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Breeding Technology Assessment at Small Holder Dairy Cattle Production Level in Selected Districts of HYDYA ZONE, Southern Ethiopia

Tsegay Lijalem[1], Mulatua Abebe[2] and Belachew Haile[2]
1, Department of Animal and Range Sciences, Agriculture College, Wolaita Soddo University
P.O. box,138, Wolaita, Ethiopia
2, Expert of Animal Production at Soro woreda, Hdiya Zone, Southern, Ethiopia

Abstract
The study was conducted from May to October 2014 in selected districts of Soro woreda, Hdiya Zone, Southern, Ethiopia. The objective of the study was to assess breeding technology on dairy cattle production at small holder level. To under taken the study, purposive sampling method was used. Data was obtained from both primary and secondary sources and the collected data were analyzed by using descriptive statistics.
The study was found 398.76 average total livestock and 350.3 cattle per households in TLU. The study showed that only 39% of the respondents used artificial insemination for breeding their dairy cattle while 61% did not use. Respectively,42 %, 23%, 19% and 16% of respondents have said artificial insemination has advantage over natural mating because artificial insemination can use in accelerating introduction of new genetics, has low cost in comparison of bull price, no need of bull management and low disease transmission. On the other hand, due to heat period of cow could be easily detected by bull (66%) and no need of technicians support (34%) the respondents have said natural mating has advantage over artificial insemination. However, of the interviewed respondents, only 32% used synchronization for artificial insemination work, the reason for not used was due to heat detection problem (28%), cow/heifer pregnant detection problem (22%) and cow is reach two months after calving (unfitting period with professional man availability time) (18%).
To detect oestrus of cow/heifer for artificial insemination service, the farmers had used different methods such as observing mucus discharge from cow, mounting to others animals, allows(want) to be mounted by others, decrease feed intake and milk yield drops and swelling and redness of vulva. The repeat heat (not conception at first service) (56%) and artificial insemination station is far from farmer areas (44%) were the most challenges for artificial insemination service; followed by shortage of inputs (liquid nitrogen and semen), delivered sex was male, AI service was not available (always) on weekend and holyday, there was no way of communication with AI technician to give feedback for improvement, management of cattle was poor and there was no sufficient AI technicians were respectively in the study areas. To be successful in animal breeding technology awareness for farmer on applications and advantages of artificial insemination should be given besides; sufficient professional man on artificial insemination should be employee to farmers.
Keywords: artificial insemination, cattle, dairy, Ethiopia, smallholder, Southern, technology

Introduction

Livestock play an important role in the economy of Ethiopia, as in many other developing countries even though statically contribution is not similar among countries. Livestock can contribute a lot benefit to human such as milk, meat, eggs, blood, wool, hair, hides and skins, draft power and manure production. They also generate cash income which can be used to purchase food grains, seeds, fertilizer and farm implements and for financing miscellaneous social obligations.

Dairy sector development in smallholder farming systems is one of the key strategic important for addressing food security and improved livelihood in developing country in particular in Ethiopia. In order to improve the low productivity of dairy cattle, selection of the most promising breeds and cross breeding of these indigenous breeds with highly productive exotic cattle has been considered a practical solution (Tadesse, 2002). Thus, the need for clear strategies on the improvement and maintenance of indigenous cattle genetic resources is required along with clear breeding programs for sustainable genetic improvement. To date, artificial insemination (AI) recognized as the best biotechnological technique for increasing reproductive capacity and has received wide spread application in farm animals (Mukasa-Mugerewa, 1989).

Artificial insemination is the process of collecting sperm cells from a bull and manually introducing them in to the reproductive tract of a cow or heifer. In commercial application, this also involves extending one collection of semen in to several doses and freezing it in liquid nitrogen to be stored in definitely and/or shipped (Connor and Peters, 2003). Artificial insemination in animal production is very common in today's agriculture industry in the developed world, especially for breeding dairy cattle. It provides an economical means for a cattle breeder to improve their herds utilizing males having very desirable traits (Nishikawa, 1964). Despite the wide application of AI in improving yield and quality of milk and its success throughout the developed world, the

success rate in Ethiopia however, is still low owing to a number of technical challenges including the number and disperse nature of smallholder dairy herds and farmers, limited technical knowledge and capability, environmental constraints including electricity and refrigeration facilities, and the inability to access and store sufficient quantities of inputs e.g. hormones and improved genetic stock and make them available and affordable in small quantities as needed (FAO, 2008).

