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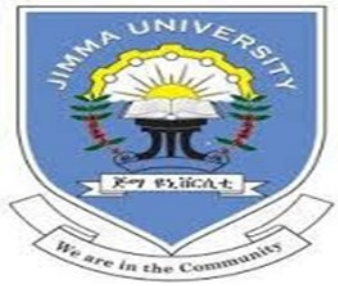

COLLEGE OF NATURAL SCIENCE

DIPARTIMENT OF BIOLOGY

ASSESSMENT 0FARTIFICIAL INSEMIATION STATUS AND ITS RELATED PROBLEM OF DAIRY COWS IN DECHA WOREDA, KAFFA ZONE, SOUTH WEST ETHIOPIA

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A RESEARCH SUMITTED TO COLLEGE OF NATURAL SCIENCES, DEPARTMENT OF BIOLOGY, IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF MASTER OF SCIENCE DEGREE IN GENERAL BIOLOGY

JUNE, 2020

JIMMA ETHIOPIA

Approval form

As thesis research advisors we here by certify that we have read and evaluated the thesis prepared under our direction by Bizuayehu W. Senbet, entitled "ASSESSMENT 0F ARTIFICIAL INSEMIATION STATUS AND ITS RELATED PROBLEM OF DAIRY COWS IN DECHA WOREDA, KAFFA ZONE, SOUTH WEST ETHIOPIA" and recommend that it be accepted as fulfilling the thesis requirement.

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As members of the examining board of the final M.Sc. open defense, we certify that we have read and evaluated the thesis prepared by Bizuayehu W. Senbet, entitled "ASSESSMENT 0F ARTIFICIAL INSEMIATION STATUS AND ITS RELATED PROBLEM OF DAIRY COWS IN DECHA WOREDA, KAFFA ZONE, SOUTH WEST ETHIOPIA" that it be accepted as fulfilling the thesis requirement for the degree of Master of Science in General Biology.

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Temesgen Bekele(MSc)	Internal examiner	Signature	Date
Bekele Serbesa (PhD.)	External examiner	Signature	Date

The table of contents

Contents *Page*

Abbreviations

AI Artificial Insemination

AIT Artificial Insemination Technicians

CSA Central Statistical Authority

EASE Ethiopian Agriculture Sample Enumeration

FAO Foods and Agricultural Organization

GO Governmental Organization

MoARD Ministry of Agricultural and Rural Development

NAIC National Artificial Insemination Center

NGO Non-Governmental Organization

OLSF Office of Livestock and Fishery

PA Peasants Association

SIDA Swedish International Development Agency

SNNPRS South Nation Nationality Peoples Regional states

SPSS Statistically Packages for Social Science

Acknowledgement

I would like to thank and have a grateful respect to my advisor Ato Girma Mossisa (Assistant professor) and co-advisor D.r Taddesse Habtamu for their critical comments, guidance and unreserved advice to carry out this research and for the successful of completion of the study. I would also like to express a grateful thanks to Jimma University Natural Science of Biology Department members and all respondents of this research and my family in giving the necessary information.

List of tables

List of figures

Abstract

Artificial insemination has been defined as a process by which sperm is collected from the male, processed, stored, and artificially introduced into the female reproductive tract for the purpose of conception. This study was conducted from August to December 2019, to evaluate the dairy cow improvement through artificial insemination and challenges in Decha district, Kaffa zone, Southwestern Ethiopia. Six PAs (Beha, Awurada, ufa, Kuti, Gundera Gera, and Gecha) were purposively selected for the study. A total of 525 artificially inseminated cow owners and 9 officers and artificial inseminators were selected using the same procedure. Dairy farm on site observation and structured questionnaire survey were used to gather data. The collected data were analyzed using SPSS and descriptive statistics such as frequency and percentage. From the total of 525 dairy cows inseminated in the two years' program (2017 and 2018) about 58.8% were successful and produced calves, while, the rest conception was failed. Multiple reasons (heat detection problem (28%), lack of awareness (18%), lack of infrastructures (16%), management problem (14%), low experience of AIT (6%), disease problems (12%), lack of incentive to the technicians and cow owners (6%) were reported for the failure. The majority (50%) of the respondents brought cows at heat during evening hours followed by those in morning hours (33.33%) a less number of cow owners (8.89%) commenced heat during afternoon hours and the rest (7.78%) of respondents didn't know the exact time of commencement of heat of their animals. The result also showed that the cow's heat period detection mechanism varies among farmers. The majority of (52.22%) observing their cow heat period when mounting one on other cows, restless and other cows bellowing behavior (27.7%) and by vulva discharge (20%).From the artificial inseminated cow owners 58.57% of them were feed their animal from their own crop farm but others (41.43%) use common grazing land. About 87.05% of the cow owners kept their cattle in their own houses and clean every day, but the rest (12.95%) had no houses. As result of this study almost all respondents in the study area didn't plant the improved forages. This is because of shortage of land (73.1%), lack of awareness, (23%) and lack of interest (3.9%). About % respondents in the study area feed their cattle by let to graze in grazing land and 29.8% of them tethering in grazing land and the rest 5.2% feed their cows indoor feeding system. As result of this study indicated 46% of respondents were as far as 500m and 39.2% of respondents far between 500m to 2km and 6.8% far between 2km to10km and 8.1% far above 10km from the veterinary service. Extensive awareness creation among farmers, quality and adequate artificial insemination facility and trained technicians are recommending to make program more effective and successful.

Key words: Artificial insemination, Dairy farm, Problems, Status

1. BACKGROUND OF THE STUDY

Artificial Insemination (AI) has been defined as a process by which sperm is 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 -196 ^{0}C. Artificial insemination has become one of the most important techniques ever devised for the genetic improvement of farm animals. It has also 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 (Bearden *et al*., 2004).

The varied and extensive agro-ecological zones and the importance of livestock in livelihood strategies make Ethiopia home to large numbers of livestock. Indeed, Ethiopia has the largest livestock heads in Africa: - 59,486,667 cattle, 30,697,942 sheep and 30,200,226 goats, 8,439,220 donkeys, 409,877 mules, 2,158, 176 horses and 59,495,026 chickens (CSA, 2017). Out of these total cattle population, the female cattle constitute about 55.5%. Eighty-three percent of all milk produced in Ethiopia comes from cattle while the remainder is from goats and camels (CSA, 2017).

In Ethiopia, artificial insemination was introduced in 1938 in Asmara (the then province of Ethiopia) interrupted due to the 2nd World War and restarted in 1952 (Yemane*et.al*., 1993). It was again discontinued due to abnormal expenses of importing semen, liquid nitrogen and other related inputs required. In 1967, an independent service was started in the Arsi Region, Chilalo Awraja under the Swedish International Development Agency (SIDA) (Shiferaw *et al*., 2003).

At the farm land artificial insemination has been introduced in Ethiopia in 1970 as a tool for genetic improvement (Zewdie *et.al.,* 2005). The present National Artificial Insemination Center (NAIC) was established in 1984 to coordinate the overall artificial insemination operation at national level Addis Abeba (GebreMedhin, 2005). The efficiency of the service in the country, however, has remained at a very low level due to infrastructure, managerial and financial problems, as well as poor heat detection, improper timing of insemination and embryonic death (Shiferaw *et al*., 2003).

As an engine of growth, Artificial Insemination (AI) provides increased income, create employment, means of foreign exchange earnings and better nutrition (Ehui, 2008). As income increases with economic development, the share of animal products in total food budget increases

faster than that of cereals. This occurs because of the relatively high-income elasticity of demand for animal products (Ehui, 2008). The Central Statistical Agency of Ethiopia (CSA, 2014) estimated that about 2.9% billion liters of cow milk produced annually and that of camel was about 230 million liters. The estimate also shows that average lactation bout six months and the average daily yield was estimated to be 1.4lit/cow (CSA ,2014).

