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ANALYSIS OF THE ASSOCIATION BETWEEN BIOSECURITY PRACTICES AND DISEASE PREVALENCE IN GOATS IN PALANGKA RAYA

Analisis Hubungan Penerapan Biosekuriti dengan Kejadian Penyakit pada Kambing di Kota Palangka Raya

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Abstract

Goats are a livestock commodity that provides animal protein, supports food security, and offers income opportunities because of their relatively short production cycle. Successful goat farming relies heavily on effective sanitation and hygiene practices, which are crucial for preventing disease transmission and maintaining optimal productivity in the herd. This study aimed to examine the relationship between farmers' characteristics (age, education, and farming experience) and the level of biosecurity and hygiene implementation, as well as their impact on disease occurrence in goat farms in Palangka Raya City, Indonesia. The study was conducted in August 2025 and involved 10 goat farmers who were surveyed, interviewed, and observed in the field. Data were analyzed using a scoring system and chi-square test (χ^2). The results indicated that age and farming experience had no significant effect ($p>0.05$) on biosecurity and hygiene practices. In contrast, education significantly influenced the implementation of isolation biosecurity, health management, and hygiene ($p<0.05$). Moreover, farms with higher biosecurity and hygiene levels showed significantly lower disease occurrence. These findings underscore the importance of education in promoting effective biosecurity and hygienic practices. Enhancing farmer knowledge through targeted training and extension programs is essential for reducing disease risks, improving livestock health, and supporting the sustainability of goat farming in Palangka Raya.

Keywords**:** Biosecuritiy, diseases prevalence, hygiene, isolation, sanitation

Abstrak

Komoditas ternak penyedia protein hewani dengan potensi mendukung ketahanan pangan dan mampu meningkatkan pendapatan masyarakat dengan masa pemeliharaan yang tergolong singkat adalah kambing. Adapun faktor penentu keberhasilan usaha ternak kambing yaitu upaya sanitasi dan higiene sebagai pengendali terjadinya penyebaran penyakit dan menjaga konsistensi produktivitasnya. Tujuan dari penelitian ini yaitu menganalisis hubungan karakteristik peternak (usia, pendidikan dan pengalaman berternak) dengan tingkat penerapan

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biosekuriti dan higiene beserta dampaknya terhadap kejadian penyakit pada peternakan kambing di Kota Palangka Raya. Penelitian dilaksanakan bulan Agustus 2025 dengan responden sebanyak 10 peternak menggunakan metode survei, wawancara dan pengamatan di lapangan. Data pada penelitian ini dianalisis dengan metode skoring dan uji *chi-square* (χ^2). Hasil penelitian ini menunjukan bahwa usia dan pengalaman berternak tidak berhubungan ($p>0,05$) terhadap penerapan biosekuriti dan higiene. Sedangkan, pendidikan memiliki hubungan ($p<0,05$) terhadap penerapan biosekuriti isolasi dan manajemen kesehatan serta higiene peternak. Kemudian pada parameter penerapan biosekuriti isolasi, manajemen kesehatan dan higiene peternak memiliki hubungan ($p<0,05$) dengan rendahnya kejadian penyakit. Dapat disimpulkan bahwa pendidikan merupakan faktor yang paling berhubungan dalam penerapan biosekuriti isoalasi, higiene dan manajemen kesehatan. Penerapan biosekuriti dan higiene peternakan yang baik dan benar berhubungan signifikan pada tingkat kejadian penyakit. Sehingga, pada peternak dengan tingkat pendidikan yang kurang dapat diberikan edukasi dan pelatihan dalam upaya peningkatan kualitas sumber daya peternak di Palangka Raya mengenai biosekuriti dan higine agar dapat meminialisir kejadian penyakit pada ternak.

Kata kunci: Biosekuriti, higiene, isolasi, kejadian penyakit, sanitasi

INTRODUCTION

Goats are a category of livestock with significant development potential. They exhibit a high degree of adaptability to diverse environmental conditions and efficiently convert low-quality feed into milk and meat (Ismaulina & Savitri, 2023). Goats contribute significantly to land and environmental management by consuming grasses and weeds that proliferate on agricultural land, thereby enhancing soil fertility through the production of high-quality fertilizers. Their relatively high reproductive capacity and resistance to diseases can further promote the expansion of livestock farming (Heluth et al., 2021).

