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PERFORMANCE ASSESSMENT OF COMMUNITY ARTIFICIAL INSEMINATION TECHNICIANS IN THE EASTERN REGION OF BHUTAN

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ABSTRACT: The study assessed the performance of Community Artificial Insemination Technicians (CAIT) in eastern region of Bhutan. All Gewogs engaging CAIT to deliver Artificial Insemination (AI) Services were sampled along with equivalent number of beneficiaries. Data were collected through face-to-face interview, using semi-structured questionnaire. Results showed that Pemagatshel Dzongkhag had the highest 22 CAITs (27%) out of 83 trained in eastern region. Among 25 CAIT interviewed, 46% are providing active AI services. Most of CAITs providing AI services were youth in their prime age of 18-30 years, with about 56% having secondary school level education. CAITs have supported AI services delivery with 1105 calves born out of 2569 AI performed resulting in calving rate of 43%. The Service per Conception (SPC) was 1.8. The calving rate and SPC is reasonably good in view of precision required in technology application vis a vis limited knowledge of beneficiaries on heat detection for timely AI service. Average inseminations/month and service charge was six and Nu.400 respectively, which however differed significantly among CAITs ($p<0.000$). With gradual transformation of herd structure of beneficiary households in favor of Jersey crossbred cattle (72%), contribution of CAIT towards breed improvement is eminent. This gives reason for about 80% of beneficiaries interviewed to be contended with the AI services received from CAIT. Similarly, over 57% of the CAITs were satisfied with their vocation and wish to continue it. However, income earned from the vocation is reportedly inadequate to meet financial needs. In addition, mobility problem faced, limited provision for equipment storage shed and lack of safety gears were the factors prompting discontinuations of services by other CAITs. Developing an understanding between beneficiaries to remunerate the CAITs adequately could affirm continuity of their services. Further to improve delivery of AI services by CAIT, it is recommended to address mobility problem faced, provide AI gears and other needed facilities. Besides, advocacy to the farmers on AI services and estrus detection, providing timely refresher course to CAITs would enhance efficiency of AI services delivery.

Keywords: Artificial Insemination; beneficiaries' satisfaction; community technician; performance assessment

1. INTRODUCTION

Cattle are predominant livestock reared by most of the rural farmers in Bhutan. Dairy farming is considered as a mainstay of rural farming households as it contributes towards the food security and income. However, dairy farming activities remained at subsistence level adopted by many smallholder farmers for their household consumptions. The government had intervened to up-scale dairy farming for enhanced dairy production through promotion and adoption of various livestock farming technologies and best practices such as Artificial Insemination (AI) to intensify breed improvement program in the country (Tshering and Tamang 2018). AI recognized as the best bio-technological technique for increasing reproductive capacity (Sisay et al. 2017) and it is considered as one of the primary breeding tools for genetic upgradation of cattle globally. The AI program was implemented since 1987 in Bhutan. Currently the services are provided by trained AI technicians through a network of over 130 AI Centers (AICs) established across the country. AI Technicians are multi-tasked requiring to provide various livestock extension services pertaining to animal health and other production related

activities. Hence, providing uninterrupted AI services on demand of the beneficiaries remained a challenge. Thus, to address the issue and to take AI technology closer to farming communities, interested farmers mostly early school leavers were trained on AI and deployed as Community AI Technician (CAIT) since 2010 (Tshering et al. 2016). Preliminary performance assessment of CAIT by the National Dairy Research and Development Centre (NDRDC) revealed that only 48% of CAIT trained is reported to be active, providing AI services with about 4705 inseminations done and 822 progenies born since the start of CAIT training and deployment program (Tshering and Tamang 2018). In eastern region, since its initiation in 2013, 83 CAITs were trained till 2021 (NDRDC 2021), and were deployed across the eastern region. However, limited studies were conducted to assess their performance, the prospects and challenges. Hence a systematic assessment of CAITs has been done to assess the performance and competency of the CAITs and evaluate their services on the breed improvement. The study will also deduce the challenges faced by the CAITs and the ways forwards to improve the services.

