SJEPS Vol. 2, Issue 3, Page: 09-30, July 2019, ISSN: 2676-2722
Impact Factor (SJIF): 8.113
Journal DOI: 10.15373/22501991
International Peer Reviewed & Refereed Journal with Indexed Journal Platforms

web: www.damaacademia.com
email: editor@damaacademia.com
Download from Journal site
https://damaacademia.com/sjeps/

Author(s)
Alemayehu Arega
Oromia Agricultural Research Institute, Adami Tulu Agricultural Research Center, P.O. Box, 35, Batu/ Ziway, Ethiopia
Email: fenalex2016@gmail.com

Sandip Banerjee
Hawassa University, College of Agriculture, School of Animal and Range Sciences, P.O. Box 05, Hawassa, Ethiopia

Solomon Gizaw
International Livestock Research Institute, LIVES project P. O. Box 5689, Addis Ababa, Ethiopia

Correspondence
Alemayehu Arega
Oromia Agricultural Research Institute, Adami Tulu Agricultural Research Center, P.O. Box, 35, Batu/ Ziway, Ethiopia
Email: fenalex2016@gmail.com

Assessment of the Status, perception of farmers and constraints of Estrus Synchronization and Mass Artificial insemination in Adami Tulu Jidokombolcha District, East Shewa Zone, Oromia Region, Ethiopia

[1]Alemayehu Arega | [2]Sandip Banerjee | [3]Solomon Gizaw

Abstract

Assessment of the status of Estrous synchronization and mass artificial insemination (OSMAI) program was conducted at Adami Tulu Jidokombolcha District. The impact assessment study for the OSMAI project was conducted using semi structured questionnaires and focus group discussions of various stake holders. A total of 120 respondents were randomly selected from 6 Kebeles where the OSMAI project was initiated. The result indicates that 75.8% of respondents in the district use both artificial insemination (AI) and natural mating (NM), however they preferred NM over AI. This was ascribed to poor services and inconsistencies by the AI technicians (AIT) especially on weekends and holidays, shortage of AIT, shortage of inputs and provision of the services. About 52.1% of respondents didn't have any information about the genotypes of the sire and their special attributes. The study further indicates that the primordial decision maker in selecting the cattle to be included in the program was the AI technician, in most of the cases this was done even without the knowledge of the farmers and also the experts involved. This led to a resentment among the beneficiaries and therefore majority of them were not satisfied with the way the program was handled and the outcome was much below their expectations. As the respondents were not appraised about the OSMAI program they were not able to follow the intricacies associated with the management of the cattle and also regarding the insemination protocols to be followed.

Keywords: *Estrus mass synchronization and artificial insemination, Adami Tulu Jidokombolcha*

1.0 INTRODUCTION

Oestrus synchronization is the manipulation of the oestrus cycle or induction of oestrus to bring a higher numbers of female animals into oestrus at a predetermined period (Paul 2010). This also helps in optimization of resources as it narrows down the insemination period to as low as that of a week. Therefore, several female animals can be inseminated at a shorter time (Lamb, 2010). Under Ethiopian scenario it is also of paramount importance as there are seasonal shortages of feed and fodder besides the demand of livestock products are by and large seasonal (Tegegne et al., 1989). This implies that the parturition of the cows can be so programmed so that most of the cows parturate when the demand for the livestock products are high and so are the resources needed for both pre calving and post calving period (Tegegne et al., 1989).

Studies by Solomon et al., (2016) also indicated that the advantage of oestrous synchronization and mass artificial insemination (OSMAI) can minimize the challenges faced by the AI services in the country. Efficiency of AI service in Ethiopia is reported to be dismally low even when compared to many developing countries in the Sub Saharan Africa with the conception rate at first service being as low as 27.1% (Desalegne et al., 2009). Furthermore, studies have shown that the numbers of inseminations provided by the AI technicians are limited as they have to cover a large area with the cattle population being scattered over a large area, therefore most of the time is spent in travelling from location to location besides there are problems associated with infrastructure and telecommunications too. Thus, it is expected that if many cattle are in estrus (associated with estrus synchronization) the technicians can cover many cattle without spending much time in travelling long distances (Solomon et al., 2016). Over the years it has been reported that the low efficiency of AI services are multifarious

viz. technical limitation, lack of transport facility, poor quality and storage of semen, improper heat detection, lack of incentive (to the inseminators), and unavailability of the artificial insemination service during the off-working hours which can be associated with both intrinsic and non-intrinsic nature (Azage et al., 2012).

Even though studies on oestrus synchronization in dairy cattle in Ethiopia was initiated in the late eighties (Azage et al., 1989; Mukasa-Mugerwa et al., 1989). The first large scale field trials were conducted under the IPMS project in Tigray and SNNPRS regions (Azage et al., 2012). The mass synchronization was conducted with the objectives of testing a hormonal estrous synchronization regime and mass insemination under on-farm conditions to improve the access to improve the dairy genetics especially by the small holder farmers (Azage et al., 2012). Following the field tests, the synchronization program was adopted and scaled up by the authorities of Ministry of Agriculture and regional Bureau of Agriculture in collaboration with the authorities of international development partners (IPMS and LIVES projects of ILRI) and the national research system.

The first round of synchronization was initiated in the year 2012 at several locations in Oromia region and the scaling-out was carried out by the regional Livestock Development and Health Agency at some selected milk shed areas of the region (Tegegne et al., 2016). The authorities of the agencies organized regional, zonal and district teams to implement the program. Even though they planned to synchronize and inseminate a total of 769,673 cows only about 611,203(79.4%) of cows were synchronized and inseminated till 2014/15 (Tegegne et al., 2016).

The districts selected for mass scale up project among other districts included Adami Tulu JidoKombolcha district. Findings by Solomon et al., (2016) indicated that the response of hormones to induce estrus (measured as the percentage of cows/heifers that showed oestrus out of the total cows included in the program), under intervention by the regular extension services of the regional BoLF was comparable to the results obtained under action research program in all the four regions of the country.

However, studies by Solomon et al., (2016) indicate that there were variations in the results varied across the regions and thus, the overall results of the scaled up project was inconsistent.

Studies have indicated that the rate of conception (among the cattle) varied between the regular development intervention and the action research project (Solomon et al., 2016). However, the conception rate was higher among the cattle included in the action research project when compared to those included in the mass synchronization program; the values were 59.2% and 39.3% respectively (Solomon et al., 2016).

In the country most of the available literatures on the mass estrus synchronization project pertain to hormonal response (percentage of animals synchronized and shown in heat), numbers of cows/heifers inseminated and the conception rate. However, information on calving rate, sex of calves born etc. we're not assessed. Thus, the study was conducted with the objectives of assessing the status and impact of estrous synchronization among the Arsi cattle reared at Adami Tulu JidoKombolcha district.

2.0 MATERIAL AND METHODS

2.1 Location of the Study area

The study had conducted at Adami Tulu JidoKombolcha districts of Oromia region. Adami Tulu JidoKombolcha district is situated in East Shewa zone of Oromia Region at about 168 kilometers of Addis Ababa, which is situated in the central rift valley of Ethiopia. The districts are located between 7°52′N to 38°42′E with an elevation of 1636 meters above sea level. The district has 38 Kebeles. AdamiTulu Jidokombolcha district is characterized by mixed livestock farming system. Cattle, goat, sheep and donkey are important livestock species reared in the area.

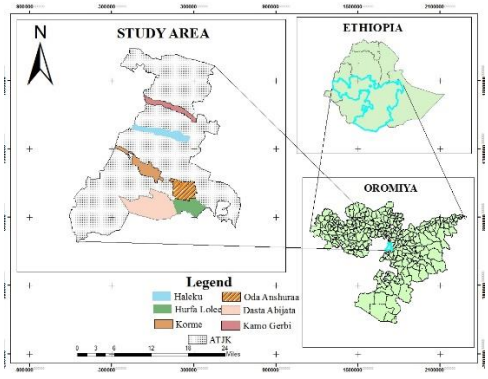

Figure 1. Maps of the study area

2.2 Sample size determination and sampling procedures

Adami Tulu Jidokombolcha district is one of the 11 districts in East Shewa Zone of Oromia region. The study was conducted at Adami Tulu Jidokombolcha district and selected purposively from the districts in which mass synchronization program was held previously in the zone. The district has a total of 43 kebeles and the OSMAI program was conducted under three clusters and of which 6 Kebeles was randomly selected from those involved in oestrus synchronization mass artificial insemination program. The information of Kebeles and owners of the cattle who were associated with the estrus mass synchronization program were obtained from the office of the District Livestock and Fisheries Resource.

A total of 120 respondents (20 from each of the 6 Kebeles) was selected randomly and interviewed. Respondents were selected randomly from lists on case book with having the experience of participating at least one round in the estrus synchronization and mass artificial insemination program.

