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Pastoralists Dairy Cattle Breeding and Reproductive Performance Evaluation Indigenous Knowledge in West Guji, Ethiopia

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***Abstract*:** Pastoralists practice extensive communal systems of animal husbandry and have their own experiences and knowledge as well as culture about livestock that fit well with their type of livestock husbandry. The objectives of this study were to assess pastoral indigenous knowledge of dairy cattle breeding and reproductive performance evaluation practices in Ethiopia. The study areas and dairy cattle-rearing households were purposively and randomly selected, respectively. The traits pastoralists use for best dairy cattle selection were body conformation, age, and coat color as well as milk yield and pedigree performance. Further, pastoralists use Birth frequency, calf growth rate, and fertility traits for best dairy cattle production. Age at first service, Age at first calving, calving interval, Days open, and Number of services pre-conception number were parameters used for reproductive performance evaluation. In general, the breeding practices and reproductive performance evaluation practiced in the areas depended on indigenous knowledge without performance recording. Therefore, supporting the indigenous knowledge of the pastoralists with science will be the best option for genetic improvement, and increasing the production and productivity of livestock is recommended.

Keywords: Dairy cattle, Breeding practices, Reproduction performance, Evaluation practice

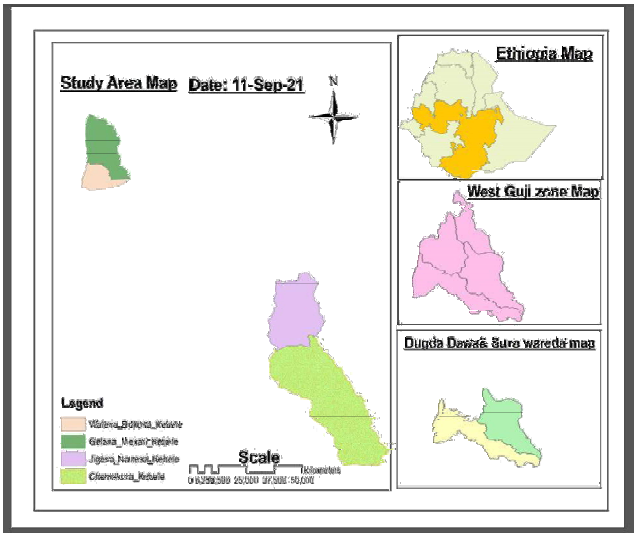
Ethiopia has the largest livestock population in Africa. Livestock is an integral part of agriculture, accounting for about 45 percent of the total value of agricultural production and supporting the livelihoods of a large share of the population around more than 14 million households or 70 percent of the population keep livestock, including many poor (FAO 2019). Cattle are kept for milk, meat, income, and other social functions. However, local cattle are poor in production due to the absence of genetic improvement interventions, low level of inputs, traditional husbandry practices as well as high environmental stress on which they are inhabited (Azage et al 2009; 2010). Nevertheless, the breeds have desirable traits for which they are preferred by the keepers and produce subsistence amounts within the existing challenges that might face pastoralists due to natural, social, economic, and political factors. Pastoralists with their long tradition of animal breeding and daily interaction with their herds, have knowledge of their animals, their needs, and their surroundings and they are privy to important information. They use traditional systems of population classification to know the qualities and the family history of animals in their herd (Ayan et al 2007, Krätli 2008). In modern production systems, ranking and selection of livestock are essential for obtaining animals for breeding but the effects of ranking and selection of livestock in pastoral systems are not well understood (Rege et al 2001). However, Pastoralists rely significantly on indigenous knowledge to memorize events and activities in a sequential way to acknowledge individual animals and ancestors' performance. Hence, pastoralists also use phenotypic traits like coat color, body size, horn shape, and udder size to select dairy cattle which has the best performance without any recorded data. However, pastoralists' indigenous knowledge regarding breeding and reproductive performance evaluation practices of dairy cattle has a scarcity of information on recording and documenting in general. Therefore, this research was designed to assess pastoralists' indigenous knowledge of dairy cattle breeding and reproductive performance evaluation practices at the West Guji zone.

