Journal of Medical, Clinical and Surgical Case Reports

Case Study

WRJMCSCR-26-022

Strategic Management Mapping and Reproduction Optimization for Artificial Insemination Success in Cattle Breeding: A Case Study in Dompu Regency, Indonesia

Al Fatih Sakti Atmaza*

Master's Program in Animal Science, Udayana University, Bali, Indonesia

***Correspondence:** Al Fatih Sakti Atmaza, Master's Program in Animal Science, Udayana University, Bali, Indonesia; E-mail: sakti.atmaza.003@student.unud.ac.id; DOI: https://doi.org/10.56147/jmcscr.2.1.22

Citation: Atmaza AFS (2026) Strategic Management Mapping and Reproduction Optimization for Artificial Insemination Success in Cattle Breeding: A Case Study in Dompu Regency, Indonesia. J Med Clin Surg Case Reports 2: 22.

Abstract

Artificial Insemination (AI) success rates in tropical smallholder cattle farms are highly variable and frequently bottlenecked by localized technical and socio-economic management issues. This study analyzed the internal and external strategic determinants influencing AI operational dynamics, established the systemic positioning of AI services and developed comprehensive reproductive management priorities for breeding farms in Dompu Regency, Indonesia. Using a case study framework from December 2025 to February 2026, data were gathered from 101 respondents (96 smallholder recipient farmers and a 5 expert Pentahelix panel). Strategic positioning was quantified *via* Internal Factor Evaluation (IFE), External Factor Evaluation (EFE) and Internal-External (IE) matrix modeling, while specific strategic alignments were extracted through SWOT and prioritized using the Quantitative Strategic Planning Matrix (QSPM). The quantitative evaluation revealed a total IFE score of 2.61 and an EFE score of 2.76, strictly locating the region's AI ecosystem within Cell V (hold and maintain) of the IE matrix. Critical functional weaknesses included deficient nutritional flushing regimens and compromised estrus recording protocols, while seasonal crop residual availability (corn straw biomass) represented a substantial external opportunity. QSPM analysis prioritized 12 strategic pathways, designating localized self-reliance in tools and raw infrastructure, specifically stabilizing liquid Nitrogen (N2) cold chain logistics as the paramount intervention (Total Attractive Score: 2.88).

Keywords: Artificial insemination; Breeding cattle; Priority strategy; SWOT; QSPM; Cold chain

Received date: July 07, 2026; **Accepted date:** July 30, 2026; **Published date:** August 03, 2026

Introduction

Artificial Insemination (AI) is a cornerstone biotechnology deployed globally to augment genetic gain, accelerate calving frequencies and eliminate venereal disease transmission pathways in cattle breeding ecosystems [1]. In developing tropical countries, the large-scale efficacy of AI remains constrained by smallholder operational vulnerabilities, environmental heat load and fragmented logistical supply chains. These multi-tiered variables create a disparity between ideal experimental conception rates (>70%) and actual field execution outcomes, characterized by elevated Services per Conception (S/C) ratios and protracted Calving Intervals (CI) [2].

Dompu regency, situated within West Nusa Tenggara Province, stands as a critical regional breeding zone for beef cattle, maintaining a substantial population of 188,160 head by 2023, representing approximately 14.41% of the provincial herd dynamics [3]. Despite this dense animal asset distribution, the adoption and operational consistency of AI services have exhibited high structural instability; AI coverage fluctuated dramatically from 14.64% in 2022, peaking at 39.2% in 2023, before contracting back down to 13.5% in 2024 [4]. Out of 75,264 productive females documented in 2024, only 9,823 received AI interventions, reflecting under-utilized reproductive capacity and systemic inefficiencies. Prior research frequently isolates individual biological constraints (*e.g.,* hormone profiles or estrus detection errors) or socio-economic markers (*e.g.,* farmer demographics) without integrating these components into a unified, actionable diagnostic framework [5-7].

Journal of Medical, Clinical and Surgical Case Reports

The objectives of this study were to: (1) Evaluate the current success rate and identify the internal and external factors affecting beef cattle AI programs; (2) analyze the specific strengths, weaknesses, opportunities and threats governing breeding management and; (3) formulate and prioritize strategic alternatives to optimize the success rate of Artificial Insemination on breeding beef cattle farms in Dompu regency.

Materials and Methods

Research design and location

This study employed a survey method with a mixed-methods approach, integrating qualitative and quantitative methodologies. The research was conducted across breeding beef cattle farms in Dompu Regency, West Nusa Tenggara Province, from November 2025 to January 2026. Site selection was based on the high density of beef cattle populations and the active implementation of government-supported Artificial Insemination (AI) programs in these areas.

