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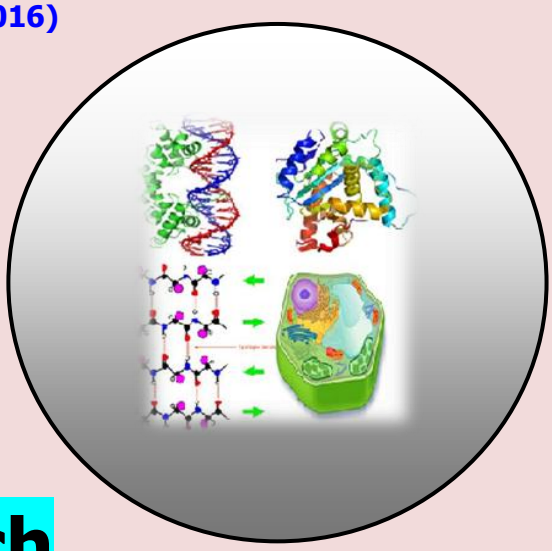

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RESEARCH PAPER

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Assessment on Constraints of Artificial Insemination Practicesin Essera, District, Dawuro Zone South Western Ethiopia

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ABSTRACT

Ethiopia in order to improve the low productivity of indigenous zebu cattle, selection of the most promising breeds and cross breeding these indigenous breeds with high producing exotic cattle has been considered as a practical solution. AI plays an important role to increase the yielding capacity of cow and is the appropriate and cheapest way of genetic improvement, the realization of breeding programs will to be well organized and excited in a very reliable way, and AI is fully function when it is corporate with good animal husbandry such as, effective heat defection. AI service is weak and even declining due to inconsistent service in the small holders' livestock production system of the Ethiopia high lands. The problem is more aggravated by wrong selection and, management of AI bulls a long with poor motivation and skills of skills of inseminators. The problem of AI service is not easily due to the lack of AI educated technicians, lack of AI materials that are used to give AI service and there is also lack awareness in the farmer to use the AI service. This study was carried out in Essera Woreda of Dawuro zone, which is located between 6.7-7.02^0 latitude and 36-37.1^0 longitudes. A total of 384 cows were selected and consisting of heifer and cows were selected from owners/farmers of four kebeles Bale, Shada, Kanbo and Oki. Based on assessment of problems associated with artificial insemination service in three districts of Essera district; less than half of small holder respondents have got the AI service regularly and without interruption. The most important constraints associated with AI service in the study site include conception failure, AITs problem, insufficiency of concerned body support, loss of structural linkage between AI center and service giving units, absence of collaboration and regular communication between NAIC,, district and kebele and other stakeholders, lack of breeding policy, inadequate resource in terms of inputs and facilities and absence of incentives and rewards to motivate AI technicians. Researcher recommends that AI service provision should be improved and functional breeding policy and strategy should be given at most priority.
Key words: Artificial Insemination, Cows, Calves, Milk and Essera.

INTRODUCTION

Background of the study

Ethiopia in order to improve the low productivity of indigenous zebu cattle, selection of the most promising breeds and cross breeding these indigenous breeds with high producing exotic cattle has been considered as a practical solution (Mekonen, *et al,* 2010). Artificial insemination is the single most important techniques ever devised for genetic improvement of animals in all aspects including milk and beef production. The development and use of artificial insemination techniques has revolutionized cattle production and genetic improvement particularly in the dairy sector in developed countries (Kaaya *et al,* 2005).

In spite of the presence of large and diverse animal genetic resource, the productivity and off take rate remain low in many developing countries including Ethiopia for various reasons such as inadequate nutrition, poor genetic potential, inadequate animal health service and other management related problem (EASE, 2003). In some countries especially in the tropics much of cattle production could be described as multipurpose, with cow being used to provide milk, meat, clothing, fertilizer, fuel, draft power and sometimes for status or as a form of currency (Ball and Peters, 2004).

AI plays an important role to increase the yielding capacity of cow and is the appropriate and cheapest way of genetic improvement, the realization of breeding programs will tobe well organized and excited in a very reliable way, and AI is fully function when it is corporate with good animal husbandry such as, effective heat defection (Nakes *et al.,* 2009). Artificial insemination, the most commonly used and valuable biotechnology has been used in Ethiopia over the last 30 years (Webb, 2003).

From the previous, few study (Dekeba et al, 2006) AI service is weak and even declining due to inconsistent service in the small holders' livestock production system of the Ethiopia high lands. The problem is more aggravated by wrong selection and, management of AI bulls a long with poor motivation and skills of skills of inseminators (Desalegn et al).The problem of AI service is not easily due to the lack of AI educated technicians, lack of AI materials that are used to give AI service and there is also lack awareness in the farmer to use the AI service.