MATERIAL AND METHODS

Study area: The study was conducted at Dugda Dawa and Suro Barguda Districts of West Guji zone, Oromia regional state, Ethiopia. The zone has a total population of 141,579 and is located between 38°-40° East longitude and latitude 4°_5° on the North and the altitude ranges from 500m up to 3500 m.a. s.l. The climatic condition of the West Guji zone is characterized by Dega (33%), Weina Dega (47%), and Kola (20%). The mean annual rainfall of the Zone is about 900mm and the annual temperature of the Zone is 25^0 C (WGLEPO, 2012).

Sampling techniques and sample size: The study employed a cross-sectional research design anda two-stage sampling technique was employed to select sample

respondents. The study areas were selected based on accessibility and potential of dairy cattle production and two (2) kebeles /villages from each district were purposively selected. From a total of 50,596 households or dairy producers having lactating cows, 100 households (52 HHs from Dugda Dawa and 48 HHs from Suro Barguda) were selected according to Bowley (1926).



ni = nNi

Where: i= 1, 2, 3, ni represents the sample size of i^{th} strata, n represents the total sample size,

Ni represents the population size of the i^{th} strata and N represents the total population size

The study employed both primary and secondary data. The sample respondents and key informant interviews yielded qualitative and quantitative primary data. Surveys were conducted with 100 cattle pastoralists who had at least four dairy cattle and more than 10 years of cattle husbandry experience from December to February 2021 using a semi-structured questionnaire. The questionnaire was prepared in English and translated to Afan Oromo (Local language) and pretested and administered to address the description of socioeconomic characteristics of pastoral households, herd structures, and other types of livestock kept. A key informant interview (Focal group discussion) with 8-10 members was held at each kebele/village. Focus group discussion (FGD) was focused on the pastoralist's knowledge of reproductive performance evaluation, practices and history of their dairy cows, age at first service, major sources of their income, and reasons for culling breeding bulls, etc. Secondary data was collected from the district office of agriculture, CSA, and other published and unpublished documents.

Data analysis: The data werecollected coded, organized, and entered into Microsoft Excel (2007). The coded and summarized data were later imported into the Statistical Package for Social Sciences (SPSS, version 24). Inferential statistics like the chi-square test and Z test were employed for socio-economic and significance, respectively.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents: The majority (78%) of the respondents were men andwere considered as owners of the resources like livestock and land assets, and responsible for the grazing decisions in the pastoral community (Table 1). This was due to culturally the women were not allowed to own pastoral assets. Therefore, their accessand activities were regulated and controlled by their husbands or fathers. Abraham et al (2022), Blench (2001), and Ngowi et al (2008) reported that pastoral women are forbidden from owning livestock, although they perform routine livestock practices including herding, milking, milk processing and selling of dairy products, calves and small ruminants rearing. Further, the children's duties were not so distinct from those of their parents, especially women; they performed herding/grazing, rearing of calves, and attention to sick animals, and small ruminants. In this regard, the division of labor and allocation of functions were based on age and gender, as previously observed by Blench (2001), Tadesse et al (2015), Homewood (2018) and Abraham et al (2022). Household members are encouraged to marry for the continuity of family lineage and labor, and, as such, about 92.95% of the respondents were married. The overall age of the respondents indicated between 30-45 years old, followed by 46-60 years old. However, the results show a significant difference at age 16-29 and above 60. Blench (2001). Otteand Chilonda (2002) reported that most pastoralists leading herds are strong and very active people. Moreover, the educational statuses of the respondents were literate. With the presence of primary and secondary schools in the village, the respondents were optimistic about improved educational status. Abreham et al (2022) also observed that literacy is usually higher among agropastoral communities than in pastoralist ones. In addition, Ocaido et al (2005) observed a 62.9% literacy level among the agropastoral communities of Serere County in Uganda. Moreover, illiteracy was high among the Maasai pastoralists of RAP land village as the majority of the respondents (54%) had never been to school. This is commonly observed among mobile pastoral communities (Abreham et al 2022).