Population and sample

The study respondents comprised two groups: (1) Livestock Farmers (n=96): Active AI program participants stratified by herd size into Stratum I (<3 head), Stratum II (4-6 head) and Stratum III (>7 head) and (2) Expert Panelists (n=5): Selected *via* purposive sampling to fulfill a Pentahelix stakeholder representation model, comprising experts from government bodies, academia, industry operators, livestock associations and non-governmental entities [8].

Research variables

The operational variables evaluated in this study were divided into demographic, reproductive performance metrics and strategic factors: (1) farmer and technician characteristics (age, educational level, farming experience, AI field experience and livestock ownership herd size); (2) reproductive efficiency metrics comprising Conception Rate (CR), Service per Conception (S/C) and Calving Interval (CI) to evaluate AI success rates; (3) internal factors comprising strengths and weaknesses affecting the implementation and technical delivery of the AI program; (4) external factors comprising opportunities and threats within the regional livestock breeding environment and; (5) priority alternative strategies to optimize and improve artificial insemination success across the sub-districts.

Data collection techniques

Primary data were collected through: (a) Field observations of breeding management, livestock handling practices and artificial insemination technical procedures at smallholder farms; (b) structured interviews using questionnaires administered to farmer respondents to gather socio-economic data and field technical experience; and; (c) in-depth interviews with expert respondents representing the Pentahelix stakeholders. Secondary data were obtained from the Dompu Regency Central Bureau of Statistics (BPS), the Department of Livestock and Animal Health of Dompu Regency, historical insemination logs from field technicians and relevant scientific literature.

Data analysis

Input stage: IFE and EFE matrices

The Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices evaluate internal strategic variables (strengths/weaknesses) and external forces (opportunities/threats). The mathematical computation is formalized as follows:

- **Factor Weighting (Wi):** Derived *via* a paired-comparison matrix across n factors, where relative importance a_{ij} is normalized to eliminate subjectivity:

$$\text{Wi} = \frac{\sum_{i}^{n}{=}\,1\, a^{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} a^{ij}} \text{ where } \sum_{i=1}^{n} Wi = 1.00$$

- **Performance Rating (Ri):** Assigned based on field diagnostic metrics (Ri {1, 2, 3, 4}) For IFE: 1 = major weakness, 2 = minor weakness, 3 = minor strength, 4 = major strength. For EFE: 1 = poor 2 = average, 3 = above-average, 4 = superior organizational response.
- **Total weighted Score (S total):** Calculated as the linear combination of weights and ratings:

$$S_{total} = \sum_{i=1}^{n} (Wi \ x\ Ri)$$

Matching stage: IE and SWOT matrices

The cumulative internal and external scores are projected onto a 9-cell Internal-External (IE) Matrix categorized into three tactical regions: Grow and build (3.00-4.00), hold and maintain (2.00-2.99) and harvest or divest (1.00-1.99).

The SWOT matrix systematically cross-references these factors into four actionable quadrants:

- SO (Strengths, Opportunities) strategies to leverage internal assets for external growth.
- WO (Weaknesses, Opportunities) strategies to resolve internal limits using external opportunities.
- ST (Strengths, Threats) strategies to deploy capacities as environmental buffers.
- WT (Weaknesses, Threats) strategies as defensive mechanisms to minimize vulnerabilities.

Decision stage: Quantitative Strategic Planning Matrix (QSPM)

The QSPM objectively prioritizes the alternative strategies formulated in the SWOT phase. Let k be the strategy index (k=1, 2, ..., m). The matrix computes the relative attractiveness using the pre-established weights (Wi):

- **Attractiveness Score (AS):** Quantifies the specific capacity of strategy k to optimize factor i, bounded by AS {1, 2, 3, 4} (1=not attractive, 2=somewhat attractive, 3=reasonably attractive, 4=highly attractive; AS=0 if the factor is irrelevant).
- **Total Attractiveness Score (TAS):** Calculated as the sum of the products of weights and attractiveness scores across all n factors:

$$TAS_k = \sum_{i=1}^{n} (Wi \ x \ AS)$$

The strategy yielding the maximum TAS is designated as the paramount operational priority.

