Literasi Nusantara
vol.4 no. 1, November 2023 – February 2024
https://journal.citradharma.org/index.php/literasinusantara/index
ISSN 2746-8208 (Online)
ISSN 2746-3575 (Print)

The Influence of Farmers and Adoption of Artificial Insemination Technology on Beef Cattle in the Suwawa Subdistrict, Bone Bolango Regency

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DOI : *https://doi.org/10.56480/jln.v4i1.991*

Received: August 24, 2023
Revised: September 29, 2023
Accepted: Oktober 24, 2023

Abstract

Artificial insemination has a very strategic role in supporting the success of the Bali cattle business because it is a series of planned and programmed processes because it will involve the genetic quality of livestock in the future. The aim of this study was to determine the influence of farmers and the level of farmer adoption of artificial insemination technology in Balidi cattle, Suwawa District, Bone Bolango Regency. This research was conducted from August to October 2023. The research method used was a survey method, namely by collecting primary data and secondary data. The determination of the sample was carried out by purposive sampling, the number of samples was 98 people spread over 3 locations, namely Tilongkabila, Kabila and North Blango Villages. The data analysis used is quantitative descriptive analysis by describing and explaining the character of the farmer and the level of adoption of artificial insemination in Bali cattle. The results of the study explain that the influence of farmers is that they are of productive age by 100% and most of them have elementary school education as much as 67%, with an average number of family dependents of 3 people, and with an average livestock ownership of 5 heads. The adoption process describes the conscious stage as having a score of 243, the interest stage 249, the assessment stage 251 the trying stage 253, the receiving stage 260. The adoption rate of farmers towards AI is categorized as high with the results of the continuum line intervals namely 98 – 392 being classified as good.

Keywords– *Farmer Influence, Adoption, Artificial Insemination Technology*

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ISSN 2746-8208 (Online) and ISSN 2746-3575 (Print)

1. Introduction

National development in the livestock sector places a strong emphasis on improving livestock products by increasing the livestock population and thereby enhancing genetic quality. This aligns with the goals of livestock development programs, specifically through the implementation of artificial insemination (AI) technology. AI plays a crucial role in accelerating the improvement of genetic traits in livestock, preventing the transmission of reproductive diseases through natural mating, optimizing the use of superior male animals, and reducing or eliminating the costs associated with acquiring and maintaining male breeding stock.

The strategic significance of artificial insemination in supporting successful Bali cattle farming lies in its carefully planned and programmed processes, influencing the genetic makeup of livestock in future generations. The innovative technology of artificial insemination not only holds practical economic value but also offers a cost-effective and rapid solution. However, the reluctance of farmers to adopt such innovations is rooted in their aversion to bearing the risks associated with potential losses. Farmers, being rational actors, tend to embrace technology only when it has been successfully tested by others, avoiding the uncertainties and potential failures.

The acceptance of technological innovation is contingent on various factors, with the influence of individual farmers playing a significant role. Tilongkabila Sub-district, situated in the Bone Bolango Regency, has been identified as an area for the development of Bali cattle farming. With a substantial livestock population totaling 9,454 heads (BPS.Gorontalo, 2022), the sub-district benefits from farmers who recognize the importance of artificial insemination in elevating genetic quality.

2. Method

The research was conducted in Suwawa Sub-district, Bone Bolango Regency. The research period spanned from August to October 2023. The selection of the research location was done through purposive sampling,

considering the area's high population of cattle, amounting to 48,317 heads, and the active involvement of extension workers in artificial insemination programs. The data sources for this research comprised both primary and secondary data.

Population and Sample

The population in this study represents the generalization of objects/subjects with specific qualities and influences applied by the researcher for study and conclusion purposes (Sugiono, 2019). The population in this research includes Bali cattle farmers in Suwawa Sub-district, totaling 628 individuals spread across 18 villages.

A sample is a portion taken from the entire population under study, considered to represent the entire population using a specific technique (Simamora, 2021). The sample determination was purposive, based on the consideration that farmers are already aware of artificial insemination technology and actively interact with artificial insemination extension workers. The sample size in this study is 15% of the population, which is 98 farmers, as the population exceeds 100 (628 farmers). Therefore, 98 farmers were chosen as the sample for this study.

Data Collection Techniques

Data in this research were collected through the following techniques:

a. Observation Technique: Direct field observations were conducted to observe physical symptoms and the community's life related to the researched problem.
b. Interview Technique: Interviews were conducted using a prepared list of questions with alternative answers for respondents to choose from.
c. Documentation: Taking notes or pictures that would become sources of data to support the research.