Objectives

General objective

- To assess and identify the major problems associated with the artificial insemination practice and achievement in the study area of Essera woreda

Specific objectives

- To assess the status of artificial insemination in Essera Woreda
- Evaluate AI efficiency on served cow

LITERATURE INTERVIEW

Cattle production in Ethiopia

Cattle production in Ethiopia has an estimated cattle population of about 41.5 million heads (EASE, 2003). Around 99.45 are indigenous breeds with very few hybrids, 0.5% and exotic 0.1%. Cattle production together with the population of other livestock sectors has been known to be an important component of the agricultural sector. Livestock contributes much by providing meat, milk, cheese, butter, export commodities (live animals, hides and skin), drought .power, manure, near-cash capital stock (*EASE,* 2003).

Artificial insemination (AI)

Artificial insemination (AI)has been defined as a process by which sperm will be collected from the male, processed, stored, and artificially introduced into the female reproductive tract for the purpose of conception (Webb, 2003).

Semen is collected from the bull, deep-frozen and stored in a container with liquid nitrogen at a temperature of minus 196 degrees centigrade and made for use. Artificial insemination has become one of the most important techniques ever devised for the genetic improvement of farm animals. It has been widely used for breeding dairy cattle as the most valuable management practice available to the cattle producer and has made bulls of high genetic merit available to all *(Webb,2003*).

History of Artificial Insemination

The first successful AI was performed in Italy in 1780 and over 100 years later, in 1890, it was used for horse breeding (Webb, 2003). According to Webb (2003), the history of AI is interesting in that old Arabian documents dated around 1322 A.D. indicate that an Arab chieftain wanted to mate his prize mare to an outstanding stallion owned by an reproductive tract, and then used it to sexually excite the stallion causing him to ejaculate. The semen was introduced into the mare resulting in conception.

In Ethiopia, AI was introduced in 1938 in Asmara, the then part of Ethiopia, which was interrupted due to the second world war and restarted in 1952 (Yemane *et al.,* 1993). It was a gained discontinued due to unaffordable expenses of importing semen, liquid nitrogen and other related inputs requirement. In 1967 an independent service was started in the then Arsi Region, Chilalo Awraja under the Swedish International Development Agency (SIDA).

In Ethiopia, there is often complaint of the AI service, by service users for imbalance female and male ratios of calves born in which the latter exceeds in percentage, which is against the interests of most of the beneficiaries (Bekele,2005). Breeding using AI or natural mating affected male: female calf ratio, which gives sense and will be applicable if the system works. However, the reason why natural mating gave more female progenies than males for cow mating to AI is not clearly known (Bekele, 200%).

Advantage of Artificial Insemination

Advantage of AI is maximum use of superior sires will be considered as the greatest advantage of AI while natural service will be linked to limit the use of one bull, probably, to less than 100 mating per year (Webb, 2003). The author further showed that AI usage enabled one dairy sire to provide semen for more than 60,000 services in one year. Gebremedhin (200%) has listed many advantage of AI including prevention of reproductive disease, control of inbreeding, minimizing the cost of keeping bulls for natural service and others. Besides, the availability of accurate breeding records such as breeding dates, pregnancy rate, inter-estrus intervals, and days to first service will be used to monitor fertility are other advantages of AI (*Sinishaw,* 2004).

Disadvantage of AI

Includes poor conception rates due to poor heat detection and inefficiency of AI technicians, dissemination of reproductive disease and poor fertility rate, high cost of production, storage, transportation of semen as well as budget and administrative problems and inefficiency of AITs (Gebre Medhin, 2005).

Application of Artificial insemination

Estrus and estrus detection

Estrus is defined as a period when the female shows characteristic sexual behavior in the presence of a mature male, such as immobility, rising the hind quarters or arching the back, pricking of the ears-features that are collectively termed lordosis in small laboratory animals; mounting and riding behavior between females is also common (Bekana et al., 2005; Gebremedhine, 2005).

Timing of insemination

In the cow, maximum fertility is achieved if insemination from mid estrus to the end of estrus (Desalegn *et al*, 2008). Fertilization of the ovum is reported to occur in the oviduct at the junction of the isthmus and ampulla.

The life span of the ovum is around 12 ±18 hours and its viability decrease with time. About 8 hours after service sufficient spermatozoa is reached the isthmus of the oviduct and fertilization is takes place, capacitation of the spermatozoa is required.

Control of estrus

The estrus cycle is regulated pharmacologically to induce or control the time of estrus and ovulation (Bekana *et al*, 2005). The main reasons for estrus control are inducting of estrus in lactating dairy cows that will be not observed in estrus by 45 days post-partum, synchronization of groups of heifers for insemination with semen of easy calving bulls, reduction of the time necessary for estrus detection, synchronization of donor and recipients cattle for embryo transfer and induction of ovarian activity in beef cows with lactation anestrus.

Factor affecting success of artificial insemination

The major factors that determine AI efficiency are: site of semen deposition, heat detection skill, fertility level of the herd, semen quality and efficiency of inseminators (Desalegn et *al.,* 2008). Similarly, a successful insemination requires the acquisition of quality semen from a bull, the detection of estrus in the female, and the ability to properly place the semen in the reproductive tract of the female (Damron, 2000). Detection of estrus has been known by disease of testis, epididymis, and accessory glands in the male (Sori, 2004) and diseases of the female reproductive tract.