Results

Farmer respondent characteristics

All 101 respondents (100%) were classified within the productive age category, with 44.80% of farmers (n=43) and 50.00% of inseminators (n=4) clustered in the 31-40 years bracket. A stark divergence is observed in institutional qualifications; while the farmer population exhibits low overall formal educational attainment, led by primary school completion at 30.21% (n=29) and supported only by non-formal socialization frameworks (100%), the inseminator cohort demonstrates a highly standardized professional baseline, with 100% (n=8) holding both a Bachelor's degree and formal technical certification. Furthermore, technical operational capacity varies across sectors: 45.83% (n=44) of farmers possess limited experience (1-4 years) managing mostly medium-scale herds of 4-7 head (62.50%), whereas the AI technician workforce is heavily anchored by veteran personnel, with 62.50% (n=5) boasting over 7 years of active field practice.

Internal Factor Analysis (IFE matrix)

The identification process revealed four strength factors and three weakness factors influencing artificial insemination success rates in Dompu regency. The results of the IFE matrix analysis are presented in **Table 1.**

Table 1: Results of the IFE matrix analysis of artificial insemination success in Dompu regency.

No	Internal factor	Weight	Rating	Score
Strengths				
1	All AI staff hold official certifications	0.21	3.60	0.75
2	Most technicians are seniors with >7 years of experience	0.08	3.20	0.26
3	Farmers are highly receptive to adopting AI	0.17	3.60	0.60
4	Breeding stock resiliently adapts to dry tropical climates	0.13	3.40	0.44
Weaknesses				
1	Farmers lack skills in estrus detection and AI recording	0.15	1.20	0.18
2	Farmers lack knowledge in feed management and flushing methods	0.13	1.60	0.22
3	Technicians face limited reproductive disorder handling and low equipment hygiene standards	0.13	1.20	0.16
Total		1	-	2.61

The data processing from the respondents yielded a subtotal score of 2.06 for strengths and 0.55 for weaknesses, resulting in a total Internal Factor Evaluation (IFE) matrix score of 2.61. An IFE score exceeding the 2.50 threshold indicates that the strategic framework to improve artificial insemination success in Dompu Regency maintains internal strengths that effectively outweigh its inherent operational weaknesses.

External Factor Analysis (EFE matrix)

The identification process revealed five opportunities factors and four threats factors influencing artificial insemination success rates in Dompu regency. The results of the EFE matrix analysis are presented in **Table 2.**

Table 2: Results of the IFE matrix analysis of artificial insemination success in Dompu regency.

No	Internal factor	Weight	Rating	Score
Opportunities				
1	Availability of local corn biomass as alternative cow feed	0.16	3.80	0.61
2	Growing market demand for AI-bred calves	0.12	3.60	0.43
3	Dompu's position as a main supplier of national livestock products	0.12	3.40	0.41
4	Potential development of specialized village breeding clusters	0.12	3.40	0.39
5	Availability of local bank credit for cattle breeding capital	0.12	3.40	0.42
Threats				
1	Infectious disease outbreaks disrupting estrus cycles and reducing fertility	0.10	1.20	0.12

Journal of Medical, Clinical and Surgical Case Reports

2	Limited availability of supporting AI infrastructure and equipment	0.08	1.40	0.12
3	Difficult geographical terrain and travel distances degrading semen quality	0.09	1.40	0.13
4	Unregulated AI service fees due to independent technician operations	0.08	1.60	0.13
Total		1	-	2.76

Data processing from the respondents yielded a subtotal score of 2.26 for opportunities and 0.50 for threats, resulting in a total External Factor Evaluation (EFE) matrix score of 2.76. An EFE score of 2.76 indicates that the strategic system to improve artificial insemination success in Dompu Regency possesses a moderate capacity to effectively respond to external opportunities.

Strategic position: IE matrix

The strategic position for improving Artificial Insemination (AI) success in Dompu regency is situated in Cell V of the IE Matrix, derived from an IFE score of 2.61 and an EFE score of 2.76. This placement classifies the program under the hold and maintain strategy, indicating that the current reproductive service system possesses moderate internal stability and a strong capacity to leverage external opportunities while mitigating threats. Consequently, the most viable strategic responses focus on intensive market penetration and service development, specifically by expanding AI service coverage, upgrading technical service quality and enhancing farmer capacity in husbandry, feed management and livestock resource utilization to ensure sustainable reproductive efficiency.