With 11.04 million cattle heads, the South Nations, Nationalities and Peoples Region (SNNPR) is the third highest potential region of the country in livestock production, (following Oromia& Amhara) (CSA, 2014). With average productivity of 1.65 liter per day per cow, the total annual milk yield in SNNPRS is 667, 562,000 liters, from which 88.6% for house hold consumption, 2.29% for local market and 9.11% is processed into other dairy derivate (CSA, 2014). According to SNNPR's Bureau of agriculture (MoARD, 2014) the total number of dairy cow was estimated to be 4, 943, 854, from which 933,225,000 liters of milk is produced per annum. However, the productivity of the livestock resources and the benefits obtained from the sector does not match with the livestock population (Abebe *et al.,* 2014).

Unlike other part of Ethiopia, Kaffa and Sheka zones, well suited agro-ecology and vegetation cover are well known in livestock population (Abebe *et al.*, 2014). However, there is little information on the status of artificial insemination. Identification of problems and understanding of the existing dairy production and the status of artificial insemination in the area is very importance to make future improvement interventions.

In Kaffa and Sheka zone, out of the total female cattle population (432,412), only 151,344 (35%) are hybrid (Abebe et al., 2014). With an average lactation length of 6 months, total milk produced during the year of 2006 was recorded to be 2.2 billion liters and an average daily milk production of 1.44 liters per cow from local cows. But during the year of 2017 was recorded to be 2.634 billion liters. This suggests that the total milk production was increase by 0.434 liters by hybrid cows (source: decha agriculture office).

1.1. Statement of the problems

Although the efficiency and impact of the operation has not been well-documented (Himanen and Tegegn, 1998), Artificial insemination(AI) was most commonly used and valuable biotechnology (Webb, 2003) has been in operation in Ethiopia for over 30 years, From the previous little studies, it has been found that AI service is weak and even declining due to inconsistent service in the

smallholder livestock production systems of the Ethiopian highlands (Dekeba *et al*., 2006). The problem is more aggravated by lack of recording scheme, wrong selection procedures, and poor management of AI cow associated with poor motivations and skills of inseminators (GebreMedhin, 2005).

As shown above, in country level many research were find out different problems associated with AI but it does not describe about the criteria for selection of dairy cow for artificial insemination and the way of management of cow owners and AI technician on artificially inseminated cows and its calf. Similarly, the AI program was in Kaffa zone in 2000 E.C and in 2004 in Decha district and 365 cows was inseminated and 201 was give calves which are female (75) and male (126) (from decha agriculture office). This suggest that the all of hybrid cows do not give birth (almost 164 cows do not give birth). The reason for failure was heat detection problem, lack of awareness, disease and lack of infrastructure. Also the milk production was increase from 1.4 L/cow to 2L/cow. Reports show that there are several problems associated with AI, at country and small holder farmers' level. But no report address the problem related to criteria for selection of dairy cows for artificial insemination and the way of management of cow owners, competency of technician of AI and the management before and after insemination. The objective of the study therefore, was to assess the status and the problems associated with artificial insemination service in Decha Woreda, Kaffa zone, Southwestern Ethiopia.

The study was tried to answers the following research questions:

1.What were the current status of AI in the study area?

2.What problems (if any) hinder the success of AI in the study area. that associated with AI?

1.2 Objectives of The Study

The general objective of this study was

- To evaluate Artificial Insemination (AI) and its associated practices, to improve the productivity of dairy farm

The Specific objectives of this study were

- To evaluate the status and success rate of artificial Insemination in the study area
- To identify traditional management practice for AI system
- To identify major constraints (problems) associated with Artificial Insemination service in the study area.

1.3 Significance of The Study

Artificial Insemination(AI) service in the country level has not been successful to improve the productivity of dairy industry (Sinishaw, 2005). However, the efficiency of service in the country, has remained at low level, the finding of the study was expected to evaluate the status of AI that as positive aspect and negative aspect, the management problem and to propose better management system. Also to show the AI contribution for the improvement of live hood of the society. Since there is no previous research conduct on this topic on the study area, the finding used as baseline data for future research.

2. LITERATURE REVIEW

2.1 History of Artificial Insemination Service in Ethiopia

Many millions of cows throughout the world are breed by AI each year and the number is increasing. In Australia approximately 1.5 million cows are inseminated annually. Most cows inseminated worldwide are dairy cows, but increasingly AI is being used in the beef industry. AI is the cheapest, safest and most effective means of spreading superior genetic material and both the beef and dairy cattle industries depend on it for their genetic advancement schemes (Dennis *et al*., 2009).

The history of artificial insemination service in Ethiopia practicing as cattle genetic improvement program accounted about six decades before, but coming with little success. The most important constraints associated with AI were loss structural linkage between artificial insemination center and service giving units, absence collaboration and regular communication between National Artificial insemination center(NAIC) and stakeholders, absence of breeding policy, lack of Artificial insemination service in the farmers area, poor semen quality, lack of awareness of farmers, management problems and hard recording system, in adequate resources in terms of inputs and facilities and absence of incentive and rewards to motivate artificial insemination technicians (GebreMedhin, 2008). It is known that no enough selection and improvement for productivity has been performed on the indigenous cattle. Nevertheless, the indigenous cattle are known to have special ability for harsh environment of the country (GebreMedhin, 2008).

Ethiopia has an estimated cattle population of about 59 million heads. Around 99.45% is indigenous breeds with very few hybrids, 0.5%. Cattle production together with the production of other livestock sectors has been known to be an important component of the agricultural sectors. Livestock contributes much by providing meat, milk, cheese, butter, export commodities (live animals, hide and skins), drought power manure, near capital stock (EASE, 2003).

2.2 Advantages and Disadvantage of Artificial Insemination

The worldwide scale and importance of artificial insemination industry in the cattle breeding are beyond questions. Maximum use of superior sires has been considered as the greatest advantages of artificial insemination while natural service has been linked to limit the use of one bull, probably, to less than 100 mating per year (Webb, 2003). The author farther showed that artificial insemination usage enabled one dairy sire to provide semen for more than 60080 services in one

year. According to GebreMedhin (2005) has listed many advantages of artificial insemination including prevention of reproductive disease, control of inbreeding, minimizing the cost of keeping bulls for natural services and others. Besides, the availability of accurate breeding records such as breeding dates, pregnancy rates, inter-estrus intervals and days to first services used to monitor fertility are other advantages of artificial insemination (Sinishaw, 2005).

Artificial Insemination, however, has disadvantages poor conception rates due to poor heat detection and inefficiency of AI technicians, dissemination of reproductive disease and poor fertility rates if artificial insemination center are not equipped with appropriate inputs and are not well manage. Other disadvantage includes high cost of production (collection and processing), storage and transport of semen (Pope, 2000), as well as budget and administrative problems and in efficiency of artificial insemination technicians (GebreMedhin, 2005).

2.3 Factors affecting the success of Artificial Insemination in Ethiopia

The successful outcomes of AI in cattle depend on a number of intrinsic and extrinsic factors. Understanding the impact of such factor on the probability of the success of AI has primary important to establish corrective measures (Haugan *et al.,* 2005). Reproductive efficiency is poor in most cattle production system, many cows fail to a become pregnant due to various factors related to management, nutrition, reproductive disease, semen quality and other factors. So that the extension services must insured that farmers get adequate information on the inputs required to benefit from cross breeds dairy cow and from those of higher genetic merits (Mekonnen *et al.*, 2010). The major factors that determine AI efficiency are heat detection skills, fertility level of the herd, semen quality and efficiency of inseminators. 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 female (Damron, 2000). Detection of estrus has been known to be one of the most difficult tasks for successful AI activities (Sori, 2004).

