Alilo AA, J Anim Res Vet Sci 2022, 6: 035
DOI: 10.24966/ARVS-3751/100035
HSOA Journal of Animal Research and Veterinary Science
Research Article

Evaluation of Achievement and Challenges of Artificial Insemination of Dairy Cow in Southwestern Ethiopia

Afras Abera Alilo*

Department of animal science, Dawro Tarcha campus, Wolaita Sodo University, Ethiopia

Abstract

Artificial insemination plays an important role in enhancing animal productivity, achieving increased milk and meat production through genetic improvement of indigenous cattle which have been the primary goal of the livestock development plan of Ethiopia. This study was conducted in Southwestern Ethiopia to evaluate the achievement and challenges of artificial insemination of the dairy cow. For this study, the purposive sampling method was employed to select woreda and systematic random sampling was used to select the study kebele and households. Sixty households who participated in dairy cattle production and sixty dairy cow insemination records for the retrospective type of study were randomly selected from the three study kebele (20 households from each kebele). A semi-structured questionnaire was prepared, pretested and used to collect data from respondents. The data were analyzed by using statistical package for social sciences (SPPS) software, version 20, SPSS, (2013). The result showed that the major purposes of keeping dairy cattle in the district were ranked in decreasing order of its importance as a source of milk and milk products, cash income, manure, insurance, meat production, and wealth. The result revealed that about 98.3% and 95 % of respondents didn't get consistent and regular mobile AI service respectively. The result showed that the average efficiency of artificial insemination service was 33.3% in the study area. The major constraints of the artificial insemination service delivery system in the study area were lack of regular delivery of service, lack of input, distance to artificial insemination center, and lack of artificial insemination technicians which interrupt smooth delivery of AI service. Even though artificial insemination services were challenged by different factors like shortage of liquid nitrogen and semen, Technician, and distance to the AI center, however, the efficiency of artificial insemination service under smallholder dairy cow's management system in the study area was fairly good. To improve the artificial insemination service, all stalk holders of livestock production including Government institutions and livestock owners should work together and proactive in solving different constraints of AI service.

Keywords: Achievement; Artificial insemination; Challenge; Esera

***Corresponding author:** Afras Abera Alilo Department of animal science, Dawro Tarcha campus, Wolaita Sodo University, Ethiopia, Tel: +251916800606; E-mail: afrasabera2001@gmail.com

Citation: Alilo AA (2022) Evaluation of Achievement and Challenges of Artificial Insemination of Dairy Cow in Southwestern Ethiopia. J Anim Res Vet Sci 6: 035.

Received: September 01, 2022; **Accepted:** September 20, 2022; **Published:** September 30, 2022

Introduction

The major economic activity of Ethiopia is agriculture. Ethiopia has largest livestock population which is estimated to be about 65.35 million cattle, 39.89 million sheep, 50.24 million goats, and 49 million poultry. The livestock sector is also a part of agricultural activities which plays a great role in the social, cultural, and economic development of the country. Similarly, it also plays a significant contribution to the economy accounting for 45 % of the agricultural gross domestic product, 18.7 % of the national gross domestic product, and between 16 – 19 % of the total foreign exchange earnings of the country [1].

Among livestock, dairy sector is an important part in the socio-economic standing of Sub-Saharan Africa (SSA); which plays their role in food security and income-generating roles, mostly at the small household level. As indicated in, most cattle in Ethiopia that are mostly of native breeds/ecotypes which are about 98.24 % indigenous, and 1.54 % crossbreed and 0.20 % exotic cattle breeds respectively. Developed countries that have a well-defined breeding strategy and a sound technical base absorb and adapt the technology to meet their needs [2].

Artificial insemination plays a great role in livestock production and productivity through genetic improvement of indigenous cattle to enhance animal productivity, increased milk and meat production in Ethiopia [3], but it has not been successful in improving the reproductive performance of the dairy industry [4], due to inconsistent service in the smallholder livestock production systems of the Ethiopian highlands [5], wrong selection and management of AI bulls along with poor motivations and skills of inseminators [6] . And also poor conception rates due to poor heat detection and inefficiency of AI technicians, dissemination of reproductive diseases and poor fertility rates if AI centers are not equipped with appropriate inputs and are not well managed and high cost of production(processing and collection), Storage and transport of semen was the major limitation of AI [7].