2.3 Types of data collected and collection procedures

Data were collected from both primary and secondary sources. The formal methods of data collection were semi structured questionnaires were prepared, pretested and used to collect information from sampled respondents for the assessment part. Focal group discussions one of the informal method of data collection method was also used for the primary data collection. Secondary data was collected from the office of Livestock and Fishery Resource of the district to assist the selection of Kebeles and respondents. The following data was collected using questionnaire survey:

Household demographic characteristics, mating system, farmer's preference for breeding methods, artificial insemination service provision and its constraints, farmer's perception regarding oestrous synchronization and mass artificial insemination, calving condition, sex of calves born and status of the calves.

2.4 Statistical Analysis

Collected data via questionnaire survey were coded and processes into Microsoft Excel and imported and analyzed by using Statistical Package for Social Science Version 20.0 (SPSS). The Chi-square ($\chi 2$) test procedure of SPSS Version 24.0 was used to analyze the qualitative data generated from survey questionnaires and quantitative data from survey were analyzed using the General Linear Model Procedure (univariate). The variation between groups was considered significant when the $P < 0.05$.

3.0 RESULTS

3.1 General information - Household socio economics characteristics

The results pertaining to the social demography of the respondents are presented in Table 1. The results indicate that most of the respondents were males irrespective of the studied locations. The findings also indicate that majority of the respondents were married.

Table 1. Sex, marital status and educational level of sampled respondents in the study area.

Parameters	Kebele of respondents							
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	$\chi 2$value
Sex of respondents								
Male	90.0	85.0	90.0	90.0	70	45	78.3	0.002
Female	10.0	15.0	10.0	10.0	30	55	21.7	
Marital status of respondents								
Single	0.0	0.0	5	0.0	0.0	0.0	0.8	0.274
Married	100	100	95	95	100	90	96.7	
Widowed	0.0	0.0	0.0	5.0	0.0	10.0	2.5	
Educational level of respondents								
Illiterate	10.0	30.0	20.0	5.0	10.0	55.0	21.7	0.018

Read & write only	25.0	0.0	10.0	20.0	10.0	5.0	11.7
Grade 1- 6	15.0	45.0	40.0	50.0	35.0	30.0	35.8
Grade 7- 8	20.0	15.0	10.0	10.0	20.0	5.0	13.3
Grade 9-12	30.0	10.0	20.0	15.0	25.0	5.0	17.5

The educational level of the respondents differed across the study areas. Majority of the respondents were illiterate at Kamo Gerbi while the highest qualifications were reported among the residents of Desta Abijata. While the overall findings indicated that across all the studied locations most of the respondents had primary level of education.

The results pertaining to the numbers of family members (by sex) too varied across the studied locations with more numbers of males per household residing at Oda Anshura while the numbers of females were higher at Korme. The results however indicated that there were no differences across the studied locations for the household size and the average age of the respondents.

3.2 Household Resource

***3.2.1 Land holding*:** The results as presented in Table 2 indicate that there were no differences across the studied areas in cultivated land holdings for both the owned and rented cultivated lands. However, the total grazing land and the area of owned grazing land was higher ($P<0.05$) in Desta Abijata, however there was no differences across the remaining studied locations.

Table 2. Land holdings and land use classification (Mean± SD) among the sampled households in the study area

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufalole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120
Cultivated land (ha)	3.00±1.89	2.65±2.00	2.20±1.64	2.25±0.71	2.75±1.02	2.05±2.48	2.48±1.57
Owned (ha)	2.50±1.39	1.75±1.16	1.70±1.52	1.70±0.86	2.20±1.00	1.65±1.46	1.92±1.27
Rented (ha)	0.55±0.83	0.80±1.43	0.50±0.68	0.35±0.58	0.45±0.75	0.30±0.57	0.49±0.86
Grazing land (ha)	1.35±1.59^{b}	0.50±0.76^{a}	0.65±0.87^{a}	0.50±0.87^{a}	0.45±0.75^{a}	0.15±0.48^{a}	0.60±0.99
Owned (ha)	1.05±1.68^{b}	0.35±0.67^{a}	0.45±0.60^{a}	0.30±0.65^{a}	0.25±0.44^{a}	0.10±0.30^{a}	0.41±0.87
Rented (ha)	0.20±0.52	0.10±0.30	0.15±0.48	0.10±0.30	0.15±0.48	0.05±0.22	0.13±0.41

N=120, $^{a, b, c}$ $P<0.05$ values across rows are different

3.2.2 Livestock and dairy herd size: The results pertaining to the livestock composition in the study areas are presented in Table 3. The results indicated that the numbers of native cows were fewer ($P<0.05$) at Hurufalole kebele with no differences in their numbers across the other studied locations. While the reverse was true for the numbers of crossbred cows in the studied areas. The results pertaining to the number of native oxen was however; lower at KamoGerbi, while those of the crossbred oxen was higher at Halaku kebele. The results pertaining to the numbers of bulls too varied across the locations with fewer numbers of native bulls being reared at KamoGerbi, while for the numbers of crossbred bulls are fewer at Hurufalole kebele. The results pertaining to the numbers of heifers (native) did not vary across the studied locations while the numbers of heifers (crossbred) was higher ($P<0.05$) at Halaku with no differences across the other locations.

The study further indicated that there were no differences (across the studied locations) in the numbers of native bull calves while there were differences ($P<0.05$) in the numbers of crossbred (bull) calves in the studied

locations with higher numbers of these calves reared at Halaku kebele. The findings also indicate that the numbers of cow calves (native) too varied across the studied locations with higher numbers raised at Desta Abijata while the numbers of crossbreed cow calves were higher at Korme kebele. The results further indicate that the numbers of goats were higher at Desta Abijata and Halaku kebeles, the numbers of chickens too varied across the studied locations with higher numbers being raised at Oda Anshura, the results further indicated that the populations of the donkeys were higher at Desta Abijata kebele.

Table 3. Livestock composition (Mean ± SD) and herd size (in TLU) of sampled respondents in the study area

Livestock type		Kebele of respondents						Overall mean
Breed		Desta Abijata	Oda Anshura	Korme	Hurufalole	Halaku	KamoGerbi	
Cows	Local	4.75±2.53^{b}	4.55±3.51^{b}	4.45±4.87^{b}	2.20±1.43^{a}	3.00±2.59^{ab}	2.20±1.73^{a}	3.52±3.14
	Crossbred	0.15±0.36^{a}	0.10±0.30^{a}	0.55±1.05^{a}	0.05±0.22^{a}	1.15±1.42^{b}	0.35±0.58^{a}	0.39±0.86
Oxen	Local	2.50±1.85^{ab}	2.55±1.35^{b}	2.10±1.48^{ab}	2.10±1.07^{ab}	2.40±0.99^{ab}	1.60±0.94^{a}	2.21±1.33
	Crossbred	0.10±0.30^{ab}		0.05±0.22^{a}	0.05±0.22^{a}	0.30±0.65^{b}		0.08±0.33
Bulls	Local	0.60±0.88^{b}	0.30±0.57^{ab}	0.50±1.05^{ab}	0.15±0.48^{ab}	0.25±0.55^{ab}	0.10±0.30^{a}	0.32±0.69
	Crossbred	-		-	0.05±0.22^{a}	0.15±0.36^{b}		0.03±0.18
Heifers	Local	2.70±2.15	2.25±2.04	2.25±3.04	0.95±1.09	2.25±4.30	1.25±1.44	1.94±2.60
	Crossbred	0.25±0.55^{a}		0.20±0.41^{a}	0.15±0.36^{a}	0.90±1.16^{b}	0.15±0.36^{a}	0.28±0.64
Bull calves	Local	1.25±1.61	1.20±1.36	0.75±1.02	0.50±0.76	0.60±0.99	0.50±0.82	0.80±1.15
	Crossbred	-	0.05±0.22^{a}	0.30±0.57^{ab}	-	0.40±0.99^{b}	0.10±0.30^{ab}	0.14±0.50
Cow calves	Local	2.10±1.71^{b}	1.35±3.36^{a}	1.10±1.11^{a}	0.60±0.75^{a}	0.90±0.78^{a}	0.50±0.76^{a}	0.09±1.74
	Crossbred	-	0.05±0.22^{a}	0.40±0.82^{b}	0.05±0.22^{a}	0.20±0.52^{ab}	0.30±0.57^{ab}	0.17±0.49
Sheep		1.45±3.10	1.70±4.76	0.20±.89	0.25 ±0.78	0.30±0.97	0.75±1.65	0.78±2.51
Goats		4.50±4.69^{b}	4.10±3.37^{ab}	3.55±3.41^{ab}	2.00±2.71^{a}	4.55±4.09^{b}	1.75 ±2.44^{a}	3.41 ±3.64
Chicken	Local	3.00±4.61	5.30±11.55	1.50 ±2.74	3.70 ±5.67	2.90±6.26	1.30±2.79	2.95±6.35
	Crossbred	0.50±1.27	0.05 ±0.22	0.95±3.36	0.21±0.63	0.15±0.67	0.65±2.00	0.42±1.72
Donkeys		2.65±2.81^{b}	1.70±1.83^{ab}	1.60±1.50^{ab}	1.15±1.04^{a}	1.35±0.93^{a}	1.00±1.02^{a}	1.58±1.71

N=120, a, b, c P<0.05 values across rows are different

3.2.3 Feed source and seasonal availability: The findings pertaining to the feed sources (seasonal) are presented in Table 4. The findings show that the pasture land predominated as the feed resource in the wet season while the reverse was true for the crop residues which were the major sources of feed in the dry season. During the dry season higher numbers of respondent provided their cattle with feed supplements the cattle received supplements, improved forage was localized to a few kebeles only and cut and carry system was prevalent mostly during the wet season.