2. MATERIALS AND METHODS

2.1 Study area

The study was conducted in eastern region of Bhutan covering six Dzongkhags (Districts) (Mongar, Lhuntse, Trashiyangtse, Trashigang, Pemagatshel, and Samdrupjongkhar) from August 2021 to April 2022. All the gewogs (sub-districts) in six Dzongkhags that had AI facilities were included in the study

2.2 Sampling method and data collection

Following purposive sampling method, 25 CAITs and 125 beneficiaries were sampled from the areas deployed with the trained CAITs in the six Dzongkhags of eastern Bhutan. The data was collected using pre-tested semi-structured questionnaire from CAIT and AI service beneficiaries. The primary data was collected from CAIT and farmer-beneficiaries of the AI services through face-to-face interview guided by the designed questionnaires. The information obtained was validated from the extension staff with the guided questions. Retrospective data on CAIT training was retrieved from Regional Livestock Development Center (RLDC), Dzonkghags and NDRDC.

2.3 Data Analysis

The primary data obtained from the field was processed in Microsoft Excel and analyzed using Statistical Package for Social Science (SPSS) version 20. One-way ANOVA, Chi-square test and one sample T-Test were used to analyze the data, interpreted and inference made wherever applied.

3. RESULTS AND DISCUSSION

3.1 CAIT training in eastern region

Training of CAITs in eastern region was first initiated in 2013 by NDRDC, Yusipang with four Technicians trained at Rural Development Training Centre (RDTC), Zhemgang. The retrospective data obtained from RLDC, Kanglung and NDRDC, Yusipang reported 83 CAITs trained in eastern region until 2021. Highest percentage (27%) of CAITs were trained from Pemagatshel and lowest (7%) from Lhuentse. The number of CAITs trained under eastern region is presented in the Figure 1.

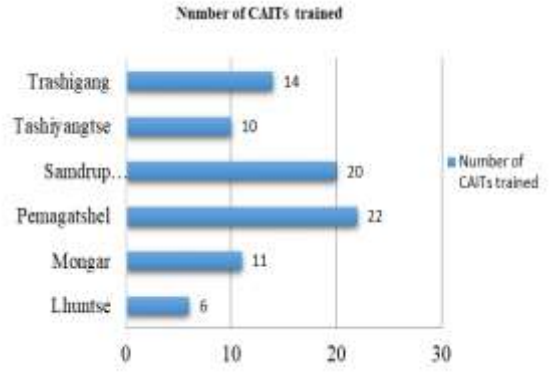

Figure 1: No. of CAIT trained in eastern region

3.2 Status of CAIT in the region

The review of the CAITs done in the field (in 2021) revealed 46% of the CAITs being active (functional) and rendering the service to the farmers. However, 42% of the CAITs are not active and they have discontinued providing AI services due to various reasons like low income, mobility problem and inadequate AI gears. Twelve percent of the CAITs were not provided with the AI inputs and are not rendering the service.

3.3 Socio-demographic characteristics of CAIT and beneficiaries

Among 125 CAIT beneficiaries interviewed, 54% of the beneficiaries were male, of which majority was >40 years of age (64%) and illiterate (48%). Among the CAITs interviewed, majority of them were male (96%). Most (40%) CAITs were youth in thethe age group of 18 - 30 years, while 36% and 24% were between 31- 40 and >40 years old, respectively. Maximum CAITs had secondary school level education (56%) (Table 1).

3.4 Performances and competency of AI services delivery by CAITs

Table 1: Socio-demographic information of the study participants

		Community AI Technicians		CAIT Beneficiaries	
Variables	Category	Frequency	Percent	Frequency	Percent
Age	18 – 30	10	40	10	8.0
	31 – 40	9	36	35	28
	> 40	6	24	80	64
Gender	Female	1	4.0	58	46.4
	Male	24	96.0	67	53.6
Education Level	Graduate	2	8.0	2	1.6
	Illiterate	6	24.0	48	38.4
	Non-Formal Education (NFE)	3	12.0	37	29.6
	Primary school	0	0	22	17.6
	Secondary school	14	56.0	16	12.8

3.4.1 AI done and calving rate

AI done and calving rate for three progressive years (2017 to 2021) were assessed to evaluate the performance and competency of CAIT in terms of efficiency in AI services delivery. The result of the survey is presented in (Table 2).