Indigenous dairy cattle breed adapt well to the tropical environmental condition that they can produce and reproduce under stress, high disease prevalence, high degree of temperature, and low level of nutritional status. However, their production performance was recorded to be low because of their low level of inputs, genetic makeup and traditional husbandry practice besides environmental stress [8-10] To improve the low productivity of local cattle, selection of the most promising breeds and cross-breeding of these indigenous breeds

with highly productive exotic cattle have been considered a practical solutions. Thus, the need for clear strategies for the improvement and maintenance of indigenous cattle genetic resources is required along with a clear breeding program for sustainable genetic improvement. Therefore, Dawuro zone generally and Esera district specifically is well known in livestock population, well-suited agro-ecology, and vegetation cover but there is little information on the achievement and challenges of a dairy cow. Evaluation of achievement and constraints of AI service of the dairy cow is important to make future improvement interventions on AI service delivery and provide solutions to the problem. Therefore the objective of this study was to evaluate the achievements and challenges of artificial insemination of dairy cows in Southwestern Ethiopia.

Materials and Methods

Description of the study area

The study was conducted in the Esera district of Dawuro Zone, South western Ethiopia. The district is 522, 575, and 584 km from Addis Ababa through Hosanna, Shashemane, and Jimma roads, respectively, and 350 km from Awassa. The study district covers a total area of 1043.1 km2 and lies between 60.7"-70.02" latitude and 36.7 to 37.10 longitudes, with an elevation ranging from 501-2500 m.a.s.l. The district has 29 kebeles (26 rural and 3 urban) with a total population of 89,123 [9] Esera district lies in three agro-ecological regions: the Kola region (32%), the WoyinaDega region (52%); and the Dega region covers (16%) of the district. The annual mean temperature varies from 17.60C - to 27.50C.). The average annual rainfall ranges between 1401-1800 mm. The agricultural practice in the area was a mixed crop-livestock production system. The livestock number of the district were 431,187 cattle; 135,180 sheep; 123,110 goats; 12,323 horses, 7281 mules; 3156 donkey; 199, 618 chicken, and 67, 437 bee hives.

Study population

All households involved in dairy cattle production in the Esera district of the Dawuro zone were the study population. The study population for this study was smallholder dairy owners who were beneficiaries of the artificial insemination service in Esera woreda. In addition to this, retrospective data obtained from the recording book was used to see the relation between the number of dairy cows inseminated and the number of calves born to check the efficiency of AI. Dairy cows kept in traditional management were considered for this study.

Study design

The study employed cross sectional survey design through applying formal survey/ questionnaire, field observation, focus group discussion, key informants discussion and retrospective type of study. The retrospective part of the study was conducted using records from selected AI centers in three kebeles-(Kanbo, Senget, and Bale kebele) of Esera-woreda.

Sampling techniques and sample size

To achieve the objective of the study, the purposive sampling method was employed to select districts based on the potential of livestock production, and random sampling was applied to select the kebele and household. The Esera district has 29 kebeles from which 5 highlands and 16 midland kebeles have participated in AI service and the rest 8 low land kebeles were not participated in AI service due to the limitation of temperature on AI service. Of 21 kebeles participated in AI service, three kebeles (Kanbo, Senget, and Bale kebele) were selected by using purposive sampling method, and households were selected by employing systematic random sampling techniques from those who are participated in dairy cattle production and AI service. A total of 60 randomly selected respondents (20 from each kebele) were included in the assessment study and sixty dairy cow records (20 from each selected kebele were selected) for the retrospective type of study to determine the efficiency/achievement of AI.

Source and methods of data collection

Both primary and secondary sources of data were used for this study. The primary source of data was gathered by direct interviewing households by employing a semi-structured questionnaire. The primary data such as socio-economic characteristics, the purpose of keeping dairy cattle, and opportunities and challenges of AI were collected through a questionnaire. Retrospective study data was collected from the service records of AI service covering the period from 2011 to 2013 E.C. The secondary data was collected from different kinds of literature, livestock, and fishery development office of the woreda and kebele administrative office of the study sit.