Artificial insemination and oestrus synchronization are inseparable technology in dairy cattle improvement program. Oestrus synchronization is widely used as a method to improve the efficiency of artificial insemination (AI). Various methods for oestrus synchronization have been developed; all are based on the use of single (combination) of hormones. Therefore today, estrus synchronization and AI remain to be the most available and widely applicable reproductive biotechnology available to dairy producers. However, the low adoption rates of these reproductive technologies are question in the direction of the dairy cattle development and improvement in Ethiopia. More ever, there has not been any documented information in the study area so far. So assessing and documenting of these technologies at small holder farmers' level is crucially important to dairy development and improvement program. Because the obtained information in the research, it would be relevant for agriculture expert who involve in dairy development program. It could be also vital for any organizations in giving upto date information regarding on these technologies which work in livestock improvement program. As a result the study was focused on assessment of artificial insemination on dairy cattle at farmer level in selected district of Hydya zone, Southern Ethiopia.

Material and methods

Description of the study area

The study was conducted from May to October 2014 in Soro woreda, Hdiya Zone, Southern Ethiopia. The study area is bordered in the south by Kembata Tembaro Zone, on the south east by the Dawro Zone, on the west by the Omo river which separate it from Oromia region, on the north by Gombora woreda, on th north east by Lemo woreda and in the south east by Duna woreda. It is located, 32km to the west from the capital city of Hadiya Zone Hossana. The study area is known by owning large cattle number 253296; sheep 43428; goats 47146; chicks 153798; horses 3343;mules 2616; donkeys 16204, and bee hive 9304(SWAO,2014 un published report). The study area is also characterized by having 25^{o}c temperature, 800-2886metre above sea level (altitude), and the atmospheric condition is 14.2% Dega, 53.1% Woyna Dega, 32.7% Kola(SWAO,2014 un published report).

Sampling method

In the present study area, purposive sampling method was used because all kebeles(districts) have not introduced artificial insemination technology equally. For this reason five kebeles (districts) which are familiar with AI technology were selected purposively. In similar way, 20 household from each selected kebele were selected purposively as all households were not producer of dairy cattle in the study area. Thus a total of 100 households were selected for the survey study.

Data collection

Data was collected by both primary and secondary sources. Semi -structured questionnaire was prepared to interviewed farmers in the study area. The questionnaire was pre-tested for appropriateness with 5 farmers before commencement of the actual survey. More ever, before interviewing the respondents, the woreda livestock data was collected by using prepared checklist (the woreda artificially inseminated cow/heifer last five years) and was targeting to prepared checklist inseminated cow/heifer households.

Data analysis

The collected data was analyzed by using descriptive statistics and represented in table, in the form of percentage.

Results and discussion

Herd composition and number

Herd composition and number is presented in Table 1. Revealed from Table 1 the number of cattle was significantly higher than other livestock. The reason might be in mixed farming system of Ethiopia where crop production is important; cattle are the most important livestock species for cultivation, threshing, manure and milk production (Getachew et al., 1993). The current result was in agreement with Suleiman (1998) study; in agro- pastoralist stock is comprised mainly for cattle and to some extent sheep and goat with little poultry. The present study was also in consistent to Daodu et al.(2009) study in Oyo area of Southwest Nigeria who resulted that; of the ruminant, cattle are more with 48% of the population compared to sheep 28% and goats 24%. More ever Girma et al. (2014) reported similar findings to current results who accounted cattle, sheep, poultry and donkey in importance of rank number.

The overall average number of livestock per household was 350. 3 cattle; 11.8 sheep; 8.5 goats; 5.06 chickens; 15.4 donkeys; 3.5 horses and 4.2 mules with 398.76 average total livestock (Table 1). However, result for cattle by Nebiyu (2008) in Delbo watershed of Wolaita;Yigrem et al (2008) in Shashemene-Dilla areas and) Asrat et al. (2013) in Bodit, Ethiopia was found 3.9, 3.1and 3.4 respectively which is significantly lower than current finding. The reason could be, in present study the land size for live stock grazing and feed availability for livestock is relatively better than. The reverse is also true as indicated by the authors in Delbo watershed; in Shashemene-Dilla areas and in Bodit, Ethiopia keeping small number of cows on the family farm might be necessitated due to the scarcity of feed and grazing land that is the critical problem in these areas. More ever, in the study area, family who have more livestock is considered as wealthy and is also considered as higher castle in social value by the community regardless of its value and productivity of the animals.

