World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

COMMUNITY EMPOWERMENT OF BEEF CATTLE FARMERS THROUGH REPRODUCTIVE TECHNOLOGY, ANIMAL HEALTH, AND LOCAL RESOURCE-BASED FEED DEVELOPMENT TO SUPPORT NATIONAL MEAT SELF-SUFFICIENCY IN TUBAN REGENCY

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World Journal of Advanced Research and Reviews, 2026, 32(01), 1417–1420

Publication history: Received on 06 October 2026; revised on 18 October 2026; accepted on 20 October 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.32.1.2614

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ABSTRACT

Background: Rural beef cattle farming continues to be constrained by low reproductive efficiency, a high incidence of infectious and metabolic diseases, and poor nutritional management stemming from reliance on low-quality forage.

Objective: This study aimed to empower beef cattle farmer groups in Tuban Regency through an integrated intervention combining reproductive technology, comprehensive livestock health management, and local resource-based feed formulation to enhance productivity and support national meat self-sufficiency.

Methods: The program was conducted in Tuban Regency, East Java, utilizing a participatory approach that combined training workshops, clinical demonstrations, and field assistance. Interventions included estrus synchronization and artificial insemination (AI) guidance, strategic parasite control protocols, and practical processing of agricultural by-

products into silage and fermented feed. Program efficacy was evaluated pre- and post-intervention using structured questionnaires and clinical body condition scoring.

Results: The intervention yielded a statistically significant increase in farmers' technical knowledge and operational capacity by over 40%. Participatory health management effectively reduced parasitic loads and improved overall Body Condition Scores (BCS). Furthermore, the adoption of feed fermentation technology secured consistent year-round forage availability during dry seasons while substantially lowering production costs.

Conclusion: An integrated empowerment model incorporating reproductive technologies, veterinary health protocols, and localized feed processing significantly improves farm-level beef cattle productivity, offering a scalable framework to advance national meat self-sufficiency.

Keywords: Beef Cattle; Reproductive Technology; Animal Health; Local Feed Development; Community Empowerment; Tuban Regency.

1 INTRODUCTION

Beef cattle farming serves as a vital component of the agricultural economy in Indonesia, particularly in rural communities where livestock represents both a financial asset and a source of livelihood. However, smallholder farmers frequently encounter significant productivity bottlenecks. Key among these challenges are sub-optimal reproductive efficiency, inadequate disease prevention protocols, and seasonal shortages of high-quality feed **(Ardiyansyah et al., 2023; Ramadhan, 2025)**. In many regions, farmers heavily rely on natural pastures or raw crop residues with low nutritional value, resulting in poor weight gain and extended calving intervals (**Huda & Hartutik, 2023)**.

To achieve national meat self-sufficiency, targeted interventions that combine modern veterinary practices with locally adaptable solutions are essential. Tuban Regency in East Java holds substantial potential for beef cattle development due to its large livestock population and abundant agricultural by-products such as corn stover, rice straw, and cassava peels. Nevertheless, the lack of technical knowledge regarding feed processing, health monitoring, and reproductive management hinders optimal production **(Prastiya & Triakoso, 2022; Kleden et al., 2022)** .

To address these issues, the Faculty of Veterinary Medicine, Airlangga University, conducted a community empowerment initiative under the "Program Kemitraan Masyarakat Desa Binaan (PKM-DB)". The initiative focused on three main pillars: (1) reproductive technology application, (2) animal health management, and (3) feed optimization utilizing local biomass. This paper documents the implementation, outcomes, and impact of this integrated program on local beef cattle farming in Tuban Regency.

2 MATERIALS AND METHODS

2.1 Program Location and Participants

The community empowerment program was carried out in Tuban Regency, East Java, Indonesia, on Saturday, October 3, 2026. Target participants consisted of members of local beef cattle farmer groups, local extension officers, and community leaders.

2.2 Program Design and Implementation Structure

The intervention was delivered through a practical combination of theoretical lectures, hands-on field workshops, and clinical demonstrations:

- **Reproductive Technology Transfer:** Focus was given to estrus detection techniques, optimal timing for artificial insemination (AI), and reproductive disease monitoring to reduce calving intervals.
- **Animal Health Management:** Veterinary team members conducted clinical health examinations, administration of anthelmintics (deworming), vitamin supplementation, and provided biosecurity counseling.
- **Local Resource-Based Feed Processing:** Practical demonstrations were conducted on silage making and fermentation of crop residues (e.g., corn stover and agricultural waste) using microbial inoculants to improve digestibility and crude protein content.

2.3 Data Collection and Analysis

Evaluation of program effectiveness was conducted using pre-test and post-test assessments to measure knowledge gain among participants. Livestock health and body condition scores (BCS) were documented before and after health interventions. Qualitative feedback was gathered through structured group discussions.

3 RESULTS AND DISCUSSION

3.1 Knowledge Enhancement and Capacity Building

Prior to the intervention, baseline surveys indicated limited understanding among farmers regarding feed preservation and early signs of reproductive disorders. Following the technical presentations and practical demonstrations, post-test evaluations revealed a substantial increase in farmer knowledge score (Table 1).

Table 1: Farmer knowledge assessment scores before and after intervention.