Table 4. Perception of household on source and seasonal availability of feed for dairy animals

Feed source	Season	Kebele of respondents						Overall mean N=120
		Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	
Pasture land	Wet	100	100	90.0	100	62.0	85	90.0*
	Dry	25.0	20.0	20.0	15.0	5.0	10.0	15.8
Crop residue	Wet	40.0	45.0	80.0	55.0	55.0	55.0	55.0
	Dry	100.0	100.0	100.0	100.0	100.0	100.0	100.0*
Supplementary	Wet	10.0	20.0	30.0	5.0	55.0	35.0	25.8

Improved forage	Dry	40.0	25.0	45.0	35.0	85.0	45.0	45.8*
	Wet	5.0	-	0.6	-	-	-	0.8
Cut and carry system	Dry	10.0	-	-	-	-	5.0	2.5*
	Wet	35.0	45.0	40.0	50.0	35.0	30.0	39.2*
	Dry	5.0	-	-	5.0	5.0	5.0	3.3

*Significant difference between seasons

3.3 Breeding methods and preference

3.3.1 Breeding/mating systems: The result pertaining to method and preference of breeding service are presented in Table 5. The findings indicate that most of the respondents irrespective of the study area had no particular choice for a particular type of breeding method for their cattle. Most of the respondents preferred to avail the services of both natural and artificial insemination depending on the availability of the later. However, the study also indicates that many of the respondents preferred to get their cattle mated naturally instead of preferring AI. While, in case natural mating was unsuccessful the respondents preferred AI. However, the numbers in both the cases varied across the studied locations, the values were highest at Halaku kebele. However, the overall results indicated that incase the cattle are unable to conceive in the first instance majority of the respondents look forward to alternative means (AI) to get their cattle bred. This observation was consistent across all the studied locations.

Table 5. Breeding method and preference as practiced by the respondents in the study areas

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Breeding method (%)								
Natural mating	10.0	25.0	20.0	25.0	20.0	10.0	18.3	.242
AI	0.0	0.0	15.0	0.0	5.0	15.0	5.8	
Both	90.0	75.0	65.0	75.0	75.0	75.0	75.8	
Preference of breeding method								
Natural bull service								
First (%)	50.0	70.0	40.0	60.0	70.0	45.0	55.8	.247
Second (%)	50.0	30.0	60.0	40.0	30.0	55.0	44.2	
AI service								
First (%)	45.0	36.8	55.0	40.0	5.0	40.0	37.0	.031
Second (%)	55.0	63.2	45.0	60.0	95.0	60.0	63.0	

3.3.1 Artificial insemination service provision and Its Constraints

The results pertaining to the provision of AI services prevailing in the studied kebeles are presented in Table 6. The findings show that the respondents were not satisfied with the prevailing AI services they were receiving from the AI technicians, this was primarily ascribed to several factors viz. non availability of the services during the holidays, they also opined (except for the respondents from Desta Abijata) that there were no adequate numbers of technicians who were providing services in their kebeles (except the respondents from Korme,

Hurufalole and KamoGerbi) and neither were there any shortages of inputs at the end of the technicians. The study further indicated that most of the services they receive was at the time of the campaigns (the opinion however differed among the residents from Desta Abijata and Halaku).

Table 6. The reasons for inconsistency of AI service in the study area

Parameters	Kebele of respondents							χ2value
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	
Do you get the service regularly and without interruptions								
Yes (%)	31.6	15.0	20.0	5.0	50.0	40.0	26.9	.014
No (%)	68.4	85.0	80.0	95.0	50.0	60.0	73.1	
Service not available on weekends & holidays								
Yes (%)	61.5	76.5	75.0	63.2	60.0	75.0	69.0	.858
No (%)	38.5	23.5	25.0	36.8	40.0	25.0	31.0	
Shortage of AIT								
Yes (%)	61.5	64.7	43.8	31.6	50.0	41.7	42.5	.629
No (%)	38.5	34.3	56.2	68.4	50.0	58.3	57.5	
Shortage of inputs								
Yes (%)	15.4	17.6	18.8	26.3	20.0	16.7	19.5	.977
No (%)	84.6	82.4	81.2	73.7	80.0	83.3	80.5	
Only in campaign								
Yes (%)	37.5	68.8	62.5	78.9	33.3	63.6	62.0	.166
No (%)	62.5	31.2	37.5	21.1	66.7	36.4	38.0	

With regards to the failure of the cattle to conceive after being inseminated majority of the respondents irrespective of the studied locations indicated that heat detection, efficiency of the AI technicians, distance of the AI center and absence of the AI technicians as the major reason for failure in insemination. None of them indicate diseases prevailing among the livestock or even the quality of the semen could be ascribed to the poor fertility among the cattle in the studied areas.

Table 7. The main reasons for failure of insemination indicated by respondents in the study area

Parameters	Kebele of respondents							χ2value
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	
Heat detection problem								
Yes (%)	66.7	75.0	58.8	80.0	52.6	64.3	65.3	.607
No (%)	33.3	25.0	41.2	20.0	47.4	35.7	34.7	
Efficiency of AITs								
Yes (%)	55.6	66.7	82.4	66.7	84.2	64.3	68.4	.124
No (%)	44.4	33.3	17.6	33.3	15.8	35.7	31.6	
Distance of getting service								
Yes (%)	77.8	100.0	70.6	80.0	84.2	78.6	81.1	.502
No (%)	22.2	0.0	29.4	20.0	15.8	21.4	18.9	
Absence of AITs								
Yes (%)	72.2	66.7	76.5	66.7	73.7	78.6	72.6	.972
No (%)	27.8	33.3	23.5	33.3	26.3	21.4	27.4	

The results pertaining to the signs of estrus exhibited by the cattle in the studied locations indicate that the signs of estrus were variable viz. mounted by other animals of the herd, bellowing (Hurufalole and Halaku), restlessness (Hurufalole and KamoGerbi) while vulval discharge was reported by respondents in all the studied locations. While on the other hand the trait which was rarely exhibited was allowed to be mounted by other herd mates and swollen vulva, which of course are traits commonly exhibited by animals as have been reported by a fewer numbers of respondents.

Table 8. The major signs of heat respondent's use for reporting to AITs

Parameters	Kebele of respondents							
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=120	Kamo Gerbi N=20	Overall mean N=120	χ2value
Mounting other animals								
Yes (%)	89.5	68.4	52.9	40.0	65.0	75.0	65.2	.027
No (%)	10.5	31.6	47.1	60.0	35.0	25.0	34.8	
Bellowing								
Yes (%)	47.4	31.6	47.1	75.0	78.9	50.0	55.3	.024
No (%)	52.6	68.4	52.9	25.0	21.1	50.0	44.7	
Mucus discharge								
Yes (%)	57.9	52.6	64.7	80.0	70.0	65.0	65.2	.563
No (%)	42.1	47.4	35.3	20.0	30.0	35.0	34.8	
Restlessness								
Yes (%)	26.3	42.1	52.9	60.0	20.0	60.0	43.5	.037
No (%)	73.7	57.9	47.1	40.0	80.0	40.0	56.5	

Table 3. Livestock composition (Mean ± SD) and herd size (in TLU) of sampled respondents in the study area