Livestock holding composition: The pastoralists kept indigenous breeds of cattle, sheep, goats, donkeys, camels, and chickens under extensive systems. The main objectives of multi-species rearing were to produce a range of products (meat, milk), and minimize risks emanating from droughts,

famines, and floods, owing to their varying degree of coping with the challenges. Among the livestock species, cattle dominate the proportions. This implies pastoralists are cattle-based. Similarly observed among pastoralists of the Oyo area of Southwest Nigeria (Daodu et al 2009). Pastoralists kept cattle purposely for milk production, essential food, an income source for pastoral households, and herd replacement. Mgongo et al (2014) also observed a similar trend in cattle rearing for the provision of milk for households Iyayi et al (2003), reported that female cattle usually dominate the herd because they are reserved for breeding and milk production with few bulls retained to replace those sold. Small ruminants were also among the livestock species reared by pastoralists. Accordingly, the small ruminant flock size kept per household was 9.9in the study areas. The higher composition of small ruminants is attributed to ease of

Table 1. Socio-economic characteristics of the respondents

Variables	Districts				Overall (N=100)	P-value (*P*<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
Sex of the respondents	F	(%)	F	(%)	(%)	
Male	40	78.8	35	77.1	78.0	0.83
Female	12	21.2	13	22.9	22.0	
Average family size		(Mean±SE)		(Mean±SE)	(Mean±SE)	
16-29 years		1.96±0.18		1.29±0.13	1.72±0.12	0.01*
30-45 years		4.43±0.28		4.36±0.22	4.40±0.18	0.86
46- 60 years		2.53±0.20		2.14±0.11	2.34±0.12	0.10
Above 60 years		1.67±0.17		1.00±0.00	1.43±0.14	0.01*
Age of the respondent (Mean ± SE)		47.25±1.89		43.48±1.64	45.44±1.27	0.14
Marital status	F	(%)	F	(%)	(%)	
Single	3	5.8	5	8.3	7.05	0.93
Married	49	94.2	43	91.7	92.95	
Divorced	0	0	0	0	0	
Widowed	0	0	0	0	0	
Educational status						
Illiterate	25	47.8	17	35.4	41.6	0.53
Basic education	5	9.6	7	14.6	12.1	
Grade 1-8	16	41.1	18	37.5	34.30	
Grade 9-12	4	7.7	6	12.5	10.0	
College	2	3.8	0	0.0	2.0	

F**=** frequency of respondents N= number of respondents SE= standard error **= significance (***P***<0.05)

Table 2. Livestock holding of households in the study areas (Mean ± SE)

Species	Districts		Overall	P-value (*p*<0.05)
	Dugda Dawa	Suro Barguda		
Oxen	3.02±0.18	2.82±0.18	2.92±0.13	0.43
Cow	9.25±0.67	5.92±0.47	7.65±0.45	0.00**
Chicken	8.85±0.82	13.0±1.16	11.2±0.8	0.01**
Sheep	2.75±0.48	2.70±0.36	2.71±0.29	0.94
Goat	6.29±0.57	8.05±0.67	7.21±0.45	0.05
Donkey	1.46±0.13	2.16±0.20	1.86±0.14	0.01**
Camels	4.26±0.5	3.45±0.03	3.86±0.27	0.08

management and adaptive nature to bushy vegetation. The pastoralists reared small ruminants for immediate cash income, mutton, as well as cultural ceremonies.

Dairy cattle management: The majority (66.7%) of the pastoralists preferred culling as a stock management system. Pastoralists culled aged dairy cattle, with poor body

Table 3. Dairy cattle culling and housing system in the study areas

Variable	Districts				Overall (N=100)	P-value (P<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
Preferring culling for stock management	F	(%)	F	(%)		
Yes	30	57.7	32	66.7	62.2	0.17
No	22	42.3	16	33.3	37.8	
Housing						
Yes	52	100	48	100	100	0.61
No	0.0	0.0		0.0	0.0	
Types of houses						
Open barn	40	76.9	40	83.3	80.1	0.51
beside with family	12	23.1	8	16.7	19.90	
Isolated pen	0.0	0.00		0.00	0.00	

