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Assessment of the Status and Farmers' Attitude on Estrous Synchronization and Mass Artificial Insemination in West Arsi and East Shewa Zones of Oromia Region, Ethiopia

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Abstract:
Assessment of the status of the Estrous synchronization and mass artificial insemination (OSMAI) program was conducted at East Shewa and West Arsi Zone of Oromia region, Ethiopia. The assessment was conducted using semi-structured questionnaires. A total of 220 respondents were randomly selected from 12 Kebeles and 4 districts where the OSMAI project was initiated. Ninety-one percent of the respondents said they use mass artificial insemination and estrous synchronization. PGF2α injections caused 92.4% of the animals to display symptoms of heat overall; 87.9% of these animals were fed artificial insemination, while the remaining 12.1% were served by a bull. The overall rate of conception in the research region is 68.9%, and there is no discernible variation in the conception rate of the animals. The AI technicians made the majority of the decisions about the selection of the cattle that were included in the program. The majority of responders (68.4%) said they had no idea what breeds their animals' sires were. Across the research area, AITs determine 99 percent of the breed and blood type of sire used in crossbreeding. According to the results, 36.5 percent of calves born were of breeding age, and 65.2%, 17.4%, and 13% of calves were served by native bulls, crossbred bulls, and AI, respectively. The results showed a substantial variation in respondents' levels of satisfaction, with 50% of respondents saying they were dissatisfied with the service they received from OSMAI and 51% saying they thought that residents in and around their village were somewhat happy with the OSMAI services provided there. Out of the respondents, 59.5 percent said the program must be continued and expanded, while 22.6 percent said it must be continued in its current form. However, 17.9% of those surveyed said that the program's success was a failure and that it ought to be discontinued. Programs for improving breeds must be implemented with farmer participation, as farmers must be informed and involved for the program to be successful. Farmers must be informed about the breed and blood type of animals that their animals crossbreed with, and they must be given the opportunity to choose and make this decision.

Keywords: Estrus mass synchronization and artificial insemination, Conception rate, Perception

INTRODUCTION

Estrous synchronization is the manipulation of the Estrous cycle or induction of Estrous to bring a higher number of female animals into Estrous at a predetermined period (Paul, 2010). Under the Ethiopian scenario, it is also of paramount importance as there are seasonal shortages of feed and fodder and the demand for livestock products is largely dependent on the season (Tegegne *et al*.,

1989). It can also minimize the challenges faced by AI services in the country (Solomon *et al*., 2016).

In Ethiopia studies on Estrous synchronization in dairy cattle 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). 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, LIVES projects (ILRI)) and the national research system. The first round of synchronization was initiated in the year 2012 in 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).

Studies have indicated that the rate of conception (among the cattle) varied between the regular development intervention and the action research with results varying across the regions and thus, the overall results of the scaled-up project was inconsistent (Solomon *et al.,* 2016). However, information on calving rate, sex of calves born, effect on animals' fertility, contribution of the program on improving blood level and milk yield, perception of farmers on the program and others are not available in West Arsi and East Shewa Zones of Oromia region. Thus, this study was conducted with the objectives of assessing the status and perception of farmers on Estrous synchronization and Mass AI in West Arsi and East Shewa Zones.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in East Shewa and West Arsi Zones of the Oromia region. A total of 4 districts, 2 districts per zone were selected based on previous exposure to estrous mass synchronization in the zones.

Sample Size Determination and Sampling Procedures

Districts were purposively selected from areas where intervention in the mass synchronization of cattle was undertaken. A total of 12 kebeles and 3 kebeles per district were randomly selected from those involved in the estrous mass synchronization program. Furthermore, respondents were randomly selected from each kebele based on lists in the case book of mass synchronization with selection criteria based on the experience of participating in a mass synchronization program for at least one round. In total, 240 respondents (20 farmers from each Kebele) were interviewed by using pre-tested semi-structured questionnaires.