Livestock type	Breed	Kebele of respondents						Overall mean
		Desta Abijata	Oda Anshura	Korme	Hurufalole	Halaku	KamoGerbi	
Cows	Local	4.75±2.53^{b}	4.55±3.51^{b}	4.45±4.87^{b}	2.20±1.43^{a}	3.00±2.59^{ab}	2.20±1.73^{a}	3.52±3.14
	Crossbred	0.15±0.36^{a}	0.10±0.30^{a}	0.55±1.05^{a}	0.05±0.22^{a}	1.15±1.42^{b}	0.35±0.58^{a}	0.39±0.86
Oxen	Local	2.50±1.85^{ab}	2.55±1.35^{b}	2.10±1.48^{ab}	2.10±1.07^{ab}	2.40±0.99^{ab}	1.60±0.94^{a}	2.21±1.33
	Crossbred	0.10±0.30^{ab}		0.05±0.22^{a}	0.05±0.22^{a}	0.30±0.65^{b}		0.08±0.33
Bulls	Local	0.60±0.88^{b}	0.30±0.57^{ab}	0.50±1.05^{ab}	0.15±0.48^{ab}	0.25±0.55^{ab}	0.10±0.30^{a}	0.32±0.69
	Crossbred	-		-	0.05±0.22^{a}	0.15±0.36^{b}		0.03±0.18
Heifers	Local	2.70±2.15	2.25±2.04	2.25±3.04	0.95±1.09	2.25±4.30	1.25±1.44	1.94±2.60
	Crossbred	0.25±0.55^{a}		0.20±0.41^{a}	0.15±0.36^{a}	0.90±1.16^{b}	0.15±0.36^{a}	0.28±0.64
Bull calves	Local	1.25±1.61	1.20±1.36	0.75±1.02	0.50±0.76	0.60±0.99	0.50±0.82	0.80±1.15
	Crossbred	-	0.05±0.22^{a}	0.30±0.57^{ab}	-	0.40±0.99^{b}	0.10±0.30^{ab}	0.14±0.50
Cow calves	Local	2.10±1.71^{b}	1.35±3.36^{a}	1.10±1.11^{a}	0.60±0.75^{a}	0.90±0.78^{a}	0.50±0.76^{a}	0.09±1.74
	Crossbred	-	0.05±0.22^{a}	0.40±0.82^{b}	0.05±0.22^{a}	0.20±0.52^{ab}	0.30±0.57^{ab}	0.17±0.49
Sheep		1.45±3.10	1.70±4.76	0.20±.89	0.25 ±0.78	0.30±0.97	0.75±1.65	0.78±2.51
Goats		4.50±4.69^{b}	4.10±3.37^{ab}	3.55±3.41^{ab}	2.00±2.71^{a}	4.55±4.09^{b}	1.75 ±2.44^{a}	3.41 ±3.64
Chicken	Local	3.00±4.61	5.30±11.55	1.50 ±2.74	3.70 ±5.67	2.90±6.26	1.30±2.79	2.95±6.35
	Crossbred	0.50±1.27	0.05 ±0.22	0.95±3.36	0.21±0.63	0.15±0.67	0.65±2.00	0.42±1.72
Donkeys		2.65±2.81^{b}	1.70±1.83^{ab}	1.60±1.50^{ab}	1.15±1.04^{a}	1.35±0.93^{a}	1.00±1.02^{a}	1.58±1.71

N=120, $^{a, b, c}$ P<0.05 values across rows are different

3.32 Feed source and seasonal availability

The findings pertaining to the feed sources (seasonal) are presented in Table 4. The findings show that the pasture land predominated as the feed resource in the wet season while the reverse was true for the crop residues which were the major sources of feed in the dry season. During the dry season higher numbers of respondent provided their cattle with feed supplements the cattle received supplements, improved forage was localized to a few kebeles only and cut and carry system was prevalent mostly during the wet season.

Table 4. Perception of household on source and seasonal availability of feed for dairy animals

Feed source	Season	Kebele of respondents						Overall mean N=120
		Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	
Pasture land	Wet	100	100	90.0	100	62.0	85	90.0*
	Dry	25.0	20.0	20.0	15.0	5.0	10.0	15.8
Crop residue	Wet	40.0	45.0	80.0	55.0	55.0	55.0	55.0
	Dry	100.0	100.0	100.0	100.0	100.0	100.0	100.0*
Supplementary	Wet	10.0	20.0	30.0	5.0	55.0	35.0	25.8
	Dry	40.0	25.0	45.0	35.0	85.0	45.0	45.8*
Improved forage	Wet	5.0	-	0.6	-	-	-	0.8
	Dry	10.0	-	-	-	-	5.0	2.5*
Cut and carry system	Wet	35.0	45.0	40.0	50.0	35.0	30.0	39.2*
	Dry	5.0	-	-	5.0	5.0	5.0	3.3

*Significant difference between seasons

3.33 Breeding methods and preference

3.33.1 Breeding/mating systems: The result pertaining to method and preference of breeding service are presented in Table 5. The findings indicate that most of the respondents irrespective of the study area had no particular choice for a particular type of breeding method for their cattle. Most of the respondents preferred to avail the services of both natural and artificial insemination depending on the availability of the later.

However, the study also indicates that many of the respondents preferred to get their cattle mated naturally instead of preferring AI. While, in case natural mating was unsuccessful the respondents preferred AI. However, the numbers in both the cases varied across the studied locations, the values were highest at Halaku kebele. However, the overall results indicated that incase the cattle are unable to conceive in the first instance majority of the respondents look forward to alternative means (AI) to get their cattle bred. This observation was consistent across all the studied locations.

Table 5. Breeding method and preference as practiced by the respondents in the study areas

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Breeding method (%)								
Natural mating	10.0	25.0	20.0	25.0	20.0	10.0	18.3	.242
AI	0.0	0.0	15.0	0.0	5.0	15.0	5.8	
Both	90.0	75.0	65.0	75.0	75.0	75.0	75.8	
Preference of breeding method								
Natural bull service								
First (%)	50.0	70.0	40.0	60.0	70.0	45.0	55.8	.247
Second (%)	50.0	30.0	60.0	40.0	30.0	55.0	44.2	
AI service								
First (%)	45.0	36.8	55.0	40.0	5.0	40.0	37.0	.031
Second (%)	55.0	63.2	45.0	60.0	95.0	60.0	63.0	

3.34. **Artificial insemination service provision and Its Constraints**: The results pertaining to the provision of AI services prevailing in the studied kebeles are presented in Table 6. The findings show that the respondents were not satisfied with the prevailing AI services they were receiving from the AI technicians, this was primarily ascribed to several factors viz. non availability of the services during the holidays, they also opined (except for the respondents from Desta Abijata) that there were no adequate numbers of technicians who were providing services in their kebeles (except the respondents from Korme, Hurufalole and KamoGerbi) and neither were there any shortages of inputs at the end of the technicians. The study further indicated that most of the services they receive was at the time of the campaigns (the opinion however differed among the residents from Desta Abijata and Halaku).

Table 6. The reasons for inconsistency of AI service in the study area

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Do you get the service regularly and without interruptions								
Yes (%)	31.6	15.0	20.0	5.0	50.0	40.0	26.9	.014
No (%)	68.4	85.0	80.0	95.0	50.0	60.0	73.1	
Service not available on weekends & holidays								
Yes (%)	61.5	76.5	75.0	63.2	60.0	75.0	69.0	.858
No (%)	38.5	23.5	25.0	36.8	40.0	25.0	31.0	
Shortage of AIT								
Yes (%)	61.5	64.7	43.8	31.6	50.0	41.7	42.5	.629
No (%)	38.5	34.3	56.2	68.4	50.0	58.3	57.5	
Shortage of inputs								
Yes (%)	15.4	17.6	18.8	26.3	20.0	16.7	19.5	.977
No (%)	84.6	82.4	81.2	73.7	80.0	83.3	80.5	
Only in campaign								
Yes (%)	37.5	68.8	62.5	78.9	33.3	63.6	62.0	.166

No (%)	62.5	31.2	37.5	21.1	66.7	36.4	38.0	

With regards to the failure of the cattle to conceive after being inseminated majority of the respondents irrespective of the studied locations indicated that heat detection, efficiency of the AI technicians, distance of the AI center and absence of the AI technicians as the major reason for failure in insemination. None of them indicate diseases prevailing among the livestock or even the quality of the semen could be ascribed to the poor fertility among the cattle in the studied areas.

Table 7. The main reasons for failure of insemination indicated by respondents in the study area

Parameters	Kebele of respondents							
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Heat detection problem								
Yes (%)	66.7	75.0	58.8	80.0	52.6	64.3	65.3	.607
No (%)	33.3	25.0	41.2	20.0	47.4	35.7	34.7	
Efficiency of AITs								
Yes (%)	55.6	66.7	82.4	66.7	84.2	64.3	68.4	.124
No (%)	44.4	33.3	17.6	33.3	15.8	35.7	31.6	
Distance of getting service								
Yes (%)	77.8	100.0	70.6	80.0	84.2	78.6	81.1	.502
No (%)	22.2	0.0	29.4	20.0	15.8	21.4	18.9	
Absence of AITs								
Yes (%)	72.2	66.7	76.5	66.7	73.7	78.6	72.6	.972
No (%)	27.8	33.3	23.5	33.3	26.3	21.4	27.4	

The results pertaining to the signs of estrus exhibited by the cattle in the studied locations indicate that the signs of estrus were variable viz. mounted by other animals of the herd, bellowing (Hurufalole and Halaku), restlessness (Hurufalole and KamoGerbi) while vulval discharge was reported by respondents in all the studied locations.

While on the other hand the trait which was rarely exhibited was allowed to be mounted by other herd mates and swollen vulva, which of course are traits commonly exhibited by animals as have been reported by a fewer numbers of respondents.