F= frequency of respondents N= number of respondents

Table 4. Dairy cattle diseases and treatment methods

Variable	Districts				Overall (N=100)	P-value (P<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
Major dairy cattle disease	F	(%)	F	(%)		
Bacterial diseases						
Anthrax	4	7.6	3	5.1	6.35	0.1
Blackleg	9	16.52	10	20.1	18.31	0.05
Mastitis	10	20.4	8	18.6	19.5	0.12
Brucellosis	2	4.2	4	8.8	6.5	0.06
Contagious bovine pleuropneumonia	19	36.2	14	29.8	33	0.07
Pneumonic Pasteurellosis	8	15.08	9	17.6	16.34	0.2
Viral diseases						
Foot and mouth disease	12	21.7	17	34.2	27.95	0.11
Lumpy skin disease	40	78.3	31	65.8	72.05	0.06
Parasitic Infestation						
Internal Parasites						
Lice and ticks	40	76.2	40	80.3	78.25	0.18
Flea	12	23.8	8	19.7	21.75	0.06
External parasites						
Lungworm	35	66.8	28	58.7	62.75	0.05
liver flukes	17	33.2	20	41.3	37.25	0.10
Treatment methods						
Treat animals at home using traditional medicine	40	76	41	78.2	77.1	0.14
Burning external parts of livestock		20.8		18.2	19.5	0.21
Using herbal remedies		55.2		60.0	57.6	0.13
Taking the animal to the veterinary clinic	12	24	7	21.8	22.9	0.07

F= frequency of respondents N= number of respondents

condition, lower milk yield, and poor fertility. All the respondents provide different types of shelter for their dairy cattle. The 80.1 and 19.90% of respondents mentioned they use open barns and beside family houses, respectively. Moreover, pastoralists housed dairy beside families when animals aged and unhealthy. The current result was agreed with report Tegegne et al (2013) that the type of housing provided for dairy varied depending upon the classes of dairy animals, agroecology, production system, and physiological stage of dairy animals.

Among the bacterial diseases, Contagious bovine pleuropneumonia was the major (36.2%) and (29.8) disease prevalence in Dugda Dawa and Suro Barguda Districts, respectively. Ayalew (2020) reported that ectoparasites were prioritized to be the most important animal health challenges of cattle in the Lalibela, Sekota and Ziquala Districts of Amhara Region. The difference might be due to the agroecology of where the community rear their livestock. Similarly, Lumpy skin disease was the most existing viral disease with 78.3% in Dugda Dawa and 68.5% in Suro Barguda districts. Besides, parasitic infection diseases both internal and external parasites existed in the study areas. The major internal parasites (78.25%) Lice and Ticks and external parasites Lung worms were the higher existed with (62.75%) in both study areas.

All the respondents vaccinated their animals against rinder pest, anthrax, and foot and mouth diseases with routine medication like antibiotics, multivitamins, and dew ormer administered or traditionally at home. The majority of pastoralists (77.1%) treat diseased animals using traditional herbal remedies (57.6%) and the burning of external parts of cattle (19.5%) in both study areas. Herbal roots and leaves of local plants are used for treating diseased cattle. Bryouy et al (2020) also reported that a range of traditional and biomedical methods were applied by livestock keepers to prevent or treat disease and to promote health. Traditional treatments included herbal preparations that were administered as a drench, intra-nasally or topically and substances such as salt, animal fat, butter, honey, kerosene, or diesel that were applied topically.

Qualitative and Quantitative traits of dairy cattle selection: The major color of dairy cattle that existed in both districts was white (91.5%) and the least frequented color was black (Tables 6 and 7). This was due to the adaptation of white-colored dairy cattle to the agroecology of the study areas. Alphonsus *et al.,* (2012) also reported that white Fulani cattle in Nigeria were selected for their genetic predisposition of hardiness, heat tolerance, and adaptation to local conditions. The colors of the coat pattern were dominated by plain coat color. Similarly, the horn shapes of dairy cattle in study areas were polled. The shiny or smooth hair type helps the cattle tolerate heat. Dikmen et al (2008) also reported that smooth (slick-haired) Holstein cows can regulate body temperature more effectively than wild-type cows during heat stress and are better able to regulate body temperature by increasing sweating rate. Besides, ear shape and hair type were the rounded ear shape and shiny hair type. The conical-humped dairy and medium size humped cattle were dominant in the study areas. In addition, large (60.0) and medium (25.0) udder size dairy cattle were highly observed in the districts. Dairy cattle were selected depending on type; growth rate, body size and composition; efficiency of feed

