



The Characteristics of Farmers and Inseminators towards the Success of Artificial Insemination (AI) in Beef Cattle in Dompu Regency, Indonesia

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Abstract

This study aims to evaluate the role of human resource characteristics and technical performance in the success of the Artificial Insemination (AI) program in Dompu Regency, a primary beef cattle hub in Indonesia. A descriptive-quantitative approach was employed, involving 96 smallholder farmers selected through purposive sampling and 5 expert respondents representing the Pentahelix sectors. Data were collected through structured interviews and field observations from December 2025 to February 2026. The results indicate that while 100% of both farmers and inseminators are in the productive age range (31–40 years), a significant educational gap exists, with 48.96% of farmers having minimal formal education compared to 100% university-graduated inseminators. Technical performance analysis revealed moderate success rates, with a Service per Conception (S/C) of 1.81 and a Conception Rate (CR) of 44.81%. A high Non-Return Rate (NRR) of 70% contrasted with a low CR suggests challenges in heat detection, contributing to an extended Calving Interval (CI) of 14.8 months. The study concludes that while technical expertise is professionally certified (100%), the program's efficiency is hindered by the communication gap and farmer-level management. Strengthening Pentahelix synergy and simplifying field-level education are essential to optimize reproductive outcomes and the regional economy.

Keywords: Artificial Insemination, Beef Cattle, Dompu Regency, Farmer Characteristics, Inseminator.

Introduction

Beef serves as a primary contributor to fulfilling human nutritional needs, particularly as a crucial source of animal protein essential for enhancing a nation's human resource quality. In Indonesia, the dynamics of animal protein demand continue to escalate alongside a population growth that reached 281,603,800 people in 2024, with a growth rate of 1.1% (1). However, this phenomenon creates a major challenge as the surge in consumption is not balanced by the availability of the domestic beef cattle population, creating a significant gap between national supply and demand.

Dompu Regency in West Nusa Tenggara Province possesses a strategic comparative advantage in the livestock sub-sector, ranking third in provincial population figures with 188,160 cattle, contributing 14.41% of the total regional population (2). To optimize this potential, the government relies on Artificial Insemination (AI) technology as a primary pillar for accelerating genetic quality and productivity. AI technology functions not only as a tool for population growth but also as a

method for cost efficiency in bull maintenance and the implementation of animal welfare principles by reducing the risk of injury to livestock (3). Despite the vast development potential in Dompu, the effectiveness of the AI program in the field still faces technical and management obstacles. Data indicates there were 30,147 AI acceptors in Dompu Regency in 2023, yet the success rate remains stagnant at the national average of 65% (4). This achievement is below the optimal national AI success standard, which is targeted to exceed 70% (5). This low reproductive efficiency is often caused by a lack of synchronization between technical factors and human factors.

The success of an AI program is the result of a complex interaction between semen quality, livestock condition, and the roles of human resources, namely farmers and inseminators (6). Farmers play a crucial role in accurate estrus detection and the provision of pre-insemination nutrition (*flushing*), while inseminators are the technical spearhead in semen deposition procedures (7). Individual characteristics such as education level, experience, and work motivation



significantly influence how this technology is adopted and implemented at the smallholder farming level (8). Given that AI success determinants are site-specific, an in-depth study regarding the characteristics of farmers and inseminators in Dompu Regency is imperative. This research is urgently required to identify internal and external barriers and to formulate strategies for strengthening human resource capacity. The results of this study are expected to provide a policy foundation for stakeholders to increase AI success percentages, ensuring food sovereignty in the beef cattle sector in Dompu Regency.

Material and Methods

Study Area

The study was conducted in Dompu Regency, West Nusa Tenggara (NTB) Province, Indonesia, from December 2025 to February 2026. Geographically, Dompu is located between 117°30' - 118°30' E and 8°06' - 9°05' S, covering 2,324.60 km² with a population of 254,667 in 2024 (2). The regency is bordered by the Flores Sea and Bima Regency to the north, Bima Regency to the east, the Indian Ocean to the south, and Sumbawa Regency and Saleh Bay to the west. The region's topography is dominated by hills (49.97% with >15% slope) and flatlands (18.48%). The synergy between corn production on flatlands and cattle grazing in hilly areas makes Dompu a strategic beef cattle hub in NTB Province.

Research Design and Respondents

This study utilized a descriptive-quantitative approach with a case study design. The population consisted of smallholder beef cattle farmers who are active participants in the Artificial Insemination (AI) program. A sample of 96 farmers was selected using a purposive sampling technique, focusing on those owning productive-age cows as AI acceptors. To provide a comprehensive strategic perspective, five (5) expert respondents were selected using a Pentahelix approach, representing the government (1), academics (2), senior inseminator as a field practitioner (1), and a business actor from the cattle breeding industry (1).

Data Collection and Variables

Primary data were gathered through field observations and structured in-depth interviews using a pre-validated questionnaire. The research parameters focused on:

1. Farmer Characteristics: Age, formal education level, and farming experience duration (8).
2. Expert Perspectives: Evaluation of AI program implementation, technical constraints, and strategic development from regulatory, scientific, and business viewpoints.

