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Perception of Dairy Cattle Owners on Oestrus Synchronization and Mass Artificial Insemination Services in Jimma Zone, South Western Ethiopia

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ABSTRACT

The study was conducted to investigate the perception of dairy cattle owners on oestrus synchronization and mass artificial insemination services in Jimma zone, south western Ethiopia. Two hundred forty nine dairy cattle owners who had used oestrus synchronization and mass artificial insemination services at least once over the last 5 years time were randomly selected and interviewed from three milk shade districts of Jimma zone. All data were analyzed by SAS version 9.2 (2008). Chi-square (x^2) test was carried out to assess the statistical significance among categorical variables. An index was also calculated to provide overall ranking. Majority (73.09 %) of beneficiaries of oestrus synchronization had low to medium perception about the important management practices like selection of appropriate cows/heifers, asking for quality of the hormone being used (expiration date of the hormone), separation of bulls and hormone treated cows/heifers and time/date of insemination after hormone treatment. Consequently, majority (67.47%) of the farmers faced failure of response for hormone treatment at least once. The main reasons for the failure were selection of inappropriate animals (I=0.40), injection of expired or ineffective hormone (I=0.37) and low dose of hormone (I=0.24). In addition, due to lack of awareness, dairy cattle owners had allowed their bulls to graze together with hormone treated cows/heifers. Moreover, the study also revealed that, 64.66 % of dairy cattle owners in Jimma zone were faced failure of mass AI services. The principal reasons for the failure of mass AI services were heat detection problem (I=025), poor quality semen (I=0.23) and distance of AI center (I=0.22). Therefore, in order to enhance the efficiency of the technology and eventually increase the satisfaction of beneficiaries, emphasis should be given on identified problems and concerted effort should be operated from all responsible sectors.

Keywords: Breeding practice, Heat detection, Hormone treatment.

INTRODUCTION

The Ethiopia's population, presently estimated to be 91 million, will jump to an estimated 278 million by mid-century (2050). To feed this population, current agricultural production from crops, livestock, fisheries and aquaculture should increase by over 60% (FAO, 2014). On the other hand, according to CSA (2016), from 57.83 million cattle populations in Ethiopia, only 1.22 percent (705,526) and 0.19 percent (109, 877) are hybrid and exotic breeds, respectively. The remaining, 98.59 percent of the total cattle populations are local breeds (CSA, 2016) though the productivity of the native livestock is low due to their genetic makeup, low level of inputs, and traditional husbandry practice besides environmental stress (Sebsibe, 2008; Azage *et al*., 2010). However, the distribution of native livestock populations across the different agro-ecologies of the country provides various options for tangible and non-tangible use of livestock products to the smallholder farmers and pastoral communities (CSA, 2016).

In order to improve the low genetic potential of local cattle in particular, selection of the most promising breeds and cross breeding of these indigenous breeds with highly productive exotic cattle has been considered as a practical solution (Tadesse, 2008). In Ethiopia, artificial insemination had been going on for nearly fifty years. However, it is widely believed that the artificial insemination (AI) service in the country has not been successful to improve reproductive performance of dairy industry (Sinishaw, 2005). Pregnancy rate of dairy cattle to first insemination is 27% in the conventional AI system (Desalegn et al. 2009). Oromia is one of regional state in Ethiopia having low conception rate which is 34.29 % (Desalegn, 2008). In order to enhance efficiency of AI service and improve heat detection problem of the dairy farmers, oestrous synchronization and mass artificial insemination

(OSMAI) had been adopted as the second applicable reproductive technology and management in areas where dairy development is feasible (Tegegne et al. 1989).

Even though, the conception rate of conventional AI service (27%) (Desalegn et al. 2009) improved to 39.3% (Gizaw et al., 2016) for hormone treated dairy cows in Ethiopia, the change was not as expected. A synchronization program to be successful, herd nutrition (cattle must be in good body condition), cycle of estrus (must be normal cycle), and herd health (free from disease and parasites) and weight of the animals must be considered (Lamb, 2010). In addition, if natural service is to be used, bull to cow ratio and age and condition of the bull (the bull need to be 2 years or older, experienced and in good condition) has to be considered (Etherington *et al.,* 1984; Stephen, 2000). Moreover, Azage et al. (2012) reported that awareness creation, proper training, careful animal selection (good body condition score, cows free from diseases and with functional ovaries), good animal handling facility at a convenient location, a well-trained, organized and motivated multi-disciplinary team (livestock science, feeds and nutrition experts, veterinarians, AI technicians, etc.) actively participant community and proper leadership and coordination are key elements for the success of synchronization program. Therefore, this study was designed to investigate the perception of the farmers involved OSMAI as beneficiaries with regard to animal selection, good animal handling facility, management of cows/heifers from hormone treatment to insemination and post insemination, and to identify problems associated with this technology in Jimma zone, western Ethiopia.