Table 8. The major signs of heat respondent's use for reporting to AITs

Parameters	Kebele of respondents							
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=120	Kamo Gerbi N=20	Overall mean N=120	χ2value
Mounting other animals								
Yes (%)	89.5	68.4	52.9	40.0	65.0	75.0	65.2	.027
No (%)	10.5	31.6	47.1	60.0	35.0	25.0	34.8	
Bellowing								
Yes (%)	47.4	31.6	47.1	75.0	78.9	50.0	55.3	.024
No (%)	52.6	68.4	52.9	25.0	21.1	50.0	44.7	
Mucus discharge								
Yes (%)	57.9	52.6	64.7	80.0	70.0	65.0	65.2	.563
No (%)	42.1	47.4	35.3	20.0	30.0	35.0	34.8	

Restlessness								
Yes (%)	26.3	42.1	52.9	60.0	20.0	60.0	43.5	.037
No (%)	73.7	57.9	47.1	40.0	80.0	40.0	56.5	

3.3.5 Breeds, decision on sire breed and blood level used for crossbreeding*:* The results pertaining to the genotypes (from the semen of the bulls preferred by the respondents) indicate that most of the respondents were unaware of the semen types available, however among those who are aware of the semen from different breeds of bulls have indicated that the semen from Holstein Friesian bulls were preferred by the respondents from Halaku and those of Jersey was preferred at Korme, the respondents from the other studied locations preferred semen from Boran bulls.

The study further indicated that the respondents themselves rarely were decision makers in selecting the semen type that was preferred and in most of the time the decision was left for the inseminator to decide. The results further indicate that at Halaku and KamoGerbi semen from Holstein Friesian and Boran are preferred over from those of Jersey bulls.

Table 9. Breeds, decision on sire breed and blood level used and breeds considered suitable for crossbreeding by respondents

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=20	χ2value
Breeds used for cross breeding								
HF	10.0	10.5	10.0	5.0	30.0	5.0	11.8	
Jersey	5.0	15.8	30.0	10.0	25.0	20.0	17.6	.054
Boran	30.0	31.6	5.0	15.0	0.0	30.0	18.5	
Don't know	55.0	42.1	55.0	70.0	45.0	45.0	52.1	
Total	100	100	100	100	100	100	100	
Who decide the sire breed and blood level used for crossbreeding								
AI technician	95.0	84.2	90.0	100	85.0	90.0	90.8	
Farmers	5.0	5.3	10.0	0.0	5.0	10.0	5.9	.357
Both	0.0	10.5	0.0	0.0	10.0	0.0	3.4	
Total	100	100	100	100	100	100	100	
Breeds they consider suitable and select for crossbreeding								
HF	25.0	5.3	25.0	30.0	50.0	20.0	26.1	
Jersey	25.0	26.3	30.0	20.0	30.0	15.0	24.4	.211
Boran	25.0	42.1	25.0	30.0	0.0	45.0	27.7	
Don't know	25.0	26.3	20.0	20.0	20.0	20.0	21.8	
Total	100	100	100	100	100	100	100	

* HF= Holstein Frisian

3.3.6 Status and Perception of Farmers of Estrous Synchronization and Mass Artificial Insemination

3.36.1 Status of Estrous Synchronization and Mass Artificial Insemination: The findings from Table 10 indicate that the decisions pertaining to the estrus synchronization and mass artificial insemination (OSMAI) indicate that the selection of the cattle were primarily in the hands of the AI technicians, with very little involvement of the livestock experts and/or the farmers themselves, which is not quite desired.

Table 10. Decision/selection of animals for OSMAI service

Parameters	Kebele of respondents Desta Abijata	Oda Anshura	Korme	Hurufa Lole	Halaku	KamoGerbi	Overall mean	χ2value

	N=20	N=20	N=20	N=20	N=20	N=20	N=120	
Decision /selection of animals for OSMAI (%)								
Farmers	5.3	10.0	10.0	5.0	0.0	10.0	6.7	.238
AITs	68.4	75.0	55.0	70.0	80.0	85.0	72.3	
Group of experts	10.5	5.0	20.0	0.0	10.0	0.0	7.6	
Farmers & AITs	10.5	0.0	0.0	20.0	5.0	5.0	6.7	
AITs & group of experts	5.3	10.0	15.0	5.0	5.0	0.0	6.7	

The findings from Table 11 indicate that there were mixed response among the respondents from the different kebeles regarding selection of the cattle to be included in the OSMAI program. While, the respondents from Korme and Halaku reported that they were not aware of the criteria for selecting the cattle. The findings further indicate that the cattle selected for the OSMAI program were those with higher body weight, but calving history was not included as a criteria for selecting them, while there was a mixed response as regards the body condition in selecting the cattle to be included in OSMAI while the respondents from Desta Abijata, Oda Anshura and Kamo Gerbi reported that it was not a criteria to select the cattle, while ability to calve easily, health of the animals and age of the animals were not considered as criteria to select the cattle to be included in OSMAI program.

Table 11. **The major criteria's mentioned by respondents for animal selection to get OSMAI service**

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Having any information on criteria's to select animals for OSMAI service								
Yes (%)	68.4	60.0	25.0	55.0	45.0	70.0	53.8	.045
No (%)	31.6	40.0	75.0	45.0	55.0	30.0	46.2	
Larger body size								
Yes (%)	100.0	90.0	100.0	100.0	77.8	91.7	93.2	.343
No (%)	0.0	10.0	0.0	0.0	22.2	8.3	6.8	
Calving more than one								
Yes (%)	0.0	30.0	0.0	18.2	44.4	16.7	18.6	.120
No (%)	100.0	70.0	100.0	81.8	55.6	83.3	81.4	
Having good body condition								
Yes (%)	41.7	10.0	60.0	63.6	55.6	33.3	42.4	.156
No (%)	58.3	90.0	40.0	36.4	44.4	66.7	57.6	
Able to calve easily								
Yes (%)	0.0	20.0	0.0	18.2	11.1	16.7	11.9	.607
No (%)	100.0	80.0	100.0	81.8	88.9	83.3	88.1	
Age								
Yes (%)	0.0	20.0	0.0	9.1	0.0	41.7	13.6	.26
No (%)	100.0	80.0	100.0	90.9	100.0	58.3	86.4	

3.37 Sex ratio of calves born and sex preference: The results from Table 12 indicate the sex ratio of the calves born from the OSMAI program. The findings indicate that the sex ratio among the calves born (crossbreds) favored the birth of the bull calves which was similar across all the study areas, the calves born during the period were mostly crossbreds.

The findings also indicate that the sex ratio of the crossbred calves favored the birth of the bull calves in all the studied locations except those reared at Hurufalole kebele. The survivability of the calves including those of the crossbred were optimum, the observations being similar across the studied areas.

Table 12. Sex and survival of calves born.

	Kebele of respondents

Parameters	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Sex of crossbred calves born								
Male (%)	75.0	75.0	69.2	50.0	62.5	70.0	66.7	.949
Female (%)	25.0	25.0	30.8	50.0	37.5	30.0	33.3	
Breeds of calves born								
Crossbred (%)	50.0	30.8	76.5	50.0	72.7	76.9	60.5	.081
Local (%)	50.0	69.2	23.5	50.0	27.3	23.1	39.5	
Survival of calves(Both genotype)								
Survived (%)	100	100	94.1	85.7	100	92.3	94.7	.532
Died (%)	0.0	0.0	5.9	14.3	0.0	7.7	5.3	
Survival of the crossbred calves								
Survived (%)	100	100	92.3	71.4	100	90.0	91.3	.410
Died (%)	0.0	0.0	7.7	28.6	0.0	10.0	8.7	

The results pertaining to the sex and the reason for preference for a particular sex are presented in Table 13. The findings show that the respondents were looking forward to the birth of the cow calves (while the reverse was observed). The results further indicate that the respondents were looking forward to the birth of the cow (female) calves for milk yield, while there were apparently no differences (significant) among the respondents in whether the calves were bred for herd replacement. The results further indicated that most of the respondents prefer birth of the bulls for draft, breeding or fattening purposes.

Table 13. Sex and reason of preference indicated by respondents.

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa Lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2 value
Sex preference								
Male (%)	35.0	22.2	23.5	20.0	26.3	36.8	27.4	.869
Female (%)	55.0	66.7	70.6	75.0	57.9	47.4	61.9	
Both	10.0	11.1	5.9	5.0	15.8	15.8	10.6	
Milk production								
Yes (%)	65.0	77.8	82.4	75.0	78.9	57.9	72.6	.529
No (%)	35.0	22.2	17.6	25.0	21.1	42.1	27.4	
Female for reproduction/ herd replacement								
Yes (%)	40.0	50.0	52.9	50.0	42.1	47.4	46.9	.966
No (%)	60.0	50.0	47.1	50.0	57.9	52.6	53.1	
Ploughing/traction								
Yes (%)	35.0	33.3	29.4	30.0	31.6	47.4	34.5	.869
No (%)	65.0	66.7	70.6	70.0	68.4	52.6	65.5	
Breeding Bull								
Yes (%)	15.0	5.6	5.9	5.0	15.8	10.5	9.7	.763
No (%)	85.0	94.4	94.1	95.0	84.2	89.5	90.3	
Bulls for fattening								

Yes (%)	15.0	5.6	5.9	15.0	0.0	0.0	7.1
No (%)	85.0	94.4	94.1	85.0	100	100	92.9

3.3.8 Perception of farmers and constraints of estrus mass synchronization

The findings as indicated in Table 14 are related to the levels of satisfaction/dissatisfaction among the respondents regarding the OSMAI. The result indicated that the majority (55.5%) of respondents were not satisfied with the service they got with OSMAI and also 37.8% of respondents think that peoples living in and near their village were also not happy with OSMAI service given in their area. The majority of the respondent indicated that non conception of their animals through the procedure, which was however not ascribed to the nature of the program itself, the efficiency or the availability of the AI technicians were some of the reasons for dissatisfaction.