Artificial insemination technology has also led to one of the most successful small holder daily systems in the developing countries (GebreMedhin, 2008). However, the use of artificial insemination and costs involved, such as for transportation of liquid nitrogen for storage of semen because of the breeding program has not been design to be sustainable. According to Nuradis*et.al.,* (2014), report 51.6% of the respondents and 48.4% of the respondents were satisfied and unsatisfied for overall artificial insemination services, respectively, due to various reasons. And

the reports also indicated the major artificial insemination services problem were failure of conception (14.7%) in availability of AI technicians (55.9), disease (16.2%) and both conception failure and unavailability of AI technicians (55.9) (Nuradis*et al*., 2014).

Several factors related management also plays in successful pregnancy among which nutritional contribute the largest proportion. Daily intake and diets types can alter the expression of transcripts of gene involved in early embryonic development. Nutritional requirements for optimum follicle growth and embryo development may be quite different. Hence, the importance of diets around the time of mating and in particular the significance of extreme underfeeds post mating in regulating pregnancy rate become evident (Mekonnen *et.al*., 2010).

2.3.1 Management of artificially inseminated dairy cows and calf in kaffa and sheka zone

Calf rearing practices: Most of dairy cattle owners (68.07%) in Kaffa and Sheka zones dairy cattle owners practiced partial suckling before and after milking, while (15.4%) practiced partial suckling prior to milking and (10.5%) practiced partial suckling during milking. The colostrum is given freely to calves. Since local/zebu cows are believed not to give milk without partial suckling, local calves from such cows are not weaned early. The cattle owners provided supplementary feeding for their calves after one-month age (Kassa et al.,2016).

Feeds and feeding systems: In most area of kaffa and sheka zone, natural pasture is the major feed resource, and crop residues are also source of feeds during dry season as there is no improved fodder production. The majority (42.7%) of the households used animal feeds from their own crop farm/private land; while (27.3%) used a combination of own farm and communal grazing land and (25.2%) used only communal grazing land. The milking cows are allowed to graze and there is no supplementary feeding. Most of the farmers did not use improved forages and (91.6%) of them had interest to take improved forages to feed their animals during the shortage of feed while the rest of them had no interest to take improved forages due to small land size they own. Moreover, (84.6%) of the cow owners had a land to sow improved forages if it is given or provided for them while the rest had no land (Kassa et al.,2016).

Housing systems: About (49.6%) in Kaffa and Sheka zones dairy cattle owners have no house for their animals and kept their animals open out of their own residence while (50.4%) kept their cattle within their own residence compound with open barn/shed. Among (74%) clean the cattle's barn every day, (19%) clean every week, (3.5%) clean barn twice a week (Kassa, *et al*.,2016).

Milking practices: in Kaffa and Sheka zones dairy cattle owners, (88.8%) of households milked their cows twice a day while the rest milk their cows once a day. The average amount of milk per cow per day per liter is 1.74 liters. Time of milking is normally in the early morning and late evening for twice/day milking (Kassa *et al*.,2016).

2.4. The varieties of cow and bull in the study area.

Despite the wide application and success of AI throughout the developed world, the success rate in Africa and other developing countries is still low owing to a number of technical, systems related to management and financial problems (Belihu, 2002). Improvement in livestock resource can be achieved through the implementation of an efficient and reliable AI services, concomitantly with proper feeding, healthcare and management of livestock. Hence cross breed cattle, the progeny of Zebu and Holstein Frisian /Jersey cattle are mainly used for milk production in Ethiopia which is concentrated to dairy farms around the major cities (Belihu, 2002). Basis of the high production of milk, the AI technicians from decha worda select and practice the Holstein Frisian /Jersey bulls' semen from Hawassa agricultural research center. And they cross breed with locally available cows that selected by AIT by different criteria (Source: Decha agricultural office 5 years' report, 2009).

3. MATERIALS AND METHODS

3.1 Description of the Study Area

This study was conducted in Decha worda, Kaffa zone, Southern Nation, Nationalities People Regional(SNNPR), South west of Ethiopia and located about 449 km from Addis Abeba. The total land area of the woreda is about55194 hectares. It is located at 8° 06′ N, 36° 28′ E. The study area has a wet tropical vegetation and rainfall pattern. This area is characterized by bimodal distribution with small rainy season *belg* (March-June) and main rainy seasons *Meher* (July-November). The annual total rainfall is about 1367 mm with respective mean annual temperature of 16.9 ^{0}C and 25.8 ^{0}C. In the study area there are different agricultural productions such as livestock (dairy farm, poultry farm, apiary etc.) and crop production were takes placed. The major livestock species includes Chicken (55,773), Cattle (47,647), Sheep (28,575), goats (11,443), Equine (5,543), bee colony (55,861) (Decha worda livestock and fishery office,2017) (CSA, 2014).