Artificial Insemination and Fertility Rates

Fertility is measured by calving rate to first service for artificially inseminated dairy cattle (Shiferaw *et al.,* 2003). Conception rate atfirst breeding provides a useful estimate of the conception rate for a herd. However, it is a measurement that will be combined the effects of semen quality, fertility oft eh cow, timing of insemination, semen handling and insemination techniques, as well as factors such as high environmental temperature and stress (Nebel, 2002).

Female fertility, male fertility, environmental factors, and techniques will be used in AI are the four general multitude factors that determine the ultimate outcome of conception per insemination. Female fertility refers to any factors directly related to the heifer/cow that alter her probability of becoming pregnant, including condition of the reproductive tract, nutritional status, change in body condition from calving to insemination, age and breed (Nebel, 2002).

Fertility in cattle is affected by environmental, genetic, disease, and management factors (Bekana *et al*., 2005). These influence the reproductive process at ovulation, fertilization, or implantation during gestation and parturition.

In postpartum cows, the mean number of service per conception as 2.4 and 2.7 for sub clinical endometritis positive cows, fourth and eighth weeks postpartum, respectively as compared to 1.7 for sub clinical endometritis negative cows showing that sub clinical endometrits has a significant effect on number of service per conception (Bacha,2007).

Higher number of service per conception was found at Assela Dairy farm and has been reported due, in most cases, to inefficiency in AI operations (Negussie *et al.*, 1998). This has been supposed to be because of incentives and bonuses, which used to be given to AITs for each insemination resulting in conception was later stopped and subsequently resulting will be increased number of service per conception. The role of incentives for inseminators was also documented to increase reproductive efficiency (Abate, 2006).

MATERIALS AND METHODS

Study area description

This study was carried out in Essera Woreda of Dawuro zone, which is located between 6.7-7.02^0 latitude and 36-37.1^0 longitudes. Essera Woreda with its capital at Bale town is situated 575 km south of the capital Addis Ababa. The district has a total area of 1043 km^2 and is divided in to 29 kebeles. The altitude of the district ranges from 501-2500 meters above the deal level.

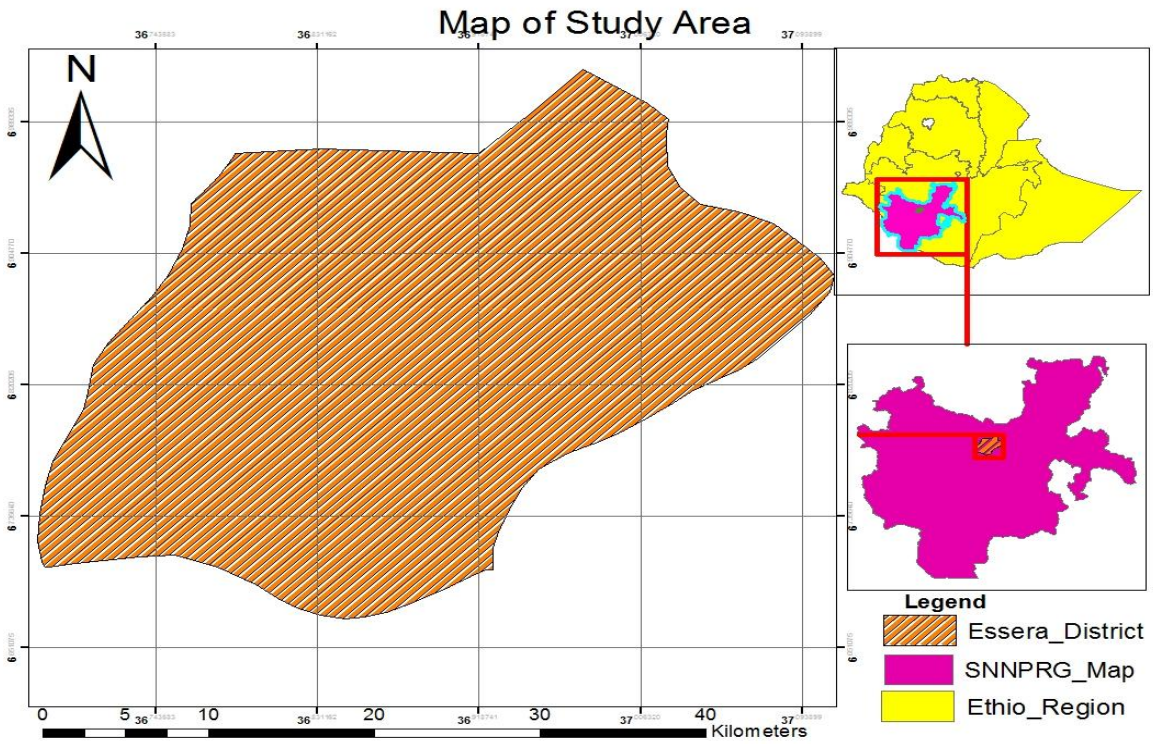

Figure 1 Map of study area.

