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Assessment of cattle breeding practice of the community in Wondo genet district, Sidama regional state Southern Ethiopia

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Abstract

The cross-sectional study was conducted from November2018to March 2019 in Wondo Genet district of Sidama regional state of southern Ethiopia, with the objective to assess cattle breeding practices of the communities of the Area. The study was conducted using survey and The 60 households were participated in the interview. All the respondents (100%) have both local and cross breed cows. Milk production, source of income, manure and social values were the major reasons of respondents keeping cattle's in the study areas. Natural pasture and crop residues were the major feed sources and river and ponds were the major water source for dairy cattle in the study area. The average daily milk yield was 1.39±0.15 and 6.02±0.93 litters for local and cross breed cow respectively. The average lactation lengths for local and cross breed dairy cow were 7.2±0.10 and 8.01 ±0.12 months respectively. The average ages at first services for local and cross breed dairy cow were 39±0.35 and 29 ±0.27months respectively. Natural mating, AI service, combination of natural mating and AI service and hormonal based estrus synchronization were the common mating methods in the study area. About 66.7% of the respondents in the study area have AI service regularly.

Keywords: Artificial insemination, Breeding practice, community, Dairy cattle

Introduction

Agriculture is the major economic activity in Ethiopia. Among the agricultural activities, livestock sector plays a significant role in the economic, social, and cultural development of the agrarian community. Cattle comprise most of the livestock population and reared across all the agro-ecologies (Debre *et al*., *2017*). Livestock raised in all the farming systems of Ethiopia including pastoralists, agro pastoralists, and crop-livestock mixed farmers. Dairy production systems can be broadly categorized into urban, per-urban, and rural milk production systems

based on scale of operation and market orientation (GebreWold *et al*., 2000; Destalem ,2015)

The cattle population of the country is dominated with indigenous zebu types, which are widely distributed across the diverse agro-ecologies of the country. It has been reported that indigenous cattle breeds account for about 98.8 % of the total cattle population of the country (CSA, 2011/12). Indigenous cattle have been naturally selected for years towards adaptive traits under harsh tropical environment and unique product qualities. These include resistance to diseases and parasites, longevity and adaptation to poor quality feeds and high fat milk (Aregawi, 2013). However, the productivity of local cattle is low due to their low genetic makeup, low level of input and tradition husbandry practice beside environmental stress (Azage*et al.,* 2010). Due to poor productivity of indigenous cattle, the country is still importing a significant amount of dairy products (Tegegn and Zelalem, 2017). Hence, improvement in livestock resources should be achieved through the implementation of genetic improvement, in parallel with proper feeding, health care, and management of livestockImprovement in livestock resources have been achieved through the implementation of an efficient and reliable AI service, in parallel with proper feeding, health care, and management of livestock (Hamid *et al*.,2016).In Ethiopia, the most commonly mating methods practiced are natural and artificial methods. The natural methods use bull mating while the artificial ones employed artificial insemination (AI) system.The use of bulls for natural service remains widespread in Ethiopia (Kelay, 2002

Objective

- To assess cattle breeding practice of the community in the study area.

Materials and Methods

The study was conducted at Wondo Genet district, Sidama regional state, southern Ethiopia. The district was located at 270 km South of Addis Ababa and 14 km southeast of Shashemene and 34 km far from Hawassa to east direction. The geographical coordinate of the district is 70 19'N and 38 ^{0} 38'E with an altitude of 1780 meters above sea level. The mean annual minimum and maximum rainfall are 709 mm and 2062 mm respectively. The district has a mean maximum and minimum temperature of 26^{o} c and 12 ^{o} C respectively. Wondo Genet has a bimodal rainfall distribution with short rains occur during March-May and the long rains in July-October. The district has 41244 local breed, 10694 cross breed cattle with a total of 51938 cattle. It also has 22736 heads of sheep and 12018 heads goats. It covers an area with a wide altitudinal range of 1600 to 1950 m. a.s.l.