Table 5. Qualitative traits that aid in the selection of dairy cattle in the study areas

List of traits	Districts				Overall (N=100)	P-value (P<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
	F	(%)	F	(%)		
Preferred color						
Brownish	34	65.4	35	70.3	67.8	0.8
White	18	35.6	13	29.7	33.2	0.2
Coat color						
Plain	34	64.5	34	68.8	66.65	0.14
Spotted	18	35.5	14	31.2	33.35	0.6
Horn shape						
Polled	30	56.2	30	62.4	59.30	0.7
Straight short	22	43.8	18	37.6	40.70	0.12
Hair type						
Shiny	41	79.9	41	85.6	82.75	0.71
Coarse	11	20.1	7	14.4	17.25	0.06

F= frequency of respondents N= number of respondents

utilization, and disease resistance. The finding showed that medium navel size, medium tail size, and large dewlap size of dairy cattle were dominant and preferable by the pastoralists. The main objective of assessing the traits was to compare the preference of pastoralists with the distribution of existing dairy cattle qualitative and quantitative traits.

Qualitative traits: Pastoralists used indigenous knowledge to remember and rank the animals by naming the animalas well as the phenotypic characteristics of the animal. Accordingly, pastoralists prefer brownish color and white color dairy cattle due to market value and ability to adapt to the environment. McManus et al (2009) also observed that light/white-colored animals are recognized as being advantageous in hot tropical regions as they reflect 50-60% of direct solar radiation compared with dark-colored animals. Similarly, pastoralists preferred plain and spotted coat color pattern cattle. Thus, about 64.5% of respondents from Dugda Dawa and 68.8% from Suro Barguda districts preferred plain coat color pattern followed by spotted coat color pattern which accounts for 35.5 and 31.2% from Dugda Dawa and Suro Barguda districts, respectively. The horn shape and size were other traits preferred for best dairy cattle selection. The pastoralists believed that cattle with polled horns and straight short horns were docile and less risky cattle. However, because of the size of herds involved, pastoralists lose track of the lineage, making the recording system full of errors. Kugonza et al (2012a) pointed outthat in small herds under uneventful settings, the pastoral mental recording was very accurate.

Quantitative traits: The traits pastoralists used for dairy cattle for breeding were hump size, udder, and teat size which were highly preferred traits by pastoralists for the selection of dairy cattle in the study areas. In addition, there were other traits that pastoralists used for selection. Accordingly, pastoralists preferred cattle with medium and large size udder dairy cattle and teat size. Pastoralists experienced cattle with medium and large udder sizes were high potential for milk. They experienced that the teat size of selected dairy cattle during milking and weaning time was large while the non-selected teat size of dairy cattle was small in size (Table 7) Yakubu (2011) also observed strong positive correlation of milk off-take with udder size in both Fogera and Dembia cattle. However, Atkins et al (2008) reported a large udder does not always mean high milk yield. Similarly, cattle with medium and large-sized teats of cattle were preferred for their suitability during milking. Furthermore, pastoralists preferred cattle with shiny hair types and coarse hair types. Besides, navel, tail, and dewlap were used as a criterion to select good dairy cattle breeds by pastoralists. This is because pastoralists believe that cattle with medium and large sizes of navel, tail, and dewlap have high reproductive and productive performance. The current finding was in line

Table 6. Quantitative traits that aid in the selection of dairy cattle in the study