Type of Data and Data Collection Methods

Both qualitative and quantitative data were collected from primary and secondary data sources during the study period. The primary data were collected by using a questionnaire survey while secondary data were collected from record books at various government offices (office of Agriculture at Zone and district level to assist the selection of Districts, Kebeles, and respondents).

With regard to primary data household demographic characteristics, mating system, farmer's preference for breeding methods, artificial insemination service provision and its constraints, farmer's perception regarding estrous synchronization and mass artificial insemination, calving

condition, sex of calves born and status of the calves were amongst the parameters of consideration.

Data Management and Statistical Analysis

The collected data were fed into Microsoft Excel, coded, and saved until analysis by statistical software. The qualitative were analyzed by using the Chi-square ($\chi 2$) test procedure of SPSS Ver. 24.0. Quantitative data from the survey were analyzed using the GLM (univariate). The variation between groups was considered significant when the $P \leq 0.05$.

RESULTS AND DISCUSSIONS

Demographic Characteristics of the Respondents

Table 1 displays the respondents' primary farming system and sex-related results. According to the results, most of the respondents were men, which is consistent with the findings of Alemayehu et al. (2019) and Bainesagn et al. (2015). The finding also shows that the main farming systems in the research area differ significantly, with mixed farming systems having a higher crop dominance (Table 1).

Table 1: Sex and major farming systems of the respondents

Parameters	Zone of respondents		Overall Mean	P value
	East Shewa	West Arsi		
Sex of respondents				
Male	63.6	68.8	66.2	0.419
Female	36.4	31.2	33.8	
Major farming system of respondents				
Crop production	11.8	0	5.9	0.000
Livestock production	20	2.8	11.4	
Mixed with crop dominate	67.3	89	78.1	
Mixed with livestock dominate	0.9	8.3	4.6	

As seen in Figure 1, 32.9% of respondents in East Shewa had experience in grades 1 through 6, but over 20% of respondents attended the same educational level in West Arsi.

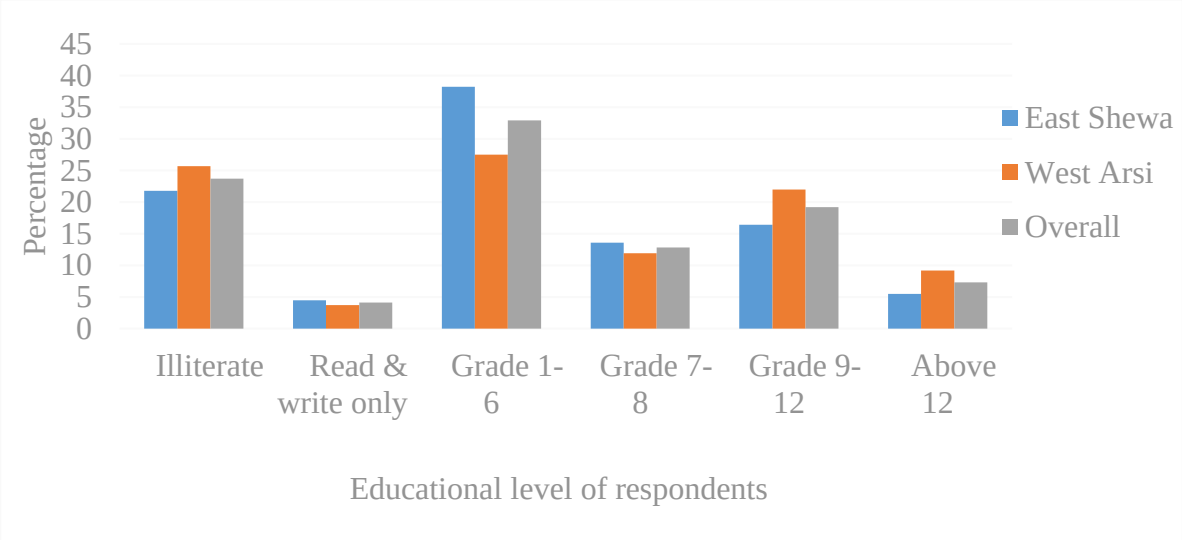

Figure 1: The educational level of respondents

Table 2: Livestock composition (Mean ± SD) and herd size (in TLU) of sampled respondents in the study area

