heartwater	3	4	3	0.05	5	1	2	2	0.02	5	2	5	4	0.04	5
Liver disease	2	4	2	0.04	6	1	1	1	0.02	6	1	4	2	0.02	6
Buta	1	2	2	0.02	7	1	1	0	0.01	7	1	2	2	0.02	7
Diarrhea	1	1	1	0.02	8	1	0	0	0.01	8	1	1	1	0.01	8
Traponomiasis	0	0	0	0.00	9	0	0	0	0.00	9	0	0	0	0.00	9

Table 6. Continued.

Disease type	Melbe (n=78) Priority					Woyama (n=105) priority				
	R1	R2	R3	I	Rank	R1	R2	R3	I	rank
FMD	7	8	11	0.10	5	25	45	35	0.32	2
CBPP	11	14	11	0.15	2	44	25	34	0.34	1
Blackleg	6	8	7	0.09	6	12	13	13	0.12	3
Pasterolosis	8	9	15	0.12	3	8	8	8	0.08	4
Heartwater	1	2	2	0.02	8	6	6	7	0.06	5
Liver disease	7	9	10	0.10	4	6	5	4	0.05	6
Buta	2	2	3	0.03	7	5	0	0	0.02	8
Diarrhea	1	1	1	0.01	9	4	3	4	0.03	7
Traponomiasis	35	25	18	0.37	1	0	0	0	0.00	9

FMD= Foot and Mouth Disease, CBPP=Contagious bovine pleuropneumonia.

3.5. Productive and Reproductive Performance of Borana Cattle in the Study Area

The reproductive and Productive Performance of Borana Cattle is shown in Table 7. According to this finding, the mean milk yield of Borana cattle was 0.30 ± 0.18 and 1.50 ± 0.78 litter per day in dry and wet seasons respectively. This finding was lower than the report of [10], which stated that the average daily milk per cow was 1.85 during the wet season and 0.35 liter during the dry season of the lowland land area Borana zone. The finding also lower than the finding of [11] and [12], which stated that average milk yield of Borana cow fed hay supplemented with various levels of energy was 2.21±0.42 liter/day and average milk off-take of Guraghe highland cows was 1.7±0.02 liter/cow/day respectively. In the present study, the overall mean for Age of sexual maturity of males and females was 5.20 ± 0.34 and 4.04 ± 1.80 respectively, while the mean average age at first calving and calving interval was 5.05 ± 0.24 and 2.25 ± 0.33 respectively. This finding is also lower than the finding of [5], which indicated that Aga at first calving and calving interval of Borana cattle was 3.56 years and 1.22 years respectively. The Reproductive lifetime of males and females was 8.18 ± 2.48 and 10.07 ±2.64 respectively.

Table 7. *Some productive and reproductive performance of cattle in the study areas.*

Traits	N	Mean (±SD)	Min.	Max.
Daily milk yield during the dry season (ltr)	324	0.30 ±0.18	0	1
Daily milk yield during the wet season (ltr)	324	1.50 ±0.78	1	2.33
Age of sexual maturity of male (Years)	320	5.20 ±0.34	3	6.50
Age of sexual maturity of female (Years)	324	4.04 ±1.80	3	5
Age at first calving (Years)	316	5.05 ±0.24	4.2	5.9
Calving intervals (Years)	324	2.25 ±0.33	1	3.50
Reproductive lifetime of male (Years)	323	8.18 ±2.48	4	14
Reproductive lifetime of female (Years)	321	10.07 ±2.64	5	16

3.6. Cattle Breeding Practices in the Study Area

3.6.1. Selection Criteria for Breeding Cattle

The selection criteria of female and male cattle in the study were presented in Table 8 and Table 9 respectively. Respondents with focus group discussions from all grazing land escapes indicated that the pastoral communities in the area have indigenous knowledge for setting selection criteria to select breeding animals. According to multiple-response analysis, the overall major selection criteria traits of breeding females were body size and confirmation (large body size), coat color, milk yield, and family history with an index of 0.37, 0.24, 0.15, and 0.11 respectively. Similarly, the major traits considered by the respondents for the selection of breeding males were body size and confirmation (large body size), coat color, family history, and horn with an index of 0.36, 0.23, 0.14, and 0.9 respectively. This study is in line with the finding of [6] that indicated primary and secondary criteria used to select breeding bulls' body size, and body conformation respectively for the Horro cattle breed.