Data Analysis

The variables observed in this research are the farmer's influence on the adoption of artificial insemination and the level of adoption of artificial insemination. The first and second objectives of this research are analyzed descriptively, aiming to examine and describe the farmer's characteristics and the

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level of farmer adoption of artificial insemination. The respondent results obtained from the questionnaire are analyzed using scoring methods. All assessment criteria use a Likert scale (Sugiyono, 2019), where each assessment criterion is measured with the following variations: A=4 (very good), B=3 (good), C=2 (not good), D=1 (not good at all).

3. Result and Discussion

Effect of Respondents

a. Age

Age is one aspect that can influence an individual's ability to participate in various daily activities. People in the productive age category have the ability to work more economically productively, thus being able to meet their living needs compared to those in the non-productive age group. The classification of respondents based on age in the Suwawa District of Bone Bolango Regency can be seen in Table 1.

Table 1. Respondents based on age in the Asparaga District of Bone Bolango Regency

No	Age (Years)	Number of People	Percentage (%)
1	21-36	32	33
2	>37-51	44	45
3	>52-65	22	22
	Total	**98**	**100**

Source: Secondary Data Source, 2023

The table indicates that the average age of farmers in Suwawa District is 44 years old. The age of farmers ranges from 21 to 65 years. The farmers' age in the research location falls within the productive age category, enabling them to optimize their performance, be enthusiastic in livestock maintenance, and possess strong motivation. Prasetya & Putro (2019) state that the non-productive age is 0-15 years, while the productive age is 15-65 years, showing high spirits and ease in adopting new things. On the contrary, farmers above 65 years of age experience a decline in work capacity, categorizing them as non-productive. This aligns with the opinion

of Wiratmadja & Gunawan (2022), who define that increasing age leads to a decrease in livestock farming productivity.

b. Education Level

The education level of farmers can influence their mindset in managing and developing an enterprise, including Bali cattle farming, which is the main asset in efforts to accept or adopt information and technologies related to livestock farming. This contributes to improving the productivity of Bali cattle farming. The impact of respondents based on their education level in the Suwawa Subdistrict, Bone Bolango Regency, can be observed in Table 2.

Table 2. Respondents based on Education Level in Suwawa District, Bone Bolango

No	Education Level	Number of People	Percentage (%)
1	SD (Elementary School)	58	60
2	SMP (Junior High School)	22	22
3	SMA (Senior High School)	18	18
	Total	**98**	**100**

Source: Secondary Data Source, 2023

Based on the results in Table 2, it is shown that the education level of respondents in Suwawa District is categorized as low. The highest education level attained is only SMA, with the majority having only completed elementary school. There are 58 individuals with an elementary school education, accounting for 60%, 22 individuals with a junior high school education, representing around 22%, and 18 individuals with a senior high school education, making up 18%. According to Hendrawati (2018), a high level of education can influence the adoption of new technology, indicating that farmers may be more willing to implement technological advancements.

c. Number of Family Dependents

Family dependents refer to the number of family members supported by the head of the household, both those living under the same roof and those residing elsewhere. The number of family members engaged in

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farming can influence the success of the managed livestock. The classification of the number of family dependents among respondents is presented in Table 3.

Table 3. Respondents Based on the Number of Family Dependents

No	Number of Family Dependents	Number (Individuals)	Percentage (%)
1	1 – 4	57	58
2	5 – 8	33	34
3	9 – 12	8	8
	Total	**98**	**100**

Source: Secondary Data Source, 2023

Based on the findings in Table 3, it is depicted that in the Suwawa Subdistrict, 57 respondents or 58% have 1-4 family dependents, 33 respondents or 34% have 5-8 family dependents, and 8 respondents or 8% have 9-12 family dependents. This illustrates that, on average, farmers have a family size of 3 individuals. According to the data, the majority of respondents have small families with varying numbers of family dependents. The number of family dependents can affect farmers in managing their agricultural activities, as mentioned by Nikmah et al. (2020).

d. Number of Livestock Ownership

The ownership of livestock among farmers generally varies, including ownership through personal acquisition, inheritance, ownership by others, and other means. The classification of respondents based on the number of livestock ownership in the Suwawa Subdistrict, Bone Bolango Regency, can be seen in Table 4.