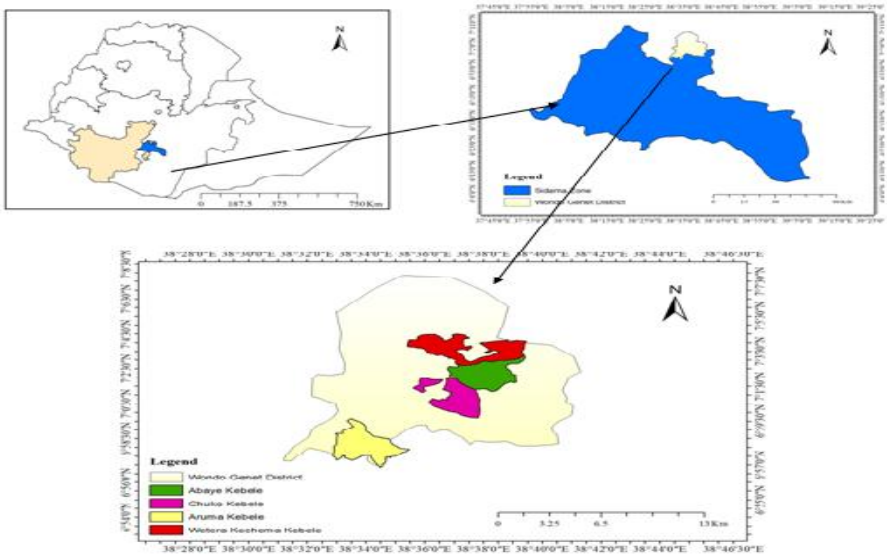

Figure 1. Map of study area

2.2 Study design

A cross-sectional type of study design supported by data recording and observation were carried out from December 2018 to march 2019 with the objective of to assess cattle breeding practice, evaluate efficiency of AI after estrus synchronization and perception of the community about the technology.

2.3 Sampling methods and sampling size

2.3.1 Sampling Techniques and sample size for Survey

This study was purposely conducted in wondoganet district of Sidam zone of southern Nation, nationalist and people's regional state. Because of the synchronization program campaign were implemented by the Livestock and Fisheries Bureau of Southern Nations and Nationalities Peoples Regional State to improve the dairy cattle productivity and availability of good infrastructure and feed for the animals. The sample size was determined by the availability of artificially inseminated cows, thus four kebeles (the lower administrative unit in the country) were selected purposely. The kebeles are Abaye, Aruma, Chuko and Waterakechama. From each kebele 15 dairy cattle owners who participated in estrus synchronization and AI were selected purposely for the interview, with a total of sixty respondents from all kebeles.

2.3.2 Types of Data Collected and their Source

Both primary and secondary data were collected from both primary and secondary data source. The house hold survey was conducted using a set of semi-structured questionnaires. The questionnaires were pre-tested before final administrate as it was crucial to ensure that the questionnaire being asked were socially appropriate sand that the expected response were within expected bounds. Focal group discussions were held in each (one pre kebele) kebele was selected district. The group was formed with (9-12) people and composed of youngster, women, village leaders and key informant who is socially respected and know the present and past social and economic status of the study area. Thus, respondents had their own dairy caw and explained diversified responses in the study area. Group discussion were focused on history of breeding practice of dairy cow, utility pattern of dairy cow and Artificial insemination service, status and major constraints of artificial insemination practice and service.

2.4 Statistical Analysis and Statistical Packages Employed

Breeding practice survey data were analyzed for descriptive statistics using frequency procedure and cross tabulation of SPSS version 20 was used. For quantitative data obtained from the survey general linear model procedure of statistical analysis system SAS 9.1(2003) was used to evaluate the effect of various performance related parameters of dairy cattle (such as milk yield, lactation length, age at first calving, calving interval, Reproductive life, Age at maturity of a male cattle and female.

Results and Discussion

3.1 Household Characteristics

The major household characteristics of the respondents are shown in Table 1. The majority of the respondents were males and training on dairy improvement should focus on male household of the study area. This result was relatively similar with the report of Fekede*et al*. (2013) and Bainesang (2015) in central highlands of Ethiopia with 84.4% and 16.6%; 90% and 15% male and female respectively. However, the results of the current study in female proportion was lower than the report of Azage (2004) who reported 33% and 67% male and female headed household livestock keepers in Addis Ababa and lower than the report of Haile *et al*. (2012) in Hawassa city with the value of 70% and 30% for male and female respectively. The difference might be due to the level of urbanization of the study area. The average family size of Abayekebeles is significantly different from the others.