List of traits	Districts				Overall (N=100)	P-value (P<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
	F	(%)	F	(%)		
Hump size						
Small	43	82.3	38	76.8	79.55	0.09
Medium	9	17.7	10	23.2	20.45	0.3
Udder size						
Medium	8	13.6	8	17.2	15.4	0.5
Large	44	86.4	40	82.8	84.6	0.4
Teat size						
Medium	8	14.5	5	10.8	12.65	0.1
Large	44	85.5	43	89.2	87.35	0.07
Navel length						
Medium	2	3.8	1	2.7	3.25	0.05
Large	50	96.2	47	97.3	96.75	0.7
Dewlap						
Length						
Medium	3	4.7	2	5.6	5.15	0.07
Large	49	95.3	46	94.4	94.85	0.4

F= frequency of respondents N= number of respondents

with Zewdu (2004) where cattle keepers in their traditional breeding practices use teat size, navel, and dewlap length as criteria to select animals for breeding. However, Zewdu et al (2006) reported that in some indigenous cattle populations of north-western Ethiopia, those criteria were used as indirect indicators of suitability for milk production and as criteria for identifying desirable breeding stock. Additionally, milk pot is a material that pastoralists use for better milk yield and performance animals. Accordingly, they believe that dairy cattle providing 3.5L of milk using traditional material is the best breed.

Pastoralists' dairy cattle breeding practices: The majority of the respondents select the best dairy cow based on qualitative and quantitative traits they experienced (Table 8). Accordingly, color, back profile, tail, head profile, and dewlap were the traits used for selection. The genetic improvement method practiced in the study areas was the natural mating method. The pastoralists know heifers reach for the mating/estrous stage by observing signs such as climbing of male, white-like liquid on her vulva, and vulva size and smoothness. This knowledge helps the pastoralists to reduce inbreeding bulls from outside of herds. Pastoralists keep breeding bulls for long periods as animals raised within the herds. Thus, keeping bulls for a long period led the bulls infertile. Kashoma et al (2010) also reported that in pastoral herds in the nearby district of Mvomelo (Kambala village) in the Morogoro region; up to 65% of bulls in pastoral herds were infertile. This strongly indicated thatthe non-culling of bulls contributes to the keeping of infertile bulls and the poor reproduction performance of pastoral herds. This might show that infertility of bulls resulted from old age and weakness of sperm motility. However, artificial insemination (AI) service) was not used for genetic improvement in the study areas. This was due to; the inaccessibility of AI services and lack of awareness of AI.

Reproductive performance evaluation practices: The dairy cattle reproductive performance evaluation practiced by respondents in the study areas is presented in Table 9.

Age at first service: Age at first service is the age at which heifers attain body condition and sexual maturity for service for the first time and were 3.16 and 3.05 at Dugda Dawa and Suro Barguda, respectively. This finding states that the average AFS in both districts were insignificant. This was as reported by Amin et al (2013) of red Chittagong cattle in Bangladesh (3.35 years). The difference might be due to management, genetic make-up of breed, and agroecology of the areas.

Age at first calving: Age at first calving determines the beginning of the cow's productive life and influences her lifetime productivity. The lengthy age at first calving decreased the lifetime production performances of dairy cattle. Hence, the overall age at first calving of the heifer in

Table 7. Pastoralists' dairy cattle breeding practices in the study areas

Variable	Districts				Overall (N=100)	P-value (P<0.05)
	Dugda Dawa (N=52)		Suro Barguda (N=48)			
	F	(%)	F	(%)		
Female breed selection						
Yes	49	94.20	44	91.70	92.95	
No	3	5.80	4	8.30	7.05	
Breeding Method						
Natural mating	52	100	48	100	100	
Artificial insemination		0.00		0.00	0.00	
Source of breeding bull						
Home breed own bull	22	42.3	29	60.4	51.35	
Neighbour bull	16	30.8	12	25	27.90	
Purchased own bull	14	26.9	7	14.6	20.75	**
Time of mating						
Knowingly	40	76.9	26	54.2	65.55	
Unknowingly	12	23.1	22	45.8	34.45	
Long-serving of animals						0.06
indigenous knowledge	52	100	48	100	100	
Recording information	0	0.00	0	0.00	0.00	

F= frequency of respondents N= number of respondents

Table 8. Reproductive performance evaluation practices of the study areas(Mean ± SE)