MATERIALS AND METHODS

Description of study area

The study was carried out in Jimma zone, south west Ethiopia. The capital of this zone is Jimma city which is found 350 km away from Addis Ababa and lies between 36°50´E longitude and 7°40´N latitude at an average elevation 1750 m.a.s.l. The climate of the area is characterized by humid tropical with bimodal heavy rainfall which is uniform in amount and distribution, ranging from 1200 to 2800 mm per year, with short and main seasons occurring from mid February to May and June to September, respectively. In normal years, the rainy season extends from mid February to early October. The ten years mean annual minimum and maximum temperature of the area was 11.3°C and 26.2°C, respectively. The size of the land holdings varies generally from 0.25 to 2.5 ha. Jimma Zone has livestock population of 2,212,962 cattle, 866,561 sheep, 457,311 goats, 96,782 horse, 17,644 mule, 77,767 donkey, 1,951,129 poultry and 546,722 bee hives (CSA, 2016).

Sampling techniques and sample size determination

Jimma zone milk shade districts were identified with the help of livestock and fishery resource development office. Three districts were selected purposively from the areas identified as milk shade districts based on number of OSMAI beneficiaries and dairy cattle population. From each district, three rural kebeles practicing synchronization scheme were selected again purposively. From each selected kebeles, households which had participated on OSMAI at least once over the last 5 years time were randomly selected and interviewed.

The representative sample size for households was determined by Yamane's Formula (1967).

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

Where: n = sample size
N = total number of household
e = Sampling error

Based on the formula, totally 249 households were selected for the study to represent the zone.

Data types and collection methods

The overall data were collected from primary and secondary data sources. Primary data was gathered through two approaches namely structured questionnaire and group discussions. The questionnaire was translated to local language (Afan Oromo) to make easily understandable and pre-tested before administration and some re-arrangement, reframing and correction was made in accordance with respondent perception. The questionnaires were administered to households by enumerators recruited and trained for the purpose, with close supervision by the researchers.

Based on the questionnaire, perception of the dairy cattle owners about OSMAI program, factors affecting success of synchronization program, and breeding technology and preferences of farmers were collected.

In addition, information was collected from group discussions. A group discussion was organized in villages of three districts with purposely selected youngsters, women, village leaders, developmental agents (DAs), artificial insemination technicians (AITs) and socially respected individuals who are known to have better knowledge on the present and past social and economic status of the area. Group discussions was focused on the history of the breeding practices of dairy cows, utility pattern of the dairy cows and OSMAI services, current status and major constraints of the OSMAI practices and services, major reproductive problems of dairy cows after AI and their perception about conception rate of AI served dairy cows.

Data management and statistical analysis

All data gathered during the study period were coded and recorded in Microsoft Excel 97-2003. All data were analyzed by SAS version 9.2 (2008). The data were described and summarized by using descriptive statistics. Chi-square (x^2) test was carried out to assess the statistical significance among categorical variables using district as fixed effect. An index was calculated to provide overall ranking. The ranking being expressed as Index= sum of (3 X reasons for the failure of synchronization ranked first + 2 X reasons for the failure of synchronization ranked second + 1 X reasons for the failure of synchronization ranked third) given for each reasons for the failure of synchronization divided by sum of (3 X reasons for the failure of synchronization ranked first + 2 X reasons for the failure of synchronization ranked second + 1 X reasons for the failure of synchronization ranked third) for reasons for the failure of synchronization (Kosgey, 2004).

RESULTS AND DISCUSSION

Perception of beneficiaries on management of cows/heifers in synchronization program

Majority (73.1 %) of oestrus synchronization beneficiaries had low to medium perception about the important management practices like selection of appropriate cows/heifers, asking for quality of the hormone being used (expiration date of the hormone), separation of bull and hormone treated cows/heifers, and time/date of insemination after hormone treatment. This could magnify the failure of OSMAI program in the study area. Consequently, majority (67.47%) of the farmers in the study area faced failure of response to hormone treatment at least once (Table 1). Similarly, Destalem (2015) reported that majority (81.2%) of farmers in central Tigray zone of Tigray region had low to medium perception about oestrus synchronization. Bainesagn (2015) also reported that, 49.1% of farmers in south Shoa zone of Oromia region had low to medium perception about oestrus synchronization.