The study revealed an overall calving rate of 43% (1105 calves born from 2569 numbers of AI performed by the sampled CAITs). Collecting information on conception and calving however had various challenges. Time constraint was one of the major factors reported by CAITs to follow-up and collect information on the outcome of AI services provided. Nevertheless, calving rate of 43% is higher than national average calving rate of 37% in Bhutan (NDRDC, 2021) which shows that CAITs are competent on AI technology application. Further the calving rate is higher than the findings of Gebregiorgis, et al., (2016) who reported 37% in Tigray region, Ethiopia. Statistically (ANOVA), result suggests significant difference among CAITs on number of AI done ($p<.000$), number of progenies calved ($p<.001$) and calving rate ($p<.001$).

3.4.2 AI per month, Service per Conception and service charge

One Sample T-Test was done to assess the difference in the Service per conception (SPC), frequency of AI done per month, and service charge availed for the insemination among the CAITs in the sampled area. The descriptive statistics showed average SPC of 1.8, average inseminations of six per month and average service charge of Nu. 400. The result revealed significant difference among CAITs on number of AI done per month ($t(24) = 7.5$, $p<.000$) and service charge availed per insemination ($t(24) = 8.9$, $p<.000$). However, there was no significant difference in SPC ($t(24) = 12.7$, $p > .05$) among the CAITs (Table 3). The highest SPC reported was four per conception.

The high SPC result is associated with inadequacy on detection of estrus sign (heat) in animals on time vis a vis mismatch of timing of insemination. The SPC reported in this study is less favorable than the findings of Ali et al. (2013) who reported SPC of 1.55 but was better compared to result reported by Kinyua (2016) with SPC of 1.9. The highest insemination service charge reported is Nu.1000 per service.

Table 2: Number of cows inseminated and calved within the sampled area**.**

CAITs	N	Cow inseminated	Progeny calved	Calving Rate (%)
		Mean ± SE	Mean ± SE	Mean ± SE
Menbi	3	47.7 ± 11.1	8.3 ± 5.2	14.0 ± 7.7
Minjey	3	19.7 ± 5.0	12.3 ± 3.2	62.4 ± 2.4
Ngatsang	3	64.3 ± 11.5	37.3 ± 5.8	59.3 ± 5.9
Themnangbi	3	82.3 ± 31.6	32.7 ± 13.6	40.3 ± 7.9
Saling	3	28.3 ± 4.1	7.7 ± 1.2	28.5 ± 6.1
Nganglam	3	77.3 ± 8.5	19.7 ± 6.1	24.3 ± 5.1
Zobel	3	22.0 ± 12.9	2.3 ± 1.2	9.5 ± 5.8
Khar	3	18.7 ± 1.8	13.0 ± 2.1	69.6 ± 9.9
Nanong	3	98.3 ± 98.3	44.7 ± 12.7	43.7 ± 4.1
Orong	3	10.3 ± 10.3	5.0 ± 1.5	47.5 ± 12.6
Gomdar	3	25.7 ± 25.7	2.7 ± 1.5	11.2 ± 7.8
Deothang-Reekhey	3	60.3 ± 10.6	26.0 ± 3.2	43.9 ± 3.4
Deothang-Martang	3	21.3 ± 9.8	6.3 ± 2.9	27.7 ± 7.8
Samkhar	3	101.3 ± 20.1	43.3 ± 10.7	41.9 ± 5.4
Radi	3	35.0 ± 11.5	9.7 ± 4.5	23.4 ± 8.5
Shongphu	3	10.0 ± 1.2	1.7 ± 0.3	17.8 ± 4.9
Yangneer	3	116.0 ± 32.0	90.0 ± 46.3	61.2 ± 30.7
Trashiyangtse	3	17.7 ± 9.1	3.0 ± 1.5	15.7 ± 10.5

However, most of the CAITs reported that they do not receive the service charge on time, which has demotivated the CAITs in taking up the job with greater vigor.

3.4.3 Beneficiaries' satisfaction on competency of CAIT on AI services delivery

Among AI beneficiaries, 58% were satisfied, 43% were moderately satisfied and 20% were not satisfied with the AI services provided by CAIT. Chi square test revealed that level of satisfaction on AI services availed differed significantly among beneficiaries of different Dzongkhags ($p<.05$) (Table 4). The inadequate knowledge of the farmer beneficiary on detection of estrus could have led to poor conception rates, which could have discouraged farmers towards availing AI service. The mobility problems faced by CAITs perhaps delayed the AI service timing, which extends the calving-to-calving intervals. These factors may have compelled farmers to resort to natural services from breeding bull which was availed by 25% of the beneficiaries.

