Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.13, No.17, 2023

Management Practice and Comparison of Reproductive and Productive Performance of Dairy Cattle between Beneficiary and None Beneficiary of Estrus Synchronization and Mass Insemination in North Shewa Zone, Amhara Region. Ethiopia

Sharew Mekonnen [1*] Simret Betsha (PhD) [2] Sandip Banerjee (PhD) [2]
1. Department Animal science, college of Agriculture, Werabe University, Ethiopia
2. School of animal and range sciences Hawassa University, Ethiopia

Abstract
This study was conducted in North Shewa zone, with the general objectives to assess the overall management practice and comparison of reproductive and productive performance between beneficiary and none beneficiary of artificial insemination and estrus synchronization and mass insemination of dairy cattle in north shewa zone of dairy cattle. Data were obtained by interviewing 270 estrus synchronization and mass insemination beneficiaries and 135 none beneficiaries' dairy farmers. Data were analyzed using SPSS version (20) ANOVA and Ms-Excel (2010). The reproductive performance of dairy cows in OSMI beneficiaries were age at first service (30.81±7.6), calving interval (6.9±5.2), lactation length (8.95±2.46), day open(5.3±3.18) and number of service per conception (1.5±0.38) whereas in none beneficiary age at first service (32.88±6.64), calving interval (18.18±5.8), lactation length (9.6±0.54), day open (5.17±3.43) and number of service per conception (1.22±0.54) months. The major factor affecting reproductive performance dairy cows are management, nutritional status, genotype, and disease.
Keywords: Breeding practice, Estrus synchronization, and mass insemination.
DOI: 10.7176/JBAH/13-17-01
Publication date: October 31st 2023

1. INTRODUCTION

Assisted reproductive technologies (ART) such as oestrus synchronization, super ovulation and artificial insemination (AI) are some of the important bio techniques for improving the reproductive and productive performance of dairy cattle thereby enhancing the overall profit from cattle farming (Webb *et al*., 2003). Oestrus synchronization involves manipulating the oestrus cycle of females, so they can be bred at approximately the same time, thereby saving both time and logistics(Rick and Gene, 2013).Oestrus This bio technique also involves regulating the follicular development and thereby provide multiple stimuli thereby inducing oestrus cycle (Rasby and Deutche 2013). Synchronization programs are selected from several predesigned protocols which have been scientifically proven to regulate the follicular development (IAARD-IJAVS-2015). Oestrus synchronization (under smallholder context) can be used as a tool to effectively use the natural resources when available abundantly to parturates healthy calves and also to evade the period when there is shortages of feed and fodder (Azage*et al*,2016) . Under Ethiopian context parturitions can also be programmed in a way that it coincides with the periods when there is less demand for milk and dairy products(Azage *et al*., 2015).It can also be used as a tool to efficiently use the Artificial insemination (Azage *et al*., 2015). In addition, synchronization of oestrus contributes to optimizing the use of time, labour, and financial resources by shortening the calving season (Kefyalew and Addis, 2015). Thereby increasing the uniformity of the calf crop, exhibit standing oestrus at a predicted time, conceive earlier in the breeding season, and calve earlier in the calving season (Hopkins and Schick,. 2013).

Oestrus Estrous synchronization also enables the farmers to reduce costs involved in the hire of AI technicians and semen import in addition to this concentrated calving and uniform weaning saves time and is cheaper than having individual cows in heat throughout the year (Hopkins and Schrick, 2013). This can be achieved through efficient and accurate detection of oestrus, proper semen handling techniques, and thereby timely AI (Walker *et al*., 1996). Failure of proper oestrus detection is the most common problem in dairy cattle breeding programs (Hansar *et al*., 2014). Thereby resulting in loss of lifetime milk yield, decrease in number of calves born per lifetime, more numbers of days open, and an increase of reproductive culling were reported by (Walker *et al*., 1996). As the accuracy and efficiency of oestrus detection declines, it is important to incorporate oestrus synchronization/induction and timed AI into the breeding management program. Oestrus synchronization assists in the accomplishment of faster livestock improvement programs such as fixed time artificial insemination (FTAI) and super ovulation of cows, thus minimizing the costs, time and labour required for oestrus detection in cows and does away with buying superior dams and sires. In line with this scenario it was proposed that artificial insemination which follows the oestrus detection can assist in increasing the numbers of crossbreds in Ethiopia (IAARD-IJAVS- 2015).

According to Shiferaw *et al*. (2003) management factors such as accuracy of heat detection, timing of insemination, proper insemination techniques, semen quality, proper semen handling and skills in pregnancy diagnosis have been reported to decrease the NSC. (Gebeyehu *et al*., 2007) added that proper heat detection; feeding and postpartum reproduction management may reduce NSPC. Furthermore Emebet (2006); Habtamu *et al*. (2010) revealed that the changes in management system and environmental condition from year to year delays age at first service and calving Gebregziabher *et al*. (2003); Mekonenn *et al*. (2010) indicated that possible causes of low conception rates at first service may fall into different categories: problems related to heat detection: not servicing a cow that is in heat, Improper timing of service, misidentification of cows leading to errors in records.