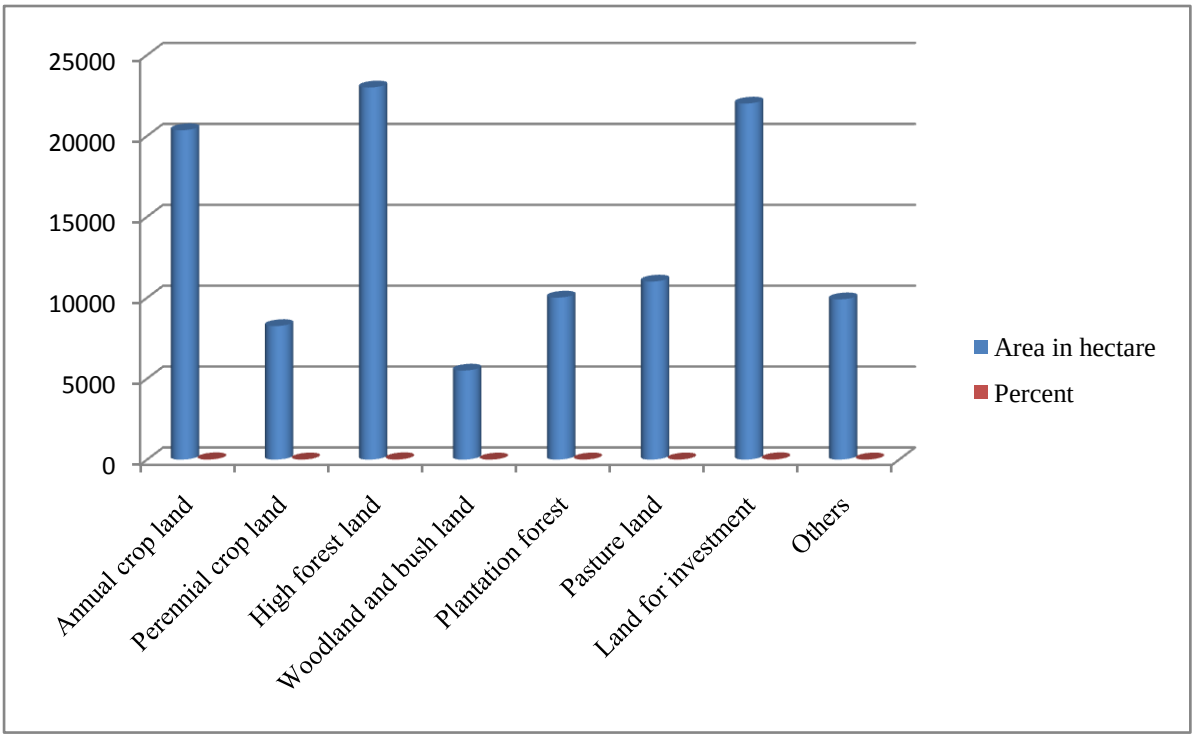

Figure 2 Land use characteristics of Essera District.

Source: Essera woreda Agriculture and Natural Resource Management Office, 2017

The area receives an average a new rainfall of about 1600.5mm and has an average annual temperature ranging from 17.6 to 27.5^{0}c mixed farming system is main economic action practiced in Essera Woreda Agricultural and Rural Development office (EWARDO, 2013). The cattle population of Woreda is 54,800.

Study animals

A total of 384**cows** were selected and consisting of heifer and cows were selected from owners/farmers of four Kebeles Bale, Shada, Kanbo and Oki, 110, 75, 120 and 79 cows were selected respectively from total dairy cow population by both qualitative and quantitative data was receiving primary and secondary source was collected. The method of primary data was collected by question survey, interviewing key formats and focus group in situation document was reviewed to generate baseline information on inseminated cows' heifers. The method of secondary data collected from previously inseminated cows' data of (EWLFRO, 2014-2016). The interview was distributed and filled by the farmers, Woreda Livestock and Fish Resource Office experts and by any other stakeholder.

Study design

Cross –sectional study design was conducted and four kebeles were selected purposely from November 2016 up to August 2017, and 384 cows and heifers were selected randomly.

Therefore, 80 households were selected from four kebeles and from each kebele HHs were selected proportionately and asked systematical random sampling.

The risk factors; Age, Bcs, breed, parity, body weight and height, time of insemination are major risk factors of AI.

Methodology

Method of the data collection

Questionnaires

Formats were prepared as questioning of:-AI problem and cow problems such as conception rate, repeating breeding ,non-returning of cow for service, date of AI conceived, age ,parity breeding or genotypes due to by face-to-face and individual questions on AI center etc .The sampling size that interviewed were 80 owners ,veterinarians, AI technicians ,DA randomly selected.