Table 1: Herd composition and number by respondents (in TLU)

Livestock	(N=100)
Donkeys	15.4
Horses	3.5
Mules	4.2
Sheep	11.8
Goats	8.5
Chicks	5.06
Cow	95.9
Heifer	67
Bull	128
Steer	47
Calf	12.4
Total cattle	350.3
Total livestock	398.76

TLU= Tropical livestock unit, N= respondents numbers

Breeding technology

Artificial insemination (AI) is one of the most effective tools available to cattle producers to improve productivity and profitability of their cattle operation. Artificial insemination has been commercially available for many years and utilized very effectively in the dairy industry in worldwide in particular in developed country. The advantages of using artificial insemination; the ability to use sires of superior genetic merit (the best bulls of the breed), improving production traits in cattle operation, the ability to mate specific sires to individual cows, reducing the number of herd bulls needed in cattle operation, increased genetics for replacement heifers and when combined with estrous synchronization, a shorter calving season can be achieved, resulting in a more consistent, uniform calf crop.

As indicated in Table 2 only 39% of the respondents used artificial insemination for their dairy cattle breeding while 61% did not use. The reason for majority not used might be due to lack of facilities and equipment for an AI centre, lack of aware for farmers the advantages of AI at the genetic, lack of veterinary, communications problem, in developing country communication is difficult between the farmer and the technician, a lack of vehicles (cars, motorcycles or bicycles) and the condition of the roads and the difficulties and costs of maintaining them are prohibitive. In lined to the result of current study Nuraddis et al. (2014) reported from Jimma zone districts, Ethiopia who found that 41% of the smallholder dairy farmers have got artificial insemination services regularly and without interruption while 59% of them do not. In closed to current study, Anthony et al. (2014) from Central Uganda indicated that natural service remains the major method of dairy breeding with over 90% of the respondents. However, Abdinasir (2000) had reported differently from current result from Bilalo district of Ethiopia who found that AI being used by the majority of the farmers (87.5%). According to the respondents, about 42 %, 23%, 19% and 16% of respondents have said artificial insemination has advantage over natural mating due to artificial insemination could accelerate introduction of new genetics, has low cost in comparison of bull price, no need of bull management and low disease transmission respectively. In similar way, Zumbach and Peters (2000) and Wittiaux (1998) has recommended to use AI because AI has opportunity to choose sires that are proven to transmit desirable traits to the next generation and minimizes the risk of spreading sexually transmitted diseases and genetic defects, increase genetic progress by upgrading the reproductive rate of the male, it is also cost effective 1820 cows can be inseminated by a bull using deep frozen semen. On the other hand, 66% and 34% of the respondents due to in natural breeding the heat period of cow could be easily detected by bull and no need of technicians support respectively have said natural mating has advantage over artificial insemination. Similar result has reported by

Wattiaux (1998) from Ethiopia natural mating remains widespread in even in areas where artificial insemination has proven to be very efficient because farmers believe that pregnancy rates are higher when a bull is used. Kelay (2002) also support in his study at Selale, Ethiopia the bull service achieved a pregnancy rate of over 95.10% , a calving rate of 94.67%, the non-return rate is also very high and no cow is reported to come back for service. However, from the fact point of view, natural mating, might be used in condition where the tasks associated with heat detection and the techniques of AI is problem, when long term genetic gain is of minor importance and when local conditions do not provide the infrastructure necessary for successful AI.

Estrus synchronization and AI program are complementary; the term "estrous" refers to the point of female sexual stimulation in mammals which causes ovulation. At ovulation females are most receptive to mating. This period is commonly referred to as heat. Therefore, estrus synchronization is more necessary in controlling breeding season with feed available and the breeding season is a more consistent, uniform calf crop is obtained especially the calves that are more uniform in age and weight. The level of uniformity creates a marketing advantage, whether you are marketing feeder cattle, replacement heifers, or both the hormones used for estrus synchronization often mimic what occurs during a cow or heifer's normal estrous cycle. Therefore, understanding the physiology of the normal estrous cycle is critical to understanding estrus synchronization. Usually, prostaglandin (PGF2α), progesterone or progestins and Gonadotropin-releasing hormone (GnrH) are used in estrus synchronization programs either use only one or a combination of two or three hormones. Thus work with the physiology of the cow's normal estrous cycle. However, of the interviewed respondents, only 32% used synchronization for artificial insemination work, the reason for not used might be due to heat detection problem (28%), cow/heifer pregnant detection problem (22%) and cow is reach two months after calving (unfitting period with professional man availability time) (18%) (Table2). As discussed with farmers, the study was also found that farmers were not efficient in either heat detection or early reporting for technician on time. As a result, in most case the timely synchronisation of the insemination of cows was not achieved. When choosing an estrus synchronization there are a number of issues to be considered including whether you detect estrus and inseminate according to the AM/PM rule, inseminate at a predetermined time, or detect estrus for 72 to 84 hr (depending upon the protocol) and inseminate any cows not detected in estrus at a fixed-time. There is an estrus synchronization protocol sheet for heifers and cows that appears in the catalogs of the major AI companies and there are protocols that fit each of the preceding synchronization approaches. Other items to consider include the proportion of females that are cycling as well as the time, labor, and cost of the protocol (Megersa, 2014).