Data analysis

The collected data were, edited, coded, entered and stored in Microsoft Excel and analyzed by using the statistical package for social sciences (SPPS) software, version 20, SPSS, (2013). Simple descriptive statistics was used to summarize the data collected from the survey are percentages, means, and frequency to describe parameters such as socio-economic characteristics of households, the purpose of keeping dairy cattle, achievements, and challenges of AI in the study area. Statistical differences between variables were proclaimed significant at ($p<0.05$). The priority Index value was calculated for purpose of keeping dairy cattle in the study area.

Results and Discussion

Socio-demographic characteristics of the households

Socio-demographic characteristics of households were summarized in Table 1. The proportion of sex of respondents was 46(76.6 %) and 14(23.4%) male and female, respectively. In the study area, the majority of the households who participated in AI service were male-headed while the low proportion of households who participated in AI service was females. This study result showed that among the respondents 70% were between 30-45 years of age, while 16.7% and 13.3% were between 15 to 29 and 46-65 years old, respectively. On average (33.3%) of the respondents were illiterate, (6.7%) were read and write only, (40%) have attended primary school, (16.7%) have attended secondary school, and (3.3%) were college diplomas and above in the study area. According to the respondent's responses, the marital status of households were 8.3 % single, 80 % married, 6.7% widowed, and 5% divorced and this result shows that the majority of the respondents were married in the study area.

Purpose of keeping dairy cattle

The purpose of keeping dairy cattle were shown in Table 2. Respondents revealed that the primary purpose of keeping dairy cattle was the source of milk and milk products for home consumption and market followed by the source of cash income, source of manure to increase soil fertility, insurance purpose (sources of cash income

without a plan or in emergency case) and ranked as milk and milk products (1st), cash income (2nd), Manure (3rd), insurance (4th), meat production (5th), and wealth (6th) in the study district.

Variables		Frequency	Percentage
Sex	Male	46	76.6
	Female	14	23.4
	Total	60	100
Age	15-29	10	16.7
	30-45	42	70
	46-65	8	13.3
	Total	60	100
Education status	Illiterates	20	33.3
	Read and write only	4	6.7
	Primary school	24	40
	Secondary school	10	16.7
	College and above	2	3.3
	Total	60	100
Marital status	Single	5	8.3
	Married	48	80
	Divorced	4	6.7
	widowed	3	5
	Total	60	100

Table 1: The socio-demographic characteristics of households.

Variables		Frequency	Rank
Purpose of keeping dairy cattle	Milk and milk products	60	1st
	Cash income	56	2nd
	Insurance	34	4th
	Manure	46	3rd
	Wealth	24	6th
	Meat production	33	5th

Table 2: Purpose of keeping Dairy Cattle.

Perception of respondents

Out of 60 smallholder dairy farmers 54(90%)) had a perception that local breeds had low milk production than cross and exotic breeds. Likewise, the majority of the respondents (57(95%)) believed that local breeds also had low genetic improvement. On the other hand, exotic breeds (54(90%)) were indicated to have low disease resistance and low adaptation to harsh environmental conditions than cross and local breeds Table 3.

Variable	Breed					
	Local		Cross		Exotic	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Low milk yield	54	90	4	6.7	2	3.3
Low genetic improvement	57	95	2	3.3	1	1.7
Low disease resistance	4	6.7	2	3.3	54	90
Low adaptation to harsh environmental conditions	4	6.7	2	3.3	54	90

Table 3: Perception of the Respondent Concerning the Breeds.

Access to AI service

Access to AI service was summarized in Table 4. Among the farmers who participated in the questionnaire survey, 59 (98.3%) revealed that they don't get consistent and regular AI service in the respective kebele. The availability of regular and consistent AI service was not different in study kebele of the district. The study also revealed that, 57 (95 %) of the respondents do not get mobile AI service while 5% farmers call to AITs home and get AI service.

Variable		Frequency	Percentage
Regular and consistent AI service	Available	1	1.7
	Not available	59	98.3
	Total	60	100
Mobile service	Available	3	5
	Not available	57	95
	Total	100	100

Table 4: Access to AI Service.

