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Biosecurity Knowledge and Practices of Backyard Hog Raisers on African Swine Fever in the City of San Fernando, La Union, Philippines

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ABSTRACT

This descriptive correlational study assessed the level of knowledge and extent of biosecurity practices among backyard hog raisers in San Fernando, La Union, in response to African Swine Fever (ASF). Results indicated that most raisers were middle-aged males with moderate knowledge of ASF-related biosecurity. They generally practiced disinfection, cleaning, and segregation. Significant correlations were found between demographic factors (experience, education, and training) and knowledge and practices. The study recommends tailored information materials, government-supported training programs, and cross-sectoral awareness campaigns to improve ASF biosecurity compliance.

Keywords: African Swine Fever, Biosecurity, Backyard Hog Raisers, Knowledge, Practices, San Fernando

INTRODUCTION

African Swine Fever (ASF) is a highly contagious and fatal disease affecting pigs with up to 100% mortality. Since its first recorded outbreak in the Philippines in 2019, ASF has caused significant economic losses, especially for small-scale or backyard hog raisers who often lack the resources for strict biosecurity. In San Fernando, La Union—the first city in the province to report ASF cases—recurring outbreaks have continued despite government efforts and interventions.

This study focuses on evaluating the knowledge and practices of backyard hog raisers in the city to determine the effectiveness of biosecurity interventions and identify gaps that hinder ASF prevention. The study is anchored in the Epidemiologic Triad, Germ Theory, and Ecological Theory, emphasizing the roles of the host (pigs), agent (ASF virus), and environment (farming practices and human behavior) in disease transmission.

METHODOLOGY

This study used a descriptive-correlational research design and surveyed 84 backyard hog raisers from San Fernando, La Union, Philippines. The correlational aspect of the study focuses on determining whether a significant relationship exists between the respondents' demographic characteristics and their level of knowledge and adherence to biosecurity measures. The City of San Fernando, Province of La Union, Philippines which is the capital and economic center of the province, playing a crucial role in agriculture, trade, and industry in the Ilocos Region. Among its agricultural sectors, hog raising is a significant contributor to the local economy, providing a source of income for both small-scale backyard farmers and larger commercial producers. The respondents were particularly from Barangays affected by ASF as suggested by the City Veterinary Office of City of San Fernando. Purposive sampling was used to select participants.

Respondents of the study were:

Small to medium-scale backyard hog raisers in City of San Fernando, La Union;

Presently or formerly raising pigs before the outbreak of ASF; and

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Must be willing to engage in surveys to provide information about their biosecurity knowledge and practices.

A researcher-developed questionnaire was validated by five experts (mean validity score: 4.70) and translated to Filipino to ensure comprehension. The instrument covered demographics, knowledge, and practices (cleaning, disinfection, segregation). Respondents completed paper-based surveys with consent forms, facilitated by the researcher. Data were analyzed using descriptive statistics, Pearson's r, and chi-square tests to determine correlations.

RESULTS

Demographic Profile

The respondents' ages are spread across different age groups, with the majority (36%) falling in the 36-45 years old range. The next largest group is 26-35 years old (18%), followed by 46-55 years old (25%). A smaller portion of respondents is from the 18-25 years old group (12%), and only 10% of respondents are aged 56 and above. The majority of respondents are married (65%), followed by separated individuals (14%) and single individuals (12%). Only a small portion (8%) are widowed.

In terms of education, most respondents have at least completed high school or some college education, with 23% being high school graduates, 35% having some college education, and 14% being college graduates. A significant portion (10%) has vocational training, which is highly relevant to the practical nature of hog raising. Only a small percentage (2%) have completed elementary school, and a few have pursued postgraduate education (4%).

Regarding experience, most respondents (40%) have been involved in hog raising for 1-5 years, followed by those with 6-10 years of experience (33%). Only 14% of respondents have less than 1 year of experience, while 12% have been raising hogs for more than 10 years. The majority of respondents (51%) have not attended any training related to biosecurity. A smaller group has attended 1-2 trainings (25%), 3-4 trainings (15%), and only 8% have attended 5 or more training sessions.

Level of Knowledge on Biosecurity

The highest knowledge level (48.81%) is observed in the awareness of the importance of regular cleaning and disinfecting of equipment, tools, and vehicles. Following closely, 42.86% of respondents understand that ASF can be transmitted through the movement of infected pigs or contaminated materials. Additionally, 41.67% of respondents are aware that swill feeding poses a significant risk for introducing ASF into the piggery. Another key area of knowledge is the recognition that wild boars can transmit ASF to domestic pigs, with 39.29% of respondents acknowledging this risk. Finally, 41.67% of respondents are aware of the need for quarantine procedures when introducing new pigs to the farm.