The overall average age of the respondents was 43 years with ranging from 27-69 years (Table 1). There was significant difference in average ages of the respondents in the kebeles. The overall average family size of the responding households in all the study areas was 6.7 with 3.5 and 3.2 male and female respectively.

Educational level of the households was assessed to reflect the level of technology adoption. Thus, as about 3.3 %, 15%, and 60% of were illiterates, read and writing and attended primary and secondary school respectively. The low average illiteracy percentage in this study area may be the result of availability of educational infrastructure in the two districts and it could increase adoption of the community on new livestock improvement technology

Table1. Household's characteristics of the study area

Respondents	Kebeles									
	Abeye (N=15)		Aruma (N=15)		Choko01 (N=15)		Woterakechama (N= 15)		Over all (N=60)	
Sex of respondents										
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Male	15	100	14	93	11	73	11	73	13	86.67
Female	0	0	1	6.7	4	27	4	27	2	13.33
Total	15	100	15	100	15	100	15	100	15	100
Family size and age of respondents										
Male	3.4		3.75		3.6		3.13		3.46	
Female	2.8		3.12		3.4		3.53		3.21	
Total family size	6.06		7		7.06		6.4		6.633	
Age	47.6		35.6		48.53		39.47		42.8	
Range for age (yrs)	38-56		32-42		27-75		27-63		27-75	
Education level of respondent										
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Illiterate	1	6.7	0	0	1	6.7	0	0	2	3.3
Read and write	3	20	4	27	0	0	2	13	9	15
Elementary (1-6)	2	14	6	40	8	53	6	40	22	36.7
Secondary (7-8)	2	13	4	27	3	20	5	33	14	23.3
High school (9-12)	1	6.7	1	6.7	2	13	2	13	6	10
Above college	6	40	0	0	1	6.7	0	0	7	11.7
Total	15	100	15	100	15	100	15	100	60	100

Land holding and Source of Income

The average land holding and source of income of the respondents were presented in Table 2. The overall average land holding per household were 0.46 and 0.095 hectare for farm and grazing land respectively. This result was smaller than that of Debir (2016) which is 1.7 for farm land and 0.5 grazing land. But it is nearly like Dastalem (2015) with of 0.66 and 0.03 hector for farm and range land respectively. Since the study area was the corridor for commercial crops such as chat, coffee, and sugarcane most of the respondents allocate their lands for cash crop and very few lands such as back yard, road side and crop borders was allocated for forage and grass land.

Table 2. Total land usage pattern of study area

Land(ha)	**Land types hold by respondents**						
	Abeye	Aruma	Chuko	Woterakechem	Overall mean	*P*-Value	Sig. level
Farm land	0.38	0.5	0.3	0.75	0.46	0.33	NS
Grazing land	0.14	0.05	0.08	0.09	0.09	0.24	NS
Source of incomes in percentage							
Crop	33	40	13.3	60	36.58		
Livestock	20	20	40	6.7	21.7		
Crop and livestock	40	40	46.7	33.3	40		
others	7.1	0	0	0	1.7		

Livestock composition and herd size

The average number of livestock holding reared by respondents were described in Table 3. Cattle was the dominant species of livestock which kept by all respondents followed by shoats (small ruminants).

Table 3. Types of livestock, average and herd size of study area

Livestock type	**Abaye (n=15)**	**Aruma (n=15)**	**Chuko (n=15)**	**Wotara/k (n=15)**	**Mean Total**
Total cattle	11.64	5.28	7.27	8.57	8.19
Local cow	1.7	1.7	1.1	1.1	1.4
Cross cow	3.7	0.2	1.7	2.5	2.03
oxen	0	0.19	0.2	0	0.1
Cross Bulls	0.14	0.19	0.07	0.27	0.17
Heifers	2.4	1.5	2.5	2.3	2.18
Calves	3.7	1.5	1.7	2.4	2.33
Sheep	2.9	1.7	3.2	2.5	2.58
Goats	0.5	0.5	0.5	3.2	1.18
Donkeys	0.7	0.8	0.6	0.5	0.65
Horse	0.5	0.5	0.4	0.5	0.48
Chickens	25.4	8.2	6.2	5.2	11.25

n=numbers of house hold in each kebeles

The average herd size per household of the study area was 5.8. The reason for smaller number of livestock kept in the current study area is due to shortage of grazing land in which most of the available land was used to produce cash crop like chat coffee and sugar cane. In addition, shortage of land due to population pressure may be other cause. This result was somewhat similar with the result of Bainesang (2015) in central highlands of Oromia. However, it was smaller than the report of Debire (2016) from two districts of Sidama zone.