The perception of beneficiaries among districts was significantly different ($P<0.01$). Among dairy cattle owners in all districts, significantly better perception was observed in Seka district cattle owners. As a result, most (91.1%) of beneficiaries in Seka district revealed their willingness to pay the cost of hormone if reliable services are given. However, the number of farmers which had faced failure of the technology is relatively high (72.3%) in this district. This leads to conclude that most of the causes for the failure were not from the farmer's side. In Mana district only 66.7% of beneficiaries showed willingness to pay the hormone. This could be due to the influence of previous discouraging results. This variation was significantly ($P<0.01$) different among districts.

Moreover, nearly half (43.0%) of the beneficiaries had allowed their bulls to graze together with hormone treated cows/heifers. This indicated that the cows/heifers have the possibility to conceive from the local bulls. As the report of AITs during group discussion, after exotic bull semen inseminated to cows/heifers, deliveries of local calves were happened and even farmers had developed lack of trust to inseminators. There was significant difference ($P<0.05$) across districts for awareness of farmers to keep their cows from bull during heat period.

The major reasons for the failure of hormone treatment

Majority (67.47%) of the farmers faced failure of response for hormone treatment at least once (Table 1). The major reasons for failure of hormone treatment were selection of inappropriate animals (poor body condition, pregnant, diseased and fatty cows/heifers), low dose of hormone and injection of expired or inefficient hormone (Table 2). According to the farmers perception, selection of inappropriate cows/heifers was the primary reason for the failure of hormone treatment in Seka and Mana districts while in Dedo district injection of expired/inefficient hormone was ranked first. The major reasons for the failure of hormone treatment in this study is slightly consistent with the result of Gizaw et al. (2016) who reported that, the major reasons for the failure of hormone treatment in Oromia, Amahara, Tigray and SNNP region of Ethiopia were feed problem, inappropriate season and low awareness of farmers on the technology (taking hormone injection for insemination and providing sterile and non-cyclic animals for PGF2α treatment).

Table 1: Perception of dairy cattle owners on oestrus synchronization (OS) and their practice

Perception and Practice	District						Overall	
	Seka		Mana		Dedo			
	N	%	N	%	N	%	N	%
What is your perception on OS?								
Low	17	21.5	34	37.8	38	47.5	89	35.7
Medium	24	30.4	40	44.4	29	36.3	93	37.3
Good	36	45.6	15	16.7	13	16.3	64	25.7
Very good	2	2.5	1	1.1	0	0.0	3	1.2
X^2								*29.8*
P								<.0001
Do you allow bulls to go with hormone treated cows?								
Yes	26	32.9	26	28.9	55	68.7	107	43.0
No	53	67.1	64	71.1	25	31.3	142	57.0
X^2								*32.24*
P								<.0001
Have you faced failure of response to the hormone treatment?								
Yes	57	72.2	60	66.7	51	63.7	168	67.5
No	22	27.8	30	33.3	29	36.3	81	32.5
X^2								*3.1*
P								0.5462
If you are asked to pay cost of hormones, are you willing to pay?								
No	7	8.9	30	33.3	21	26.2	58	23.3
Yes	72	91.1	60	66.7	59	73.8	191	76.7
X^2								*14.68*
p								0.0006

N=Number of households

Table 2: The major reasons for the failure of Synchronization program

Purpose of keeping	District												Overall Index
	Seka				Mana				Dedo				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	
Selection of inappropriate cows/heifers	29	21	7	0.40(1)	46	11	3	0.45(1)	9	42	0	0.36(2)	0.40
Low dose of hormone	7	14	36	0.25(3)	5	27	28	0.27(3)	1	2	48	0.18(3)	0.23
Provision of expired/inefficient hormone	21	22	14	0.35(2)	9	22	29	0.28(2)	41	7	3	0.46(1)	0.36

Index= sum of (3 X reasons for the failure of synchronization ranked first + 2 X reasons for the failure of synchronization ranked second + 1 X reasons for the failure of synchronization ranked third) given for each failure of synchronization divided by sum of (3 X reasons for the failure of synchronization ranked first + 2 X reasons for the failure of synchronization ranked second + 1 X reasons for the failure of synchronization ranked third) for all failure of synchronization.