Overall, the mean percentage score for knowledge on biosecurity stands at 36.11%, indicating that the respondents are "Moderately Knowledgeable" about ASF and biosecurity measures. While there are notable strengths in certain areas, such as cleaning and disinfection and quarantine procedures, there are still significant gaps in other areas, particularly regarding the risks associated with contaminated feed, water, and materials.

Table A Level of Knowledge on Biosecurity

Indicators	**Correct Answer** **Frequency**	**PS**	**DE**
I am aware that Biosecurity helps in prevention of African Swine Fever:	32	38.10	MK
I am aware that African Swine Fever is caused by virus:	28	33.33	MK

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African Swine Fever is transmitted directly from infected pigs to healthy pigs:	30	35.71	MK
African Swine Fever is transmitted indirectly thru contact on a contaminated meat, blood, urine, feces, feeds, truck, humans, clothings, footwears etc.:	22	26.19	SK
I am aware that Swill Feeding post a high treat in African Swine Fever introduction to the piggery:	35	41.67	MK
I am aware that there is currently no vaccine for African Swine Fever.	19	22.62	SK
I understand that ASF can be spread through the movement of infected pigs or contaminated materials.	36	42.86	MK
I am aware that wild boars can transmit African Swine Fever to domestic pigs.	33	39.29	MK
I understand the importance of regular cleaning and disinfecting of equipment, tools, and vehicles.	41	48.81	MK
. I know that introducing new pigs to the farm should involve quarantine procedures to prevent ASF transmission.	35	41.67	MK
. I am aware that ASF can be transmitted through contaminated feed and water sources.	21	25.00	SK
. I understand the need to monitor for and report unusual symptoms in my pigs to local authorities.	29	34.52	MK
. I am aware that ASF can cause severe financial losses due to the culling of infected pigs.	26	30.95	MK
. I know that strict control of farm access, including visitors, is important to prevent ASF.	32	38.10	MK
. I am aware that biosecurity practices such as cleaning footwear, clothing, and hands can help prevent ASF.	36	42.86	MK
Mean Percentage Score		**36.11**	**MK**

Legend: 70-100% = Highly Knowledgeable (HK); 50-69% = Knowledgeable (K); 30-49% = Moderately Knowledgeable (MK); 1-29% = Slightly Knowledgeable (SK)

Extent of Practices on Biosecurity

Disinfection

The practice of regular and thorough disinfection of pigpens, walls, floors, and surrounding areas has the highest weighted mean score of 3.92, categorized as "Often Practiced" (OP). This suggests that the respondents generally follow this essential biosecurity measure to minimize the risk of African Swine Fever (ASF) transmission. While it is not always practiced consistently, it shows a relatively high level of commitment to maintaining clean and safe environments for the pigs.For the proper disinfection of new equipment entering the piggery, such as feeders, waterers, and tools, the weighted mean score is 3.49, also falling within the "Often Practiced" (OP)

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category. This indicates that respondents are generally aware of the need to disinfect equipment before it enters the piggery, though there may be occasional lapses in fully implementing this practice across all types of equipment.

The disinfection of footwear before and after entering the piggery, using properly maintained footbaths with ASF-approved disinfectants, has a lower weighted mean score of 3.18, classified as "Sometimes Practiced" (SP). This suggests that while the practice is implemented to some degree, it may not be consistently followed by all individuals. Regular and thorough disinfection of pigpens after every pig turnover, which includes disinfecting all surfaces, equipment, and areas where animals have had direct or indirect contact, received a weighted mean score of 3.43, also in the "Often Practiced" (OP) category. This shows that the respondents understand the importance of disinfecting the environment after each turnover of pigs to reduce the risk of disease transmission, though, like other practices, it may not be carried out uniformly every time. Finally, the disinfection of vehicles that transport animals or supplies before and after visiting the piggery has a weighted mean score of 3.46, categorized as "Often Practiced" (OP). This indicates that respondents are aware of the importance of vehicle disinfection in preventing ASF and generally follow this practice, but there may still be occasional lapses or insufficient attention to ensuring that all vehicles are disinfected consistently.