Alternative strategies: SWOT matrix

The SWOT matrix integration for enhancing Artificial Insemination (AI) services in Dompu regency outlines four distinct strategic pathways: (1) SO strategies leverage institutional strengths to capture market opportunities through technical guidance on AI management for farmers, certification for junior inseminators and the establishment of specialized village breeding clusters. (2) WO strategies address internal limitations by optimizing local biomass-based feed formulations, synchronizing mandatory reproductive recording with regional bank credit requirements and modernizing housing systems to enhance estrus detection. (3) ST strategies mitigate external vulnerabilities by promoting self-reliance in equipment innovation among senior technicians, intensifying farm-level biosecurity measures against infectious diseases and establishing standardized, uniform service fees *via* stakeholder consensus. (4) WT strategies establish defensive protocols through the implementation of strict standard operating procedures (SOPs) to reduce AI failure, regional integration of data management to overcome geographic boundaries and proactive mitigation of reproductive disorders induced by outbreaks.

Discussion

Characteristics of farmers and inseminators

The demographic profile of human resources in Dompu Regency demonstrates optimal strategic potential, as the majority of farmers and inseminators fall within the productive age bracket, ensuring a strong work ethic, responsive reporting and rapid adaptation to Artificial Insemination (AI) technologies [9,10]. Regarding formal education, a gap exists between the livestock keepers where 30.21% are dominated by primary school education, affecting the speed of innovation absorption and the inseminators, who possess 100% higher education degrees, guaranteeing science-based field operations [11]. This literacy gap is effectively bridged by non-formal education, evidenced by the 100% participation rate of farmers in technical guidance (Bimtek) that increases openness to government programs [12], alongside the 100% competency certification held by inseminators, which minimizes the risk of operational failures (human error) in the field [11].

Technical maturity and farm scale further reinforce the success of this reproductive program. Effective early estrus detection is driven by substantial farming experience averaging 8.2 years, which empirically enhances farmers' intuition and resilience in managing daily field challenges [13]. This synergy is bolstered by AI experience, where the majority of farmers have participated for 5-6 years (45.83%) and 62.5% of inseminators possess over 7 years of service, a crucial combination for reducing technical failures and improving semen deposition accuracy [9]. Additionally, the dominance of medium-scale livestock ownership ranging from 4 to 6 head (62.5%) enables focused daily monitoring and provides strong economic incentives for farmers to sustain the reproductive efficiency and productivity of each breeding cow [14].

Technical performance, semen distribution and field execution of artificial insemination in Dompu regency

The performance, distribution and execution of artificial insemination (AI) in Dompu Regency face integrated technical and logistical challenges:

- AI success rates are suboptimal, marked by a moderate Service per Conception (S/C) of 1.81 and a low Conception Rate (CR) of 44.81% due to farmer characteristics and education influencing adoption [6]. This low CR, paired with a high 70% Non-Return Rate (NRR), indicates undetected silent heat, leading to an inefficient Calving Interval (CI) of 14.8 months that requires better semen quality, technician skills and optimal timing to fix compared to ideal S/C standards below 1.4 [1,15].
- Semen distribution and storage rely on BIB Banyumulek, where a 70.56% dominance of exotic

breeds reflects market shifts toward crossbreeding profitability, but maintaining cold-chain integrity remains critical to prevent sperm mortality [16]. This is hindered by limited government funding for liquid Nitrogen (N2), forcing technicians to independently manage strict 14-21-day refilling schedules to maintain the critical -196°C temperature, as inconsistent infrastructure frequently lowers regional pregnancy rates [7].

- AI execution procedures apply thawing at 37°C-38°C for 15-30 seconds to prevent cold shock, yet field success is limited by poor cage sanitation and lack of handling facilities, which increase infection risks and lower service quality [16]. Furthermore, geographical constraints cause delayed estrus reporting by farmers, missing the optimal ovulation peak and driving up S/C values, a management bottleneck typical of areas with limited infrastructure that necessitates real-time reporting solutions [7,17].

Core strategic framework for AI success in Dompu regency

The strategic development of artificial insemination (AI) in Dompu Regency exhibits robust internal capacity and strong environmental responsiveness, evidenced by an Internal Factor Evaluation (IFE) score of 2.61 and an External Factor Evaluation (EFE) score of 2.76. Positioned in Cell V of the IE Matrix, the program falls under the hold and maintain classification, indicating that while the reproductive service framework is internally stable, it requires enhanced market penetration and service development [18]. Strengths such as BNSP-certified technicians, experienced senior inseminators and high farmer adoption rates significantly counteract prominent weaknesses like deficient reproductive recording and inadequate estrus detection skills [6]. On the external front, low threat impacts (0.50) demonstrate that current protocols effectively cushion challenges like geographic barriers and liquid nitrogen shortages, allowing the system to capitalize on strategic opportunities [10,16].