Table 14. The major reason for dissatisfaction in OSMAI service as indicated by the respondents.

Parameters	Kebele of respondents Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufalole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	$\chi 2$ value
Cows were repeating								
Yes (%)	38.5	27.3	25.0	46.7	30.0	44.4	36.4	.852
No (%)	61.5	72.7	75.0	53.3	70.0	55.6	63.6	
Animals doesn't conceive until now								
Yes (%)	46.2	45.5	12.5	40.0	10.0	11.1	30.3	.149
No (%)	53.8	54.5	87.5	60.0	90.0	88.9	69.7	
Less success rate								
Yes (%)	46.2	54.5	50.0	46.7	10.0	22.2	39.4	.240
No (%)	53.8	45.5	50.0	53.3	90.0	77.8	60.6	
Provision of service in campaign form only								
Yes (%)	23.1	9.1	50.0	20.0	20.0	0.0	19.7	.172
No (%)	76.9	90.9	50.0	80.0	80.0	100	80.3	
Lack of awareness creation								
Yes (%)	23.1	9.1	12.5	0.0	30.0	44.4	18.2	.093
No (%)	76.9	90.9	87.5	100.0	70.0	55.6	81.8	
AIT technician not available								
Yes (%)	0.0	9.1	0.0	26.7	20.0	0.0	10.6	.126
No (%)	100.0	90.9	100.0	73.3	80.0	100	89.4	
AIT are inefficient								
Yes (%)	27.3	10.0	12.5	0.0	0.0	44.4	14.5	.032
No (%)	72.7	90.0	87.5	100	100	55.6	85.5	

3.3.9 Future of estrous mass synchronization program

More than half (54.6%) the respondents indicated the program has to be continued and scaled up whereas 15.1% indicated the program has to be continued as such. On the other hand, 30.3% of respondents indicated that the program success was less efficient and it should be discontinued. The findings as presented in Table 15 pertain to the reasons for scaling up, continuation or discontinuation of the OSMAI program. The findings show that the respondents presumed that the OSMAI program could improve the genetic makeup of the cattle associated with the program thereby help in poverty reduction; improve the social status and also economic improvement of the respondents this was across all the study locations.

The results also indicate that the OSMAI program was discontinued because of poor estrus among the cattle reared under the program, this may be ascribed to the poor nutrition available to the cattle, and this was observed across all the studied kebeles except among the cattle raised in Oda Anshura kebele. The findings also show that the reasons for poor conception may be ascribed to poor body condition which was true in all the studied locations except those reared at Oda Anshura kebele.

Table 18. Reasons for the program scaling up and continuation and discontinued

Parameters	Kebele of respondents							
	Desta Abijata N=20	Oda Anshura N=20	Korme N=20	Hurufa lole N=20	Halaku N=20	Kamo Gerbi N=20	Overall mean N=120	χ2value
Reasons for scaling up and continuation								
Improve genetic makeup of animals								
Yes (%)	92.3	72.7	92.3	61.5	81.2	94.1	83.1	.144
No (%)	7.7	27.3	7.7	38.5	18.8	5.9	16.9	
Help in poverty reduction								
Yes (%)	92.3	72.7	76.9	84.6	75.0	82.4	80.7	.823
No (%)	7.7	27.3	23.1	15.4	25.0	17.6	19.3	
Improving the social status of the owners								
Yes (%)	61.5	36.4	61.5	53.8	50.0	76.5	57.8	.400
No (%)	38.5	63.6	38.5	46.2	50.0	23.5	42.2	
It will have a positive impact in improving the economic status of the owners								
Yes (%)	92.3	81.8	100	84.6	75.0	75.0	84.1	.398
No (%)	7.7	18.2	0.0	15.4	25.0	25.0	15.9	
Reason for to be discontinued								
Because the synchronized cows have problems in coming in estrus in the normal manner								
Yes (%)	100.0	88.9	100	85.7	100	100	94.4	.743
No (%)	0.0	11.1	0.0	14.3	0.0	0.0	5.6	
Because animals have to be good feeding and health services in place before the program is launched								
Yes (%)	33.3	66.7	14.3	14.3	50.0	0.0	33.3	.118
No (%)	66.7	33.3	85.7	85.7	50.0	100	66.7	
Because there are problems with conceiving								
Yes (%)	66.7	100	100	85.7	100	100.	91.7	.198
No (%)	33.3	0.0	0.0	14.3	0.0	0.0	8.3	
Because body condition of the cows have to be a strict criteria for including in the program								

Yes (%)	33.3	66.7	28.6	42.9	0.0	66.7	41.7	.251
No (%)	66.7	33.3	71.4	57.1	100.0	33.3	58.3	

4.0 DISCUSSIONS

4.1 General information

4.1.1 Household socio economics characteristics: The results as indicated in Table 1 show that most of the respondents were males, married and the literacy levels were variable. This may be because of the social structure of the region where most of the householders are males, this is in close accordance with the findings of (Bainesagn, 2015). The results also indicate that most of the respondents were attending primary education with a variation across the study areas which are somewhat in close accordance with the findings of (Alemenesh, 2015) who reported that education levels in the rural areas are low especially among the rural communities. Low education levels are a bane in modern animal husbandry as such farmers are unable to follow the recommendations provided by the extension agents and the technical staff alike (Aregawi, 2013). Such respondents will generally not be able to maintain records much needed for the development and implementation of scientific projects.

Therefore, it becomes necessary to strengthen the prevailing livestock extension agencies, educate the respondents and also to develop associated materials which can be helpful for the respondents to strengthen the livestock husbandry practices in the region (Bainesagn, 2015). A strong livestock extension agency can be very helpful in improving the livelihood of the farming communities.

4.1.2 Household resources

Land holding: The average land holdings among the respondents as presented in Table 2, indicate that the average land holdings are in close accordance with the findings of (Azage *et al*., 2013). The land holdings are similar to the national average land holding reported by (CSA, 2013). However, larger land holdings have also been reported by Megersa, (2016); Azage *et al.*, (2013) from West Shoa Zone and lowlands of Metema. While, larger land holdings can be correlated with larger numbers of livestock reared as the byproducts from the agrarian activities can serve as feed for the animals (Azage *et al.*, 2013).

The farmers can also allot a part of their land for grazing purposes which again can be beneficial for livestock husbandry in the area. However, in the study area the ratio between the average family size and land holdings indicate that the only option to enhance their family income is to adopt modern agricultural and animal husbandry operations. Thus in order to achieve the same strengthening of the agricultural and livestock activities become imperative which also demands strengthening the linkage between the research stations, Universities and Bureau of livestock and fisheries so that the holistic development of the agrarian communities can be achieved. It also demands establishment of linkages between sister organizations which can lead to provision of proper inputs and also marketing of the products under value chain approach.

4.1.3 Livestock and dairy herd size

The findings from Table 4 relates to the livestock herd size shows that most of the cattle reared in the study area are of native (indigenous) types which is in accordance with the findings of Abera, (2016); Bainesagn, (2015) who reported that the numbers of crossbreed cattle are quite low in the country and do not account for more than 5%. The larger numbers of native cattle (irrespective of all the studied locations) may also be associated with poor AI services and also management/nutrition which are usually associated with raising crossbred cattle (Kahi, 2002).

The findings also indicate that the numbers of all the other classes of cattle also favor the native cattle which may be ascribed to the use of bulls for agrarian purposes, use of which is dominant in the rural areas of the country especially those practicing the crop livestock production system (Abera, 2016). Goats are higher when compared to the sheep which may be ascribed to the agro climate, studies by Alemenesh, (2015) have indicated that numbers of goats are more in the lowlands while the reverse was true for sheep population of which are higher in the highlands. The numbers of native chickens are also higher in the study area which too indicates that there is lack of extension activities in the area.