Table 4. Respondents Based on Livestock Ownership Scale

No	Number of Ownership (Years)	Number (Individuals)	Percentage (%)
1	< 3	27	28
2	4 – 7	58	59
3	> 7	13	13
	Total	**98**	**100**

Source: Secondary Data Source, 2023

Table 4 indicates that livestock ownership in the Suwawa Subdistrict, Bone Bolango Regency, with ownership scale < 3 heads is 27 individuals or 28%, 4-7 heads is 58 individuals or 59%, and ownership of more than 7 heads is 13 individuals or 13%. The average livestock ownership in the research location is around 3 heads, with the highest ownership being more than 7 heads. This aligns with the statement by Rusman et al. (2020) that Balidi cattle ownership in rural areas is still at the household level, with ownership levels of less than 10 heads.

Farmers' Adoption of Artificial Insemination Technology

a. Awareness

In the research location, farmers exhibit a high level of awareness, attributed to their knowledge of artificial insemination and its benefits in improving the quality of beef cattle. The awareness of Balidi farmers in Suwawa District is presented in Table 5.

Table 5. Farmers' Awareness of Artificial Insemination (AI) Technology

question number	Score								total
	1		2		3		4		
	F	%	F	%	F	%	F	%	
1	0	0	10	10	64	65	24	25	248
2	0	0	16	16	61	62	21	22	242
3	0	0	18	18	59	60	21	22	238
total									728
average									**243**

Source: Secondary Data Source, 2023

Based on the research results in Table 5, the awareness of farmers in Suwawa Subdistrict obtained an average score of 243. This can be categorized as high farmer awareness, with 65% of farmers being aware. They are already informed and aware of the importance of artificial insemination technology before information or counseling on artificial insemination enters the research location. According to the continuum of farmer awareness of artificial insemination (AI) technology, it is high. This aligns with Nur's (2019) opinion that some farmers are already aware of the

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existence of artificial insemination technology, mainly because, on average, farmers are in their productive age, constituting 100%.

b. Interest

In the process of adopting artificial insemination technology (AI), after farmers become aware, they will develop an interest. The interest stage conducted by farmers towards this technology in Suwawa Subdistrict, Gorontalo Regency, is presented in Table 6.

Table 6. Farmer Interest in Artificial Insemination (AI) Technology

question number	Score								total
	1		2		3		4		
	F	%	F	%	F	%	F	%	
1	0	0	0	0	70	71	28	29	267
2	0	0	14	15	72	73	12	12	243
3	0	0	8	8	78	80	12	12	238
total									748
average									249

Source: Secondary Data Source, 2023

Based on Table 6, it is evident that farmers' interest in the innovation of artificial insemination (AI) technology in Suwawa Subdistrict, Bone Bolango Regency, scored 71%, with an average score of 249. According to the continuum of farmer interest in artificial insemination technology, it is categorized as high. This aligns with Hasnuni's (2022) statement, defining that farmers' interest in artificial insemination (AI) technology is high due to frequent consultations with extension workers or other farmers who have tried artificial insemination technology. Farmers have shown an interest in artificial insemination technology at a rate of 71%.

c. Evaluation Stage

In the evaluation stage, farmers use various methods related to artificial insemination (AI) technology, such as considering profit or loss, risks, and the costs or expenses incurred by farmers. The evaluation stage of farmers towards artificial insemination (AI) technology in Suwawa Subdistrict, Bone Bolango Regency, can be observed in Table 7.

Table 7. Farmer Evaluation of Artificial Insemination (AI) Technology

question number	Score								total
	1		2		3		4		
	F	%	F	%	F	%	F	%	
1	0	0	0	0	74	75	24	25	**264**
2	0	0	18	18	68	70	12	12	**248**
3	0	0	17	18	67	68	14	14	**239**
total									**751**
average									**250**

Source: Secondary Data Source, 2023

In Table 7, it is shown that farmers' evaluation of artificial insemination (AI) technology in Suwawa Subdistrict, Bone Bolango Regency, averages 250. This can be categorized as a high stage of farmer evaluation. Farmers in Suwawa Subdistrict consistently consider the use of artificial insemination technology, especially in terms of cost. This indicates that farmers' evaluation of artificial insemination technology is high, reaching 75%. Farmers' evaluation of artificial insemination technology is high because they have assessed farmers who have conducted artificial insemination trials on their livestock. Farmers provide evaluations regarding the costs incurred for artificial insemination, as stated by Wijatksono (2020), who mentions that in case of failure, inseminators often lower costs or provide the service for free, making farmers interested in using artificial insemination technology.

d. Trial

Farmers, upon receiving information about the use of artificial insemination technology from other farmers on a small scale, express a desire to try artificial insemination (AI) technology. According to farmers who have used artificial insemination technology, they believe that this method will lead to better beef cattle production. The stage of farmers trying artificial insemination technology in Suwawa Subdistrict, Gorontalo Regency, can be seen in Table 8.