The reproductive efficiency of the cow can be attributed if the cow parturates regularly. The world strategy is "**One calf per year per cow**", in order to achieve this strategy in the country, the calving interval need to be optimized (Perez *et al*. 2012).In this context, oestrus synchronization as reproductive management tool was initiated in 2013 in North Shewa zone of Amhara region(BoZAR,2015). The synchronization program was started on a pilot scale by the Bureau of Agriculture in North Shewa zone in 2006/2013.Now a day expand in to Siyadebrnawyu, Tarmaber, Angolelanatera, Debre Birehan town and Basona worena districts. Records till 2017 indicated that in the three districts Siyadebrnawyu, Angolelanatera, and Basona worena districts of North Shewa zone 9097cows were synchronized and 5074 dairy cows inseminated. However, there is no any comprehensive study on management practice and comparison of reproductive and productive performance between beneficiary and none beneficiary of artificial insemination and estrus synchronization and mass insemination of dairy cattle in North Shewa zone (BoZLFDA, 2013-2017)

General objectives

- Management practice and comparison of reproductive and productive performance of dairy cows between beneficiary and none beneficiary of estrus synchronization and mass insemination.

Specific Objectives

- To determine management practice of dairy cows in north Shewa zone
- To compare reproductive and productive performance of dairy cows between beneficiary and none beneficiary of estrus synchronization and mass insemination
- To evaluate the constraints of estrus synchronization and mass insemination.

2. MATERIALS AND METHODS

2.1. Description of the Study Areas

The current study was conducted in DebreBirhan milk shed area of North Shewa zone. North Shewa Zone is bordering on the north by DebubWollo zone, on the east by the Afar Region and from the south and the west by the Oromia region. The zone is located at about 177 km east of the capital Addis Ababa. Its latitude and longitude are 90º 40' 19.3''N and 390º 31' 45.3'' E, respectively (Google map satellite). The selected districts are Siyadebrnawyu, Basona worena, and Angolelatera. Siyadebrnawyu. Basona worena is located at the eastern edge of the Ethiopian highlands in the north Shewa Zone. The town of DebreBirhan is an enclave inside this woreda. Angolelanatera is found in west of DebreBirhan town and is located 120 km east of the capital city of Addis Ababa. The average minimum and maximum rain fall is 750 and 1100 mm respectively. Its human and cattle population is 2,080,080 and 1,482,346 heads respectively (Ethiopian CSA, 2016/17) respectively. According to (ZAB 2013), its climatic conditions 32.02% were highland and 45.58% midland. The main feed resource of the area is grazing land, crop aftermath and crop residue. The farming system is largely characterized by mixed farming system.

Map indicating the selected districts

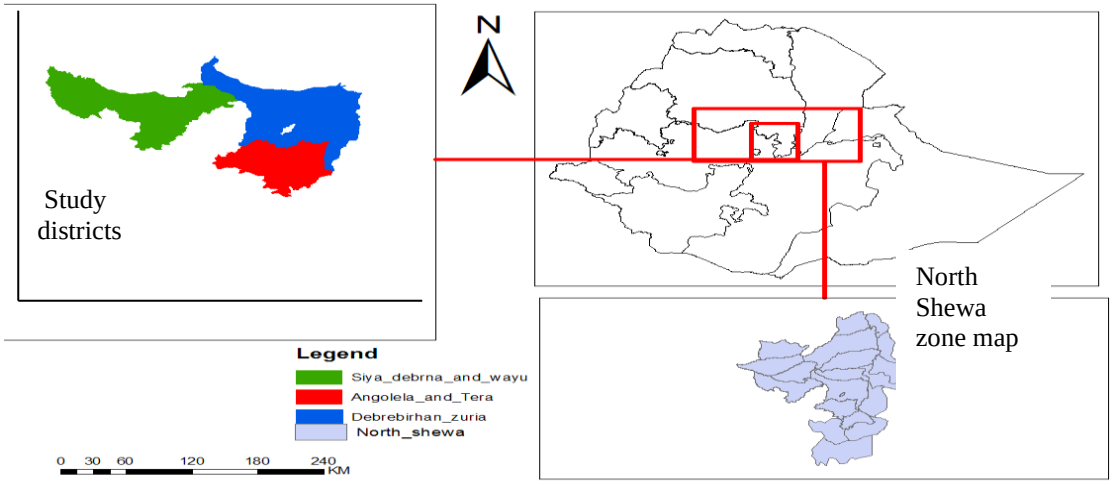

Figure 1. Map of the study areas

2.2. Sampling Procedures

Based on number of synchronized dairy cows, AI practice, attitude of farmers to adopt estrus synchronization and mass insemination technology, their milking shed potentiality, accessibility, and availability of infrastructure, out of 27 districts three districts (Siyadebrnawyu, Basona worena, and Angolelatera) were selected using multi-stage stratified purposive sampling followed by random sampling technique. The number of farmers involved in the OSMI was identified from districts record data and from these farmers 270 respondents were selected randomly per districts. In addition, 135 farmers per districts who were not involved in the OSMI were randomly selected. Based on the Yemane (1967) sample formula with 95% confidence level, totally 405 households head were selected for the study to represent the zone.

$$\mathbf{n = \frac{N}{1 + (N * e^2)}}$$

Where n=sample size, N=number of population in the three districts, e=0.05 margin error.