Purpose of Keeping Dairy Cattle

Livestock kept in the study area was for milk production, income source, manure, social value, and traction in their order of importance. As shown in Table 4, 66.7 and 40% of Abaye and watera-kechamakebeles respondents respectively kept their cattle for milk production whereas, 40% of Arumakebele respondents kept their cattle for income source.The main reason of keeping cattle for milk production is due to the high demand of milk in this cash crop study area. This study was similar with Debir (2016) in high land and midland districts of Sidama zone. But the purpose of keeping cattle in the current study was different from Mekonen*et al. (*2012) in west Oromia region described that the Horro cattle owners were keeping their cattle primarily for draught power followed by milk production.

Table 4. Purpose of keeping cattle in the study area

Purpose of keeping	Lists Kebeles					
	Abaye (%)	Aruma (%)	Chuko (%)	Watarakachama (%)	Mean (%)	Rank
Milk production	66.7	53.3	33.3	40	48.33	1
Source of income	26.7	40	26.7	20	28.35	2
Manure	6.7	6.7	20	6.7	10.03	3
Social value	0	0	1	3	1	5
Power/traction	0	0	13.3	13.3	6.65	4

Source of Cattle Feeds and Feeding System

As shown in Table 5. The feed source and feeding system were different across kebeles. Hence, natural forage and free grazing were the common feed resource and feeding system respectively in kebeles (Aruima and Woterakechama). In Abaye and ChukokebelesCatand carry, cut and carry, crop residue, and natural pasture in their order of importance were the common feed resources while in Aruma and Waterakechama natural pasture was the common feed source followed by crop residue. Industrial by products were the other source of feed used as supplementation in the study area. Cut and carry was common feeding system kebeles (Abaye and Chuko) while free grazing was common for kebeles (Aruima and Woterakechama). Respondents utilized free grazing in Aruma and Woterakachama due to the presence of few communal grazing lands. But due to shortage of gazing land in Abaye and chukokebeles their feeding system was cut and carries. During wet season, in both areas there was no shortage of feed. Most of the farmers responded that during this season natural pastures were dominant and free grazing was common. The Abaye and chuko farmers buy the grass from others peoples and freely graze their cattle during this season. During dry season crop residue was common.

During dry season, crop residue was the main source of cattle feed in study area. Most of the respondents in study areas supplied feeds for their animals in different groups of animals by considering age, conception, and milk production. Almost all the respondents provide supplementary feed for lactating and pregnant cows, and new born calf.

Table 5. Source of Dairy Cattle feed and feeding system of the study area

Source of feed	Lists of kebeles					χ^2
	Abaye (%)	Aruma (%)	Chuko (%)	Waterakechama (%)	Total (%)	
Natural pasture	26.7	66.7	33.3	40	41	0.532
Crop residue	60	20	53.3	40	43.3	
Industrial by product	13.3	13.3	13.3	20	15	
Feeding system						
Cut and carry	40	66.7	33.3	73.3	53.3	0.27
Free grazing	60	33.3	66.3	26.7	46.7	

Source of Water and watering frequency of dairy cattle

As indicated in Table 6.Water source of cattle was different in different kebeles and from season to season of the study area. River was the main source in all study kebeles during wet season while pipe and pond water were common sources of water during dry season in all the study kebeles. This indicates that dairy animals were provided clean pipe water during dry season. The current study was different from Destelam (2015) in northern Tigray who reported 21.1, 50 and 28.9% of households' respondents gave water for their dairy cattle from pond, river, and pipe respectively. Majority of the household revealed that the water obtained from the river was not clean. Sometimes the sources of water from pond and river for dairy cattle could be one of the causes for disease incidence. Watering frequencies were similar in all kebeles and watering frequency may be increased for dairy cattle that produced high milk production

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Table 6. Water source and watering frequency