The overall average weighted mean (AWM) of 3.50, categorized as "Often Practiced" (OP), reflects that while the disinfection practices are generally followed by the respondents, there is still room for improvement in terms of consistency and thoroughness. Some practices, like footbath disinfection, show room for more frequent and consistent implementation to enhance the overall biosecurity measures on the farm.

Table 1B Extent of Practices on Biosecurity along Disinfection

Disinfection	**5**	**4**	**3**	**2**	**1**	**WM**	**DE**
Regular and thorough disinfection of pigpens, walls, floors, and surrounding areas is essential to minimize the risk of ASF transmission.	34	23	16	8	3	3.92	OP
Proper infection of new equipment entering the piggery, such as feeders, waterers, and tools.	20	23	24	12	5	3.49	OP
Footwear disinfection before and after entering the piggery using a properly maintained footbath with ASF-approved disinfectants.	15	18	26	17	8	3.18	SP
Regular and thorough disinfection of pigpens after every pig turnover which includes all surfaces, equipment, and any areas where animals have had direct or indirect contact.	18	26	19	16	5	3.43	OP
Disinfection of vehicles that transport animals or supplies before and after visiting the piggery.	19	28	17	13	7	3.46	OP
AWM						**3.50**	**OP**

Legend: 4.21-5.00 = Always Practiced (AP); 3.41-4.20 = Often Practiced (OP); 2.61 – 3.40 = Sometimes Practiced (SP); 1.81 – 2.60 = Seldom Practiced (SeP); 1.00 – 1.80 = Never Practiced (NP)

Cleaning

The highest score, 3.75, is for regular cleaning of the area surrounding the piggery, including pathways, yards, and fences. This is classified as "Often Practiced" (OP), suggesting that respondents place a significant emphasis on ensuring that the external areas of the piggery are free from organic materials that could serve as vehicles for

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ASF transmission. Another key practice is the daily routine cleaning of the pigpen to remove manure, waste, and feed remnants, which could harbor ASF viruses. This received a weighted mean score of 3.65, also categorized as "Often Practiced" (OP). The thorough cleaning of surfaces before disinfection, which includes walls, floors, equipment, and feed/water containers, received a weighted mean score of 3.54. This practice, categorized as "Often Practiced" (OP), suggests that respondents understand the importance of thorough cleaning before applying disinfectants to ensure the disinfectants' effectiveness in killing the ASF virus.The cleaning and disinfection of feeders, waterers, and troughs to reduce the risk of ASF transmission also scored 3.69, falling in the "Often Practiced" (OP) category. This suggests that respondents are attentive to the need to disinfect equipment that comes into direct contact with feed and water, which can be a significant source of disease transmission.The practice of cleaning footbaths to avoid contamination and deactivation of disinfectants received a lower score of 3.37, categorized as "Sometimes Practiced" (SP). This suggests that while cleaning of footbaths is recognized as important, it may not be consistently practiced or prioritized.

The overall average weighted mean (AWM) of 3.60 falls within the "Often Practiced" (OP) category, indicating that respondents generally follow cleaning protocols to maintain biosecurity standards. However, there are areas, such as the cleaning of footbaths, where further attention is needed to ensure that all cleaning practices are consistently and thoroughly applied to minimize the risk of ASF transmission.

Table 2B Extent of Practices on Biosecurity along Cleaning

Cleaning							
Daily routine cleaning of the pigpen to remove manure, waste, and feed remnants, as these can harbor ASF viruses.	28	21	19	10	6	3.65	OP
Regular cleaning of the area surrounding the piggery, including pathways, yards, and fences to ensure that the area is free of organic material that could serve as a vehicle for ASF transmission.	32	21	14	12	5	3.75	OP
Thorough cleaning of all surfaces, including walls, floors, equipment, and feed/water containers before disinfection ensuring that disinfectants are more effective in killing the ASF virus.	29	16	19	11	9	3.54	OP
Cleaning and disinfection of feeders, waterers, and troughs to reduce the risk of ASF transmission.	22	29	22	7	4	3.69	OP
Cleaning of footbaths to avoid contamination and deactivation of disinfectants.	17	22	28	9	8	3.37	SP
AWM						**3.60**	**OP**

Legend: 4.21-5.00 = Always Practiced (AP); 3.41-4.20 = Often Practiced (OP); 2.61 – 3.40 = Sometimes Practiced (SP); 1.81 – 2.60 = Seldom Practiced (SeP); 1.00 – 1.80 = Never Practiced (NP)