Table 8. *Selection criteria for breeding female.*

G/ landscape	Selection criteria	1st criteria	2nd criteria	3rd Criteria	Index
Dire	Body size and conformation	37	20	15	0.38
	Coat Color	15	27	28	0.29
	Milk yield	8	10	11	0.13
	Family history	5	7	8	0.09
	Udder size	4	4	5	0.06

G/ landscape	Selection criteria	1st criteria	2nd criteria	3rd Criteria	Index
	Horn (short)	2	2	3	0.03
	Teat normality	1	2	2	0.02
Golbo	Body size and conformation	1	2	2	0.36
	Coat Color	18	20	22	0.27
	Milk yield	10	12	14	0.16
	Family history	8	6	6	0.10
	Udder size	2	4	6	0.05
	Horn (short)	4	6	6	0.07
	Teat normality	0	0	0	0.00
Gomole	Body size and conformation	30	22	20	0.36
	Coat Color	16	24	25	0.28
	Milk yield	10	10	12	0.14
	Family history	7	7	7	0.10
	Udder size	4	4	4	0.06
	Horn (short)	3	4	3	0.05
	Teat normality	2	1	1	0.02
Malbe	Body size and conformation	30	24	18	0.36
	Coat Color	11	12	13	0.16
	Milk yield	14	16	19	0.22
	Family history	9	10	11	0.13
	Udder size	6	6	7	0.09
	Horn (short)	2	4	4	0.04
	Teat normality	0	0	0	0.00
Woyama	Body size and conformation	32	21	19	0.36
	Coat Color	13	15	16	0.20
	Milk yield	6	8	9	0.10
	Family history	9	10	11	0.13
	Udder size	5	7	9	0.09
	Horn (short)	4	6	8	0.07
	Teat normality	3	5	0	0.04
Overall	Body size and conformation	159	111	90	0.37
	Coat Color	73	98	104	0.24
	Milk yield	48	56	65	0.15
	Family history	38	40	43	0.11
	Udder size	21	25	31	0.07
	Horn (short)	15	22	24	0.05
	Teat normality	6	8	3	0.02

Table 9. *Selection criteria for breeding male.*

G/ landscape	Selection criteria	1st criteria	2nd criteria	3rd Criteria	Index
Dire	Body size and conformation	33	21	18	0.37
	Color	13	16	18	0.21
	Family history	6	8	8	0.10
	Growth rate	9	11	12	0.14
	Libido	3	5	4	0.05
	Horn	5	6	8	0.08
	long sheath	2	4	4	0.04
Golbo	Body size and conformation	30	24	18	0.36
	Color	14	16	16	0.21
	Family history	10	10	12	0.14
	Growth rate	4	6	5	0.07
	Libido	4	6	6	0.07
	Horn	8	8	10	0.12
	long sheath	2	2	5	0.03
Gomole	Body size and conformation	20	19	18	0.27
	Color	29	24	21	0.36
	Family history	8	8	10	0.12
	Growth rate	2	5	6	0.05
	Libido	3	5	5	0.06
	Horn	5	6	6	0.08
	long sheath	4	4	4	0.06
Malbe	Body size and conformation	34	20	18	0.37
	Color	10	14	17	0.17
	Family history	11	16	18	0.19
	Growth rate	4	4	3	0.05
	Libido	5	5	7	0.07
	Horn	6	8	9	0.10
	long sheath	2	2	0	0.02
Woyama	Body size and conformation	41	23	8	0.41
	Color	10	16	20	0.19
	Family history	8	13	14	0.15
	Growth rate	5	6	9	0.08
	Libido	3	6	9	0.07
	Horn	5	8	11	0.10
	long sheath	0	0	1	0.00
Overall	Body size and conformation	158	107	80	0.36
	Color	76	86	92	0.23

G/ landscape	Selection criteria	1st criteria	2nd criteria	3rd Criteria	Index
	Family history	43	55	62	0.14
	Growth rate	24	32	35	0.08
	Libido	18	27	31	0.06
	Horn	29	36	44	0.09
	long sheath	10	12	14	0.03

3.6.2. Sources of Bull, Purpose of Bull Keeping and Mating System in the Study Areas

Sources of bull, Purpose of bull keeping, and mating system in the study areas are shown in (Table 10). Respondents indicated that about (59%) indicated that their bull source was from their herd (45%) from neighbors and (12%) from through buying. The majority of Respondents (83%) indicated that the main purpose of keeping bull was for breeding purposes while the least was for daft power. mating type were (86%) uncontrolled seasonal natural The respondents revealed that mating (13%) uncontrolled no seasonal natural mating and (8%) controlled seasonal natural mating. All respondents with group discussion indicated that they allow their bull to mate with his relatives. The main reason was, that they didn't know about the effects of inbreeding.