Water Source	Lists of Kebeles										χ^2
	Abaye (%)		Aruma (%)		Chuko (%)		W/kachama (%)		Overall mean (%)		
	WS	DS	WS	DS	WS	DS	WS	DS	WS	DS	
River	93	6.7	67	20	70	13	60	0	70	10	
Pond	0	27	6.7	20	6.7	33	10	13	13	28	
Pipe	6.7	47	20	53	20	33	20	33	13	42	
Stream	0	20	6.7	6.7	3	20	10	33	3	20	
Watering frequency/day											
Once	67	40	73	20	60	67	53	20	63	37	
Twice	0	53	6.7	80	27	33	13	80	12	62	
Once/two days	33	6.7	20	0	13	0	33	0	25	1.7	

Milk production performance of dairy cattle and lactation length

The daily milk yield and lactation length of local and cross breed cows of the study area are indicated in Table 7. The average daily milk yield was significantly (P< 0.001) different between breeds. The average daily milk yield of local dairy cow was higher in Abayekebele than the other contemporaries and the Average daily milk yield of cross breed cattle was higher in Chuko followed by Abaye and Waterakechema. The average daily milk production of cross breed in the study area was 6.02 litters with maximum of 9.59 liters. But the average daily milk of local breed was lower and this indicates that still local breed cattle need more genetic improvement for milk production.

The present study was similar with the result of Debir (2016) which is about 1.54 liter for local cow but higher for cross breed. The present study was smaller with the report of Bainesang(2015) with average daily milk yield of 2 and 8.98 litter for local and cross breed dairy cows respectively. This difference may be due to genetic difference and level of management.

The lactation length of local and cross breed dairy cattle in the study area was 7.21 and 8.01months respectively. The present study was similar Baineseng (2015) for local breed with overall mean lactation length of 7.64 months but lower than cross breed with value of 10.08 months. Debir (2016) in sidama zone reported similar lactation length for local breed cow with 7.38 months but higher for cross breed (9.83 months). The lower average lactation length in the current study may be attributed to genetic and environmental factors.

Milk yield			
	Kebele	Breed	
Abaye	4.24	Local	1.38[b]
Aruma	2.00	Cross	6.02[a]
Chuko	5.07	p-value	< 0.001
Watera/k	3.50	SL	***
p-value	0.108		
SL	NS		
Lactation length (in months)			
	Kebele	Breed	
Abaye	7.80	Local	7.21[b]
Aruma	7.53	Cross	8.01[a]
Chuko	7.66	p-value	< 0.0001
Watera/k	7.46	SL	***
p-value	0.445		
SL	NS		

Reproduction Performance of Dairy Cattle

The reproductive performances of dairy cattle in the study area are shown in Table8. The current result show that there was significant (< 0.001) different between breeds in age at first service (AFS), age at first calving (AFC) and calving interval (CI) and hence AFS, CI of local cows and AFS of local bull were higher than cross breed. This is because cross breed has high feed conversion efficiency and as a result, they grow faster than the local breed and reach at puberty earlier and conceive with less delay. The result of the present study reveals that both age at first service and age at first calving were smaller than the result of Debir (2016). But it is higher than that of Ahmed *et al*. (2017) with average AFS 22.6 months for Ethiopian zebu cattle.

Table 9. Reproductive performance of local and cross breed cattle in different kebeles of study area

Effect=BREED				
AFSM (month)	ASFF (month)	AFC (month)	CI (month)	
Cross	34.55[b]	29.60[b]	38.60[b]	11.82[b]
Local	42.57[a]	39.07[a]	48.02[a]	13.33[a]
CV	4.61165	7.09184	5.66938	15.7595
SL	***	***	***	***
Effect=KEBELE				
	AFSM (month)	ASFF (month)	AFC (month)	CI (month)
Abaye	37.07[c]	34.47[a]	43.37[ba]	12.2
Aruma	38.73[b]	35.80[a]	44.80[a]	12.4
Chuko	40.03[a]	34.27[ba]	43.27[ba]	12.37
W/K	38.40[b]	32.80[b]	41.80[b]	13.33
CV	4.61165	7.09184	5.66938	15.7595
SL	***	***	***	NS

Where AFSF= Age at first service for female. AFSM = Age at first service for male. AFC= Age at first calving. CI= calving interval. W/K= waterakeachemakebele

Breeding practice of Cattle in Community

Mating System and Source of Breeding Bull

The mating system and source of breeding bull in the study area are presented in Table 10. Natural mating, AI service, natural mating combination with AI, natural mating with hormone and AI with hormone were the different methods of mating system identified in the current study area. The mating system in the current study was consistent with Bainesang (2015) and Debir (2016) in West Shoa and Sidama zones respectively. However, majority of the respondents in the study area were practiced natural mating and few practiced AI with estrous synchronization. Due to unsuccessful conception of AI service, most of the respondents mate their cross and local bred cows using cross bred sire through natural mating. The present study was different from Dastalem (2015) in which AI is the dominant mating/breeding practice in central zone of Tigray.