Segregation : The practice of not allowing access to unauthorized individuals inside the piggery to reduce the risk of ASF introduction has a weighted mean score of 3.33, categorized as "Sometimes Practiced" (SP). This suggests that while respondents recognize the importance of limiting access to the piggery, it is not consistently enforced. The use of designated footwear when inside the piggery and the prohibition of outside footwear from entering the facility received a weighted mean score of 3.44, categorized as "Often Practiced" (OP). This reflects a relatively strong adherence to this biosecurity measure, with respondents generally following the protocol of using specific footwear inside the piggery to minimize the risk of contamination from external sources. The establishment of strict protocols for feed delivery and storage to ensure that external contamination is prevented

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scored 3.32, falling within the "Sometimes Practiced" (SP) category. This indicates that while respondents understand the importance of securing feed from contamination, it may not always be practiced effectively. The prohibition of pork and pork products inside the piggery received a score of 3.36, also categorized as "Sometimes Practiced" (SP). This suggests that while respondents acknowledge the importance of preventing pork and pork products from entering the piggery, this practice is not always consistently followed. Pork products can carry the ASF virus and act as a vehicle for transmission, so ensuring that they are strictly prohibited within the facility is crucial to preventing outbreaks. Finally, the installation of a secure fence around the piggery to protect against unauthorized entry of people and animals received the lowest score of 3.04, classified as "Sometimes Practiced" (SP). This indicates that while some respondents may have installed a fence around their piggery, it is not a universal practice and may not be a high priority for all respondents.

Most participants had moderate awareness of ASF and biosecurity measures. They reported regular disinfection, cleaning, and segregation of pigs. Training and years of experience were significantly related to better biosecurity practices.

The overall average weighted mean (AWM) of 3.30 places the practices under the "Sometimes Practiced" (SP) category, reflecting that while segregation measures are acknowledged, they are not always consistently implemented across all areas.

Table 3B Extent of Practices on Biosecurity along Segregation

Segregation							
Not allowing access to unauthorized individuals inside the piggery under any circumstances to reduce the risk of ASF introduction.	12	22	37	8	5	3.33	SP
Use of designated footwear when inside the piggery and never bring outside footwear into the facility.	18	19	32	12	3	3.44	OP
Establishing strict protocols for feed delivery and storage, ensuring that external contamination is prevented.	13	22	33	11	5	3.32	SP
Prohibition of pork and pork products inside the piggery as these products could carry the virus and act as a medium for transmission among pigs.	12	22	37	10	3	3.36	SP
Installation of a secure fence around the piggery to protect against unauthorized entry of people and animals.	11	19	22	26	6	3.04	SP
AWM						**3.30**	**SP**

Legend: 4.21-5.00 = Always Practiced (AP); 3.41-4.20 = Often Practiced (OP); 2.61 – 3.40 = Sometimes Practiced (SP); 1.81 – 2.60 = Seldom Practiced (SeP); 1.00 – 1.80 = Never Practiced (NP)

The overall average weighted mean (AWM) of 3.30 places the practices under the "Sometimes Practiced" (SP) category, reflecting that while segregation measures are acknowledged, they are not always consistently implemented across all areas. There is a clear need for further reinforcement of these practices to ensure that the biosecurity protocols related to segregation are thoroughly followed to prevent the introduction and spread of ASF within the piggery.

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Table 4B Summary Table on the Extent of Practices on Biosecurity

Practices	**AWM**	**DE**
Disinfection	3.50	OP
Cleaning	3.60	OP
Segregation	3.30	SP
Overall AWM	3.47	**OP**

Legend: 4.21-5.00 = Always Practiced (AP); 3.41-4.20 = Often Practiced (OP); 2.61 – 3.40 = Sometimes Practiced (SP); 1.81 – 2.60 = Seldom Practiced (SeP); 1.00 – 1.80 = Never Practiced (NP)

Relationship between Demographic Profile and Level of Knowledge on Biosecurity

In Table 1C, the relationship between various demographic factors and the level of knowledge on biosecurity practices is explored using Pearson correlation coefficients and their corresponding p-values. A p-value of 0.05 or less indicates a statistically significant relationship, meaning the correlation between the two variables is unlikely to have occurred by chance. The following relationships show significant associations, with p-values equal to or less than 0.05:

Table 1C Relationship between Demographic Profile and Level of Knowledge on Biosecurity