Goats can be a source of additional income through the sale of live goats, milk, and meat products. Goat meat is an affordable source of animal protein that can improve food security, especially in low-income communities. The development of well-managed goat farms has promising export potential, especially for products such as meat, milk, and skin (Farhas, 2020).

Based on statistical data, goats rank third after pigs and cattle, which rank first and second among livestock raised by farmers in Central Kalimantan, respectively. The goat population reached 48,971 thousand heads (Statistics Indonesia-BPS, 2022). Goat farms in Palangka Raya City are generally located in the same area as the study site. The goat farming sector needs to be developed to support the economy. One factor that needs to be considered during breeding is the implementation of biosecurity and hygiene (Noywuli et al., 2024).

Livestock biosecurity is an effort to protect livestock from the threat of disease spread that can enter the barn environment and endanger livestock (Rostini & Biyatmoko, 2021). All biosecurity activities are carried out to separate the host (livestock) from the disease source and vice versa (Libriani et al., 2020). The concept of biosecurity is often applied in livestock farms and research laboratories.

The status of biosecurity implementation on goat farms varies depending on the location, type of farm, and husbandry practices. Several steps to implement biosecurity in goat pens include restricting access to and from the pens in relation to goat husbandry practices (Djati et al., 2023). The implementation of pen biosecurity includes disinfecting equipment and pen areas, isolation biosecurity, livestock traffic, and good health monitoring (Noywuli et al., 2024).

Hygiene constitutes a critical measure in preventing the transmission and spread of diseases within livestock farms. The implementation of hygiene practices by farmers serves to protect

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both farmers and livestock from contamination that may lead to disease (Fawaid, 2020). Adherence to proper hygiene practices has been demonstrated to significantly decrease bacterial presence in rearing environments, thereby reducing the occurrence of diseases, such as diarrhea, and enhancing growth optimization (Halpin et al., 2024).

The relationship between biosecurity and farmer hygiene is integral to livestock enterprise sustainability. Effective implementation of these practices can control and prevent disease, reduce mortality rates, and maintain high productivity, thereby enhancing production outcomes and contributing to the long-term viability of livestock businesses (Ilham & Mardianto, 2021). Furthermore, effective implementation can mitigate the risk of disease transmission, thereby preventing the financial losses associated with livestock mortality (Libriani et al., 2024). Good biosecurity and hygiene can reduce the risk of zoonotic pathogen transmission and assist in controlling public health (Msimang et al., 2022).

Studies on the application of biosecurity and farmer hygiene are important for understanding, preventing, and controlling diseases that threaten livestock health. Improvements in biosecurity and farmer hygiene will help develop early warning systems and effective strategies for dealing with infectious diseases. Currently, the spread of disease between regions is occurring at an increasingly rapid pace worldwide. One example of a disease that is spreading again is foot-and-mouth disease (FMD). Central Kalimantan is one of the provinces affected by FMD, causing economic problems (Susila et al., 2023). Therefore, the implementation of biosecurity and hygiene measures is necessary to prevent the spread of disease. This study was conducted to analyse the relationship between farmer characteristics and the implementation of biosecurity and hygiene measures. A further analysis was conducted between the implementation of biosecurity and hygiene by farmers and the occurrence of diseases. Studies on biosecurity can contribute to the protection of livestock, humans, and the environment, as well as the sustainability of goat farming.

RESEARCH METHOD

Animal Ethics

This study did not require animal ethics approval. This study used a surveillance method on goat farmers in Palangka Raya; therefore, there was no direct intervention with animals.

Research Object

The sample in this study was selected using a purposive method, considering the population size and discussions with relevant agencies. The study was conducted using survey and observation methods at goat farms in Palangka Raya. Primary data were obtained using a pre-designed questionnaire. Interviews were conducted with each farmer to support the questionnaire's results. These observations were useful for assessing the level of biosecurity and hygiene implementation by farmers. This study was conducted on 10 goat farmers in August 2025 in Palangka Raya City.

Reseach Design

This study was conducted using observational methods on goat farmers in Palangka Raya City. This study was conducted to determine the relationship between farmer characteristics and the implementation of biosecurity, including barn and environmental sanitation, isolation and health management, and farmer hygiene. This was followed by further analysis of the relationship between biosecurity, hygiene, and disease occurrence.