Secondary data, including geographical profiles and AI achievement statistics, were retrieved from the Central Bureau of Statistics (BPS) and the Department of Livestock and Animal Health of Dompu Regency (2), (9).

Statistical Analysis

Data were subjected to descriptive statistical analysis. Profiles and expert insights were categorized and presented using frequency distributions and percentages to identify the

correlation between human resource characteristics and AI success in the region (10).

Result and Discussion

Human Resource Characteristics

The demographic and professional profiles of farmers and inseminators in Dompu Regency are critical determinants of the Artificial Insemination (AI) program's performance. The socio-economic characteristics are summarized in Table 1.

Table 1: Socio-demographic characteristics of farmers and inseminators

No	Human Resource Characteristics	Farmer		Inseminator	
		n = 96	%	n = 8	%
1.	Age (Years):				
	15 – 30	16	16.66	2	25
	31 – 40	43	44.80	4	50
	41 – 60	37	38.54	2	25
2.	Formal Education:				
	No Schooling	18	18.75	-	-
	Primary School	29	30.21	-	-
	Junior High School	19	19.80	-	-
	Senior High School	20	20.83	-	-
	Bachelor's	10	10.41	8	100
3.	Non-Formal Education:				
	Socialization	96	100	-	-
	Certification	-	-	8	100
4.	AI Experience:				
	1 – 4 years	44	45.83	1	12.5
	5 – 6 years	18	18.75	2	25
	>7 years	14	14.59	5	62.5
5.	Livestock Scale:				
	1 – 3 head	14	14.59	-	-
	4 -7 head	60	62.50	-	-
	8 – 10 head	16	16.66	-	-
	>10 head	6	6.25	-	-

Table 2: Artificial Insemination (AI) Success Parameters in Dompu Regency

No.	Reproductive Parameter	Result	Category
1.	Service per Conception (S/C)	1.81	Moderate
2.	Conception Rate	44.81%	Moderate

(CR)		
3. Non-Return Rate (NRR)	70%	Good
4. Calving Interval (CI)	14.8 Months	Less Ideal

As shown in Table 2, the S/C rate of 1.81 and CR of 44.81% reflect a moderate success level. However, the contrast between a good NRR (70%) and a moderate CR suggests issues with early pregnancy detection or "silent heat" cases. This directly impacts the Calving Interval (14.8 months), which stays above the ideal 12-month target, thereby reducing the annual economic turnover for farmers in Dompu (5), (11).

Human Resource Dynamics and Technology Adoption The findings in this study indicate a unique demographic synergy in Dompu Regency. The dominance of the productive age group (31–40 years) among both farmers (44.80%) and inseminators (50.00%) is a strategic asset for the sustainability of the Artificial Insemination (AI) program. Individuals in this age range typically possess the physical stamina required for the intensive management of cattle in Dompu's hilly terrains and are more psychologically receptive to technological innovations compared to older generations (8). However, a significant "knowledge gap" exists due to the disparity in formal education. The fact that 100% of inseminators are university graduates while 48.9% of farmers have either no formal schooling or only primary education creates a communication challenge. High-level technical concepts regarding reproductive physiology must be translated into practical, local terms to ensure farmers can accurately identify estrus signs. Despite this, the 100% socialization rate for farmers indicates a strong "social capital" and high enthusiasm for the program, which compensates for the lack of formal education (10), (12). A critical paradox is observed between the Non-Return Rate (NRR) of 70% and the CR of 44.81%. A high NRR usually suggests success, but when paired with a low CR, it indicates "Silent Heat" or, more likely, the farmers' inability to detect a return to estrus after a failed first insemination. This gap suggests that farmers may assume a cow is pregnant simply because it does not show obvious signs of heat, leading to delayed re-insemination.

Impact on Economic Productivity

The ultimate consequence of these human and technical factors is the Calving Interval (CI) of 14.8 months. This

exceeds the ideal biological target of 12 months (one calf per year). In a beef cattle breeding system, a delay of 2.8 months beyond the ideal CI represents a significant economic loss, as it increases the maintenance cost without increasing the calf crop output (13). Pentahelix perspective suggests that the maturity of inseminators (62.5% with >7 years experience) is the primary factor keeping the S/C from escalating further. However, to bridge the CI gap, a more synchronized "early warning system" between the experienced farmers and the certified inseminators is required. The professional legal status (100% certification) of the inseminators in Dompu should be leveraged not just for technical injection, but for more intensive field-level education for the farmers (9), (14).

Conclusion

The success of Artificial Insemination in Dompu Regency relies on synchronizing inseminator expertise with farmer capacity. Despite a productive workforce, the 14.8-month calving interval necessitates simplified education to bridge the farmer education gap. Optimizing human factors through Pentahelix synergy is vital to transform moderate reproductive results into sustainable economic advantages for the regional cattle industry.

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