Parameters	Districts						Overall (N=100)	P-value (*P*<0.05)
	Dugda Dawa (N=52)			Suro Barguda (N=48)				
		F	(%)		F	(%)		
AFS (Year)	3.16±0.05			3.05±0.04			3.11±0.03	0.12
2.5-3.5	3.50±0.06	45	86.5	3.34±0.05		0.48		
3.6-4	2.82±0.04	7	13.5	2.76±0.03	45	93.8		
AFC (Year)	4.11±0.05			4.00±0.05	3	6.2	4.06±0.04	0.13
3.5-4	4.50±0.06	31	59.6	4.21±0.06				
4.1-5	3.72±0.04	21	40.4	3.79±0.04	31	64.6		
CI (Year)	1.30±0.04			1.34±0.04	17	35.4	1.32±0.03	0.52
1-1.5	1.50±0.05	44	84.6	1.62±0.05				
1.6-1.9	1.10±0.03	8	15.4	1.06±0.03	34	70.8		
DO (Days)	106.58±1.25			108.23±1.47	14	29.2	107.37±0.96	0.39
85-115	130.5±1.4	50	96.2	122.3±1.62				
116-130	82.66±1.1	2	3.8	94.16±1.32	37	77.1		
NSPC (Number)	1.56±0.07			1.63±0.07	11	22.9	1.59±0.05	0.50

F= frequency of respondentsN= number of respondents SE= standard error

the study areas was 4.06years. The current finding was insignificant with age at first calving at 4.075 years reported by Taju (2018) of Ethiopian indigenous cows in the Dawro zone. However, the present result disagreed with the average age at first calving at 4.83 years reported by Ayantu et al (2012) for local heifers in the Horro district. The variation in age might be due to a lack of good management, environment, and genetic factors.

Calving interval: The average calving interval (CI) of the Dugda Dawa and Suro Barguda districts were 1.30 and 1.34, respectively. The result of the present finding in study areas was greater than the value of 1.22 years months reported by Million and Tadelle (2003) for the Borana breed. This variation might be due to poor nutrition, disease, and poor management practices.

Days open: The average days open in Dugda Dawa and Suro Barguda districts were 106.58 and 108.23, respectively. This research results were in line with the value ranges between (85 to115 days) reported by Gebeyehu et al (2007) and Tadesse et al (2010) which is considered optimum for dairy cows. However, the current finding results were lower than 148 days reported by Tadesse et al (2010) in Holetta. This difference might be due to the unavailability offeed and poor heat detection. Thus, all factors should be corrected for agro-ecology.

Number of services per-conception: The number of services per conception is the number of services (natural or artificial) required for successful conception. The average numbers of Dugda Dawa and Suro Barguda districts were1.56and 1.63, respectively. Borkowska et al (2012) also reported that the number of services per conception is frequently used asan indicator of fertility and the optimum value is considered to range between 1.6 and 1.92to 2.15 services of local cows Asella district. This difference might be due to management and environmental factors.

CONCLUSION

The majority of the respondents were men and were considered as owners of the resources like livestock and land assets, and responsible for the grazing decisions in the pastoral community. Pastoralists kept different types and species of animals. The main objectives of multi-species rearing were to produce a range of products (meat, milk), and minimize risks emanating from droughts, famines, and floods, owing to their varying degree of coping with the challenges. Breeding practices were key activities for genetic and productivity improvement, and pastoralists select the best dairy cows based on traits like color, back profile, tail, head profile, and dewlap. Besides, the reproductive performance evaluations practiced by pastoralists were age at first services (AFS), age at first calving (AFC), calving interval (CI), days Open (DO), and number of services per conception (NSP), respectively. Above all, pastoralists select females depending on milk yield, pedigree performance, udder size, and mothering ability. In general, it can be concluded that pastoralists practice indigenous knowledge for breeding and reproductive performance evaluation of their cattle without recording. Therefore, based on the research results incorporating indigenous knowledge of the pastoralists in community-based breeding programs will be

the best option for improving breeding and reproductive performance to increase production and productivity of livestock is recommended.

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