In the study area there were different source of breeding bull. As shown in Table 13 source of breeding bulls for most respondents were bull from neighborhood with payment. As Respondents explained if there was no breeding bull in their kebele they search from other kebeles even from other district. In the study area most of the respondents used controlled natural mating with bull except Arumakebele. In this kebele uncontrolled mating was common due to interaction of different house hold herds in the communal grazing land.

Table11. Mating system and the source of breeding bull

Mating systems	**Lists of kebeles**				**overall mean (%)**
	Abaye (%)	Aruma (%)	Chuko (%)	W/kachama (%)	
Natural Mating (cross)	40	13.3	40	33.3	31.7
AI and Natural mating	46.7	46.7	26.7	40	40
AI only (exotic)	6.7	13.3	20	13.3	13.3
AI with hormone	6.7	13.3	6.7	6.7	6.7
Natural with hormone	0	13.3	6.7	6.7	8.3

source of breeding bull					
Their own	13.3	33.3	13.3	6.7	16.7
Neighbor freely	26.7	6.7	20	0	13.3
Neighbor with payment	33.3	40	40	66.7	45
Private freely	20	13.3	13.3	13.3	15
Private with payment	6.7	6.7	13.3	13.3	10

AI= Artificial inseminations. W/kachama= wotarakachama

Farmers' Awareness on AI and AI Service Delivery

The awareness, participation, and time of AI service in the study area are presented in Table12. Majority of the respondents have knowledge and information about importance of AI but most of them did not know the critical time of standing heat of cow. In most respondents can (66.7%) have gotten AI service regularly but after 1st AI service the respondents which were the owner of the animal shift the mating to natural mating due to unsuccessful conception of the first AI service. The inefficiency of AI services is due to problem of heat detection, ineffectiveness of AI technicians,and unavailability of the service in weekends and holidays, shortage of inputs and a combination all. Solomon *et al.* (2016) reported the same reason as of the present study. From the survey reveals that they have information about the importance of AI technology but they have no information about critical time of stand heat. From most respondents took their animals to AI service center when the AI technician was available followed by immediately after heat detected on the cow. Hence, most of the respondents shift their mating method from AI to natural mating in next consecutive heat.

Table12. Use, Participation and Time of AI Service in the study area

AI service	kebeles				overall mean (%)
	Abaye (%)	Aruma (%)	Chuko (%)	w/kachama (%)	
Get AI service regularly					
yes	53.3	73.3	73.3	66.7	66.7
no	46.7	26.7	26.7	33.3	33.3
If not get service on time					
Other 21 day	6.7	46.7	33.3	6.7	25
Using natural mating	93.3	53.3	66.7	86.7	75
Participate in of AI					
yes	80	73.3	46.7	93.3	73.3
no	20	26.7	53.3	6.7	26.7
Time of service					
Morning s/d	13.3	6.7	0	0	5
Afternoon of s/d	33.3	26.7	13.3	13.3	21.7
Morning of n/d	13.3	33.3	0	26.7	18.3
Afternoon of n/d	6.7	6.7	6.7	40	13.3
AIT available	33.3	26.7	46.7	46.7	38.3

AI= artificial insemination. AIT= Artificial insemination technicians. S/D= same day. N/D= next day.

Conclusion and Recommendation

Natural mating, AI service, combination of natural mating and AI service and hormonal based estrus synchronization were the common mating methods in the study area. The primary reasons of keeping dairy cattle in the study area were milk. Based on these conclusions some recommendations as follow.

Proper animal selection, heat detection efficiency, farmers' awareness to detect heat and on time bringing of cattle for insemination should be satisfactorily considered for effective Artificial insemination. Local breed cattle need more genetic improvement for milk production.

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