Table 8. Farmers Trying Artificial Insemination (AI) Technology

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question number	Score								total
	1		2		3		4		
	F	%	F	%	F	%	F	%	
1	0	0	13	13	67	68	18	18	**246**
2	0	0	0	0	76	78	22	22	**266**
3	0	0	9	10	74	75	16	16	**241**
total									**753**
average									**251**

Source: Secondary Data Source, 2023

In Table 8, it is explained that farmers trying artificial insemination technology in Suwawa Subdistrict, Bone Bolango Regency, have a score of 251. The average score indicates that farmers trying artificial insemination technology (AI) in Suwawa Subdistrict are categorized as high based on the continuum. Farmers in Suwawa Subdistrict have attempted artificial insemination (AI) at a rate of 81%. This aligns with the opinion of Mulyani & Yusuf (2018), stating that farmers try various innovations, including artificial insemination technology, which can assist in livestock development.

e. Acceptance

Farmers have started to implement new practices with several innovations, including the adoption of artificial insemination technology (AI). Farmers in Suwawa Subdistrict, Bone Bolango Regency, who have accepted this technology can be observed in Table 9.

Table 9. Farmers Accepting Artificial Insemination (AI) Technology

question number	Score								total
	1		2		3		4		
	F	%	F	%	F	%	F	%	
1	0	0	9	9	72	73	17	18	**246**
2	0	0	5	5	76	77	18	18	**263**
3	0	0	0	0	78	79	20	21	**270**
total									**779**
average									**260**

Source: Secondary Data Source, 2023

Based on Table 9, it is explained that farmers in Suwawa Subdistrict, Bone Bolango Regency, who accept artificial insemination (AI)

technology, have an average score of 260 based on the continuum. They are categorized as having a high level of acceptance of artificial insemination technology (AI). In Suwawa Subdistrict, Bone Bolango Regency, 79% of farmers have embraced artificial insemination technology. According to Mahalubi (2019), information and experiences play a crucial role in enabling farmers to easily accept artificial insemination technology (AI), allowing them to apply it in the field of livestock farming.

Farmers' Adoption Levels of Artificial Insemination for Beef Cattle

The levels of farmer adoption of artificial insemination (AI) technology include patience, interest, evaluation stage, trial, and acceptance. The levels of farmer adoption of Artificial Insemination technology can be observed in Table 10.

Table 10. Farmer Adoption Levels of Artificial Insemination (AI) Technology

Statement	Skor								total	
	1		2		3		4			
	F	%	F	%	F	%	F	%	Total	Average
Awareness (Sadar)	0	0	10	10	64	65	24	25	98	243
Interest (Berminat)	0	0	0	0	70	71	28	29	98	249
Evaluation (Penilaian)	0	0	0	0	76	78	22	22	98	251
Trial (Mencoba)	0	0	0	0	78	79	20	21	98	253
Acceptance (Menerima)	0	0	0	0	56	71	23	29	98	260

Source: Secondary Data Source, 2023

Based on Table 10, it is explained that the level of adoption of artificial insemination (AI) technology by farmers in Suwawa District, Bone Bolango Regency, goes through several stages. The awareness stage has a score of 243, the interest stage has a score of 249, the evaluation stage has a score of 251, the trial stage has a score of 253, and the adoption or implementation stage has a score of 260. The scores in these adoption stages indicate a high category, as per the continuum line results, with an interval score range of 98 - 392.

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According to Nando (2021), farmers in the village are generally well aware of and have implemented artificial insemination technology for livestock as an effort to enhance beef cattle production.

4. Conclusion

Based on the research findings, several conclusions can be drawn:

a. The influence of farmers on the adoption of artificial insemination consists of productive age individuals, predominantly males, with an educational background of elementary school, an average family dependency of 3 people, and an average ownership of livestock of 5 heads.
b. The level of adoption of artificial insemination (AI) innovation by Balidi cattle farmers in Suwawa District, Bone Bolango Regency, is categorized as high with a score of 260.

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