Provision of mass artificial insemination services in the study area

Majority (68.7%) of farmers in the study area communicated to AITs through phone when they detect sign of heat from their cows/heifers while the other 30.5% of dairy cattle owners took to AI centers when they look sign of heat on their cows/heifers (Table 3). However, small holder farmers are engaged in various farm activities and are quite

difficult for them to detect proper time of heat. The dairy cattle owners could detect the heat time but it might not match with appropriate time of insemination. This leads to the heat period of the cows and heifers passed before the AI service have been given or inappropriate time of insemination that cause failure to conception. Similarly, Bainesagn (2015) reported that, 60.5% of farmers in south Shoa zone of Oromia region detect heat by their own and took their cows to AI station.

Interestingly, most (79.1%) of the farmers in Jimma zone had the awareness and the chance to choose the type of bull breed that the AITs use to inseminate their cows. In addition, around half (55.8%) of the farmers knew the effect of inbreeding when the AITs use the same bull repeatedly to inseminate their cows. In contrast, Destalem (2015) reported that 100% of AI user farmer's in central Tigray zone of Tigray region had not idea about selection of semen (bull breed) and 94.4 % of them were not aware about problem of inbreeding.

Table 3: Mass AI Service administration

Mass AI Service delivery	District						Overall	
	Seka		Mana		Dedo			
	N	%	N	%	N	%	N	%
How do you communicate with AI technicians?								
visit us daily	0	0.0	0	0.00	2	2.5	2	0.8
call to them when we need	61	77.2	68	75.6	42	52.5	171	68.7
We take our cows to the AI station	18	22.8	22	24.4	36	45.0	76	30.5
X^2								*16.9*
p								0.0021
Do you have any say in the selection of the type of semen you use?								
Yes	61	77.2	80	88.9	56	70.0	197	79.1
No	18	22.8	10	11.1	24	30.0	52	20.9
X^2								*9.4*
p								0.0091
Are you aware of the problems of inbreeding?								
Yes	34	43.0	69	76.7	36	45.0	139	55.8
No	45	57.0	21	23.3	44	55.0	110	44.2
X^2								*24.9*
p								<.0001
Have you faced failure of insemination?								
Yes	58	73.4	57	63.3	46	57.5	161	64.7
No	21	26.6	33	36.7	34	42.5	88	35.3
X^2								*4.5*
p								0.1046

N=Number of households

The reasons for failure of mass AI services

Majority (64.7%) of the farmers faced failure of mass AI services at least once (Table 3). The major reasons for success of AI services were heat detection problem, AI technician inefficiency, distance of AI center, shortage of AI technician, disease problem and poor semen quality (Table 4).

The study showed that the primary reason for the failure of AI services in Seka and Mana districts was heat detection problem (discrepancy between time of heat that dairy cattle owners report to AITs and appropriate time of insemination). In Dedo district, beneficiaries of AI services reported that the primary reason for the failure of the service was poor quality semen. In addition, as they reported during group discussion, they had information that sometimes immotile sperm was used for insemination of cows/heifers. Distance of AI center was reported as secondary factor in Mana and Dedo districts while in Seka district dairy cattle owners reported that both disease and poor semen quality were secondary factors for resulting inefficient AI services (low conception rate). The major reasons for the failure of mass AI services in this study is in line with the result of Gizaw et al. (2016) who reported that, the major reasons for the failure of AI services in Oromia, Amahara, Tigray and SNNP region of Ethiopia were, failure to detect heat, poor semen quality/problem in semen handling and low performance of the inseminator.

Table 4: Reasons for the failure of AI service

Reasons for the failure of AI	District												Overall Index
	Seka				Mana				Dedo				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	
Heat detection problem	13	27	11	0.30(1)	35	9	4	0.37 (1)	1	6	4	0.07 (5)	0.25(1)
AI technician inefficiency	1	0	5	0.02 (6)	3	4	10	0.08 (5)	2	0	0	0.02(6)	0.04(6)
Distance of AI center	2	8	18	0.12 (5)	14	22	8	0.28 (2)	16	10	3	0.26 (2)	0.22(3)
Shortage of AI technician	7	11	13	0.16 (4)	1	10	15	0.11 (3)	0	3	29	0.13 (3)	0.13(5)
Disease problem	20	3	4	0.20 (2)	2	7	13	0.10(4)	1	12	8	0.13 (3)	0.14(4)
Semen quality	15	9	7	0.20 (2)	2	5	7	0.07 (6)	26	15	2	0.40 (1)	0.23(2)