To achieve sustainable reproductive efficiency, a twelve-point SWOT matrix model establishes four integrated action paths: (1) SO Strategies prioritize expanding technical guidance (Bimtek) on estrus windows, mentoring junior staff and developing specialized breeding clusters like Nangamiro Village [6,19]. (2) WO Strategies heavily exploit regional government macro policies, specifically the cross-sectoral commodity optimization under Dompu Regency's "Jara Pasaka" program and NTB Province's "PIJAR" program, by processing over 250,000 tons of local corn biomass, rice straw and legume residues *via* government-backed silage/ammonization technologies into high-nutrient flushing diets (14%-16% Crude Protein, 60% TDN) to maintain an ideal cow Body Condition Score (BCS) of 3.0 and ensure uterine readiness, while synchronizing mandatory recording with regional bank credit (KUR) eligibility [20]. (3) ST Strategies mitigate resource deficits and disease risks (*e.g.,* FMD/LSD) through technician-led equipment self-reliance, farm-level biosecurity and unified service tariff regulations [21]. (4) WT Strategies institute defensive quality assurance protocols *via* strict thawing SOPs, external cross-regional digital management platforms and advanced diagnostic training to treat pathological reproductive disorders prior to insemination [10].

Strategic recommendations based on QSPM analysis

Quantitative Strategic Planning Matrix (QSPM) analysis prioritizes technician-led material self-reliance (TAS=2.88) as a crucial contingency to bypass bureaucratic delays and maintain semen cold-chains [22]. The remaining strategic hierarchy is ranked by Total Attractiveness Scores (TAS):

- **High priority:** Local cattle biological resilience (2.82); Premium calf production for external markets (2.62); Extensive-to-intensive housing transitions (2.07).
- **Medium priority:** Leveraging senior technicians for transitions (1.91); Synchronizing estrus data with feed management (1.87); Enforcing mandatory recording for KUR credit eligibility (1.75); accelerating specialized breeding clusters (1.70).
- **Operational priority:** Strict equipment hygiene standardizations (1.69); establishing uniform, self-regulated service fees (1.66); integrating corn waste *via* "Jara Pasaka" and "PIJAR" programs for flushing; Upgrading diagnostic competence for reproductive disorders (1.18) [20].

Conclusions

Based on the research findings, the conclusions for enhancing Artificial Insemination (AI) success in Dompu Regency are synthesized as follows: (1) The internal-external diagnostic framework identifies 7 internal factors led by the major strength of officially certified technicians and the major weakness of poor farmer understanding of nutritional flushing methods and 9 external factors, dominated by the opportunity of abundant local corn biomass and the threat of infectious disease outbreaks. (2) The program is positioned within Cell V of the IE matrix under the "Hold and Maintain" quadrant, dictating general strategies of market penetration and product development to preserve current operational stability and service quality. (3) Out of 13 formulated strategic recommendations, the Quantitative Strategic Planning Matrix (QSPM) designates technician-led equipment and raw material self-reliance as the primary priority strategy (TAS=2.88) to effectively counteract government infrastructure deficits and guarantee uninterrupted field service continuity.

Funding

This research received no external funding.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the Faculty of Medicine, Udayana University (Protocol Code: 2025.02.1.1036/2843/UN14.2.2.VII.14/LT/2025) and date of approval: 3rd of December 2025) with an exempted status due to its non-invasive, survey-based nature involving socioeconomic questionnaires for farmers and performance evaluations of standard field technical services, which did not subject the animals to experimental interventions or harm.

Acknowledgments

The author wishes to express gratitude to the Department of Animal Science, Udayana University, for the academic support. Special thanks are also extended to the Department of Livestock and Animal Health of Dompu Regency, the field inseminators and the local farming communities for their excellent cooperation and data access during the study.

Conflicts of Interest

The author declares no conflict of interest.

References

1. Yumiati Y, Putranto HD, Yulihartika RD (2016) Profit analysis of beef cattle farmers in the artificial insemination program in Selebar district, Bengkulu City. Agritepa J Ilmu Dan Teknol Pertan 2: 112-130. [Google Scholar]

2. Nugraha WS, Putra D, Suryadi U (2020) The success rate of artificial insemination in beef cattle across various regions. J Ilmu Ternak Trop 7: 55-62.