The method included were reviewing primary data, question surveyed and set of questionnaires were prepared and were filled by researcher and Essera Woreda Livestock and Fish Resource Office (EWLFRO) stakeholders like veterinarians, AI technicians DA.etc. It can open ended or close ended question and also by observation which is important method of identify the existing problem in naked eyes**.** Therefore, the questionnaires formats were attached at last parts of proposal papers.

RESULT AND DISCUSSION

Descriptive Analysis

This chapter presents the survey data and interpretation of the analytical findings. Of the 80 sample respondents 55 reported that they have participated in artificial insemination. However, the degree of adoption differs widely between households.

Demographic Characteristics

From the sample of 80HH, the result indicates that 79% of the heads of household are male. These household heads include a wide range of people, village elders, decision makers (local administration), younger people, older people, poor farmers and rich farmers. Out of the total sample households in the study area, 21% of the household heads are women, who are single, widowed or divorced.

Education Status of Household

Table 1. Educational status of household heads.

Educational status	Frequency	Percent
Illiterate	22	28.0%
Write and read	13	17.0%
Primary school	40	50.0%
Secondary school	5	7.0%
Total	80	100.0%

Sources: Field survey (2017)

From the survey results, better-educated households have more realistic perceptions about AI problems and more knowledge related to AI. From discussion with key informants, with respect to educational status of households educated farmers have positive attitude in AI.

Age Status of Households

Three age groups of family members were identified as it can be seen from table and figure

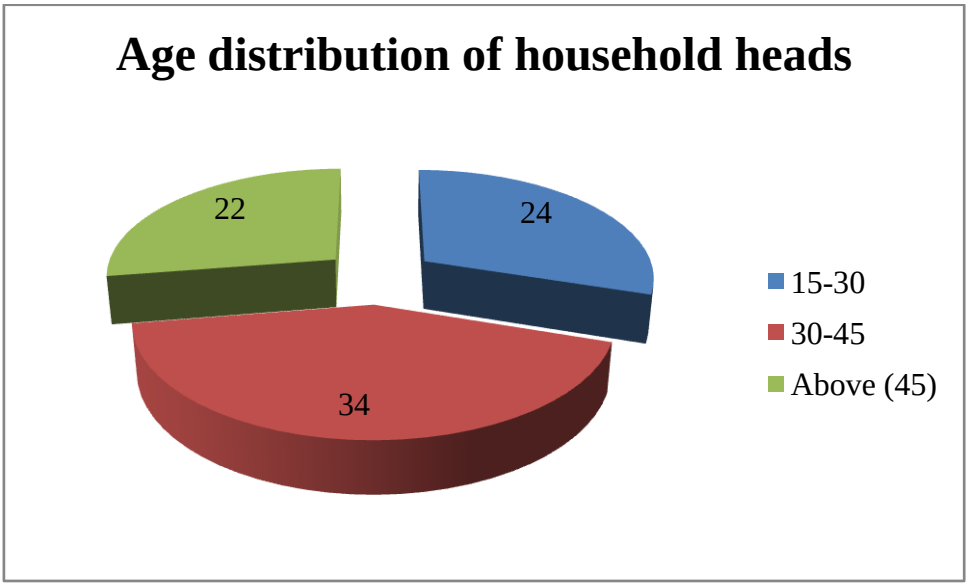

Figure 3 Age group of respondents.

Results of Assessment of Problem from Dairy Owners

From m total 80 farmers taken as respondents 39 found in Bale, 25 in Kambo, 10 in Oki and 6 in Shada. From 80 dairy farmers as the result indicated that 33 (41%) of them satisfied while 47 (59%) of them were unsatisfied with the overall AI service due to varies reasons. From 47 non-satisfied dairy farmers 29(62.5%) passed the date without breeding the cow from AI and natural mating and also 18 (37.5%) used natural mating and waiting the next time to use AI service and statistically significant difference was found among dairy farmers.

Similarly from 33 satisfied dairy farmers 3(10%) passed the date without breeding the cow from AI and natural mating and waiting the next cycle to use AI service.

Eighty two percent (82%) of the respondents identified the problems of inbreeding. The maximum perception of the respondents to ward inbreeding problem was recorded in Essera district Shada (47.2%) followed by Oki (34%), Kambo (10%) and the least is recorded in Bale kebele (8.8%).The major diseases reported in the study area were mastitis, heart water, gastrointestinal parasite and bloating, respiratory diseases and problems associated with reproduction.

In addition to the above problems, the way of communication systems and long distance travelling to the AI stations area were make the AI service challenge full for some farmers particularly those living in Shad kebele and its surrounding. 73.8% of the AI users contacted the AI-technician by cell phone, 23% of them took their cows to the AI station and 3.3% of dairy farm owners used to be visited by the AITs daily. Retrospective data obtained from AIT recording book covering from year 2014/15- 2016/17 indicates an increment number of inseminated dairy cows from year to year. Similarly, as the numbers of dairy cows inseminated are increasing from year to year, the numbers of calves born are also increasing in relation to numbers of inseminated cows. The numbers of female calves born in every year is greater than the numbers of male calves born. From January to April, 2016, 200 dairy cows inseminated and 130 of them become pregnant and 70 of them didn't conceive due to conception failure and heat detection problem. In general, the result of this retrospective data revealed that the AI service at this study area is still at its infant stage and it requires urgent measures to change the situation and to achieve a success.