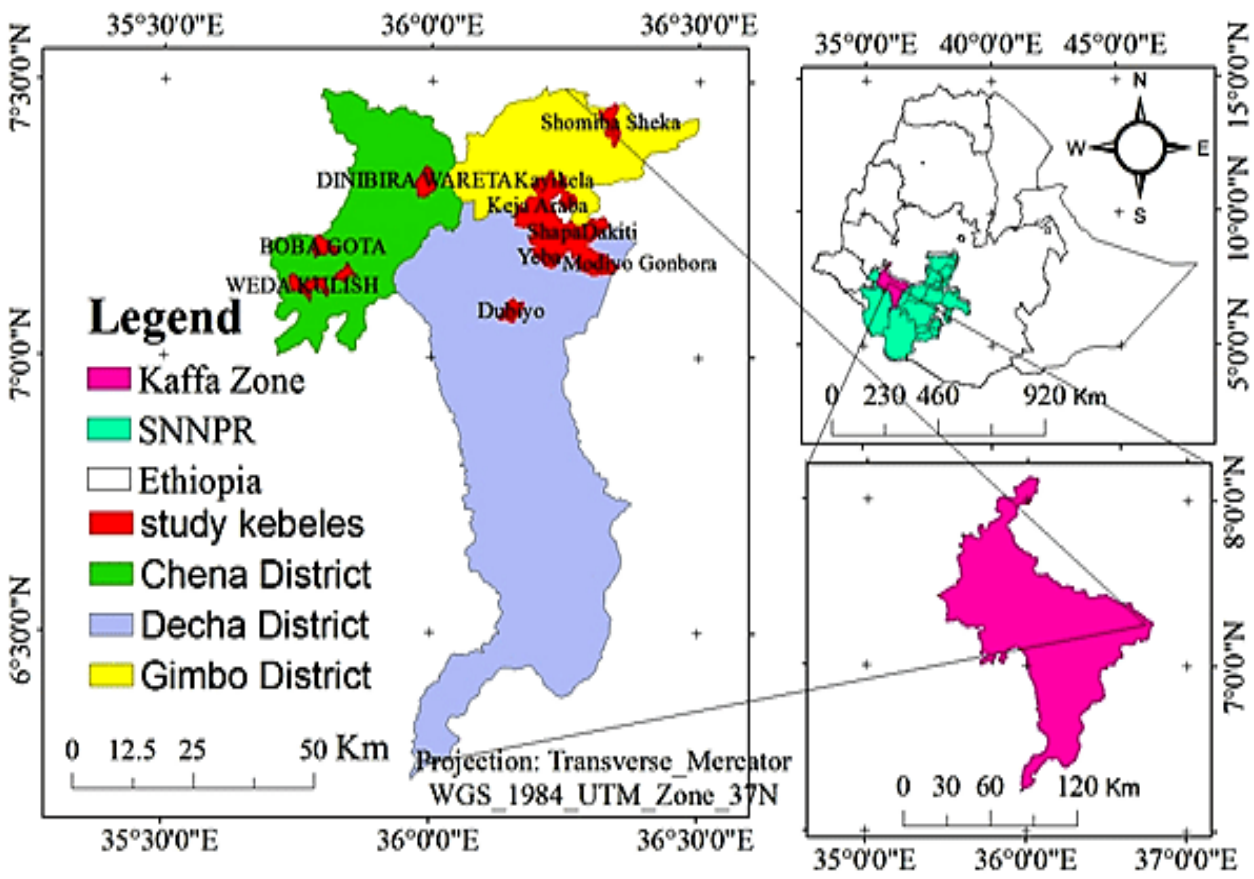

Figure 1. SNNPR, Kaffa Zone and Decha District Map

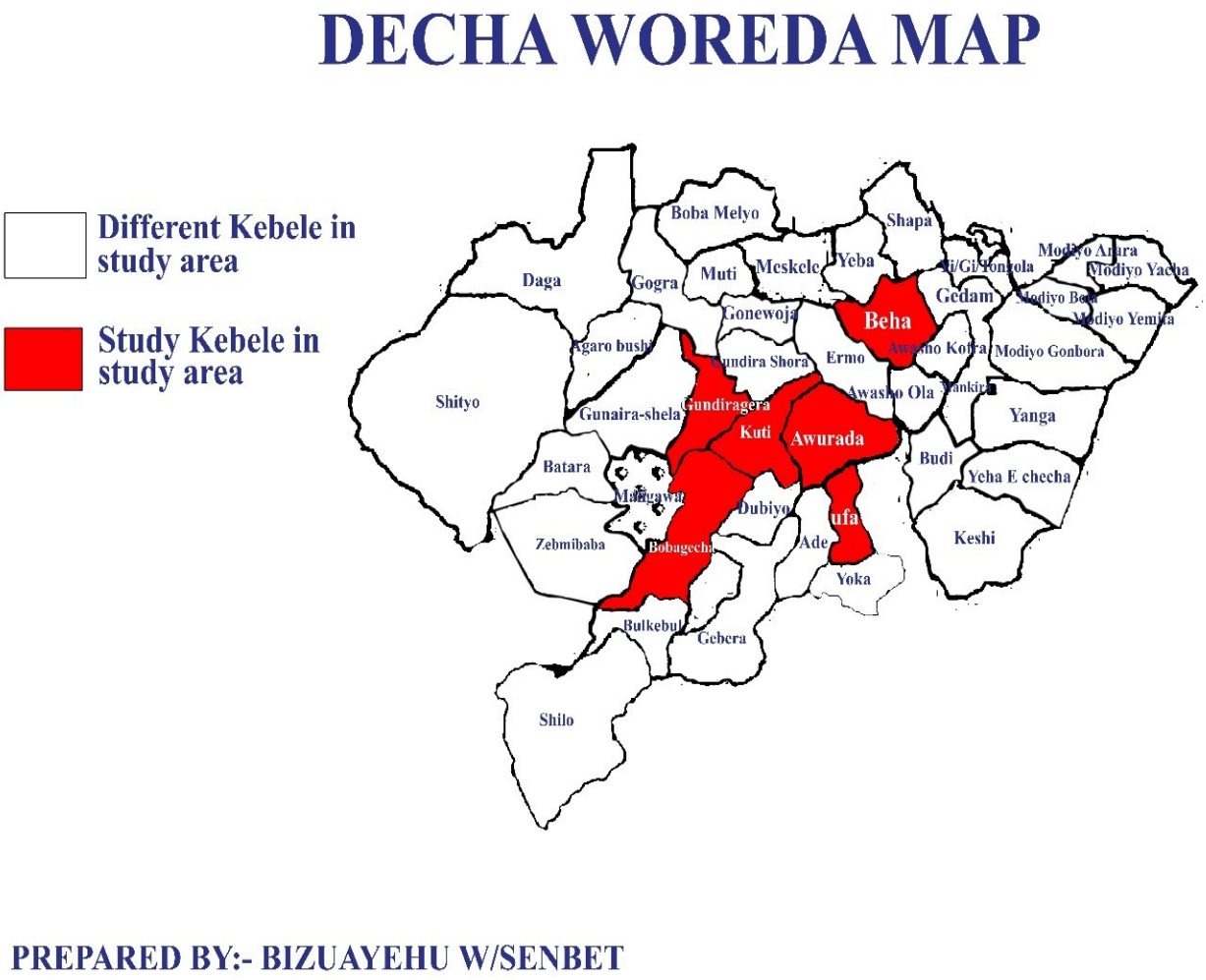

Figure 2. Different kebeles in Decha District (Source: Decha Agricultural Office)

3.2 Research design

The research was designed and implemented in Decha Woreda and the status and the problem associated with AI was assessed. From six purposively selected keble 525 cow owners and 9 officers were selected for the study. The data were gathered using structured questionnaire and field observation procedures that were analyzed by using SPSS and simple descriptive type of statistics and the result was presented in the form of tables.

3.2.1 Data type and Source of Data

Both quantitative and qualitative data type was used for the study. Primary data was collected from the cattle owner, artificial insemination technician and officers.

3.2.2 Sampling design

Six PAs (Beha, Awurada, Gecha, Gundira Gera, Uffa and Kuti), officers and AI technicians were selected by purposive sampling method.

3.2.2.1. Sampling and sample size

The cow owner who documented in decha agricultural office of AI, currently practice the AI program, have a readiness, the AI technician and other animal health and production professionals who work currently on AI program were included and purposively selected in the study.

3.3. Method of Data Collection

3.3.1 Questionnaire

The primary data was collected through structured questionnaires that prepared to a dairy cow owner, officers and AI technicians. As a source of primary data dairy farmers from six purposively selected kebeles based on cross breed cow populations (Beha, Awurada, Gecha, Gundira Gera, Uffa and Kuti), used to evaluate the success rate of artificial insemination and to identify major constraints associated with artificial insemination in the study area. Artificial insemination records were obtained from inseminators' record book as the retrospective data.

During the questionnaire process every respondent included in the study was briefed about the objective of the study before starting presenting the actual questions. Then the questions were presented to the respondents. In the survey information on the developed questionnaires include the address of the owner's breed of cow's category of animals, managements of cattle feeding, the success of AI, the failures of AI, reason for failures and problems of AI service. Employing

questionnaires survey regarding the importance of AI for cow owners, related to milk production, cow and calf management and information about general status of the AI practices in the study area was also assessed.

3.3.2 Field observation

During field observation, the primary data was collected by observe cattle owners of dairy cow from purposively selected kebele (Beha =28, Awurada=43, Ufa =36, Kuti=27, G. Gera=78 and Gecha-=97) by observe born calf, grazing land, house of cattle, management practice to assess the status and problem of AI in study area.

3.4 Data analysis

The collected data was analyzed by using SPSS and simple descriptive type of statistics (such as frequency and percentage) and the result was presented in the form of tables.