Heat detection and constraints of AI service are also presented in Table 2. In herds using AI service, accurate and efficient detection of estrus is very important for reproductive success (Leblanc, 2005). According to the respondents of the study area most used more than one sighs to detect oestrus; by observing mucus discharge from cow, mounting to others animals, allows(want) to be mounted by others, decrease feed intake and milk yield drops and swelling and redness of vulva. In agreement to current study Nuraddis et al. (2014) reported from Jimma zone districts, Ethiopia in estrus detection about 32.8% of the dairy farmers detect their dairy cows by observing mounting of the cow on other animals, vulva (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%). Revealed from Table 2, repeat heat (not conception at first service) (56%) and AI station is far from farmer areas (44%) were the most challenges for AI service in the study areas, followed by shortage of inputs (liquid nitrogen and semen), delivered sex was male, AI service was not available (always) on weekend and holyday, there was no way of communication with AI technician to give feedback for improvement, management of cattle was poor and there was no sufficient AI technicians respectively in rank importance. Similar study was conducted by Tesfaye et al.(2015)who reported that AI services affected reproductive performance like conception rate, non return heat, calving rate, sex rate due to different factors such as distance sites from AI station, body condition and age of the cow, management system and regularity of the AI services and problems in practicing AI (technician problem). Zerihun et al. (2013) also reported similar result to current study in West Gojjam Zone from 412 cattle owners 285 (69.17%) were not satisfied in different ways in the use of AI service during the time of weekends and holidays, due to shortage of artificial insemination technician, shortage of input, distance from AI service and inefficiency of artificial insemination technician (AIT) and number of AI service may vary from one to other districts. In consistence to current study Baltenweck et al. (2014) from Kenya reported that low availability/access, high cost of the service, and technical failures that led to many repeats. Anthony et al. (2014) also from Central Uganda reported the cause for not used AI because farmers perceive that AI produced more male calves than females. In similar to current result Nuraddis et al. (2014) reported from Jimma zone districts, Ethiopia; AI service is challenged due to unavailability of artificial insemination technicians (27%), discontinuation of service along weekends and holidays 30 (24.6%) and lack of inputs 9(7.4%).

Table 2: Artificial insemination, natural mating, synchronization, heat detection and artificial insemination constraints by respondents (in percentage)

Parameters	N=100
Do you use AI?	
Yes	39
No	61
Advantage of AI over natural mating	
Low disease transmission	16
Low cost	23
No need of bull management	19
Accelerate introduction of new genetics	42
Advantage of natural mating over AI	
Easily detect heat by bull	66
No need of technicians	34
Do you use synchronization for AI?	
No	68
Yes	32
Reason for not using synchronization	
heat detection problem	28
Cow/heifer pregnant detection problem	22
Cow is reach two months after calving(un fitting period)	18
Heat detection	
Mucus discharge (=yes)	100
Mounting to others (=yes)	100
Decrease feed intake and milk yield drops (=yes)	13
Swelling and redness of vulva (=yes)	9
Allows others to mount her(=yes)	15
Constraints of AI	
AI service was not available on weekend and holyday (=yes)	10
There was no AI technicians (=yes)	3
There was no way of communication with AI technician (=yes)	6
There was shortage of inputs(liquid nitrogen and semen) (=yes)	30
Delivered sex was male (=yes)	24
Repeat heat(not conception at first service) (=yes)	56
AI station was far(=yes)	44
Management of cattle was poor (=yes)	4

AI= artificial insemination, N= respondents numbers

Conclusion

In the study area, cattle were dominantly found than other livestock species. The reason might be cattle are the most important livestock species for cultivation, threshing, manure and milk production. The study showed that only 39% and 32% of the respondents used artificial insemination and synchronization for breeding their dairy cattle respectively. This was due to lack of facilities and equipment for artificial insemination centre, lack of aware for farmers, lack of technician, lack of infrastructure, heat and pregnant detection problem; and unfitting period with professional man availability time. According to the respondents of the study area, most of the farmers used more than one sighs to detect oestrus; by observing mucus discharge from cow, mounting to others animals, allows(want) to be mounted by others, decrease feed intake and milk yield drops and swelling and redness of vulva.

Recommendation

To be successful in animal breeding technology in the study area, awareness for farmers through a consistent training, regarding on applications and advantages of artificial insemination and synchronization should be given. More ever, artificial insemination station centre should be established nearby farmers' areas besides, sufficient professional man on artificial insemination should be employee to farmers. In this way, it is believed to reduce time and transportation costs associated with going too far distance as well as facilitate easy and safe insemination process. So farmers would get artificial insemination service on time effectively and efficiently.

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