2.3. Data collection method

Data was collected from primary and secondary sources. Primary data was collected using structured questionnaire. For this a structured questionnaire was prepared and pre-tested for its applicability before its administration to the potential respondents and every respondent included in the study was briefed about the objective of the study before starting and presenting the actual questions. Interview was done by the enumerators together with researcher and supervisor. Separate questionnaires were also prepared for the artificial insemination technicians, livestock experts in the districts.

A focus group discussion was held with those who were associated with estrus synchronization and none-associated farmers. Focus group discussion was also organized in each selected kebeles included 5-12 members at most focused on the history of the management practice of dairy cows and AI services, major constraints and opportunities of the estrus synchronization and mass insemination (OSMI).Secondary data was also collected from zonal, districts and kebeles agricultural administrates documents.

2.4. Collected Data

The data that was collected through the survey include productive and reproductive performance of dairy cows, livestock feed types, factor affecting conception rate, constraint and opportunities of AI and mass estrus synchronization, perception of the farmer on mass estrus synchronization and AI.

2.5. Data Analysis

After all the data was collected fed to Ms-Excel (2010) and analyzed by SPSS version 20 Quantitative data obtained from the survey was analyzed by using one way ANOVA. Whereas qualitative data analyzed by chi-square using cross tabulation. Ranking also analyzed by using Ms-Excel (2010). The reproductive performance of the dairy cows as computed the following formula:

$$NSPC = \frac{\text{numberofconceived cows/heifers}}{\text{number ofinseminated cows/heifers}}$$

The Model used for reproductive and productive performance of dairy cows

Yij=μ+ai+bj+Ck+eij

Where yij=response variable (AFS, LL, DO, CI, NSPC)
μ =Overall mean
ai=fixed effect of i^{th} districts (i=3: Angolelanatera, Basonaworena and Siyadebrnawyu)
bi= fixed effect of j^{th} breeds (j=3: Native, HFC, HHFC)
Ck=fixed effect of k^{th} OSMI (K=2: beneficiary and none beneficiary of OSMI)
eij= residual error

3. RESULTS

3.1. Educational status and ratio of land holding to family size

The results pertaining to the educational status and ratio of land holding to family size of the respondents are presented in Table 1. Furthermore the major respondents in across the study areas Basona worena , Siyadebrnawyu and Angolelanatera were attained grade 1-8 , and followed by read and write however this included respondents from illiterate to those who were well educated (>12 class). The studies further indicate that the total land holding to family size was not significance difference between the districts.

Table 1. Educational status and ratio of land holding to family size of the respondents in the study areas

	Districts			
	Basona worena (N=135)	Siyadebrnawyu (N=135)	Angolelanatera (N=135)	Overall (N=405)
Educational status (%)				
Illiterate	10.4	13.3	11.1	11.6
Read and write	40.7	30.4	37.0	36.0
1-8	38.5	37	55.5	51.8
9-12	8.9	13.4	13.3	11.9
>12	1.5	5.9	6.7	4.7
The ratio of land holding to family size in (mean)				
	0.638/1.92	0.520/1.88	0.535/1.89	0.56/1.94

3.2. Total Cattle Herd size per Household

The findings as presented in Table2 shows that there were no differences in the her composition of the native cattle across the studied locations, except that of the numbers of oxen numbers of which were higher in Angolelanatera when compared to the other two locations. The overall results also show that the numbers of native cattle were higher (P<0.05) at Angolelanatera.

The results further indicate that the numbers of Holstein Friesian crosses (F_1 and 62.5% Holstein Friesian) (HFC) were too varied (P<0.05) .The findings pertaining to the higher Holstein Friesian crosses (≥ 75% Holstein Friesian blood levels) too varied across the studied locations with higher numbers of cattle being reared at Angolelanatera and Basonworena.The results pertaining to the numbers of Jersey crosses indicated that the numbers did not vary across the studied locations.

Table 2. Total cattle herd size per household by District and breed type in study areas of North shewa (Mean±SD)

Types of cattle category	Districts			
	Basona worena (n=135)	Siyadebrnawyu (n=135)	Angolelanatera n=(135)	Overall N=405
Native	3.0±2.1^{a}	3.5±1.9^{ab}	3.83±2.1^{b}	3.43±2.01
HFC	6.86±3.8^{b}	4.23±2.5^{a}	6.5±2.96^{b}	5.87±3.35
HHFC	1.91±.9^{ab}	1.00±.00^{a}	2.47±1.2^{b}	2.09±1.2
JERC	4.25±1.36	3.00	---	2.42±0.5

a-b means with the different superscripts under the same row for the same parameter is significantly different at p<0.05, SD-standard deviation, = Jersey cross, HFC=Holstein Frisian cross, HHFC, higher Holstein Frisian cross (>75% blood level).

3.3. Management Practice of Dairy Cows

3.3.1. Feed resources and feeding system

The results as presented in the study areas pertaining to the availability of feed and fodder across the studied locations are presented in Table 3. The findings show that fodder was available the year round in most of the locations, with variations ($P<0.05$) across the studied locations. The results were indicative that the availability was lower at A with no differences across both the other locations. The study further indicates that conservation and storage of fodder is practiced across all the locations.

The study also shows that at S District the respondents cultivated fodder oats while in the other two locations the respondents provided fodder which was a mixture of vetch(Vicia sativa) and oats(Avena sativa) fodder .