Data Collection Methods

This study used both primary and secondary data. The questionnaires completed by the farmers

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and the observation results were the primary data sources. Secondary data were obtained from supporting documents, such as farmers' records, reports, and books related to the study. The questionnaire and observation results were tabulated using a scoring method and analysed statistically (Astuti et al., 2023). Scoring was divided into three categories: good (score 2.1-3), fair (score 1.1-2), and poor (0-1) for assessing biosecurity and farmer hygiene. The disease occurrence parameter was divided into three categories according to the percentage of disease occurrence each year compared with the goat population on each farm. The categories were good (0-5%), fair (6-10%), and poor (11-15%). The definition of disease used in this study was a condition in which clinical symptoms appeared in goats, causing them to deviate from their normal physiological condition. The number of disease occurrences was obtained from the information provided by the farmers. The age and education categories were determined according to Astuti et al. (2023), where age was divided into four categories: < 20, 20–30, 30–40, and > 40 years. Education was categorised according to level: elementary school, junior high school, high school, and college level. Farming experience was divided into three categories: low (<5 years), moderate (6–10 years), and high (>10 years) (de García et al., 2023).

Data analysis

All questionnaire and observation data that had been tabulated using scoring were analysed using SPSS through a chi-square ($\chi 2$) test. The results of the analysis are presented descriptively.

RESULTS AND DISCUSSION

Relationship between Farmer Characteristics and the Level of Application of Biosecurity in Barn Sanitation and the Environment

Farmer characteristics, including age, education, and farming experience, were tested to determine their relationship with the level of application of biosecurity in barn sanitation and the environment. The results of this analysis are shown in Table 1.

The participants in this study comprised 10 goat farmers from Palangka Raya, whose ages ranged from 30 to over 40 years old. There were no farmers aged under 20 or between 20 and 30 years (0%). There were three farmers (30%) aged 30–40 years and seven farmers (70%) aged over 40 years. However, the analysis showed that there was no relationship ($p>0.05$) between farmer characteristics based on age and the level of implementation of barn and environmental sanitation biosecurity measures. This is not in line with Aini et al., (2022) , who stated that age affects people's mindset in accepting and applying their knowledge. The results of this study may be due to the homogeneity of the age range of the respondents. As stated by Astuti et al. (2023) , the level of heterogeneity of the research respondents is thought to influence the relationship between age characteristics and the implementation of sanitation and environmental biosecurity. The goat farmer respondents in this study were aged 30 to over 40 years old, and Tumewu et al. (2023) stated that the age range of 30–50 years is considered productive age; therefore, the homogeneity of the respondents in this study caused age characteristics to be unrelated to the implementation of biosecurity sanitation and the environment of goat farmers in Palangka Raya.

The next parameter is the characteristics of goat farmers in Palangka Raya based on education regarding the implementation of biosecurity in barn sanitation and the environment. In this study, goat farmers in Palangka Raya had completed high school education, namely five people (50%), and the least education was elementary school, namely one person (10%). The results of this study indicate that there is no relationship ($p>0.05$) between the characteristics of farmers based on education and the level of implementation of biosecurity sanitation in barns and the

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environment. These results contradict those of Yamanik et al. (2025), who found that education influences a person's understanding and comprehension of knowledge and its application. This insignificant difference is thought to be due to other factors in the implementation of biosecurity sanitation in barns and the environment. As stated by Setiyowati et al. (2022), the implementation of biosecurity in livestock farming is influenced by access to information and training as external factors.

The farming experience of goat farmers in Palangka Raya ranged from 1 to 5 years for seven people (70%), 6 to 10 years for two people (20%), and more than 10 years for one person (10%). These results show that there is no relationship ($p>0.05$) between farmer characteristics based on farming experience and the level of implementation of biosecurity in barn sanitation and the environment. These analysis results are not in line with the research by Windani et al. (2022) , who found that characteristics based on experience influence knowledge and its application; the longer a person's experience, the better their mastery of the field tends to be. In addition to experience, Ismael et al. (2021) stated that farmers need education, training, and guidance to support their understanding and implementation of biosecurity measures.