3.5 Study Variable

The dependent variable the status and the problem associated with AI and independent variables are : socio-demographic and socio-economic factors: (sex, age, educational status) Status of the AI cows: (number of cattle, purpose of the cattle, milking frequency in local and breed cow, milking time for local and breed cows) the problems associated with AI: (feeding pregnancy cow, access and size of grazing land, time of grazing cow, time of heat detection, plant improved plants), Management of the AI cows and calf: (ways and source of breeding, feeding ways ,clean the weight, feed colostrum of calf, graze and treat of the calf) and others.

4. RESULTS

4.1 General Characteristics of respondents

Characteristics of respondents based on age, gender and educational level, from the total of respondents (96.4%) were males and (3.6%) were females. The result also showed that (44.76%) of respondents were farmers who were age between 26_30 years old and (34.28) of respondents were 41to 50 years old, (18.09%) of respondents were aged 31 to 40 years old. Regarding to educational level, 88.9% of respondents are literate, while 10.2% have basic education, 0.38% have primary education and 0.38% have secondary education and have reach high school (Table1).

Table 1. The Status of Artificial Inseminated cow owners

Age of respondent	Frequency	Percent
15-25	15	2.85%
26-30	235	44.76%
31-40	95	18.09%
41-50	180	34.3%
Total	525	100%
sex of the respondent	Frequency	Percent
Male	506	96.4%
Female	19	3.6%
Total	525	100%
education status of the respondent	Frequency	Percent
Illiterate	467	88.9
Have basic education	54	10.2
Complete primary school	2	0.38
Complete secondary school	2	0.38
Total	525	100%

4.2. The Number and Purpose of Cattle

In the study area most of the respondents (farmers) have a number of cattle between 5_10 (68.3%) and they rearing their cattle mainly for dairy production (50.8) (Table 2)

Table 2. The number and purpose of cattle

Numbers of cattle	Frequency	Percentage
5-10	359	68.3
Above 10	208	31.7
Purpose of the cattle		
Purpose of the cattle	Frequency	Percentage
For dairy production	267	50.85
For dairy production & material transport	110	20.95
For dairy production & agriculture	100	19.04
For resource saving	48	9.21

4.3. The Milking Practice

Out of the respondents of cattle owners, 98.4% of households milked their cows twice a day. The high percentage of milking twice a day is similar to the milking frequency practiced in many parts of kaffa and sheka reported by Kassa *et al.,* (2016). The time of milking is normally in the early morning and late evening. In the study area, farmers did not bother about the regularity of milking time.

Table 3. The Status of milking Dairy Cows

Milking time for local cow	Frequency	Percent
Morning	2	0.6
morning and evening	307	99.4
Total	309	100.0
Milking frequency in local cow		
Milking frequency in local cow	Frequency	Percent
once per a day	4	1.3
twice per a day	304	98.4
thrice per a day	1	0.3
Total	309	100.0
Milking frequencies crossbreed cow		
Milking frequency in crossbreed cow	Frequency	Percent
once per a day	-	-
twice per a day	309	100%
thrice per a day	-	-
Total	309	100%
Milking time for local cow	Frequency	Percent
Morning	-	-
morning and evening	309	100%
Total	309	100%

4.4. Artificial insemination and the technician

About 77% of Artificial insemination technician were male and the rest (23%) were females. Majority (55.55%) of Artificial insemination technician were age between 25_30 and (33.33%) were age between 35_40 and most of them (77%) has BSA in education status, whereas the rest (23%) has diploma. Most of the Artificial Inseminators (66.7%) used body size while the remaining used age as criteria to select cows for artificial insemination.

Accordingly, long body sized (head –body, between 3m and 4m were best preferred), while age between 9 and 14 years were most preferred candidates for AI. After artificial insemination takes place about 55.5% inseminators inspected four times for health and to check fertility success.

Table 4. The Status of Artificial Insemination Technician

Age of respondent	Frequency	Percent
15-25	1	11.11%
26-30	5	55.55%
31-40	3	33.33%
41-50	0	0%
Total	9	100%
sex of the respondent	Frequency	Percent
Male	7	77.77%
Female	2	22.33%
Total	9	100%
education status of the respondent	Frequency	Percent
Have basic education	0	0
Diploma	2	22.33
BSc/BA and above	7	77.77
Total	9	100%

4.5. Dairy cows Inseminated and calves born

From Artificial insemination office record book there is increment of Artificially inseminated cows and calves. For instant by year 2017 AI cows were 164 and by year 2018 AI cows were 361. Also the number of born calves were increase from 93 to 216 by the year of 2017 to 2018 respectively. (Table5)

Table 5. The status of Artificial Insemination

Kebeles	Number of farmer who inseminated cows in 2017	Born calves	Failed	Number of farmer who inseminated cows in 2018	Born calves	Failed	Total success	Total Failed
Beha	17	11	6	31	17	14	28	20
Awurada	15	9	6	58	34	24	43	30
Ufa	17	11	6	44	25	19	36	25
Kuti	14	9	5	32	18	14	27	19
G.Gera	48	25	23	84	53	31	78	54
Gecha	53	28	25	112	69	43	97	68
Total	164	93	71	361	216	145	309	216

The summary of AI in study area in two years

Year	AI cows	Calves born			Success rate in %
		Male	Female	Total	
2017	164	36	57	93	56.7%
2018	361	116	100	216	59.8%
Total	525	152	157	309	100%

4.6 Constraints of Artificial Insemination

For the failure of conception farmers reported multiple reasons. Accordingly, 60 (28%) farmers reported heat period detection problem, 39(18%) lack of awareness, 35(16%)lack of infrastructures including inseminator, road, inseminator place etc. About30 (14%)farmers reported management problem,26 (12%) disease problem and 13(6%) lack of incentive of AIT and cattle owners individually. The result of the present study was agreed with Nuraddis *et al*., (2014) who reported among 1321 inseminated dairy cows in Jimma zone (51.6%) of them become pregnant.

Table 6. The constraints that hinder the success of AI

Constraints	Frequency	Percent (%)
Heat detection problem	60	28%
Management problem	30	14%
Disease problem	26	12%
Lack of AIT experience	13	6%
Lack of awareness	39	18%
Lack of incentive	13	6%
Lack of infrastructure	35	16%
Total	216	100%

4.7. Time of commencement of heat in dairy cows

The result of the study revealed that half of (50.09%) the respondents brought cows at heat during evening hours followed by those in morning hours (33.33%), a less number of cow owners (8.95%) known commenced heat of their cows during afternoon hours and the rest (7.61%) of respondents were not known the exact time of commencement of heat of their cows. As Mekonnen et.al., 2010 report, lowered environmental temperature (during morning and evening hours), which had a stimulatory effect on pituitary hormone for estrus cycle initiation. Also in this study area the above effect might be the cause for greater number of dairy cows were showed estrus in this period (Table 7).

Table 7. Time of Commencement, Strategy to detect heat and Satisfaction of farmers

Time	**Number of respondents**	**Percentage**
Morning	175	33.33%
Noon/afternoon	47	8.95%
Evening	263	50.09%
Don't know the time	40	7.61%
Total	525	100%
Farmers strategy to detect heat period of their cows		
Mounting to other cows	274	52.22
Restlessness& Bellowing	146	27.78
Vulva discharge	105	20
Total	525	100
Farmer satisfaction on AI in the study area		
Unsatisfied	181	34.4
Satisfied	344	65.6
Total	525	100

4 .8 Farmers strategy to detect heat period of their cows

The result of this study showed that the majority (52.22%), of respondents detect their own cows by observing mounting cows on the other animals, 27.78% of respondents detecting by restlessness and bellowing of cows and 20% of respondents detecting by vulva discharge. (table 7). The result was agreed with Melkasa (2012). Who reported that 51% of respondents detect their own cows by observing mounting cows on the other animals, 31% of respondents detecting by restlessness and bellowing of cows and (18%) of respondents detecting by vulva discharge.