Livestock type	Breed	Kebele of respondents		Overall mean
		East Shewa	West Arsi	
Cows	Indigenous	1.79±0.20	1.32 ± 0.12	1.56 ± 0.12
	Crossbred	0.95±0.15	0.92 ± 0.08	0.94 ± 0.08
Oxen	Indigenous	1.80 ±0.17	1.10 ± 0.11	1.45 ± 0.10
	Crossbred	0.10 ± 0.04	0.29 ±0.06	0.20 ± 0.04
Bulls	Indigenous	0.36 ± 0.08	0.53 ± 0.08	0.45 ± 0.06
	Crossbred	0.10 ± 0.03	0.19 ±0.05	0.14 ±0.03
Heifers	Indigenous	0.95 ± 0.16	0.51 ± 0.07	0.74 ± 0.09
	Crossbred	0.49 ± 0.10	0.54 ± 0.07	0.52 ± 0.06
Bull calves	Indigenous	0.65 ± 0.10	0.41 ± 0.07	0.53 ± 0.06
	Crossbred	0.26 ± 0.05	0.28 ± 0.04	0.247 ± 0.03
Cow calves	Indigenous	0.55 ± 0.09	0.28 ± 0.06	0.42 ±0.05
	Crossbred	0.24 ± 0.06	0.39 ± 0.05	0.31 ± 0.04
Sheep	Indigenous	1.77 ± 0.35	1.26 ± 0.28	1.51 ± 0.22
Goats	Indigenous	1.60 ± 0.34	0.75 ± 0.23	1.18 ± 0.21
Chicken	Indigenous	2.78 ± 0.45	1.11 ± 0.25	1.95 ± 0.26
	Crossbred	2.84 ± 0.75	0.96 ± 0.25	1.90 ± 0.40

The data presented in Table 2 about the composition of the study areas' cattle herd shows that most of the animals raised by the respondents were native breeds. This outcome is consistent with other research (Abera, 2016; Bainesagn, 2015), which found that crossbred cattle make up less than 5% of all cattle in the nation.

Estrous Mass Synchronization Status

The majority of respondents (91.2%) stated that they use mass artificial insemination and estrous synchronization services. 92.4% of the animals who were synchronized by PGF2α came into heat. Out of the 182 cows that exhibited heat symptoms, 160 (87.9%) underwent artificial insemination, while the remaining 12.1% were mated by a bull. In the research area as a whole, the conception rate was 68.9%. The present outcome is less than the Tegegne et al. (2012) report. The latter was implemented in an organized manner by a group of specialists; therefore, the discrepancy could be the result of different implementation strategies. They have participated in the program one to three times during the course of their tenure.

Table 3: Summary of animals included in the program by respondents

No of animals		Zone of respondents		
		East Shewa	West Arsi	Total
Estrous synchronized	N	90	107	197
	%	45.7	54.3	100
Comes to heat	N	78	104	182
	%	86.7	97.2	92.4
Served by artificial insemination	N	69	91	160
	%	88.5	87.5	87.9
Served by Bull	N	9	13	22
	%	11.5	12.5	12.1
Conceived	N	44	80	124
	%	57.1	77.7	68.9

Table 3 presents the results for the number of animals injected with PGF2α, exhibited heat signs, served by AI, natural bulls, and conceived. Overall, 92.4% of the animals who received PGF2α injections displayed signs of heat; of these, 87.9% were served artificially through insemination, and the other 12.1% were by bull. Over the entire research area, the rate of conception is 68.9%.