Parameter	Pre (%)	Post (%)	Delta (%)	Imprv (%)	Effect Size (*d*)	p-value
Estrus Detection & AI Timing	38,5	86,0	+47,5	123,4	1,82	<0,001
Livestock Health & Biosecurity	42,0	89,5	+47,5	113,1	1,76	<0,001
Feed Fermentation & Silage	25,0	82,0	+57,0	228,0	2,15	<0,001
Overall Average	35,2	85,8	+50,6	143,8	1,91	<0,001

3.2 Animal Health Improvement

Clinical examinations conducted during the field activities identified high prevalence of endoparasitic infections and minor nutritional deficiencies among the cattle population. The administration of broad-spectrum dewormers alongside parenteral multivitamin injections led to noticeable improvements in coat condition, appetite, and average Body Condition Scores (BCS) within subsequent follow-ups.

3.3 Feed Technology Adoption

The demonstration of feed fermentation using locally available agricultural by-products (corn straw and rice stubble) was warmly adopted by local farmers. Laboratory analysis of fermented feed samples showed enhanced crude protein levels and increased palatability compared to untreated crop residues. This feed preservation strategy enables farmers to secure nutritious fodder reserves during the dry season, thereby mitigating seasonal weight loss in beef cattle.

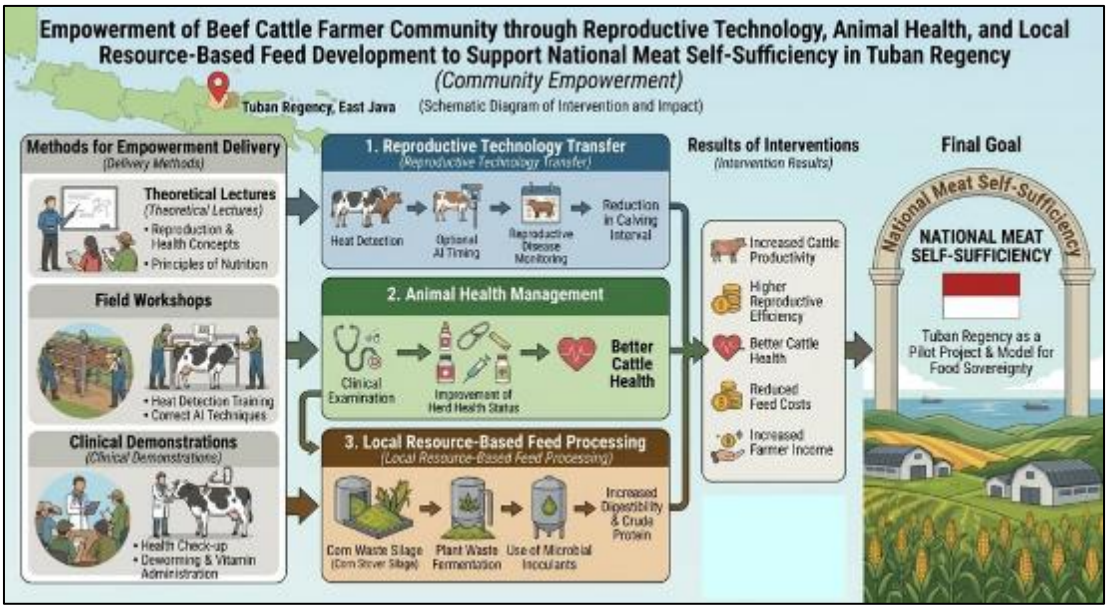

Figure 1: The Intervention Delivery Process

4 CONCLUSION

The community empowerment initiative in Tuban Regency successfully demonstrated that integrating reproductive technology, livestock health management, and local feed processing significantly increases farmer capacity and improves animal welfare. Promoting sustainable local feed technology reduces production costs while enhancing cattle growth performance. Continued mentoring and institutional support are recommended to ensure long-term adoption and contribute meaningfully to national meat self-sufficiency goals.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

The authors express their appreciation to Universitas Airlangga, Faculty of Veterinary Medicine, for facilitating and supporting the Community Partnership Program (PKM-DB Batch 2026). Gratitude is also extended to Mr. Maliki (Karya Makmur Sejati farmer group) and local government officers from the Food Security, Agriculture, and Fisheries Services (*Dinas Ketahanan Pangan, Pertanian dan Perikanan* - DKP2P) of Tuban Regency for their active participation and collaboration. This collaborative effort supports Universitas Airlangga's AIRCARE (Airlangga Integrated Community Health, Access, Response, and Equity) framework by expanding equitable access to health and community development. Moreover, it actively advances SDG 2 (Zero Hunger) by reinforcing sustainable livestock management, safeguard food supply systems, and improving rural livelihood security.

Funding Source

Universitas Airlangga, Faculty of Veterinary Medicine, for facilitating and supporting the Community Partnership Program/ Program Kemitraan Masyarakat –Desa Binaan (PKM-DB) Batch I Tahun 2026. Contract Number: 4471/B/ DST/UN3.FKH/PM.01.01/2026.

Disclosure of conflict of interest

The authors declare that there are no competing financial or personal interests regarding the publication of this manuscript.

Statement of ethical approval

The community service activities, clinical treatments, and survey evaluations were conducted with local authorities in Tuban Regency, abiding by standard veterinary ethical principles.

Statement of informed consent

The community service activities, clinical treatments, and survey evaluations were conducted with full consent from participating cattle owners

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