4.9. Farmer attitude and satisfaction on artificial insemination

The result of this study showed 34.4% of the respondents were unsatisfied with the overall the Artificial insemination services because of no training, no awareness about AI and diseases. According to table 7, 34.4% of unsatisfied farmers, passed without breeding the cow from AI services and using their own bull (natural mating) for their cows. However, 65.6% of respondents were satisfied on artificial insemination services because they get improved calves, improved milk etc. (Table 7). As the result showed that the satisfaction of farmers in the study area were increased by 14% from the report of Nuradis et. al., (2014) that 51.65% of the respondents and 48.4% of them were satisfied and unsatisfied for overall artificial insemination services respectively due to various reasons. (Table 7)

4.10. Field Observation on cattle management

As observed result, from success artificial inseminated cow owners, 58.57 % of them feed their animals from their own crop farm while, other (41.43 %) use communal grazing land but no supplementary feeding program for dairy cows. Most of the farmers didn't use improved forages. From the observed result of this study 87.05 % of them kept their cattle with in their own houses, and clean them every day, but the rest (12.95%), had no houses. 91.26% of them practiced partial suckling before and after milking, this is because local cows are believed not give milk without partial suckling (Table 8)

Table 8. feeding, housing and milking practice

Feeding	Frequency	Percent
Feed cow from their own crop farm	181	58.57%
Use common grazing land	128	41.43%
Housing		
Kept their cow in their house	269	87.05%
No house for their cows	40	12.95%
Milking practice		
Practice partial suckling before and after milking	282	91.26%
Not Practice partial suckling before and after milking	27	8.74%

The result of this study revealed that majority (93%) respondents in the study area had separate pen for their calf and the remaining have no and (95.1%) of the respondents clean the barn of their calf.

Table 9. Housing System of calf

Separate pen for the calf		Frequency	Percent
	yes	290	93.9
	No	19	6.1
	Total	309	100
Clean the barn	yes	294	95.1
	No	15	4.9
	Total	309	100

The result of this study revealed that almost all respondents in the study area feed colostrum for their calves and 80.9% of the respondents suckle their calf 3 times per a day and 71.8% respondents in the study area provide supplementary food for their calves after two weeks and 28.2% provide fresh grass after a week. The majority (68%) respondents in the study area provide fresh grass for their calf separately and 89.6% respondents in the study area feed their pregnant cows after they got birth and the remaining (7.4%) feed their pregnant cows at time of parturition.

The result of this study revealed that majority (83.8%) respondents in the study area feed colostrum immediately after the calf was born.

The result of this study revealed that majority (99%) respondents in the study area had access of grazing land. And 42.72% have no conserved land for their cattle. But majority (99%) respondents in the study area didn't plant the improved forages. This is because of shortage of land (73.1%). (Table10.2.)

The report mention here is aligning with the report of Kass*et al*., (2016) that the major causes for not planting improved forages of Kaffa and Sheka people are shortage of land, lack of awareness and lack of interest. The result of this study revealed that majority (65%) respondents in the study area feed their cattle by let to graze in grazing land. The report mention here is aligning with the report of Kass *et al*., (2016) that most cattle owners (71%) feed their cattle by let to graze in grazing land and (29%) feed by tethering in grazing land (Table 10.2).

Table 10.1. feeding system of calf by cattle owners

		Frequency	Percent
Feed colostrum of the calves	Yes	309	100%
	No	-	-
	Total	309	100%
The time of feeding colostrum of calves	immediately after the calf is born (1_6) hrs.	259	83.8
	after 24 hours	50	16.2
	Total	309	100%
Frequency of calf sucking per a day		Frequency	Percent
	twice per a day	14	4.5%
	3 times	250	80.9%
	4 times	45	14.6%
	Total	309	100%
Start calf grazing	after one week	87	28.2%
	after two weeks	222	71.8%
	Total	309	100%
Calf feeding system	separate grazing	212	68.6%
	mix with other calf	59	19.1%
	feed by collect grass	38	12.3%
	Total	309	100%

Table 10.2 Feeding system of dairy cows by cattle owners

		Frequency	Percent
Accesses of grazing land	Yes	306	99%
	No	3	1
	Total	309	100%
Size of the land	.5 hectares	105	34%
	1hectares	48	15.5%
	2 hectares	24	7.8%
	No	132	42.7%
	Total	309	100%
Time of grazing land	2_4 hours	309	100%
Reason for not planting improved forages		Frequency	Percent
	shortage of land	226	73.1%
	no awareness	71	23%
	no interest	12	3.9%
	Total	309	100%
Plant and use of improved forage	Yes	-	-
	No	309	100%
	Total	309	100%
Feeding ways of dairy cows	Indoor feeding system	8	2.58%
	Individual feeding system	8	2.58%
	Let to graze in grazing land	200	64.72
	Tethering system	92	29.77%
	Total	309	100%

4.11. Health Management of the cattle owners in the study area

As result of this study almost all respondents in the study area got vaccine for their calf and majority (46%) respondents are as far as 500m and 39.2% of respondents are far 500m to 2km from the veterinary service. Therefore, the distance for getting supplementary treatments for their calves and cows affect health and the AI service. The report mention here is aligning with the report of Ayalew*et al*, (2018) that the major problem of dairy production in enemay district, east Gojjam, Amhara region of Ethiopia,49% of cow owners was far 1km from artificial insemination service center. From the result, 223 (72.2%) of cattle owners stop suckling when diarrhea happen. Almost all of the dairy cattle owners get vaccine calf 308 (99.7%) and 217 (70.2%) of the cattle owners take to the veterinary office for treatment and the rest 92(29.8%) of the dairy cattle owners treat locally (Table 11).

Table 11. The health management of the cattle owners in the study area

		Frequency	Percent
Calf diarrhea when feed colostrum	Yes	307	99.4%
	No	2	0.6
	Total	309	100%
Get vaccine calf	Yes	308	99.7%
	No	1	0.3%
	Total	309	100%
Treatment when calves are diseased	take to the veterinary office	217	70.2%
	treat by local medicine	92	29.8%
	Total	309	100%
The distance of veterinary service	500m	142	46
	500m_2km	121	39.2%
	2km_10km	21	6.8%
	above 10km	25	8.1%
	Total	309	100%
Treatment when diarrhea happen on calf	Stop suckling	223	72.2%
	Continue suckling	12	3.9%
	Treat by local medicine	63	20.4%
	Treat by modern medicine	9	2.9%
	No treatment	2	0.6%
	Total	309	100%

5.DISCUSSION

As result showed from 525 artificially inseminated cow owners 96.4% were males and 3.6% of them were females. This result was aligning to Ashebir *et al*., (2026) which reported in Tigray regional state northern Ethiopia,97%of the cow owners were male and the reaming proportion of the house hold was headed by females' members of different and educational status. The female headed household in this particular study would indicate either the husband has died or they are divorce. Out of the respondents 58.8% of cow owners were mainly kept the cattle for dairy production. The report was aligning with Tarkengy Kassa and Dekamo Fiseha that report 68.9% of the local cattle owners were kept for production of milk in most area of kaffa and sheka. Also the result showed that out of the respondents of cattle owners 98.4% of households milked their cows twice a day.

The high percentage of milking twice a day is similar to the milking frequency practiced in many parts of kaffa and sheka which reported by Kassa *et. al*., (2016). The time of milking is normally in the early morning and late evening. In the study area, farmers did not bother about the regularity of milking time.