Efficiency/achievement of AI service

The associations of the number of cows inseminated and conceivability with different parameters like kebeles of the cow comes to AI service, breed, and management practice, and body conditions of cows were summarized in Table 5. The parameters included in the study did not show a significant variation in the number of cows inseminated and the conception rate of the cow. The management of the cow showed a significant variation in which the higher conception rates of cows were obtained in good management followed by medium management practice.

Parameters	No of cow inseminated and observed	No-of cow conceived	Percentage
Kebele			
Bale	20	6	30
Kanbo	20	8	40
Senget	20	6	30
Total	60	20	33.3
Breeds			
Local	53	17	32
Cross	5	2	40
Exotic	2	1	50
Management			
Good	13	9	69.2
Medium	19	11	57.9
Poor	28	0	0
Body condition square			
Good	12	8	66.7
Medium	20	12	60
Poor	28	0	0

Table 5: Different risk factors and their association with conception rate.

Challenges of AI service

Major constraints of AI service were presented in Figure 1. According to the respondent's response, lack of regular delivery of AI service, lack of input (Liquid nitrogen and semen), and distance to AI center, lack of AI technician, heat detection problem, and grazing land and feed shortage were the major constraints of AI service delivery system in the study area. Among the constraints, respondents prioritized the major and primary constraints of AI service were lack of regular delivery of AI service followed by lack of input (Liquid nitrogen and semen) in the study area. Similarly, according to [11-13] reported that heat detection, AI technicians' efficiency and fertility level of the herd was the most severe problems of AI delivery system. Additional shortage of input for AI activity particularly semen and liquid nitrogen was reported as the constraint of artificial insemination service in the current study, which harms semen quality and reproductive performance of dairy cows. As per the findings of this study, [14-16] also reported that the most common constraints of AI services as AITs (31.3%) and conception failure (18%). They also reported other constraints of AI service like insufficient AI centers, poor awareness among dairy farmers about the AI service, lack of managerial and technical support, and shortage of inputs.

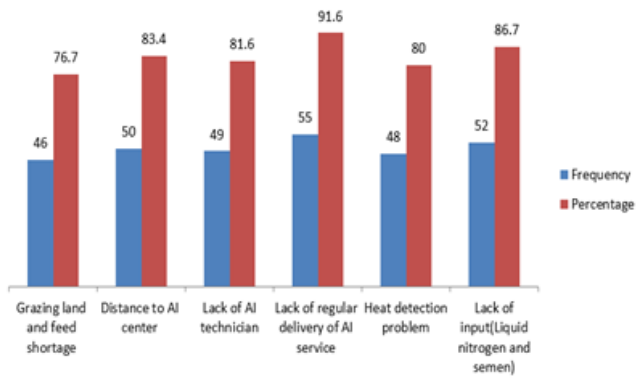

Figure 1: Major constraints of AI delivery service.

Conclusion and Recommendation

Conclusion

Dairy cow plays a significant role for smallholder farmers through the source of milk and milk products for home consumption and market followed by the source of cash income, source of manure to increase soil fertility, insurance purpose (sources of cash income without a plan or in emergency case) in the study district. Generally, the overall observed efficiency of artificial insemination service under smallholder dairy cow's management system in the study area was fairly good. Hence, coverage of the AI service and the ongoing activities to improve and expand the provision of liquid nitrogen and semen with appropriate exotic blood levels at the smallholder level in the area. However, lack of regular delivery of AI service, lack of input (Liquid nitrogen and semen), distance to AI center, lack of AI technician, heat detection problems, and grazing land and feed shortage are identified as major constraints of AI services in the current study.