The outcome shows a notable variation in the breed of calves born, with 24.4% of the calves being native and 75.6% of the calves being crossbred. They show that 7.3 and 5.2% of respondents kept their animal alongside other animals without and with a bull, suggesting that this may be related to the management and follow-up of animals after the first service. The current outcome is consistent with Alemayehu et al.'s 2019 analysis, which found that most calves born in the study locations were of crossbred kinds with just minor variations. This could be the result of the majority of animals who come into heat being artificially inseminated, with a small exception. Additionally, they reported that 73.4% of their animals had repeated after the first service, and 56.5% of them had used natural bull service because they had not received artificial insemination services and AITs were not present in their area during the time the animals were repeating. Since artificial insemination was provided in the form of a campaign in their area, this had an impact on the calf breed that would be born and on the advancement of genetic improvement in the area.

A regular follow-up is necessary to ensure the growth of the calves. The survivability of the calves born (across both genotypes) was 10.7%, which was higher than the values reported by (Asseged and Birhanu, 2004, Alemayehu et al, 2019) from dairy farms in and around Addis Ababa and Adami Tulu Jido Kombolcha districts areas of the country. The location of the area and the care given to calves from the moment of birth onward may be the cause of the discrepancy.

Selection and Handling of Animals

The findings indicate that the AI technicians made most of the decisions on which animals to include in the artificial insemination program. The results are at odds with those of (Tegene and Zelalem, 2016), who claimed that a committee of farmers and specialists selected the animals. One possible explanation for such work could be a lack of a participatory approach. Of those surveyed, about 41.6% lacked knowledge regarding the standards used to choose animals for mass synchronization services. The current outcome differs from reports by Alemayehu et al. (2019) and Bainesagn (2015), which claimed that farmers were aware of the animals' selection criteria. The discrepancy may result from farmers' varying degrees of mass synchronization awareness.

When it came to the care of the animals following hormonal injection, 87.5% of them separated their inseminated cows from other male animals, watched for signs of heat, and returned the animals for artificial insemination, while 13.6% of them chose not to return their animals even after they displayed heat for the purpose of artificial insemination. Regarding the pregnancy diagnosis, 61.9% of the participants reported having no experience using animals for the diagnostic. Overall, the results show that respondents' understanding of the care and monitoring of animals in the research region is lacking.

Getting Access to the Breeding Service

Eighty-seven percent of respondents said they had used a breeding service in the year prior to the data collection. Of those, seventy-nine percent received AI services, and the remaining fifteen percent and thirteen percent received both improved bull service and both services combined.

In terms of the service providers in the most recent year of data collecting, the findings show that 80.2%, 10.4%, 8.3%, and 1% of the services were rendered by governmental, private, non-governmental, and both types of organizations, respectively. Regarding AI services specifically, they found that 86.6% of respondents receive assistance from governmental AITs, 6.7% receive assistance from private AITs, and 6.7% receive assistance from both. The results show that there is variation in the understanding of the sire breeds utilized in the insemination of their animals when it comes to the crossbreeding used in their dairy animals. Sixty-eight percent of the responders, or most of them, were unaware of the sire breeds that their animals were crossed with. Across the research area, AITs determine nearly 99 percent of the breed and blood type of sire involved in crossbreeding.

According to the survey, the respondents had no idea what breed was used to collect the semen for insemination. This is not the case with a prior statement made by Bainesagn (2015), who stated that farmers knew the sire breeds that their animals were inbred to. This variance could be the result of inadequate extension technique implementation and limited community awareness creation. This ultimately leads to a lack of success in the technology's acceptance and a shaky start from farmers on its use.