Table 3. Annual feed availability and cop up mechanism during dry and wet seasons in North Shewa zone (%)

Feed availability/ year	Basonaworena N=135	Siyadebrnawyu N=135	Angolelanatera N=135	Overall N=405
Available	76.4	79.3	51.8	69.17
Not available	23.6	20.7	48.2	30.83
Cope up mechanisms				
Storing the fodder	84.4	80.8	78.5	81.2
Purchasing the fodder	3.1	3.8	15.4	7.43
Feeding the animals every alternate feeds	---	11.6	1.5	4.4
Purchasing &storing the fodder	12.5	3.8	4.6	6.97
Type cultivate forage				
Oat	18.0	61.5	34.6	38.03
Vetch	6.0	38.5	11.6	18.77
Mixed	76.0	0	53.8	43.2

3.3.2. Source of water during dry and wet seasons

The study pertaining to the source of water across the seasons (Table 4) indicate that river water predominated at Basona worena District while in Siyadebrnawyu District the water was mostly provided from wells and rivers during the dry season , while in the wet season the water was mostly obtained from the ponds. The study further indicates that river as source of water predominated in the dry season at Angolelanatera District while river, pond and tap water were the sources during the wet season.

Table 4.Water source during dry and wet season in North Shewa zone (%)

	Districts						
Water source	Basonaworena (n=135)		Siyadebrnawyu (n=135)		Angolelanatera (n=135)		
	Dry (%)	Wet (%)	Dry (%)	Wet (%)	Dry (%)	Wet (%)	Overall
River	61.4	56.4	38.5	9	68.9	34.1	44.7
Pond	29.7	42.9	5.9	75.5	---	34.8	31. 5
Tape	7.4	0.7	21.5	14.8	31.1	31.1	17.8
Well	1.5	---	34.1	0.7	---	---	6
Separate waterier	***		***		***		
Users	12.6		0.7		----		4.4
None users	87.4		99.3		100.0		95.6

* means with significantly different under the same row for the same parameter is at *** p=0.001

3.3.3. Housing system of cattle prevailing in the studied Districts

The results pertaining to the housing of the cattle reared in the studied locations are presented in Table 5. The findings show that most of the respondents house their cattle in houses which are prepared from stone (wall and floor) with thatched roof. These observations were consistent across the studied Districts. The findings also show that the drainage system was satisfactory only at Angolelanatera District while the reverse was observed in the other two locations. The findings also showed that there was no separate houses for the cattle in Basonaworena and Angolelanatera Districts while most of the cattle raised at Siyadebrnawyu District were provided with separate houses. The study further indicates that the cattle were not provided with separate mangers in most of the Districts.

Table 5.The percentage of housing system of dairy cattle in the study area of North Shewa N=135

	Districts			
Type of housing (%)	Basonaworena	Siyadebrnawyu	Angolelanatera	Overall
Wood wall stone floor thatched roof	17.0	38.5	14.1	23.2
Stone wall stone floor thatched roof	73.5	48.3	71.9	64.53
Mud walls with tin roof	4.4	4.4	0.7	3.17
Cement floors with tin roof	5.1	8.8	13.3	9.1
Drainage & Ventilation (%)				
Only ventilated	3.0	6.7	7.4	5.7
Only drained	11.1	23.0	9.6	14.53
Well drained and ventilated	29.6	27.3	68.9	41.97
Poorly drained and ventilated	56.3	43.0	14.1	37.8
Presence of separate house for dairy cows (%)				
Absent	85.9	32.6	98.5	72.3
Present	14.1	67.4	1.5	27.7
Presence of separate manger (%)	***	***	***	
Present	19.3	0.7	26.7	15.57
Absent	80.7	99.3	73.3	84.43

** Means with the different superscripts under the same row for the same parameter between season is significantly different at p=0.0000, N=number of respondents per districts.

3.3.4. Common dairy cow disease

The findings pertaining to the diseases in cattle in the studied Districts show that foot and mouth disease (FMD) followed by mastitis the diseases were observed across all the locations. The other problem that was commonly observed was abortion among the cattle; however the exact nature of the abortion was not ascertained.

3.3.5. Reasons of culling of cattle reared in the studied locations

The reasons pertaining to the culling of cattle in the studied locations are presented in Table 7. The study shows that at B most of the time the cattle are sold off to meet immediate cash needs while in S an A Districts the cattle are culled for meat production .The study further showed that most of the respondents had to travel anything between 1-5 km to visit the veterinary clinics, however some of them have reported that the clinic may be within the kebele itself, the respondents also indicate that most of them depended on the government clinics to get their cattle treated.