3.5 Herd structure and effectiveness of AI Technology dissemination on dairy breed improvement

Assessment of herd structure of beneficiary households revealed that maximum number of animals reared were Jersey Crossbred category (72%) followed by Holstein Friesian and Local cattle. This is indicative of rising awareness of the beneficiaries on the importance of AI Technology adoption for dairy breed improvement. CAITs involved thus have contributed to transfer the AI technology via

Table 3: Service per conception, AI/month; and Service Charge

Variables	N	Mean ± SE	P value
Number of AI service in a month	25	6.0 ± 0.79	*
SPC	25	1.8 ± 0.14	**
AI Service Charge	25	400 ±0.44	*

*Significant difference observed within CAITs ($P < .05$) ** Not significant ($p > .05$)

insemination of cows/heifers with quality frozen semen.

Average milk production reported from each household was 9.3 liters/day, with maximum of 40 liters and minimum of 2 liters/day. There was significant difference in the milk production among different households ($p<.05$). Over 1105 calves born from AI services provided by CAIT in the last three years could have contributed to change of herd structure and subsequently total milk production at the household level. From the above total number of calves born and expected mortality rate of 5%, effective number of calves survived was 1050. With 50% female birth from conventional semen, 525 females will join the herd. Considering the average milk production of 7.8 liters (cow^{-1} day^{-1}) in exotic crossbred cattle population (Rai et al. 2020), when all surviving females are in productive stage, 1249MT milk can be produced per year (305 days in milk), generating gross return of 49.96M to beneficiaries per annum (milk price of Nu.40 L^{-1}). Thus, the positive impact of the AI Technology transfer on dairy breed improvement is observed with resultant trickledown effect on increased milk production and income generation by beneficiary farming households foreseen.

3.6 CAITs' perception and opinion toward their profession/vocation

The study revealed no significant difference ($p>0.05$) among the CAITs on their perception towards their profession (Table 7). Over 57% of the CAITs were satisfied with their profession/vocation while 43% were not happy with it. The lack of facilities such as AI structure (AI crates, and AI can storage facilities), mobility problems and lack of AI gears/extension kits could have led to dissatisfaction of the 43% CAITs towards their own profession. Besides, most of the CAIT also reported that the income from the AI service is minimal and inadequate to meet their financial needs (67%), which may lead to change in perception and opinion towards their profession/ vocation.

Table 4: AI beneficiaries' satisfaction assessment on overall AI service

Satisfaction	Dzongkhags						
	Lhuntse (%) (n=10)	Mongar (%) (n=15)	P/gatshel (%) (n=20)	S/jongkhar (%) (n=25)	T/gang (%) (n=30)	T/yangtse (%) (n=25)	Total
Poor	0	0	0	36	13	44	24
Good	30	67	30	16	43	28	43
Very good	70	33	70	48	43	28	58

Table 5: Assessment of CAITs perception towards their profession

Perceptions	Frequency	Percent
Overall feelings of being CAIT		
Feeling worthy	17	56.7
Not feeling worthy	13	43.3
Income from AI service address financial needs?		
Yes	10	33.3
No	20	66.7

3.7 Challenges and a way forward for effective AI service delivery by CAIT

Major challenges and solution to enhance the efficiency of CAITs is presented in Table 6: The major challenges reported are mobility issue, scatter and distance settlement from AI facilities, lack of AI gears, and limited knowledge or awareness of farmers on estrus detection.