3. BPS (2025) Mid-year population (thousand people), 2021-2024.

4. Ananta AH, Hafid H, Sani LOA (2015) Factors affecting the productivity of Bali cattle farming in transmigrant and non-transmigrant farms on Kabaena Island Bombana regency. J Ilmu Ternak Tropika 2: 52-67.

5. Khoirani K, Nikmaturrayan N, Lukman HY (2022) The factors affecting the success of artificial insemination program on cattle in Woha district, Bima regency. J Riset Veteriner Indones 4: 20-28. [Google Scholar]

6. Setiawan BD, Herlina B, Agustina SD, Waluyo T (2025) The success rate of artificial insemination of Bali cattle (Bos sundaicus) in Jaya Loka district, Musi Rawas regency, South Sumatra Province. J Anim Res Appl Sci 6: 16-24. [Crossref] [Google Scholar]

7. Alim I, Priyanto R, Jakaria J (2023) Factors affecting the reproductive performance efficiency of beef cattle in South Sulawesi province. J Ilmu Ternak Univ Padjadjaran 23: 120-131. [Crossref] [Google Scholar]

8. Sadeghi M, Barati M, Moeini BA (2023) Multi sample path analysis including a novel psychological indicator on compassion satisfaction and burnout among healthcare workers. SAGE Open Nurs 9: 13-20.

9. Nandari NPS, Suranjaya IGL, Indrawati RR (2020) Characteristics of farmers and their contributions to the success of artificial insemination in Bali cattle. J Peternak Tropikal 8: 295-308.

10. Putri BRT, Suparta IN, Kayana IGN, Hellyward J (2023) Agribusiness strategy of trigona honey bee farming *(Trigona sp.)* to strengthen local economy in Pempatan village, Bali, Indonesia. Global Sci Acad Res J Multidiscip Stud 4088: 5-10. [Google Scholar]

11. Mahalubi RI, Rintjap AK, Malingkas JA, Oley FS (2019) Response of beef cattle farmers to the implementation of Artificial Insemination (AI) technology in Tondegesan Dua Village, Kawangkoan district, Minahasa regency. Zootec 39: 71-81.

12. Muhyidin M, Arman C, Zaenuri LA (2019) Analysis of knowledge level, attitude and motivation of cattle farmers in the adoption of artificial insemination technology in West Sumbawa. J Ilmu Dan Teknol Peternak Trop 6: 304-312. [Crossref] [Google Scholar]

13. Adiputra IP, Sumardani NLG, Sukanata IW (2024) The influence of Bali cattle farmers' characteristics on the adoption rate of artificial insemination in Rendang district, Karangasem regency. J Nukleus Peternak 11: 75-82. [Crossref] [Google Scholar]

14. Hasyim H, Junaedi J, Arman A (2020) Factors influencing the adoption of artificial insemination innovation among beef cattle farmers. J Ilmiah Ilmu-Ilmu Peternak 23: 122-124.

15. Jones A, Brown R (2019) Optimizing service per conception in dairy cattle. Vet Reprod 77: 201-212.

16. Sumardani NLG, Budaarsa K, Puger AW (2022) Improving reproductive performance of sows through piglet weaning management. J Veteriner 23: 64-69.

17. Putri BRT, Sumardani NLG, Singarsa IDP, Yastini NN (2020) Cultivation strategy of pangasius catfish *(Pangasius sp.)* to increase the income of Mina Kencana fish farming group in Pering village, Blahbatuh district. Buletin Udayana Mengabdi 19: 33-38. [Google Scholar]

18. Dewi D (2018) Bali cattle calf business strategy to increase farmers' income in Nusa Penida.

19. Annisa NN, Roslizawaty R, Hamdan H, Iskandar CD, Ismail I, et al. (2018) The role of farmers on the success of artificial insemination in cattle in Asahan regency. JIMVET 2: 155-160.

20. Sama S, Yamin A, Anggara M (2024) Analysis of the effectiveness level of the Artificial Insemination (AI) program on cattle development in West Sumbawa regency. JIIP 7: 34-40.

21. Razak NR, Herianto H, Armayanti AK, Kurniawan ME (2021) The influence of farmer characteristics and technology adoption on the success of artificial insemination in West Sinjai district, Sinjai regency. J Agrisistem Seri Sosek Dan Penyuluhan 17: 111-118. [Crossref] [Google Scholar]

22. Putra RD, Widodo A (2020) Application of descriptive quantitative research methods in social science studies. J Ilmu Sos Dan Humaniora 9: 115-124.