Table 6.Cause of cattle culling and Distance of clinic with source of medicine in the study areas (n=135)

	Districts			
Reason of culling cattle	Basonaworena (%)	Siyadebrnawyu (%)	Angolelanatera (%)	Overall
Financial requirement	55.1	20.7	23.5	33.1
Poor production potentials	25.1	1.7	---	8.9
For meat production	11.2	70.7	56.3	46.1
Poor body conformation	8.6	6.9	20.2	11.9
Distance of clinic				
Less than1km	34.8	30.4	12.6	25.9
1-5km	53.3	65.2	86.7	68.4
6-10km	11.1	4.4	0.7	5.43
> than10km	0.8	---	---	0.27
Source of medicine				
Veterinary	85.2	80.78	100.0	88.7
Private pharmacy	9.6	19.22	0	9.61
Market	5.1	0	0	1.73

3.4. Productive and Reproductive Performance of Dairy Cows between Beneficiary and None Beneficiary of OSMI

3.4.1. Reproductive Performance of Dairy Cows between Beneficiary and None Beneficiary of OSMI

The mean value of AFS, CI, LL, DO and NSPC in OSMI beneficiaries were 40.5±13.6, 17.6±6.4, 8.52±2.4, 5.5±3.75 and 1.49±0.6 respectively whereas 42.7±9.12, 19.46±4.5, 9.15±3.55, 6.2±3.1 and 1.30±.49 in none OSMI beneficiaries with the respective of AFC, CI, LL, Do and NSPC (Table 5). OSMI beneficiaries had been better reproductive performance in HFC and JERC dairy cows as compared to none OSMI beneficiaries.

Table 7. The mean plus standard deviation of the reproductive performance of dairy cows between beneficiaries of OSMI and none beneficiaries of OSMI in the study districts in month

	Breed	Native	HFC	JERC	Overall
AFS	Beneficiary	40.5±8.6	31.78±8.3	20.14±5.9	30.8±7.6
	None beneficiary	42.7±9.12	34.88±7.2	21.07±3. 6	32.88±6.64
CI	Beneficiary	17.6±6.4[a]	17.1±4.31[a]	16.0±4.8[a]	16.9±5.2
	None beneficiary	19.5±4.5[b]	17.1±4.6[a]	18.0±8.5[b]	18.18±5.8
LL	Beneficiary	8.52±2.4[a]	9.4±1.95[a]	8.9±3.10[a]	8.95±2.46
	None beneficiary	9.15±3.55[a]	9.16±1.8[a]	10.5±4.9[b]	9.6±0.54
DO	Beneficiary	5.5±3.75[a]	5.12±2.9[a]	5.21±2.9[b]	5.3±3.18
	None beneficiary	6.2±3.1[a]	5.30±2.6[a]	4.00±.00[a]	5.17±3.43
NSPC	Beneficiary	1.49±.6[a]	1.5±.56[b]	1.50±0.0[b]	1.5±0.38
	None beneficiary	1.3±0.49[a]	1.24±0.5[a]	1.12±.65[a]	1.22±0.54

a-b means with the different superscripts under the same two consecutive column for the same breeds is significantly different at p<0.05, HFC=Holstein Frisian cross, JERC=Jersey cross), SD-standard deviation.

The age at first service of the native cattle as presented in Table 8 show that varied (P<0.05) across the studied breed with higher values reported among the cattle raised HFC and JERC. The AFS of the HFC crosses indicated that the values were higher (P<0.05) among the JERC. There were differences among the breed in CI, LL, DO, NSPC as presented in table8. Reproductive performance of dairy cattle across the three breed was significantly deference in all parameter in the same row.

Table 8. Reproductive performance of dairy cows per breeds in the study districts in months (mean ±standard deviation)

Breeds	AFS	CI	LL	DO	NSPC
Native	41.5± 9.8[c]	21.72±4.51[b]	8.75±2.443[a]	7.51±2.527[c]	1.51±0.627[b]
HFC	32.9±7.76[b]	18.01±3.86[ab]	9.68±1.64[ab]	5.41±2.818[b]	1.41±0.86[b]
JERC	21.3±3.71[a]	16.90±4.878[a]	10.38±1.94[b]	4.14±2.372[a]	1.14±0.42[a]
Overall	35.35±10.45	19.22±4.500	9.48±1.984	6.07±2.902	1.35±0.63

a-b means with the different superscripts under the same column for the same parameter in different breed type is significantly different at p<0.05.AFS=age at first service, CI=calving interval, LL=lactation length,DO= days open, NSPC= numbers of service per conception HFC=Holstein Frisian cross, JERC=Jersey cross.

3.4.2. Milk yield between beneficiary and none beneficiary of OSMI

Milk yield between beneficiary and none beneficiary of OSMI was presented in Table 9. The finding shows that there is no significance difference (p>0.05) between beneficiary and none beneficiary in milk yield of native dairy cows. The overall average milk yield of native dairy cows was 1.63L per cow per day /L in beneficiary on the other hand 1.5L per day obtained none beneficiary from native dairy cows. The current result pertaining that there is slight significance (p<0.05) difference between beneficiary and none beneficiary in HFC, HHFC and JERC dairy cows per day per cows in milk yield. An overall average milk yield of 6.2L and 3.3L per day obtained by beneficiary farmers from HFC and JERC dairy cows respectively while 5.2L and 2.3L were obtained by none beneficiary from HFC and JERC dairy cows respectively (Table 6).