Recommendation

Based on the above conclusion, the following points were forwarded

- Government should supply the trained AI technician and necessary inputs to improve the AI service delivery
- All stalk holders of livestock production including Government institutions and livestock owners should work together and pro active in solving different constraints of AI services like lack of regular delivery of AI service and long-distance to AI centers to improve the performance of the dairy cow
- Government should provide training to livestock owners and stalk holders on accurate detection estrus time

References

1. Eshetie T (2018) Meat production, consumption and marketing tradeoffs and potentials in Ethiopia and its effect on GDP growth a review. Journal Nutritional Health Food Eng 8: 228-233.
2. BBC History (2015) Robert Bake well (17251795)' BBC Historic Figures.
3. Heinonen M (1989) Artificial Insemination of Cattle in Ethiopia.Ministry of Agriculture, Addis Ababa, Ethiopia. 71-103.
4. Sinishaw W (2005) Study on semen quality and field efficiency of AI bulls kept at the National Artificial Insemination Center. MSc thesis Addis Ababa University Faculty of Veterinary Medicine Debre Zeit.
5. Dekeba A, Ayalew W, Hedge PB, Taddese Z (2006) Performance of the Abernossa Ranch in the production of Ethiopian Boran x Holstein cross bred dairy heifers in Ethiopia. Journal of Anim Prod 6: 33-53.
6. GebreMedhin D (2005) A Practical Guide to Dairy Farming. Agri-Service Ethiopia Printing Unit Addis Ababa 20: 15- 21.
7. Pope G (2000) A cost comparison of AI and natural mating. SARDI, South Australian.
8. Azage T, Gebremedhin B, Hoekstra D (2010) Livestock input supply and service provision in Ethiopia: Challenges and opportunities for market-oriented development.
9. Esera Woreda Finance and Economic Development Office (EWFEDO) (2021) Official document on livestock resource and land condition of the Esera woreda, Dawro zone Southwestern Ethiopia.
10. Engidawork B, Mekasha Y, Kebede K (2013) Evaluation of Artificial Insemination Service Efficiency and Reproductive Performance of Crossbred Dairy Cows in North Shewa Zone, Ethiopia. M.Sc. Thesis, School of Animal and Range Sciences School of Graduate Studies of Haramaya University Haramaya.
11. Damron WS (2000) Introduction to Animal Science Global Biological Social and Industry.
12. Barrett MA, Larkin PJ (1974) Milk and Beef Production in the Tropics. Oxford University Press Ely House London.
13. Morrell JM (2011) Artificial Insemination, Current and Future Trends. Swedish UniversityofAgricultural Sciences, Uppsala, Sweden: In Artificial Insemination in Farm Animals. First Edition 1-14.
14. Ibrahim N, Hailu R, Mohammed A (2014) Assessment of problems associated with artificial insemination service in selected districts of Jimma Zone. J Reprod Infertil 5: 37-44.
15. CSA (2018) Agriculture sample survey Report on crop and livetsock product utilization Private peasant holdings Meher Season. Central Statistical Agency Addis Ababa Ethiopia.
16. CSA (2020) Agricultural Sample Survey Volume II report on livestock and livestock characteristics private peasant holdings. Central Statistical Agency Addis Ababa Ethiopia.