Relationship between Farmer Characteristics and the Level of Implementation of Isolation Biosecurity and Health Management

The next data analysis was an observation of the relationship between the characteristics (age, education, and farming experience) of goat farmers in Palangka Raya and the level of implementation of isolation, biosecurity, and health management. The results showed a significant relationship ($p<0.05$) between education and the level of implementation of isolation biosecurity and health management. However, there was no significant relationship between age, farming experience, and the level of implementation of isolation biosecurity and health management. There were no farmers aged < 20 years and 20-30 years (0%). Meanwhile, there were 3 farmers were aged 30–40 years (30%) and seven were aged >40 years (70%). Older age is accompanied by increased life experience. Syafitri dan Indirawati (2022) stated that as a person ages, they tend to have more experience. The absence of a relationship between the age of farmers and the level of implementation of isolation biosecurity and health management is due to farmers practicing farm biosecurity based on knowledge and culture passed down through generations. This is in line with the opinion of Christijanti et al. (2025), who found that many farmers in Indonesia still carry out the biosecurity maintenance process based on knowledge that has been passed down from generation to generation.

In this study, farmers with high school and college education tended to implement better isolation biosecurity and health management than those with lower education (elementary and junior high school). These results are consistent with those of Suryadhi et al. (2024), who reported that education affects farmers' receptivity to knowledge and its application. Farmers with higher education levels have a better understanding of biosecurity and livestock health management. This is in line with Setiyowati et al. (2022), who stated that the individual factors that influence farmers' knowledge are motivation, formal education, land area, and income level. The quality of farmers' knowledge through formal education facilitates access to information and understanding of isolation, biosecurity, and health management.

However, farming experience did not show any correlation ($p>0.05$). Although experience plays an important role in technical skills, these results indicate that experience does not affect the implementation of isolation biosecurity and good health management practices. This finding contradicts the research conducted by Widayati et al. (2024), who determined that experience is essential for farmers in business development and is associated with the level of business success. Thus, the insignificant relationship in this study may be due to a lack of knowledge

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about isolation biosecurity and health management, which requires special training for implementation.

Relationship between Farmer Characteristics and Level of Hygiene Implementation

The analysis results in Table 3 show that the age of the farmer was not related to the level of hygiene implementation ($p>0.05$). The absence of a significant relationship may be due to the fact that the level of hygiene practices among farmers is still based on habits that have been cultivated since they first started farming. This finding is supported by the results of a study by Can dan Altug (2014), which states that age has no effect on the implementation of biosecurity, as older farmers tend to rely more on traditional methods.

The results of the analysis show that education is related ($p<0.05$) to the implementation of hygiene by farmers. The data show that the implementation of hygiene by farmers is influenced by their level of education, which means that the higher the level of education, the easier it is for farmers to understand the importance of hygiene in preventing the spread of disease among livestock. These results are in line with the research by Niemi et al. (2016), who stated that formal education improves farmers' ability to receive information, understand technology, and apply livestock health practices more consistently.

In addition, farming experience was related to the implementation of hygiene ($p<0.05$). Farmers with 1–10 years of experience were more likely to be in the adequate to good category than those with >15 years of experience. This is thought to be due to the existence of old habits that are difficult to change among senior farmers, while relatively new farmers are more open to information, resulting in better implementation of hygiene practices. Lestari et al. (2019) eported that long experience does not always guarantee biosecurity compliance, because without updating their knowledge, experienced farmers tend to maintain old practices that are not in line with standards. This is consistent with the research by Thu et al. (2025), which found that farmers with longer experience tend to avoid risks in new biosecurity practices and choose to apply traditional practices.

The Relationship Between the Implementation of Biosecurity and Hygiene and the Occurrence of Disease

The results of this study show that there is no relationship ($p>0.05$) between the implementation of biosecurity measures in barn sanitation and the environment and the occurrence of disease. This is because the sanitation practices of farmers are almost identical, namely cleaning barns of manure and watering them. Ridhana et al. (2024) similarly observed that comparable sanitation practices among farmers are associated with analogous rates of disease occurrence. In Palangka Raya, the implementation of biosecurity sanitation by farmers necessitates additional measures to mitigate disease occurrence in livestock, including the adoption of isolation biosecurity, traffic control, and regular disinfection of livestock housing. This is in line with the research by Sandriya et al. (2023), who explained that pen sanitation plays a role in minimizing contamination, but this also needs to be supported by the implementation of isolation biosecurity and livestock traffic monitoring.