Blood Level Used for Crossbreeding, Breeds, and Choice of Sire Breed

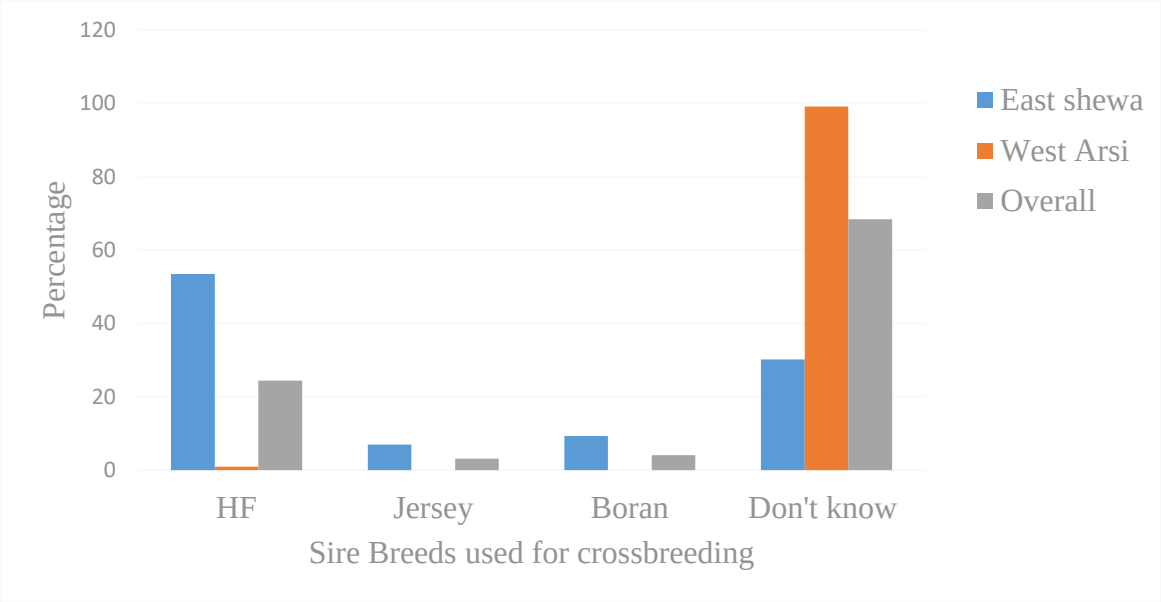

Figure 2: Sire breeds used for crossbreeding

The findings showed that respondents' preferences for sire breeds that they believe are appropriate for crossbreeding in their location varied significantly; 72.7%, 9.1%, and 4.0% of them preferred HF, Jersey, and Boran breeds, respectively, while 14.1% of them were unsure which breed to choose.

Table 4: Decision maker and preference of sire breed and blood level used for crossbreeding

Parameters	Zone of respondents		Overall mean	P value
	East Shewa	West Arsi		
Decision maker of sire breed and blood level used for crossbreeding (%)				
AITs	63.0	99.1	99.0	
Farmers	1.1	0	0.5	0.364

Both	0	0.9	0.5	
Preference of sire breeds by respondents				
Holstein Friesian	63.0	81.1	72.7	0.000
Jersey	16.3	2.8	9.1	
Boran	8.7	0	4.0	
Don't know	12.0	16	14.1	

The Situation of the Born Calves

According to the results, 36.5 percent of calves born were old enough to reproduce, and 65.2%, 17.4%, and 13% of calves were served by native bulls, crossbred bulls, and AI, respectively. Since the study examined data from 2016 to 2020 and the majority of calves were born at younger ages, the number of calves reaching reproductive age is lower. At first parity, they produce 7.56 ± 0.96 liters of milk daily on average. With regard to the male calves that were born, 57.6% of the respondents utilized them for plowing, while the remaining 39.41% and 3.6% sold them and used them for breeding, respectively.

Because they are crucial for the replenishment of the dairy herd, 88.4% of respondents preferred female calves, whereas 7.2% and 4.4% preferred both sex and male calves.