4.1.4 Feed source and seasonal availability

The results from the Table (4) indicate that the type of feed vary across the seasons, while the pasture lands predominate during the wet season findings being in consonance with those of (Debir, 2016). During the dry season most of the pasture land withers away due to lack of moisture during the dry season the crop residues are the major feed sources the observations are in close accordance with those of (Destalem, 2015). The supplementary feed too is provided during the dry season which are also in accordance with those of Aregawi, (2013) as the quality of the crop

residues have poor nutritional value when compared to the pastures. However, the farmers need to be appraised about the methods to conserve the agricultural byproducts (supplements), as poor post-harvest storage this may result in the formation of mycotoxins in feed the results of which have been recently reported from the country (Gizachew *et al.*, 2016).The results also indicate that cultivation of improved forage is yet to pick up while the same may be ascribed to lack of land holdings among the respondents where the agronomic activities predominate over forage cultivation .

4.1.5 Breeding methods and preference

Breeding/mating systems: The results presented in Table 5 indicated that there was a significant difference between breeding method and their preference across the Kebeles. The study shows that the respondents did not have any specific preference for either natural or artificial mating. These are in close accordance with those of (Gizaw *et al.*, 2016). The results also show that there might also be ascribed to the poor quality of AI services which results in non-total dependence of the same, this observation are also in close accordance with those of (Abera, 2016). Therefore, there is interdependence of both the methods simultaneously. In contrast to the present observation Debir, (2016) indicated natural mating as common breeding method in Sidama zone of Southern region.

4.1.6 AI service provision and Constraints:

The findings as presented in Table 6 are in continuation of the previous table 5. This shows the reason why the respondents still depended on the natural service, which show that as the provision of the AI services are not quite regular desists the respondents to be totally dependent on the same, the observations are in close accordance with those of (Gizawu and Dima, 2016).

Artificial insemination services in most of the cases not available during the holidays too leads the respondents to seek for alternatives (Bainesagn, 2015). However, in most of the cases the respondents believed in the human factor for the poor AI services as they opined that there were no problems associated with the provisions needed with the AI services, these observations are in consonance with the findings of Aregawi, (2013). However, the observations contradict with the findings of Abera, (2016) who reported from West Shoa zone, of Oromia that there is erratic supply of the provisions especially liquid nitrogen.

The results as presented in Table 7 show that most of the respondents were not able to detect the cattle in estrus which is in accordance with the findings of Abera, (2016) who reported that heat detection was the major top problem across the three dairy production systems in West Shoa zone of Ethiopia. Proper detection of estrus is imperative for the success of AI program in the area and if not properly detected can lead to failure of the services. The study further also indicates that absence and shortage of AITs were the major reasons. The current observation was in accordance with the report by (Bainesagn, 2015). The results also show that distance towards the AI center too was an important factor pertaining to the efficiency, as animals which have to travel long distance before or after the AI services can have low conception (Gizawu and Dima, 2016), this may be associated with the stress in travelling. The absence of gynecological problems or venereal diseases cannot be totally ruled out as the farmers may not be able to detect the presence of the diseases properly. Review by Hamid and Alemayehu, (2015) have indicated that most of the failures in conception are associated with several venereal diseases especially brucellosis which can influence conception. However, the present findings are in close accordance with those of Muluye, (2016) who reported low incidences of gynecological or venereal diseases as factors associated with poor conception.

The findings also indicate that the respondents were satisfied with the quality of semen, however they may not be aware of the different protocols associated with thawing of the straws, maintaining the levels of liquid nitrogen and allied formalities associated with proper AI. These observations are in close accordance with those of (Abera, 2016). It can also be associated with lack of proper motivation of the inseminators in the region which need to be looked into properly by the authorities and may be some sort of incentives for every cow conceiving in their operational area, similar recommendation has also been reported by Desalegn *et al.*, (2009) in Ethiopia. The findings from Table 8 show the different visual signs of estrus as have been reported by the respondents, all the signs as reported are more of less similar to those reported in the literatures, the observations are in close accordance with those of (Gizawu and Dima, 2016). There have also been reports of silent heat among the cattle especially in the tropics therefore such studies need to be conducted and the cause identified.

4.1.7 Genotypes and deciding factor of the bulls used for crossbreeding:

The results as presented in Table 9, indicate that the respondents were more or less not aware of the breeds of bulls whose semen were available with the inseminators, this left very little room for participatory breed improvement in the region, the observations are in contrast with the observations of Bainesagn, (2015) who reported

farmers were aware about sire breeds with which their animals inseminated. This may further be ascribed to the lack of availability of semen of a particular genotype at the inseminators end.

This may also be a fallout of lack of proper livestock extension education for the respondents who did not aware of the attributes associated with a particular genotype and thereby decide if the genotype is suitable for their specific agro ecology.

4.1.8 Status, perception of farmers and constraints of estrous mass synchronization

Status of estrous mass synchronization: The results pertaining to the participation of OSMAI as presented in Table 10, indicate that the selection of the cattle included in the program were by and large selected based on the decision of the AI technicians. The findings are in contrast with those of Tegene and Zelalem, (2016) who reported that the selection of animals was done by a group of experts and farmers. The poor success of the AI projects in the past and however in few of the cases participatory decisions were also there, which is not a good practice. Participatory approaches are always good when such types of programs are initiated as the farmers and livestock can help in deciding the best approach in selection of the cattle under such mass insemination program.

This was observed across all the study areas and may have played in the poor success of the program. The findings from Table 11 show the criteria mentioned to them regarding selection of the cattle to be included in OSMAI program. The findings indicate that there were differences across the kebeles when it came to the information regarding the program, the respondents from Korme and Halaku indicated that they were not appraised about the project. Thus, either the program was initiated in a haste or the livestock extension personnel were themselves not properly appraised by the authorities or they did not appraise the respondents themselves. Such information gap can lead to widespread discrepancies in the success of the projects and the authorities must crosscheck to plug the gaps prior to initiation of any such program. The cattle were selected based on their large body size, which in one stance may be important when semen from Holstein Friesian (HF) or even Jersey bulls are used, as phenotypic dissortative matings are prone to dystocia and also may lead to abortions at later stages of gestation (Mukasa Mugerwa, 1989). The study also indicated that cattle were selected based on above average body conditions, which necessities for the body reserve much needed for a successful conception and maintenance of pregnancy (Mukasa Mugerwa, 1989). However, this criterion was over looked in some of the studied kebeles which is a serious flaw and need to have been looked into prior to the initiation of the project.

The condition of calving ease was also overlooked; this may have been because the heifers were preferred over cows. However, in this case too pelvic dimensions of the heifers could have been assessed so as to ensure calving ease. Selection of the cattle with above average health too was a welcome gesture, however apparently healthy looking animals may still not be pathologically healthy. Therefore, the criteria of assessment of health should be based on properly defined criteria. Age of the animals too were not considered which is because heifers are expected to be of more or less similar ages provided they have a good body condition.

4.1.9 Sex ratio of calves born and sex preference

The results pertaining to the sex ratio of the calves born from the OSMAI are presented in Table 12. The results indicated that there were no differences across the studied locations for the trait, however there were more numbers of bull calves born which is in accordance with the observations of (Frehiwot *et al.*, 2014) who reported that there was a skewness in sex ratio of the calves (favoring the birth of the bull calves). There were also reports from (Bekele,2005) where the farmers preferred natural service over AI as the sex ratio of the calves were skewed favoring the birth of the bull calves among the cows conceiving through AI. The findings are however contrary to the reports of Effa *et al*., (2014) who reported that there were no differences across the sexes of the calves born from AI and NM. The results also indicate that most of the calves born were of crossbred types with slight variation across the study areas, this might be to achieve the aim to improve the milk yield from the area so as to achieve the national plan. The survivability of the calves born (across both the genotypes) were optimum and were better than the values reported by Asseged and Birhanu, (2004) from dairy farms in and around Addis Ababa areas of the country, however, regular follow up has to be taken so as to ensure growth of the calves.

Perception of farmers and constraints of estrus mass synchronization: The results as presented in Table 14 pertaining to desiring the sex of the calves born from the OSMAI project indicate that most of the respondents desired the birth of a cow calf which is in close accordance with the findings of Bekele, (2005) from highland part of Ethiopia. This was associated with high demand of milk and dairy products in the areas, these observations are in close accordance with those of (Bekele, 2005). The findings also show that the respondents across all the studied locations preferred to have cow calves when compared to bull calves as rearing bulls were not their primary goal to go in for OSMAI project the observations are in similarity with those of. However, results of studies by Debir, (2016)

from Southern part of the country indicate that in midlands under mixed crop livestock production system bulls are of primordial importance for the farmers and cows are reared for their mothering ability and as mother of the bulls.

5.0 CONCLUSIONS

5.1 Future of estrous mass synchronization program

The results pertaining to the reasons for dissatisfaction of the OSMAI program as presented in Table 14 indicate that the respondents were mostly dissatisfied regarding the way the program was implemented, this is in close accordance with the findings of Bainesagn, (2015) who reported that in such mass insemination programs it is important to take into confidence the aspirations of the beneficiaries and the pros and cons of such project be intimated to them in advance. The results as presented in Table 15 further indicates that the respondents had very high aspirations with the project and opined that the project could solve many of their prevailing miseries and could improve their living conditions, which practically does not occur over night and hence can be considered as a serious flaw in the implementation of the project as it indicates that the respondent were not apprised about the aims and also the pros and cons associated with the project as a whole , these observations are in close accordance with those of (Tegegn and Zelalem , 2016).