Table 2. Artificial insemination service in the study site.

Location	weekends and holidays services		Shortage of AI Technicians		Shortage of In put	
	Total	No	Total	Yes	Total	Yes
Bale	39	34	39	37	39	35
Oki	10	7	10	9	10	8
Shada	6	2	6	4	6	6
Kambo	25	19	25	23	25	18
Total	80	62	80	73	80	67

Source; survey, 2017

Table 3. Cows pass without breeding from AI and natural mating.

Pass without breeding from AI and Natural mating			
Satisfaction	No	Yes	Total
Unsatisfied	33	47	80
Satisfied	47	33	80

Source; survey, 2017

Table 4. Awareness of time of insemination in the study site.

When cows and heifers show heat at afternoon		When cows and heifers show heat at morning
Time of insemination	No. of respondents (%)	No. of respondents (%)
As heat sign is seen on it	3 (4.1%)	3 (4.1%)
Morning of the next day	60 (74.6%)	-
As the technician ordered	17 (21.3%)	60 (74.6%)
The same day afternoon	-	17 (21.3%)
Total	80 (100%)	80 (100%)

Source; survey, 2017

Table 5. Major AI service problems identified in the study site.

No. of respondents in each kebele				
Variables	Bale	Kambo	Shada	Oki
Conception failure	13	20	16	8
In availability of AITs	11	5	18	19
Diseases	8	12	19	29
Both conception failure and unavailability of AITs	3	41	17	3
Total	35	78	70	59

Source; survey, 2017

Almost all of the respondents (85.2%) isolated their cows from the male animals and 14.8% of them live the cows with male animals. When they face the repeat breeding problem, they use AI service repeatedly (62.3%) and natural mating (37.7%). In case of repeat breeding, the maximum perception of AI users toward using of AI again and again is recorded in Kambo kebele (85.7%) followed by Bale kebele (83.3%) and the least is recorded in Shada kebele (44.1%).

About 88.5% of the dairy farmers had an idea in the selection of the type of semen they use and 84 (68.9%) of them use milk production factors, 4 (3.3%) breed type and34 (27.9%) of them use both milk production and breed type factors to select the type of semen. The results of the questionnaire surveys indicated that all farmers (100%) participated in the study confirmed their willingness to pay more fees for the service provided they get reliable, efficient and effective services. Majority of the dairy farmers were evaluating the efficiency of AI Tsin giving the service for them non-cooperatively (65.6%) while 13.1% of the dairy farmers evaluate cooperatively and 21.3% of them didn't give any information how to evaluate the efficiency of AITs giving the service for them.

Table 6. Inbreeding problem in the study area.

No. of respondents in each kebele				
Problems	Bale	Kambo	Shada	Oki
Low genetic improvement	13	12	16	18
Low milk production	11	5	14	19
Low adaptability	8	12	19	29
Low genetic improvement and milk production	9	41	17	3
Total	41	70	66	69

Source; survey, 2017

Table 7. Dairy cattle diseases in the study area.

No. of respondents in each kebele				
Animal health problems	Bale	Kambo	Shada	Oki
Mastitis	13	12	16	18
Heart water and mastitis	20	5	14	19
GIT parasite and bloating Mastitis and problems associated with calving	8	12	19	29
Respiratory disease and mastitis	9	41	17	3
Total	50	70	66	69

Source; survey, 2017

Table 8. Number of dairy cows inseminated and calves born between 2014/15-2016/17.

Year of insemination				
		2014/15	2015/16	2016/17
No. of animals inseminated		130	237	200
No. of calves born	Female	45	69	70
	Male	30	36	40
Total		75	105	110

Source; survey, 2017

Results of questionnaires survey of the AITs revealed that 66.7% of the AITs evaluated the quality of training as good and 33.3% of them evaluated as very good. About 5(83.3%) of them responded that they never got on job trainings and no incentives at all.

Two third (66.7%) of them were giving service on the weekend and holidays on personal agreements while 33.3% didn't give service. One third (33.3%) of the AI technicians complained that material inputs including liquid nitrogen is not readily available and the rest 66.7%disagreed with them.

Most of the AI technicians (83.3%) believed that there is a risk of indiscriminate insemination while 16.7% did not have any idea about the problem or believed it can be controlled. Two third of them said that they do believe that National Artificial Insemination Center (NAIC) is doing its responsibilities properly. 66.7% of AI technicians revealed that they don't get necessary supports by the respective district and regional bureaus of agriculture to perform their duties appropriately. Similarly, 66.7% said that AI service delivery is not consistent in their respective areas.