The next step was to determine the relationship between the implementation of isolation biosecurity and health management and disease occurrence. The results of this study show a significant relationship ($p<0.05$) between isolation biosecurity and health management and disease occurrence. The data show that farmers with good isolation and health management practices have more cases of low-category diseases (0–5%), while in the moderate category, cases of up to 11–15% are found. The implementation of isolation biosecurity and health management is one of the factors in the prevention and control of livestock diseases. This is in

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line with the research by Chowdhury et al. (2020), who stated that factors in disease control efforts in livestock include routine sanitation practices, isolation biosecurity, vaccination, and routine health monitoring, which must be carried out comprehensively and in an integrated manner.

The next parameter was the relationship between farmer hygiene and disease occurrence. The results of this study show that there is a relationship ($p<0.05$) between farmer hygiene and disease occurrence. Farmers with good hygiene did not experience high disease occurrence (0-5%), whereas farmers with adequate hygiene still faced relatively higher cases (6-15%). Moje et al. (2023) showed that the implementation of farmer hygiene can significantly minimize the potential for disease spread. This is in line with the research by Fawaid (2020) , which found that the function of farmer hygiene is not only to protect livestock but also to protect farmers from sources of contamination and disease-causing contaminants.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study demonstrates that the characteristics of farmers, particularly their educational background, are the primary factors influencing the implementation of biosecurity and hygiene practices. This implementation is directly related to the occurrence of disease on the farm. Enhanced biosecurity and hygiene practices are associated with a reduced occurrence of disease in goat farms in Palangka Raya.

Recommendations

Based on the results of this study, efforts that can be made to improve the implementation of biosecurity and hygiene practices include education, outreach, and research for farmers so that they can minimize the risk of disease and achieve optimal productivity on goat farms in Palangka Raya.

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Table

Table 1. Relationship between Farmer Characteristics and the Level of Application of Biosecurity in Barn Sanitation and the Environment

Charcteristic	Description	Biosecurity of the farm			P
		Poor	Fair	Good	
Age	30 – 40 years	0	0	3	0.091
	>40 years	0	2	5	
Education	Elementary school	0	1	0	0.405
	Junior high school	0	1	1	
	Senior high school	0	2	3	
	College	0	0	2	
Farming Experience	1-5 years	0	2	5	0.375
	6-10 years	0	1	1	
	>10 years	0	1	0	

Note: The asterisk (*) indicates a significant relationship with the implementation of biosecurity ($p<0.05$).

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Table 2. Relationship between Farmer Characteristics and Level of Implementation of Isolation Biosecurity and Health Management

Characteristic	Description	Livestock biosecurity			P
		Poor	Fair	Good	
Age	30 – 40 years	0	1	2	0.880
	>40 years	0	2	5	
Education	Elementary school	0	1	0	0.019*
	Junior high school	0	2	0	
	Senior high school	0	0	5	
	College	0	0	2	
Farming Experience	1-5 years	0	2	5	0.202
	6-10 years	0	0	2	
	>10 years	0	1	0	

Note: The asterisk (*) indicates a significant relationship with the implementation of biosecurity ($p<0.05$).

Table 3. Relationship between Farmer Characteristics and Level of Hygiene Implementation

Characteristic	Description	Livestock biosecurity			P
		Poor	Fair	Good	
Age	30 – 40 years	0	2	1	0.788
	>40 years	1	4	2	
Education	Elementary school	1	0	0	0.014*
	Junior high school	0	2	0	
	Senior high school	0	4	1	
	College	0	0	2	
Farming Experience	1-5 years	0	5	2	0.035*
	6-10 years	0	1	1	
	>10 years	1	0	0	

Note: The asterisk (*) indicates a significant relationship with the implementation of biosecurity ($p<0.05$).

Table 4. Relationship between the Implementation of Biosecurity and Hygiene and the Occurrence of Disease

Characteristic	Description	Occurrence of Disease			P
		0-5%	6-10%	11-15%	
Biosecurity, Sanitation of Pens and Environment	Poor	0	0	0	0.082
	Fair	0	2	2	
	Good	3	3	0	
Isolation and Health Management Biosecurity	Poor	0	0	0	0.045*
	Fair	0	1	2	
	Good	3	4	0	
Farmer Hygiene	Poor	0	0	1	0.007*
	Fair	0	5	1	
	Good	3	0	0	

Note: The asterisk (*) indicates a significant relationship with the implementation of biosecurity ($p<0.05$).

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