The respondents also indicated that the cattle included in the project had difficulties in return of estrus in the natural way, which may be ascribed to interference of the exogenous hormones to the normal endocrine secretions, these observations are in close accordance with those of Destalem, (2015) who also reported that cows which are provided with PGF2 or their analogue had problems with conception in the subsequently. These observations were contradicted with the findings of Azage *et al.,* (2012) who reported that there were no differences in subsequent conception among the cattle.

5.2 Recommendations

Farmers has to be aware and trained about the OSMAI service in detail especially on the management and handling of animals after being synchronized and inseminated before the commencement of the service. The participation of farmers should be active from the initial until the implementation. The time table of the program should be synchronized with feed availability in the area. Farmers has to know and given the chance for selecting and deciding on breed and blood level of animals with which their animals crossbred. AIT should work efficiently and technical capable through providing on job trainings.

5.3 Acknowledgement

The authors are grateful to Oromia Agricultural Research Institute for financial support, Adami Tulu Agricultural Research Center management and technical staffs (especially Dairy Research Team staffs), International Livestock Research Institute LIVES project for supplying inputs for the study and Hawassa University, College of Agriculture, School of Animal and Range Sciences.

References

Abera, M. 2016. Reproductive and productive performance of crossbred and Indigenous Dairy Cattle under Rural, peri urban dairy farming systems in West Shoa zone, Oromia, Ethiopia. M.Sc. Thesis Jimma University, Ethiopia.

Alemnesh Belete, 2015. Assessment of Quality and Marketing of Hide and Skin in Adami Tulu Jidokombolcha and Bora Woreda, in East Shewa Zone of Oromia Regional State, Ethiopia. MSc Thesis College of Veterinary Medicine and Agriculture, Department of Animal Production Studies. Addis Ababa University

Amenu, K. 2013. Assessment of water sources and quality for livestock and farmers in the Rift Valley area of Ethiopia. Implications for health and food safety. PhD thesis. Hohenheim, Germany. University of Hohenheim.

Aregawi, H., 2013. Evaluation of the Reproductive and Artificial Insemination Service Efficiency of Dairy Cattle in Eastern Zone of Tigray, North Ethiopia. M.Sc. Thesis Haramaya University.

Asseged, B. & Birhanu, M., 2004. Survival Analysis of Calves and Reproductive Performance of Cows in Commercial Dairy Farms in and Around Addis Ababa, Ethiopia Tropical Animal Health and Production (2004) 36: 663.

ATARC, 2003. Adami Tulu Agricultural Research Center, strategic planning and management document, P. 67.

Azage T., Awete E., Asrat T. and Dirk H. 2012. Technological options and Approaches to improve Smallholder access to desirable animal genetic martial for Dairy development: for dairy Development: IPMS experience with synchronization and mass insemination. Tropentag, September, 19-21, 2012, Göttingen.

Bainesagn, W., 2015. Assessment of Breeding Practices and Evaluation of Estrus Synchronization and Mass Insemination Technique in Dairy Cattle in West Shoa Zone. MSc Thesis Haramaya University.

Balhara, A.K., M. Gupta, S. Singh, A.K. Mohanty and I. Singh, 2013. Early pregnancy diagnosis in bovines: current status and future directions. The Scientific World Journal, pp: 1-10.

Bekele, T., 2005. Calf Sex Ratios in Artificially Inseminated and Natural Mated Female Crossbred Dairy Herd. In: proceedings of the 13 annual conference the Ethiopian Society of Animal Production. Addis Ababa, Ethiopia, pp: 225-230.

Carvalho R.V., Del Campo M.R., Palasz A.T., Plante Y. and Mapletoft R.J. (1996). Survival rates and sex ratio of bovine IVF embryos frozen at different developmental stages on day 7. Theriogenology. 45, 489-498.

CSA (Central Statistical Agency). 2015. Federal Democratic Republic of Ethiopia. Agricultural Sample Survey. Livestock and Livestock Characteristics Bulletin, Volume II, Central Statistical Agency, Addis Ababa, Ethiopia.

CSA 2012/13. Agricultural sample survey. Report on livestock and livestock characteristics. The Federal Democratic republic of Ethiopia, Central Statistical Agency (CSA). Private Peasant Holdings. Statistical Bulletin 570, Addis Ababa, Ethiopia, April, 2013.

D.P. Berry, A.R. Cromie, (2006), Artificial insemination increases the probability of a male calf in dairy and beef cattle, Theriogenology doi: 10.1016/j.theriogenology.2006.08.003

De Graaf S.P., Beilby K.H., Underwood S.L., Evans G. and Maxwell W.M.C. (2009). Sperm sexing in sheep and cattle: the exception and the rule. Theriogenology. 71(1), 89-97

Debir, L., 2016. Assessment of Breeding Practice and Evaluation of Estrus Synchronization of Dairy Cattle in Sidama Zone, Southern Ethiopia. MSc Thesis Hawassa University, Hawassa, Ethiopia.

Desalegn, G., B. Merga, T. Azage and B. Kelay, 2009.Status of artificial insemination service in Ethiopia. In: The 17th Annual Conference of the Ethiopian Society of Animal Production (ESAP), Sept 24-26, 2009 Addis Ababa, Ethiopia, pp: 87-104.

Destalem, G., 2015. Breeding practice and Estrus Synchronization Evaluation of Dairy Cattle in Central Zone of Tigray, Northern Ethiopia. M.Sc. Thesis Jimma University.

Dransfield MBG, Nebel RL, Pearson RE, Warnick LD. (1998) Timing of artificial insemination for dairy cows identified in estrus by a radio telemetric estrus detection system. Journal of Dairy Science; 81:1874-1882.

Fantahun, T. & Admasu, Z., 2017. Evaluation of oestrus synchronization and mass artificial insemination service of dairy cattle in Mizan Aman area, Bench Maji zone, South West Ethiopia. Academic journals: International Journal of Livestock Production, Volume 8(1), pp. 1-4.

Gizachew D, Szonyi B, Tegegne A, Hanson J and Grace D. Aflatoxin contamination of milk and dairy feeds in the Greater Addis Ababa milk shed, Ethiopia. Food Control 59(2016): 773-779.

Gizaw, S., Tesfaye, Y., Mekuriaw, Z., Tadesse, M., Hoekstra, D., Gebremedhin, B. and Tegegne, A. 2016. Oestrus synchronization for accelerated delivery of improved dairy genetics in Ethiopia: Results from action research and development interventions. LIVES Working Paper 12. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Gizawu, T. & Dima, F.G., 2016. Assessment of Problems and Constraints Associated with Artificial Insemination Service in the two Selected Districts of Arsi Zone. Journal of Harmonized Research (JOHR), Volume 3(1), pp. 14-37.

Hamid Jemal & Alemayehu Lemma, 2015. Review on Major Factors Affecting the Successful Conception Rates on Biotechnological Application (AI) in Cattle. Global Journal of Medical Research: G Veterinary Science and Veterinary Medicine Volume 15 Issue 3 Version 1.0 Year 2015

Mukasa Mugerwa, E. Tegegne, A. Mattoni, M. and Cecchini, G. 1989. Effect of oestrous synchronization with prostaglandin F2α in Ethiopian Highland Zebu (Bosindicus) cows. Animal Production 48:367 373.

Mukasa-Mugerwa E 1989, A review of reproductive performance of female Bos indicus (Zebu) cattle. ILCA, Monograph No. 6. ILRI, Addis Ababa, Ethiopia.

Odde, K.G., 1990. A review of synchronization of estrus in postpartum cattle. Journal of Animal Science 68: 817–830.

Tegegn Fantahun and Zelalem Admasu, 2016. Evaluation of oestrus synchronization and mass artificial insemination service of dairy cattle in Mizan Aman area, Bench Maji zone, South West Ethiopia International journal of Livestock Production Vol. 8(1), pp. 1-4.

Tegegne, A., Hoekstra, D., Gebremedhin, B. and Gizaw, S. 2016. History and experiences of hormonal oestrus synchronization and mass insemination of cattle for improved genetics in Ethiopia: From science to developmental impact. LIVES Working Paper 16. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Tegegne, A., Warnick, A.C., Mukasa Mugerwa, E. and Ketema, H. 1989. Fertility of Bos indicus and Bos indicus x Bos taurus crossbred cattle after oestrus synchronization. Theriogenology 31:361 370.

Tegene, A., Gebremedhin,B. and Hoekstra,D. 2013. Smallholder dairy production and marketing systems in Ethiopia: IPMS experiences and opportunities for market oriented development; Working paper No.13. Nairobi, Kenya, International Livestock Research Institute (ILRI).