All of the AITs provide both stationed and mobile service delivery by using motor bike and they cover a maximum of 1-20 Km (66.7%) and 20-30 Km (33.3%) which is convenient for the service they deliver. The average numbers of cows being covered by AITs were ranged from 1-10 per day. However all of them thought that the number of services varied between seasons. All of them have no other job which affects their work. The most obvious heat sign that have practical importance used by AITs is mucus discharge from the vulva 5(83.3%) followed by reddening and swelling of the vulva 1(16.7%). Four of the technicians said that they checked for heat before they inseminated and three also checked for pregnancy. All of them said that they wouldn't perform the insemination if the cow didn't show any signs of heat. Two third of the AITs (66.7%)revealed that cows that come to heat early in the morning should be inseminated on the same day afternoon and other respondents indicated that the cow should be inseminated after she is checked for estrus sign (33.3%). All of them said that they selected the type of semen or bull to be used. 83.3 percent of the AITs revealed that they are not satisfied and neither are they happy with their jobs as AITs because of the very little attention given to it by all responsible bodies.

From four respondents, (83.3%) of the Animal Health and Production Professionals (AHPPs) said that there are no functionally effective responsible bodies at zonal and district levels to coordinate the AI services and (41.7%) of them confirmed that no proper mechanisms of controlling indiscriminate inseminating. Moreover, it was found that there are problems associated with the AI service as regards to properly carrying out responsibilities by the NAIC (4.2%) and the zone/ district agriculture bureaus (70.8%). More than three fourth of the AHPPs confirmed that there are no appropriate collaborations and communications between the NAIC, zonal, district and other stakeholders at all. In relation to this, 29.2 percent of them didn't have any information about the semen obtained from NAIC is believed to be the desired quality or not. Almost all of the participants revealed that having a national responsible body (95.8%) and a national breeding policy in place soon (91.7%) is important to coordinate and assist the AI service, respectively. 87.5%of them said, AI service is not a success at national level in general and in study area in particular. Similarly, one fourth of the respondents explained there is no any control mechanism employed in region, zone or district to evaluate semen for quality in terms of health, reproduction, etc.

Animal health and production professionals raised inadequate budget allocation (8.3%), deficiency and irregular supply of inputs (liquid nitrogen and semen) (10.4%), shortage of AITs (31.3%), insufficient AI center(16.7%), insufficiency of concerned body support (12.8%)and poor awareness creation in dairy farmers about the AI service (16.7%) is the major problems associated with AI services in the study area. Similarly, 91.7 percent of them confirmed that lack of breeding policy, less nitrogen plant center, lack of attention and incentives to AI technicians, limitation of inputs and facilities, shortage of AITs and poor collaboration of government bodies with NGO's, community and other concerned bodies are the major problems associated with AI in the country in general.

DISCUSSION

Assessment of problems associated with artificial insemination services in Essera district was conducted on80 smallholder dairy farmers, 4 animals' health and production professionals (AHPPs) and 3 artificial insemination technicians (AITs) supported by questionnaire survey in 4 kebeles which are Bale, kambo, Oki and Shada. The present study revealed that 41% of the smallholder dairy farmers have got AI service regularly and without interruption while59% of them do not due to unavailability of AITs (27%), discontinuation of service on weekends and holidays 30 (24.6%) and lack of inputs 9(7.4%) with statistical significance between districts ($P<0.05$) which is higher than the result reported by Desaleng (27.7 % and72.3%) and Ephrem (3.2% and 96.8%), at Kaliti and Wolaita Sodo towns, respectively. In this study, there was statistically significant difference in shortage of AIT ($P<0.05$) among the districts, this might be due to uneven distribution of AITs and the number of dairy cattle owners in which in line with the findings of Desalegn and Zerihun *et al*. Among the study districts, in Bale kebele better AI service is given. The current study revealed that the AI beneficiaries use natural mating (22.1%) when the service discontinued due to different factors and postpone time of insemination for the next cycle of insemination (77.9%). These were the possible solutions of AI users when the service discontinuous due to holiday and absence of AITs during time of onset of heat which is comparable with the result reported by Milkessa (20% and 78.6%), respectively at Ambo town.

From 80 cattle owners (59%) were not satisfied in AI service and the cow and heifers were passing without breeding from AI and natural mating (62.5%) and used natural mating (37.5%). There was difference among the study districts in pass without breeding and natural mating and used natural mating because, the assessment indicated that there were shortage of AITs and inputs and less service were given in weekends and holidays.

This finding is in agreement with Zewdie *et al*. Zerihun *et al* and IAEA. On the other hand, 50 (41%) dairy farmers were satisfied with AI service that is in contrast with reports of Desalegn (27.7%) and Zerihun *et al*. (30.83%). The most outstanding problems of AI delivery system were conception failure (18%), unavailability of AITs (9.8%), disease (15.6%) and both conception failure and unavailability of AITs (17.2%).

The problem of repeat breeding was also mentioned by farmers and hence needs to be seriously addressed. High numbers of services per conception are the results of problems associated with poor semen quality, poor semen handling practices, discontinuation of incentives to AI technician, season of breeding, management factors in relation to estrus detection, timing of insemination and skill of pregnancy diagnoses and poor insemination practices. Way of communication systems and long distance travelling to AI beneficiary area make the AI service challenge full for some farmers. As a result transportation, telephone, infrastructure and other agricultural practice need further attention for the development of AI activity. Efficiency of AITs and input for AI activity were also serious problems for AI delivery system.