Index= sum of (3 X reasons for the failure of AI service ranked first + 2 X reasons for the failure of AI service ranked second + 1 X reasons for the failure of AI service ranked third) given for each failure of AI service divided by sum of (3 X reasons for the failure of AI service ranked first + 2 X reasons for the failure of AI service ranked second + 1 X reasons for the failure of AI service ranked third) for all failure of AI services

Breeding practice preferences of dairy cattle owners

The major breeding practice of dairy cattle owners in Jimma zone were natural mating, AI with naturally cycling cows/heifers (AI without oestrus synchronization) and OSMAI services. Nearly half (41.4 %) of dairy cattle owners in Jimma zone preferred OSMAI services for their dairy cattle breeding while the other 33.7% of dairy cattle owners preferred AI without oestrus synchronization (figure 1). In contrary, Destalem (2015) reported that 15.0% of dairy cattle owners in central Tigray zone of Ethiopia preferred OSMAI services. Moreover, Bainesagn (2015) reported that, only 3.3% of farmers in south Shoa zone of Oromia region practiced OSMAI services for breeding their dairy cattle. The difficulty of diagnosing early pregnancy through rectal palpation made OSMAI low preferable than conventional AI and natural mating since administration of hormone to pregnant cows induces abortion (Gizaw et al., 2016).

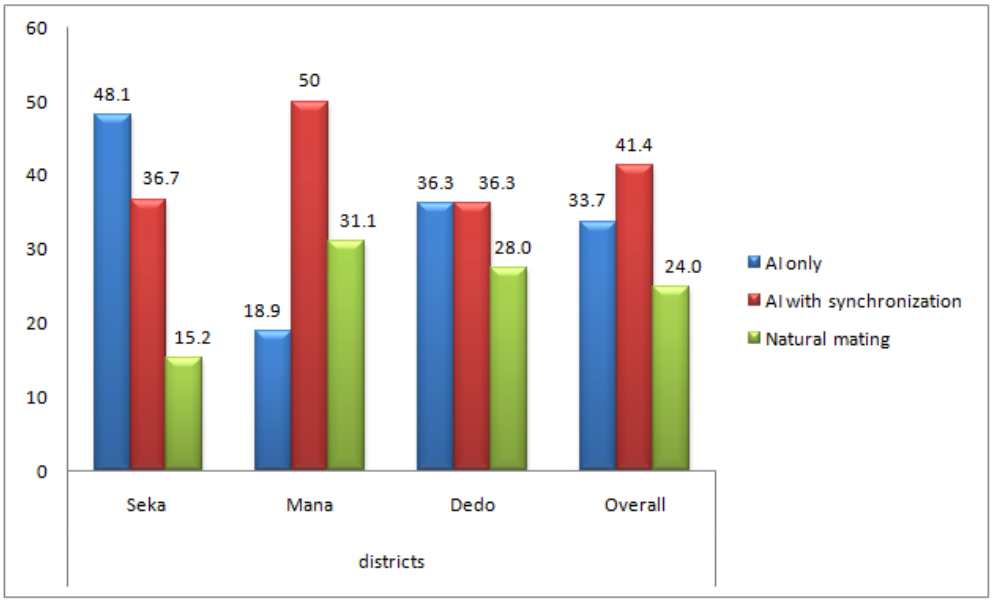

Figure 1: Breeding practice preferences of farmers in the study area

CONCLUSION

The study revealed that dairy cattle owners in Jimma zone perceived that the main reasons for failure of hormone treatment of cows/heifers were selection of inappropriate animals, low dose of hormone and injection of expired or inefficient hormone. For enhancing the efficiency of the synchronization program all investigated reasons should be strictly considered by respective expertise. In addition, dairy cattle owners had been allowed their bulls to graze together with hormone treated and naturally heated cows/heifers. This indicated that the farmers lack awareness of the cows/heifers to be mated by local bulls and ultimately delivery of local calves which leads to argument between service providers and the farmers. Therefore, intensive training like separation of bulls and cows during hormone treatment and time of insemination should be given for the farmers. Moreover, the study also showed that the primary reasons for the failure of mass AI service in Jimma zone were heat detection problem (discrepancy between time of heat that dairy cattle owners report to AITs and appropriate time of insemination), poor quality semen, distance of AI center, shortage of AI technician and disease. Therefore, the AITs have to round and check the cows/heifers after treated by hormone rather expecting call from farmers, AI centers should be constructed at kebele levels to decrease distance from the farmer's premises and AI centers, training of more AITs, semen quality test and disease diagnosis should be performed before the hormone treatment and insemination of cows is operated.

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STATEMENT OF INTEREST

The authors declare that there is no conflict of interest involved in this study.

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