Table 10. *Sources of bull, Purpose of bull keeping and mating system in the study areas.*

Grazing land escapes	Dire (n=65)	Golbo (n=22)	Gomole (n=90)	Malbe (n=78)	Woyama (n=105)	Overall (N=360)
Sources of breeding bull						
From own herd	63.33	53.33	65.83	58	52.5	59
From Neighbor	43.89	50.5	39.60	47	45	45.3
Through Purchasing	5.56	11.11	8.33	2.78	12.5	12.35
Purpose of keeping bull						
For breeding	87	83	75	78	91	83
For selling	30	20	45	40	25	32
For draft power	21	10	40	23	15	22
Mating System					45	
Uncontrolled, no seasonal natural mating	10	15	12	20	17	13
un controlled, seasonal natural mating	82.2	80	88	87	90	85.7
Controlled seasonal natural mating	8	7	9	5	7	7.5
Did you allow the bull to mate with his relatives						
Yes	100	100	100	98.6	100	99.7

3.6.3. Effective Population Size and Inbreeding Coefficient

The most crucial factors are the effective population size and inbreeding ratio since there is a chance that the breeding cows in the study areas will occasionally mate next to the same bull or a closely related bull when grazing, housing, or watering. To compute the Effective population size in the current study, the ratio (number) of male-to-female cattle held by the pastoralists was employed. Thus, with effective population numbers of 45.5, 39.5, 43.15, 40.2, and 37 and correspondingly, the population's inbreeding coefficient was found

to be 0.0110, 0.0127, 0.0116, 0.0124, and 0.0135% at Gomole, Dirre, Golbo, and Woyema grazing areas (Dheedaas) respectively.

(Table 11). The combined (mixed) population's inbreeding coefficient was found to be 0.0013, 0.0016, and 0.0017%, with effective population sizes of 370.8, 327.6, 536.4, 309.6, and 374.4 respectively in the grazing types, which was calculated methodically from the total cattle owned per household by subtracting the number of bulls owned per household from the total herd owned per household gave number of breeding female cow and the total number of bulls owned per the small. The current result was less than the findings of [13], which stated that Mursi cattle made up 0.06% of the effective population size of the mixed herd 911.3. In general, the minimum effective population size should fall between 30 and 250 to minimize inbreeding depression and maximize fitness gains through natural selection. As a result, the inbreeding rate in the study areas is lower than the top allowable limit of 0.063 [14].Though the inbreeding coefficient was low for the current study, the pastoralists did highly practiced uncontrolled mating type that the bull was allowed to mate his mother, daughter, and sister as indicated above in Table 10. This result was agreed with [15], who stated that Even though the inbreeding coefficient was low the communities did not have an awareness about the merits of controlled mating. Even, the bull was allowed to mate his mother, daughter, and sister which were dangerous phenomena of causing inbreeding in the population cattle of Benishangul-Gumuz.

Table 11. *Effective population size and level of inbreeding in the study areas.*

Herd		Gomole	Dirre	Golbo	Melbe	Woyema	Overall
Herd mean per household	Nf	9.1	7.9	8.63	8.04	7.4	35.15
	Nm	1.03	0.91	1.49	0.86	1.04	4.498
	Ne	45.5	39.5	43.15	40.2	37	175.75
	ΔF (%)	0.0110	0.0127	0.0116	0.0124	0.0135	0.0028
Mixed herd	Nf	655.2	568.8	621.36	578.88	532.8	2530.8
	Nm	74.16	65.52	107.28	61.92	74.88	323.86
	Ne	370.8	327.6	536.4	309.6	374.4	1619.3
	ΔF (%)	0.0013	0.0015	0.0009	0.0016	0.0013	0.0003

Where, Nf= Number of breeding females, Nm =breeding male, Ne= effective population size. ΔF= coefficient of in-breeding.

4. Conclusion and Recommendation

The majority of respondents reported that the types of their farming activity were pastoralist i.e. their livelihood depended almost on livestock production, Even though crop farming practices is an increasing trend. Despite being primarily used for beef, the majority of Borana cattle were used for milk and income, with female cattle used for milk production and both for income. The study reveals that pastoral communities in the area have indigenous knowledge for setting selection criteria for breeding cattle with major traits such as body size, coat color, milk yield, and family history though the inbreeding coefficient was low for the current study most respondents identified of mating types as uncontrolled seasonal with natural mating and high degree of inbreeding. In general, the finding stated that lower productive and reproductive performance as well as lower for most quantitate measurements from previous work done within the same areas of study. The following recommendation stated:

In the current finding, milk yield and fast growth of males can be identified as the two most important traits of Borana cattle. Therefore, these traits and associated traits like adaptation and reproductive performances need to be incorporated in designing a breeding program for the improvement of Borana cattle.

Even though the inbreeding coefficient was low for the current study most respondents with the focus group identified mating types as uncontrolled mating and a high degree of inbreeding allowing the bull to mate with his dam, sister and daughter which leads to low productivity. Thus repeated training on awareness creation should implemented for pastoral communities about merits and de merits of controlled mating and inbreeding respectively, by all stakeholders in the study area.

Abbreviations

ACTESA	Alliance for Commodity Trade in Eastern and Southern Africa
CBPP	Contagious Bovine Pleuropneumonia
FMD	Foot and Mouth Disease

Nf	Number of Breeding Females
Nm	Number of Breeding Male
Ne	Effective Population Size

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Conflicts of Interest

The authors declare no conflicts of interest.

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