Table 9.Milk yield between OSMI beneficiary and none OSMI beneficiary per day in litter in the study areas (means± SD)

	Early		Mid		Late	
Breeds	Beneficiary	None beneficiary	Beneficiary	None beneficiary	Beneficiary	None beneficiary
Native	2.61±.1	2.5±1	1.5±.74	1.37±0.7	0.79±0.4	0.72±0.4
HFC	9±4.0[b]	7.64±4[a]	6.±2.1[b]	5.±3.0[a]	3.6±2.1	2.88±.2
JERC	5.±1.2[b]	3.4±.49[a]	3.2±.45[a]	2.08±.8[b]	1.80±.8	1.33±.82
Overall	5.54±2.1	4.5±1.83	3.6±1.1	2.82±1.5	2.1±1.1	1.64±0.473

a-b means with the different superscripts under the same two consecutive column for the same breeds is significantly different at p<0.05,JERC= Jersey cross, HFC=Holstein Frisian, HHFC, higher Holstein Frisian (>75% blood level).

3.5. Factor Affecting Reproductive Performance of Dairy Cow

Factor affecting reproductive performance of dairy cows in the study area was presented in Table 10.The current survey result showed that 49.6% of respondents agreed that management is the main factor that influences reproductive performance and 34.1% of respondents were agreed feed is the other limiting factor on reproductive performance followed by genotype (13.8%) and disease (2.5%) in the study areas.

Table 10. Perception of farmers on the Factors affecting reproductive performance of dairy cow per districts in (%).

	Districts			
	Basonaworena	Siyadebrnawyu	Angolelanatera	Overall
Feed	35.6	31	35.6	34.1
Genotype	14	11.8	15.6	13.8
Management	46.7	57.1	45.1	49.6
Disease	3.7	0.1	3.7	2.5

3.6. Constraints of Oestrus Synchronization and Mass Insemination Program

The findings as indicated in Table 11 indicate the constraints associated with OSMI program are manifold. The respondents from B district have indicated that there was no strict follow up of the synchronization, poor body condition of the cattle at the time of synchronization and also that the inseminator was unwilling to come over to the farmers doorstep. The respondents from S district opined that the lack of improved genotypes, no strict follow up of synchronization and also poor body condition of the cattle reared in the area. This is all the more important as the OSMI program coincided with the dry season when the quality and quantity of the feed was compromising. The findings pertaining to A district indicate that the major constraints are poor body condition and also no strict follow up of the synchronization program.

Table 11. Constraints of application of OSMI in the study areas (N=270)

Major constraints OSMI and AI	**Districts**			
	Basona worena%	Siyadebrnawayu%	Angolelanatera%	overall
Lack of AIT	16.7	19.3	5.6	13.87
Lack of improved breed for this service	0.0	24	4.4	9.467
No strictly follow up after synchronized	24.4	20.0	23.3	22.57
AIT only depend on that 3 days after injection	8.9	7.8	13.7	10.13
Unwillingness of AITs not to com	18.9	6.7	5.6	10.4
Poor body condition of cattle	20.0	22.2	23.6	21.93
Long distance of inseminate center	1.1	0.0	5.4	2.167
Availability of concentrate feed	10.0	0.0	18.4	9.466

*There is significant***P<0.001and **P<0.01 per districts OSMI=estrus synchronization mass insemination significant, n= number of respondents in the three districts.

4. DISCUSSION

4.1. Household Demography

The results pertaining to the educational status and ratio of land holding to family size of the respondents are presented in Table 1. The study further indicated that most of the respondents had only basic education and very few of them have education beyond the secondary schooling, these observations too are in close accordance with those of (Leekim ,2014; Asemu *et al*.,2013; Melku, 2016). However findings have indicated that most of the respondents were illiterate with very few of them who were able to read and write which impairs them from maintaining proper records at their farm (Tsegaye and Tesfaye, 2002). Thus they are mostly dependent on recall method which in most of the cases inaccurate (Destalem, 2015; karume, 2013). The extension agents' stakeholders are expected to develop proper extension manuals and recording systems which are user friendly for all sections of the livestock rearers. The study further indicates that the overall land holding per family size was very low in across all districts. So the respondents should be changed from cropping farming system to livestock production system.

4.2. Total Herd size per house hold and per breed

The findings from Table 2 show that the overall heard size of the native cattle are in close agreement with those of (Adisu *et al*., 2016) from North Gondar. However, the numbers are lower than those reported by (Azage, 2009) from North Gonder. The lower numbers of native cattle as observed may be to the fact that the respondents prefer the crossbred cattle over the native cattle; the findings are in close agreement with those of (Belay and Geert, 2016). The proportionately higher numbers of crossbred cattle in the study areas may be because the respondents have at their disposal good amount of crop residues which can ensure better nutritional availability the year around. The study further indicates that higher proportion of Holstein Friesian and Jersey crossbreds, which too is in accordance with the observations of (Zewdie 2010; Belay and Geert,2016; LeeKim, 2014). The higher proportion of crossbreds indicates the presence of a good artificial insemination system in the area. The

fewer numbers of HHFC i.e higher blood levels of Holstein Friesian crossbreds indicate that either these crossbreds do not perform well in the prevailing agro ecology or the farmers are not aware of their management practices , the observations are in close accordance with those of (Million and Tadelle,2013) from Debre Zeit. Studies by (Madalena,1990) have indicated that in the tropical environment the higher blood levels of exotic cattle suffer from tropical degeneration and therefore such cattle rarely perform better than the F_1 crossbreds. These observations are in close consonance with the findings of (Kiwuwa *et al* 1983; Million and Tadele, 2003).