Table 6: CAITs views on challenges faced and suggestions towards improvement of AI service delivery

Variables	N	No of respondents	% Respondents
Problems faced by CAITs			
Facing mobility problem to give services on time	30	30	100
Liquid Nitrogen not available on time	30	14	47
Semen not available on time	30	2	7
Estrous detection problem	30	22	73
Conception failure	30	21	70
Means to improve the AI services			
Providing important AI gears to Technicians	30	30	100
Awareness creation to farmers on AI services	30	28	93
Providing AI refresher course to CAITs frequently	30	21	70
Increasing numbers of CAITs	30	5	17
Construction of proper AI shed	30	30	100
Providing mobility bike for CAITs	30	30	100
Providing additional incentives from the government	30	23	77

CAITs engagement in AI services delivery is appreciated and more training of deployment of CAITs in the field is expressed. provided by the CAITs. Providing incentives such as AI gears, proper AI equipment storage shed, mobility facilities (if possible) and adequate remuneration for AI services by the beneficiaries are likely to motivate CAIT to perform better. Farmers especially in peri-urban areas and members of dairy groups and cooperatives with better income from dairy farming business are willing to adequately compensate for AI services provided.

4. CONCLUSIONS & RECOMMENDATION

The study concludes that engagement of youth as Community AI Technicians is promising as most of the CAIT service providers are mostly in the age group of 18-30 years. However, most of the CAITs had discontinued providing AI services owing to multiple factors, which includes less income from services provided, limited mobility facilities and lack of other incentives. Nevertheless, CAITs have complemented AI services delivery and, without doubt with the progenies calved with their services in beneficiaries' herds had proven them to be competent in bringing about gradual changes in dairy herd structure of rural households. Majority of the beneficiaries were satisfied with the AI services provided by CAITs and suggest that their services have to be strengthened and continued. Some of the possible recommendations to improve AI service delivery by the CAITs are to ensure adequate/timely payment of services fee by the beneficiaries; incentivization of CAITs by the government through provision of AI gears including mobility on cost sharing basis (motor bikes), proper sheds to store/ house AI equipment are imperative. Further, awareness must be created amongst the farmers on the benefits of AI, and capacity must be enhanced on estrus detection. In addition, the capacity development of CAITs must be a continuous process vide provision of timely refresher course to refresh and upgrade their skill, which in turn would enhance AI efficiency and in parallel accelerate dairy development in the country.

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REFERENCES

Alazar WB. (2015). Assessment of problem assocoated with artificial insemination service on dairy cattle in Debretabourtown, Ethiopia. Journal of reproduction and infertility, 6(2), 48-55.

Ali T, Lemma A, and Yilma T. (2013). Reproductive performance of dairy cows under artificial insemination in south and northwest part of Ethiopia. Livestock research for rural development, 25(12):191.

Gebregiorgis A, Alemselem B, Tadesse G, Pema L, Karma D, and Sonam P. (2016). Status of artificial insemination in Tigray Regional State. Journal of Dairy Veterinary and Animal Research, 3(3):00078.

Kinyua J. (2016). Evaluation of artificial insemination service performance in a small holder dairy herd under extensive management. Weber agriculture research and management, 2(191).

NDRDC. (2021). Annual centre report July 2020-June 2021. Department of Livestock. Yusipang: National Dairy Research and Development Centre.

NDRDC. (2021). Technical report on CAIT trained in Bhutan (unpublished). Yusipang: National Dairy Research and Development Center.

Rai DB, Tamang NB, and Koirala AN. (2020). Breed improvement, milk production and socio-economic benefits of CHBPP in western and western central region. Bhutan journal of Animal science, 4(1), 90-97.

Sisay W, Tamene D, Worku G, Kidanu D, Getahun B, and Nuraddis I. (2017). Evaluation of Artificial Insemination effifiency in and around Ejere District, Western Shoa Zone, Ethiopia. Journal of reproduction and infertility, 8(3).

Tadesse B. (2010). Calf sex ratios in artificial insemination and natural mated female cross bredd dairy herd. Proceedings of the 13th annual conference of the Ethiopia Society of animals production Addis Ababa Ethiopia, (p. 227).

Tshering L, and Tamang NB. (2018). Decades of artificial insemination: Bittersweet experience on cattle breeding in Bhutan. Bhutan journal of animal science, 2(1), 1-6.

Tshering L, Rai DB, and Dorji. (2016). Improving reproducitve efficiency of non cycling cows through estrus synchronization. Yusipang: National Dairy Research Center.

Tshering L, Rai DB, and Dorji. (2016). Improving reproductive efficiency of non-cycling cows through estrous synchronization. Yusipang: National Dairy Research Centre.