Among the study kebeles in estrus detection about 32.8% of the dairy farmers detect their dairy cows by observing mounting of the cow on other animals, vulva discharge (28.7%), bellowing (16.4%), swelling, redness and mucus discharge of the vulva (9%), restlessness and nervousness (6.6%), both restlessness and loss of appetite (4.9%) and decreased milk production (1.6%).Our result is higher than that reported by Milkessa with 16.9% for mounting of the cow on other animals, 10%for vulva discharge, 4.6% for bellowing and 3.1% for restlessness.

About 74.6% of AI beneficiaries inseminate their cows and heifers at the right time of insemination.

Thus, when the cow shows heat sign in the afternoon of the day and morning, they allow their cow to be inseminated at early morning of the next day and late afternoon of that day respectively.

This result shows that one fourth of AI users inseminate their cows at the incorrect time of insemination which is lower than the finding of Milkessa. This difference could be due to the awareness of the community to AI service. Due to poor perception about time of insemination, the AI beneficiaries exposed to loss of time, money and energy to perform AI at the allocated center repeatedly.

Having profound knowledge and skill on aforementioned points the best recommendable insemination time to achieve maximum conception rate was at standing heat (more specifically, from the middle of standing heat to 6hrs after standing heat). The maximum perception of the respondents towards inbreeding problem was recorded in Shada kebele (88.2%) followed by Oki (76.2%) and the least is recorded in Kambo and Bale kebeles.

The outcome of the assessment of AI technicians regarding to the evaluation of the quality of training,(66.7%) of them evaluated as good and (33.3%) of them evaluated as very good. Two (66.66%) of them responded that they never got on job trainings and no incentives at all. The study has found an alarming result with motivations of the AI technicians in which 83.3% of them have indicated that they are not motivated to work as AI technicians due to very little attention given to it by all responsible bodies. The situation is closely associated to the discontinuation of in-service trainings and incentive mechanisms. This is fully supported by the reports of that indicated a very high turnover of AI technicians all over the country.

Again, it was revealed that all responsible bodies is not giving proper attention to the AI service indicating that decision makers need to work hard to change the current situation of the AI operation at national level.

It was found that 95.8% of the AHPPs and 100% of AI technicians supported the necessity of a national responsible body to coordinate the AI service. This result is in line with Gebre Medhin .Furthermore, the outcome of the study revealed that absence of appropriate collaboration and communications between the NAIC, zonal, district and other stakeholders consequently contributed to the unsuccessfulness of the service. The retrospective data result covering from year2014/15 to 2016/17 indicates that, as number of AI users increasing from year to year, the numbers of calves born also increasing in relation to numbers of inseminated cows. Even the numbers of AI users and calves born is increasing; the AI service at this study area is not at good stage. This might be due to poor heat detection, the farmers want to inseminate too young animals, poor semen quality, cows are in poor condition, management problem, diseases, efficiency of AITs and no record keeping by farmers. The overall most outstanding constraints of AI service identified in this study area were deficiency of inputs (10.4%), insufficiency of concerned body support(12.8%), conception failure (18%), shortage of AITs(31.3%), poor awareness creation in dairy farmers about the AI service (16.7%), insufficient distribution of AI center in the country (16.7%), inadequate budget allocation (8.3%), disease (15.6%), problem of repeat breeding and ways of communication of dairy cattle owners with AITs. Moreover, according to this study result three fourth of the AHPPs confirmed there is no appropriate collaboration and communications between the NAIC, district and kebele other stakeholders at all and 91.7 percent of them and 100% of the AI technicians indicated that lack of attention and incentives to AI technicians, limitation of inputs and facilities, poor collaboration of government bodies with NGO's, community and other concerned bodies and lack of breeding policy were identified as major problems. These findings are in agreement with the report of Gebremedhin, Zewde and Zerihun *et al*.

Regarding the possible solutions, providing of semen and necessary materials on time (8.3%), allocate adequate budget (6.3%), providing supports from the concerned body (25%), and awareness creation to smallholders about AI service (8.3%), expanding AI center in the country (10.4%) and training AITs (41.7%) were the possible solutions suggested by AITs and AHPPs.

CONCLUSION

Based on assessment of problems associated with artificial insemination service in three districts of Essera district; less than half of small holder respondents have got the AI service regularly and without interruption. The most important constraints associated with AI service in the study site include conception failure, AITs problem, insufficiency of concerned body support, loss of structural linkage between AI center and service giving units, absence of collaboration and regular communication between NAIC,, district and kebele and other stakeholders, lack of breeding policy, inadequate resource in terms of inputs and facilities and absence of incentives and rewards to motivate AI technicians. Researcher recommends that AI service provision should be improved and functional breeding policy and strategy should be given at most priority.

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