From 525 artificially inseminated cows 41.14% were not give birth. The failure of conception reported by farmers, was multiple reasons:28% farmers reported heat period detection problem, 18% lack of awareness, 16% lack of infrastructures including inseminator, road, inseminator place etc. About 14%farmers reported management problem,12% disease problem and 6% lack of incentive of AIT and cattle owners individually. The result of the present study was agreed with Nuraddis *et al*., (2014) who reported among 1321 inseminated dairy cows in Jimma zone 51.6% of them become pregnant and the rest 48.8% were not pregnant due to similar reasons. As result showed that 50.9 % of the cow owners were brought cows at heat during evening hours and 33.33 % were in morning the report was align with Gebremedhin *et al*., (2008) report that 50.2 % of the cow owners were brought their cows at evening hours and the remain (42.85%) were brought in the morning at country level. As Mekonnen et.al., 2010 report, lowered environmental temperature (during morning and evening hours), which had a stimulatory effect on pituitary hormone for estrus cycle initiation. Also in this study area the above effect might be the cause for greater number of dairy cows were showed estrus in this period. As the result of the study showed that 65.6% of the respondents were satisfied due to improved calves and milk production on AI service and the

remains 34.45% of them were unsatisfied due to failure of conception. As the result showed that the satisfaction of farmers in the study area were increased by 14% from the report of Nuradis et. al., (2014) that 51.65% of the respondents and 48.4% of them were satisfied and unsatisfied for overall artificial insemination services respectively due to various reasons.

So creating the awareness toward the advantage of AI was very important to increase the effectiveness of the AI service. From the artificial inseminated cow owners 58.57% of them were feed their animal from their own crop farm but others (41.43%) use common grazing land. This result was aligned with Tarkey Kassa and Dekamo Fiseha (2016) that report 42.7% of the households use animal feeds from their own farm while 25.2 % used only communal grazing land. This was one of the management problems in production of milk.

As result showed that 87.05% of the cow owners kept their cattle in their own houses and clean every day, but the rest 12.95%had no houses. This report was increase by 36.65% from the report of Tarkey kass and Dekamo Fiseha (2016) that in Kaffa and Sheka zone only 50.4% cattle owners kept their cattle with their cow residence compound with open barn but the rest cattle owners have no houses. The practice of housing to their cattle in this district is good when compared to other area of Kaffa and Sheka zone cattle owners.

About 99% of farmers had access of grazing land and 42.7 % of the dairy cow owners have no conserved land for grazing and only 34% dairy cow owners had 0.5 hectare grazing land and the rest 15.5% had one hectare. As result of this study almost all respondents in the study area didn't plant the improved forages. This is because of shortage of land (73. 1%).The report mention here is aligning with the report of Kass *et al*., (2016) that the major causes for not planting improved forages of most Kaffa and Sheka people are shortage of land, lack of awareness and lack of interest. The result showed that 65% respondents in the study area feed their cattle by let to graze in grazing land and 29.8%. The report mention here is aligning with the report of Kassa *et. al*., (2016) that most cattle owners 71% feed their cattle by let to graze in grazing land and 29% feed by tethering in grazing land. As result of this study 46% respondents in the study area far 500m and 39.2% of respondents in the study area far 500m to 2km from the veterinary service.

The report mention here is aligning with the report of Ayalew *et. al.*, (2018) that the major problem of dairy production in Enemay district, east Gojjam, Amhara Region, 49% of cow owners was far 1km from artificial insemination service center. Therefore, the distance for getting supplementary treatments for their calves and cows affect health and the AI service.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

As show in the result from 525 dairy cows, only 309 (58.86) dairy cows success but 216 (41.14) was not success and the study area is greatly influenced by the status of cattle owners in relation to heat detection (28), management problem (14%), disease problem (12%), lack of AIT experience (6%)and lack of infrastructure (16%).This study result show that giving attention for the practice of AI is very important in the study area. Although the AI practice has been accepted by cattle owners 344 (65.6%), certain factors greatly influence acceptance of this practice by others. These factors are: heat detection problem, feeding, housing and milking practice or management of dairy cows and calf's problem. For instant from the result almost all of the cow owners don't plant and use improved forage for their cattle. Although there is a good practice in care of cows and calf, some of cow owners treat their cows and calf health locally. Based on the result of this study it can be concluded that, the AI services in the study area has not well organized and, the artificial insemination service in the area was still at its infant stage.

6.2 Recommendation

Based on the above conclusions the following are recommended:

- Dairy cow owners should be supported through services related to grazing land, conserving of grazing land and ways of managing, heat detection of dairy cows.
- Improvements in facilities and management should be necessary before implementing artificial insemination.
- Creation of farmer's awareness should be improved on breeding, feeding and overall cattle management practices is necessary.
- The skill and knowledge based training for enhancement artificial insemination must be given for both the farmers and implementers to enhance perception and adoption of technology.
- Mechanism like regular training should be devised to improve the involvement of stakeholders in the activity of artificial insemination in the study area.
- Professional associations of AI should critically work in close collaborations with the office of AI technician of district and kebeles of artificial insemination in implementation of artificial insemination.
- Generally, this study result show that giving attention for the overall practice of AI is very important.

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APPENDIX I

Jimma University

Collage of Natural Science

Department of Biology

Sample Questionnaire to Keble Artificial Insemination Technician, animal health and production professionals.

Questionnaire to be filled by Keble Artificial Insemination Technician, animal health and production professionals.

Dear Respondent

General Direction

The purpose of this Questionnaire is to assess the status of artificial insemination and to generate information for the better application on the sectors and give feedback to decision makers to take appropriate major on it.

Therefore, I would like to thank you for genuine cooperation in responding to the questions. You are kindly requested that put (X) mark in the choice from questions and write your response in the blank spaces.

Thank you for your cooperation!

Part One

Back ground information

I. Age 15-25 ( ) 26-36 ( ) 37-47 ( ) Above 47 ( )

II. Sex Male ( ) Female ( )

III. Educational status: Certificate ( ) Diploma ( ) BA/BSC ( ) MA/MSC ( )

Part two: Circle or Put (X) mark in the choice from questions and write your response in the blank spaces.

Cow Health Management

1. What are your criteria of selecting a cow for artificial insemination?

A. Young age

B. Short calving interval and milking capacity

C. Large body size and good conformation improved breed.

D. No criteria

E. Other, If

2. Do you diagnosis the diseases of cows for breeding purposes during the current artificial insemination?

A. Yes B. No

3. Do you experience abortion in your farmer's dairy cow in last two years? A. Yes B. No

4. If yes at what stage of gestation does the abortion occurred in your farmer's dairy in last two years?

A. before 3 months of gestation

B. between 3 and 6 months of gestation

C. after 6 months of gestation

5. What do you suspect as a possible source of infection to your farmer's dairy cow?

A. Newly introduced animal to the herd

B. Transmission from other animals with in the herd.

C. Transmission from other neighboring herd.

D. If other, mention it. _____

6. Is the diagnosis of the diseases confirmed? A. yes B. No

If yes who did the confirmation?

A. animal health technician?

B. Local people

C. my self

7. What have been done as reproductive diseases prevention and control strategy in your area for different diseases, if available?

A_____

B_____

C_____

8. Does your farmer' cow vaccinated as diseases diagnosis during? A. Yes B. No, If no, why_____

10. How many times do you observe your cattle owners?

A. One time a year B. two times a year C. Three times a year D. Four times a year

APPENDIX II

Sample Questionnaire to Cattle Owners

Jimma University

Collage of Natural Science

Department of Biology

Questionnaire to be filled by Cattle Owners

Dear Respondent

General Direction

The purpose of this Questionnaire is to assess the status of artificial insemination and to generate information for the better application on the sectors and give feedback to decision makers to take appropriate major on it.