4.3. Management Practice of Dairy Cows

4.3.1. Feed resources

The feed resources available in the study areas are presented in Table (4) the study indicates that feed availability is not a problem for most of the respondents. This may be attributable to the availability of crop residues, these findings are in close accordance with the reports of (Endale, 2015). The observation regarding the use of crop residues as a source of fodder too has been reported by Desta(2002); Endale(2015) from high land parts of the country. The use of oats and vetch as a source of fodder too finds consonance with the observations of (Zewdie 2010). However, it's not only the availability of the feed that matters but providing a balanced diet to the pregnant and lactating cow is imperative for ensuring an overall productivity and the economics of a cattle (Zewdie 2010). Thus, the respondents need to be made aware of the intricacies of balancing the feed for different genotypes and classes of cattle. Therefore, the livestock extension agents need to demonstrate the respondents as to how to develop a balanced diet using locally available feed resources. This in one way is expected to meet the nutritional requirements of the cattle but also can help in utilization of locally available resources and also recycling of nutrients.

4.3.2. Source of water during dry and wet seasons

The findings show that most of the respondents in the areas used various sources of water viz. river, pond, tap and well, the observations are in close accordance with those of (Belete *et al*. (2010) andZewdie (2010) from Fogera Wodera Amhara region and high land of Ethiopia in respectively). Clean water is important for all physiological processes. However, the usages of each source varied across the locations. It was observed that river water was the most commonly used source across all the studied locations especially during the dry season, these finding is in accordance with the observation of Zewudie(2010) from high land of Ethiopia . While, the presence of nearby river ensures that the water is available the year round, however the water may also be contaminated from parasites and diseases upstream and mayalso pass on the same to animals which use the same source downstream (Destalem ,2015). Moreover contamination from faeces, urine and other exogenous wastes can also influence the productivity of the livestock using the source downstream. The usage of pond water too was reported by many of the respondents, which too is in close accordance with those of (Alemshet, 2014). The usages of pond water too have to be done with care and separate space has to be provided for the sick and infirm animals to prevent spread of diseases (Amenu, 2013). The study also indicates that no separate watering space is provided to the cattle which are in close accordance with those of (Tesfaye *et al*, 2011). Separate watering space is to be provided to the cattle as a part of good husbandry practice and also the respondents need to be appraised about clean water and waterier and its benefit on the health of the animals as a whole. The livestock extension agents need to appraise the respondents about construction of proper mangers using locally available materials. They should also be informed about the cleaning process of the same and importance of clean and safe drinking water.

4.3.3. Housing of cattle in the study areas

Providing proper housing for the cattle is one of the most important husbandry practices which are needed to protect the animals against the vagaries of nature and thefts and predators alike (Teshome *et al*.,2016). Housing has to be so provided that it is well ventilated and well drained (LeeKim, 2014). The housing of livestock should be such that it is comfortable and prepared to suit the local climatic condition and prepared from locally available materials. The study indicates that in most of the cases the houses are prepared from stones (floor and walls) and thatched, while stone floor can at times be slippery and may not be able to provide adequate cushioning for the animals housed. The crevices between the stones are difficult to clean and can be a potential source of infection (Elmore et al., 2015).Therefore, the respondents need to be appraised about cementing the crevices and also proper drainage. The roofs are mostly thatched can be prone to fire and allied hazards besides they can also house different predators and vermin's. It has been observed in several studies that if a livestock is housed comfortably their production and reproduction ability is improved manifold (Million and Tadele, 2013). However, the housing has to be such that it suits the prevailing agro climatic conditions of the area besides proving comfort to the animals themselves.

The study also indicates that in many cases the cattle are not housed separately, which again is one of the greatest drawbacks, as it can lead to impairment in productivity and also does not provide the privacy desired for parturition. Studies have also indicated that cases of abortion are higher among the cattle housed together with other livestock or different ages of cattle as butting by the bulls or steers (Harouna, 2013). Care has to be taken

so as to provide adequate ventilation in the cattle house so as to lower the production of ammonia in the house. Studies by (Rotz, 2004) have indicated that higher amount of ammonia in livestock houses can impair the productivity and also is uncomfortable for the handlers.

4.3.4. Common dairy cow disease

The results pertaining to the disease incidences among the livestock indicate the prevalence of foot and mouth disease (FMD) in the herd, the observations are in close accordance with those of (Workineh, 2013) from Oromia Region and FMD is a vaccine preventable disease hence the respondents need to be made aware of the same (OIE, 2009). Care of the infected cattle too needs to be understood and hence the livestock extension agent needs to be proactive in these cases and teach the preliminary veterinary care for the infected livestock (OIE, 2009). It was also reported that mastitis is also another disease of economic importance and can be prevented following proper hygiene (OIE, 2009). The respondents need to be trained about udder care and management by the extension agent besides the use of teat dipping has to be promoted by the respondents. Studies have indicated that the economic losses due to mastitis can be substantial and can account for more than 11024 million Birr annually (Janzen, 1970) in the US.