Farmers' Perceptions

The results of this study suggest that respondents' opinions about artificial insemination and estrous mass synchronization vary in terms of how satisfied or dissatisfied they are. Of the respondents, 50% were dissatisfied and just 49.5% were satisfied. The percentage of individuals in and around the village who were satisfied with the service was 26.5%. Those who were moderately satisfied (51%) and dissatisfied (22.4%) came next. The degree of pleasure with the technology is varied, as supported by statistical evidence ($p<0.001$) Table 5. This is consistent with earlier research (Bainesagn, 2015), which found that in mass insemination initiatives like these, it's critical to consider the goals of the recipients and inform them beforehand of the benefits and drawbacks of the projects. The findings indicate that the primary cause of the respondents' dissatisfaction with the OSMAI service was the cows' inability to conceive and come to heat within a regular cycle. These findings align closely with those of (Destalem, 2015), who also noted that cows given PGF2α or its analogue experienced difficulties conceiving later on. The results of (Azage et al., 2012) showed that there were no variations in the cattle's future conception, which refuted these observations. Given that the program was implemented through action research, the variation may have resulted from the implementation technique used.

Table 5: Satisfaction level of respondents and people in and around their village

Parameter	Zone of respondents			P value
	East Shewa	West Arsi	Total	
Level of satisfaction by respondents				
Satisfied	30.3	65.4	49.5	.000
Not satisfied	69.7	33.6	50	
Somewhat satisfied	-	1	0.5	
Level of satisfaction of people in and around their village				
Satisfied	18	33.6	26.5	.000
Not satisfied	42.7	5.6	22.4	
Somewhat satisfied	39.3	60.7	51	

Farmers' Perceptions of The Estrous Mass Synchronization Program's Future Trends

Out of the respondents, 59.5 percent said the program must be continued and expanded, while 22.6 percent said it must be continued in its current form. However, 17.9% of those surveyed said that the program's success was a failure and that it ought to be discontinued.

The farmers shared their predictions for the use of mass synchronization technology in the future. Several arguments have been put forth to justify the program's continuation, including the role that technology plays in improving animals' genetic makeup (91.4%), reducing poverty (90.9%), and raising the social standing of owners (90.9%).

On the other hand, some people argue that the technique should be abandoned because cows are having difficulty conceiving (72.9%) and coming into estrous in a normal way (66%). The current study contradicts the findings of Azage et al. (2012), who stated that there were no variations in the cattle's future conception. However, it is similar to the report by Alemayehu et al. (2019).

Table 6: Reasons for the program scaling up and continuation and discontinued and abandoned

Parameter	Zone of respondents			
	East shewa	West Arsi	Total	P value
Reasons for scaling up and continuation				
Improve the genetic makeup of animals				
Yes (%)	81	100	91.4	0.000
No (%)	19	-	8.6	
Help in poverty reduction				
Yes (%)	80	100	90.9	0.000
No (%)	20	-	9.1	
Help in improving the social status of the owners				
Yes (%)	80	100	90.9	0.000
No (%)	20	-	9.1	
Reason for discontinuation				
Synchronized Cows have a problem in coming to estrous in the normal manner				
Yes (%)	58.3	90.9	66	0.046
No (%)	41.7	9.1	34	
Cows face problems with conceiving				
Yes (%)	64.9	100	72.9	0.021
No (%)	35.1	-	27.1	

CONCLUSION AND RECOMMENDATIONS

In the East Shewa and West Arsi Zones, the status and attitudes of farmers toward mass artificial insemination and estrous synchronization were evaluated. AITs make the decision based on the semen they have available at that particular moment; most animal owners are unaware of the sire breed and blood level with which their animals cross. There are notable differences in the animal conception rate throughout the research area. With regard to the mass artificial insemination and estrous synchronization services provided in their location, half of the respondents expressed dissatisfaction.

Programs for improving breeds must be implemented with farmer participation, as farmers must be informed and involved for the program to succeed.

Farmers must be informed about the breed and blood type of animals that their animals crossbreed with, and they must be given the opportunity to choose and make this decision.

Experts must execute estrous synchronization and mass AI services, and in order to support service delivery, AITs must be provided with job training, incentives, input supplies, and logistics.

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