HERALD

Advances In Industrial Biotechnology | ISSN: 2639-5665

Advances In Microbiology Research | ISSN: 2689-694X

Archives Of Surgery And Surgical Education | ISSN: 2689-3126

Archives Of Urology

Archives Of Zoological Studies | ISSN: 2640-7779

Current Trends Medical And Biological Engineering

International Journal Of Case Reports And Therapeutic Studies | ISSN: 2689-310X

Journal Of Addiction & Addictive Disorders | ISSN: 2578-7276

Journal Of Agronomy & Agricultural Science | ISSN: 2689-8292

Journal Of AIDS Clinical Research & STDs | ISSN: 2572-7370

Journal Of Alcoholism Drug Abuse & Substance Dependence | ISSN: 2572-9594

Journal Of Allergy Disorders & Therapy | ISSN: 2470-749X

Journal Of Alternative Complementary & Integrative Medicine | ISSN: 2470-7562

Journal Of Alzheimers & Neurodegenerative Diseases | ISSN: 2572-9608

Journal Of Anesthesia & Clinical Care | ISSN: 2378-8879

Journal Of Angiology & Vascular Surgery | ISSN: 2572-7397

Journal Of Animal Research & Veterinary Science | ISSN: 2639-3751

Journal Of Aquaculture & Fisheries | ISSN: 2576-5523

Journal Of Atmospheric & Earth Sciences | ISSN: 2689-8780

Journal Of Biotech Research & Biochemistry

Journal Of Brain & Neuroscience Research

Journal Of Cancer Biology & Treatment | ISSN: 2470-7546

Journal Of Cardiology Study & Research | ISSN: 2640-768X

Journal Of Cell Biology & Cell Metabolism | ISSN: 2381-1943

Journal Of Clinical Dermatology & Therapy | ISSN: 2378-8771

Journal Of Clinical Immunology & Immunotherapy | ISSN: 2378-8844

Journal Of Clinical Studies & Medical Case Reports | ISSN: 2378-8801

Journal Of Community Medicine & Public Health Care | ISSN: 2381-1978

Journal Of Cytology & Tissue Biology | ISSN: 2378-9107

Journal Of Dairy Research & Technology | ISSN: 2688-9315

Journal Of Dentistry Oral Health & Cosmesis | ISSN: 2473-6783

Journal Of Diabetes & Metabolic Disorders | ISSN: 2381-201X

Journal Of Emergency Medicine Trauma & Surgical Care | ISSN: 2378-8798

Journal Of Environmental Science Current Research | ISSN: 2643-5020

Journal Of Food Science & Nutrition | ISSN: 2470-1076

Journal Of Forensic Legal & Investigative Sciences | ISSN: 2473-733X

Journal Of Gastroenterology & Hepatology Research | ISSN: 2574-2566

Journal Of Genetics & Genomic Sciences | ISSN: 2574-2485

Journal Of Gerontology & Geriatric Medicine | ISSN: 2381-8662

Journal Of Hematology Blood Transfusion & Disorders | ISSN: 2572-2999

Journal Of Hospice & Palliative Medical Care

Journal Of Human Endocrinology | ISSN: 2572-9640

Journal Of Infectious & Non Infectious Diseases | ISSN: 2381-8654

Journal Of Internal Medicine & Primary Healthcare | ISSN: 2574-2493

Journal Of Light & Laser Current Trends

Journal Of Medicine Study & Research | ISSN: 2639-5657

Journal Of Modern Chemical Sciences

Journal Of Nanotechnology Nanomedicine & Nanobiotechnology | ISSN: 2381-2044

Journal Of Neonatology & Clinical Pediatrics | ISSN: 2378-878X

Journal Of Nephrology & Renal Therapy | ISSN: 2473-7313

Journal Of Non Invasive Vascular Investigation | ISSN: 2572-7400

Journal Of Nuclear Medicine Radiology & Radiation Therapy | ISSN: 2572-7419

Journal Of Obesity & Weight Loss | ISSN: 2473-7372

Journal Of Ophthalmology & Clinical Research | ISSN: 2378-8887

Journal Of Orthopedic Research & Physiotherapy | ISSN: 2381-2052

Journal Of Otolaryngology Head & Neck Surgery | ISSN: 2573-010X

Journal Of Pathology Clinical & Medical Research

Journal Of Pharmacology Pharmaceutics & Pharmacovigilance | ISSN: 2639-5649

Journal Of Physical Medicine Rehabilitation & Disabilities | ISSN: 2381-8670

Journal Of Plant Science Current Research | ISSN: 2639-3743

Journal Of Practical & Professional Nursing | ISSN: 2639-5681

Journal Of Protein Research & Bioinformatics

Journal Of Psychiatry Depression & Anxiety | ISSN: 2573-0150

Journal Of Pulmonary Medicine & Respiratory Research | ISSN: 2573-0177

Journal Of Reproductive Medicine Gynaecology & Obstetrics | ISSN: 2574-2574

Journal Of Stem Cells Research Development & Therapy | ISSN: 2381-2060

Journal Of Surgery Current Trends & Innovations | ISSN: 2578-7284

Journal Of Toxicology Current Research | ISSN: 2639-3735

Journal Of Translational Science And Research

Journal Of Vaccines Research & Vaccination | ISSN: 2573-0193

Journal Of Virology & Antivirals

Sports Medicine And Injury Care Journal | ISSN: 2689-8829

Trends In Anatomy & Physiology | ISSN: 2640-7752