4.3.5. Reasons of culling cattle

The findings as presented in Table 7 show that the major reason for culling cattle are for fulfilling financial requirements of the family (in B district) , this is in consonance with the observations of Barrett (1991) from Zimbabwe. However, studies by Godadaw *et al*. (2014) have indicated that bovines are sold only in the dire consequences by the farmers and it's the small ruminants which are sold off first . It may be that the respondents sell of their excess cattle for income generation, these amounts to the sale of the male animals, barren cows and also at times heifers (Azage, 1989; Jeroen *et al*.,2000). The utilization of cattle for beef purposes may also be ascribed to the use of male animals as a source of beef for the family and the neighbours, these observations are in close accordance with those of (Jeroen *et al*.,2000). Poor production and body conditions too were considered as criteria for culling of cattle, which may be ascribed to the economics of rearing the cattle (Godadaw *et al*.,2014). Cattle with poor body condition are usually the ones that are culled first as they are economically unviable to rear (Godadaw *et al*., 2014).

The study also indicates that most of the respondents avail the facilities of the government veterinary clinic which too is in agreement with those of (Bahlibi, 2015). The findings also show that most of the veterinary facilities are situated within 5 kms from the respondents residence, which is also in close accordance with the findings of (Tegegn and Zelalem, 2016) from Bench Maji zone South West parts of Ethiopia. Well-equipped veterinary facilities need to be in place when the crossbred cattle are reared as the crossbred are prone to tropical diseases (Singh, 2011). It has also been observed that establishment of Para veterinary clinics too need to be established within the kebeles so that proper veterinary care can be made available to the crossbreds, this can also serve as employment opportunities of veterinary or ATVET graduates and thereby arrest migration to the urban areas.

4.4. Reproductive Performance of Cattle Reared by the beneficiary and Non- beneficiary of OSMI and per breed

The results from Table 7 were indicative that the reproductive functions of the cattle reared by the participants were better than those of the non-participants. This may be because the participants were selected based on their experience of cattle husbandry. It may also be ascribed to several rounds of trainings that the participants had received during the course of the project.

The results pertaining to the influence of genotypes on the milk production traits indicate that the AFS, CI, and DO was lower in the native cattle when compared to the HFC and HHFC which too is in close agreement with the findings of(Galukande, 2010). This may also be ascribed to the genetic makeup of the native cattle and partially due to the fact that the farmers usually provide some sort of preferential treatment to the crossbreds

4.5. Milk Yield between Beneficiary and None Beneficiary of OSMI

The findings as presented in Table 9 indicate that there were differences ($P<0.05$) across the milk yield of the cattle raised by the participants of OSMI project in comparison those reared by the non-participants. This may be ascribed to the fact that the participants were selected based on some predefined traits such as experience in rearing cattle Studies by (Ahmed *et al*., 2017) have also indicated that rearers well experienced in rearing cattle usually understand the nutritional and husbandry requirements better than the beginner. The differences may be also ascribed to the trainings received by the participants pertaining to scientific cattle husbandry practices (Ahmed *et al*., 2017).

4.6. Factor Affecting Reproductive Performance of Dairy Cow

The findings as indicated in Table 10, is indicative of the reproductive performance of the cattle in the areas studied are grossly influenced by management of the cattle followed by the nutrition of the cattle. The findings

are in close accordance with the reports of (Shiferaw *et al*., 2003). Management of the cattle influences the growth of the cattle and thereby their reproduction (Roche, 2006; Santos, *et al*., 2004). Besides the same, cattle receiving poor nutrition both in quality and quantity will impair the development of the reproductive organs (Roche, 2006). Studies by (Lucy, 2008) have also indicated that poor nutrition of livestock can also influence the hormonal functions of the cattle and thereafter the reproduction function. Studies have also indicated that while native cattle are able to utilize poor quality forage better than the crossbred cattle (Hansen, 2004).

4.7. Constraints of Oestrus Synchronization and Mass Insemination Program

According to the respondents during the study period, there are a lot of obstacle of this service in the study areas which include but not limited to these; lack of AIT, no strictly follow up after synchronized and lower cattle body condition.

5. SUMMARY AND CONCLUSION

The present study was initiated due to lack of detailed analysis and lack of inclusive assessment of, limited information on management practice of dairy cows practiced by farmers.

Natural pasture and crop residue were the most common feed resources in the study areas. River water was the major source of water for their cattle and well water was used when river water is not available. In their order of importance; FMD, mastitis, and abortion were the major diseases of cattle in the study area.

The results indicated that the reproductive performance of the cattle reared by the participants were better than those of the non-participants. There was significant ($p<0.05$) difference in milk yield between beneficiary and none beneficiary in HFC, HHFC and JERC dairy cows per day per cows.

In North Shewa zone starting 2013/14 up to 2015/16 there are some problems identified in OSMI such as no strict follow up after synchronized, AIT only depend on the 3rd days, after hormone injection (Poor body condition cow, provide non-cycling cows, heat detection problems and pass insemination time.

There was a significance difference between breed in reproductive performance across the three breed.

6. RECOMMENDATIONS

- Creation of farmers' awareness in the study area, on managerial as well as breeding aspects create an opportunity in improving breeding and management practice of dairy cattle and also it avoid misunderstanding of different managerial aspects which are practiced by farmers traditionally.
- Participatory and sustainable breading strategy could be undertaken through incorporating indigenous knowledge of farmers and by including training of the dairy owners to improve productivity of dairying.
- To improve efficiency of dairy cattle productivity practicing and estrus synchronization and mass insemination improving oestrus detection method, proper time of insemination, good management practice, proper semen handling, full inseminator equipment etc.

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