Therefore, I would like to thank you for genuine cooperation in responding to the questions. You are kindly requested that to Circle in the choice from questions and write your response in the blank spaces.

Thank you for your cooperation!

Part One

Back ground information

I. **Age** 15-25 ( ) 26-36 ( ) 37-47 ( ) Above 47 ( )

II. Sex Male ( ) Female ( )

III. Educational status: Non Educated , ( ) 1_8 Completed ( ) ,10(12) completed ( ), Diploma ( )

Part two: Circle or Put (X) mark in the choice from questions and write your response in the blank spaces.

Section 1. Livestock production

A. Cattle Local_____ Cross bred_____ Total_____

B. Milking Cow Local_____ Cross bred_____ Total_____

C. Dry cows Local_____ Cross bred_____ Total_____

D. Oxen Local_____Cross bred_____ Total_____

E. Calves Male Local_____ Cross bred_____ Total_____

F. Heifers Local_____ Cross bred_____ Total_____

G. Bulls Local_____ Cross bred_____ Total_____

Section 2 A. Purpose of keeping Cattle

A. Traction: A. Yes B. No

B. Milk: A. Yes B. No

C. Both Traction and Milk A. Yes B. No

D. Saving A. Yes B. No

E. Other (specify) _____

Section 3. Dairy Cow production and Reproduction

1. Milking frequency per day

A. Local Cows a. Once per day b. twice per day c. thrice per day

B. Cross bred Cows a. Once per day b. twice per day c. thrice per day

2. Milking times

A. Local Cows a. Moring b. Early afternoon c. evening

B. Cross bred Cows a. Moring b. Early afternoon c. evening

3. How do you breed your dairy animals?

A. use nature mating (breeding bulls)

B. Artificial insemination

C. Artificial insemination through synchronization.

4. Where is the source of breeding of your dairy cows?

A. Reared at home.

B. Purchased

C. Offices of agriculture and agricultural research

Section 4. Feeding Management of Animals

1. How do you feed your dairy cows?

A. Indoor feeding using individual feeding system.

B. In collection yard using group feeding.

C. Let to graze in a grazing land.

D. Tethering in grazing land.

E. Other, Specify

2. At which time do feed pregnant cow?

A. At early pregnancy

B. At late pregnancy

C. At time of parturition

D. At late pregnancy and time of parturition

3. Do you have access to grazing land? A. Yes B. No

If Yes, What type of grazing land? A. Private B. Communal C. both

4. If you let your dairy cow to graze, for how long do they graze per day? A.1-2 hours

B. 2-4 hours C. 4-10 hours D. Above 10 hours.

5. What is the size of your grazing land? A. Half hectare B. one-hectare C. two hectare

D. above two hectare

6. Do you plant and use improved forages? A. Yes B. No

If you don't plant improved forage crops, what is your reasons?

A. shortage of Land

B. shortage of capital

C. shortage of improved forage seeds

D. difficult topography

E. poor soil fertility and drainage

F. No awareness about it

G. I have no interest

H. If Other (specify it) _____

Section 5 Calf Management

1. Do you have parturition barn for late pregnant cows? A. Yes B. No
2. Do you clean the barn regularly? A. Yes B. No
3. Do you record the born weight of the calf? A. Yes B. No
4. Do you have separate pen for your calves? A. Yes B. No
5. Do you feed colostrum to your calves? A. Yes B. No
6. If you have practice of feeding colostrum to yours calve, at which time after parturition?

A. Immediately after the calf is born (1-6) hrs.

B. 6-24hrs after parturition

C. After 24hrs

7. The frequency of calf suckling per a day? A. once per a day B. Twice per a day
   C. Three times per a day
8. At what age after parturition the calf starting grazing? A.once-day B. Twice aday C. three times a day

9. What is your calf grazing habit? A. Separately grazing B. zero grazing
C. Graze mixed with other species D. graze mixed with adult cows

Section 6 Calf Health Management

1. Do you separate pen for calf housing? A. Yes B. No

2. If yes, for Questions 1, what type of house is it? A. concrete wall B. Earthen Wall C. aside to dam's barn D. other, specify_____.

3. When does calf feed colostrum? A. within first 3 hours. B. within first 6 hours C. within first 12 hours D. after 12hours

4. Do you calve experience diarrhea when feed colostrum for first time? A. Yes B. No

5. If yes, for the above, what do you do? A. Stop suckling B. continue suckling

C. Give local treatment D. Give modern treatment

6. Do you know vaccines are available for calves to protect from diseases? A. Yes B. No

7. Do you know cows should be vaccinated to common diseased to protect the calf health? A. Yes B. No

8. If not for question above, why not? A. no access B. expensive

C. professionals are not around D. Other (specify)

9. Do you give or make your calves get vaccination? A. Yes B. No

10. What do you do when your claves are diseased? A. Treat by myself B. Take animal health post C. takes to clinic D. no treated

11. At what distance do the veterinary service available to your home? A. Below 500m B. 500-2kms C. between 2-10km D. above 10kms

12. Do you apply disease preventation and control strategy to reduce or avoid diseases in calves?

A. Yes B. No

If not for the question above, why?

_____

13.Do you know the time of commencement of heat sign of your dairy cows?

A. Yes B. No

If yes, show the time of commencement of heat. A. morning B. Evening C. Moring C. Evening D.I don't know the exact time

14.how do you know when your dairy cows commence heat sign?

A. Mounting on te other animals B. Vulva discharge C. Restlessness and bellowing D. other

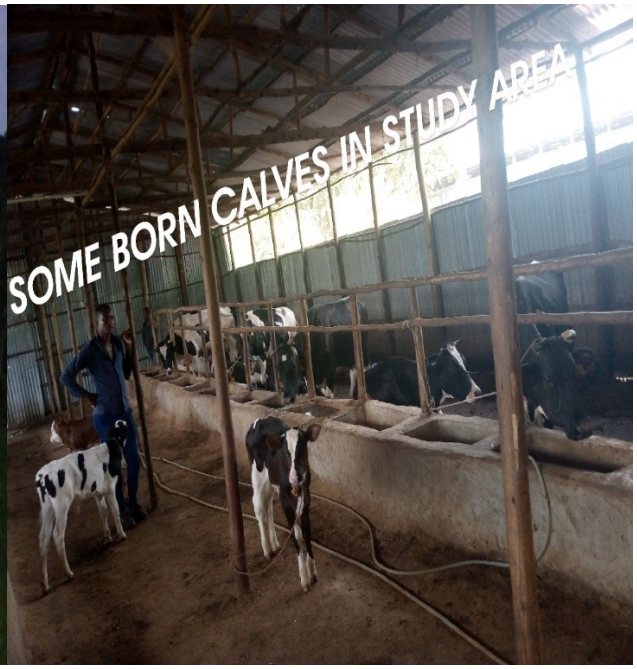
15.do you Satisfy on AI services for previous insemination of your cows? A. Yes B. No

16. What are the major constraints that hinder the success of artificial insemination?

A. Conception B. lack of awareness C. management problem D. Lack of artificial insemination services in our vicinities E.

APPENDIX III

Sample pictures from study area




WHEN THE CALF BORN


አርሶአደሮች ከብት ሜዳ ላይ ስጠብቁ


When calf start Grazing


When Calves Feed in the field


Input Your Message
WHEN SOME FARMERS INTERVIED
AND OBSEVED