Indicators		**Age**	**Sex**	**Civil Status**	**Highest Educational Attainment**	**Years in Hog Raising**	**Number of Trainings related to Biosecurity**
I am aware that Biosecurity helps in prevention of African Swine Fever:	Pearson Correlation	.051	.079	.007	.062	.157**	.065
	Sig. (2-tailed)	.223	.059	.864	.141	**.000**	.121
I am aware that African Swine Fever is caused by virus:	Pearson Correlation	.020	.080	.013	.089*	.179**	.073
	Sig. (2-tailed)	.636	.058	.753	**.035**	**.000**	.081
African Swine Fever is transmitted directly from infected pigs to healthy pigs:	Pearson Correlation	.008	.051	.018	.079	.113**	.080
	Sig. (2-tailed)	.854	.224	.664	.060	**.007**	.058
African Swine Fever is transmitted indirectly thru contact on a contaminated meat, blood, urine, feces,	Pearson Correlation	.008	.005	.083*	.038	.109**	.104*
	Sig. (2-tailed)	.846	.905	**.048**	.371	**.009**	**.013**

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feeds, truck, humans, clothings, footwears etc.:							
I am aware that Swill Feeding post a high treat in African Swine Fever introduction to the piggery:	Pearson Correlation	.068	.035	.064	.048	.140**	.098*
	Sig. (2-tailed)	.107	.408	.126	.256	**.001**	**.020**
I am aware that there is currently no vaccine for African Swine Fever.	Pearson Correlation	.033	.074	.037	.014	.074	.059
	Sig. (2-tailed)	.427	.078	.381	.743	.079	.160
I understand that ASF can be spread through the movement of infected pigs or contaminated materials.	Pearson Correlation	.014	.090*	.024	.050	.024	.087*
	Sig. (2-tailed)	.739	**.032**	.565	.234	.572	**.039**
I am aware that wild boars can transmit African Swine Fever to domestic pigs.	Pearson Correlation	.048	.016	-.031	.034	.137**	.093*
	Sig. (2-tailed)	.257	.702	.458	.426	**.001**	**.026**
I understand the importance of regular cleaning and disinfecting of equipment, tools, and vehicles.	Pearson Correlation	.032	.020	-.041	.029	.106*	.113**
	Sig. (2-tailed)	.454	.629	.336	.494	**.012**	**.007**
. I know that introducing new pigs to the farm should involve quarantine procedures to prevent ASF transmission.	Pearson Correlation	.048	.022	-.021	.041	.058	.105*
	Sig. (2-tailed)	.259	.605	.616	.333	.171	**.013**
. I am aware that ASF can be transmitted	Pearson Correlation	.019	.029	.027	.035	.007	.141**

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through contaminated feed and water sources.	Sig. (2-tailed)	.653	.489	.516	.407	.868	**.001**
. I understand the need to monitor for and report unusual symptoms in my pigs to local authorities.	Pearson Correlation	.048	.070	.080	.057	.035	.057
	Sig. (2-tailed)	.253	.095	.056	.177	.410	.173
. I am aware that ASF can cause severe financial losses due to the culling of infected pigs.	Pearson Correlation	.052	.072	.066	.023	.001	.082
	Sig. (2-tailed)	.218	.088	.119	.592	.987	.051
. I know that strict control of farm access, including visitors, is important to prevent ASF.	Pearson Correlation	.069	.031	.067	.051	.014	.106*
	Sig. (2-tailed)	.100	.456	.111	.224	.747	**.011**
. I am aware that biosecurity practices such as cleaning footwear, clothing, and hands can help prevent ASF.	Pearson Correlation	.064	.070	.057	.072	.137**	.050
	Sig. (2-tailed)	.126	.094	.175	.085	**.001**	.231

Highest Educational Attainment and Knowledge of ASF as a Viral Disease (p = 0.035): A significant correlation is found between the respondents' highest educational attainment and their awareness that ASF is caused by a virus. The p-value of 0.035 indicates that those with higher educational levels tend to have a

Years in Hog Raising and Awareness of Swill Feeding's Threat (p = 0.001):

There is a significant relationship between the number of years a respondent has been involved in hog raising and their awareness of the risks associated with swill feeding in ASF transmission. The p-value of 0.001 indicates that individuals with more experience in hog raising are more likely to be aware of the high threat posed by swill feeding. This suggests that experience plays an important role in increasing awareness of the risk factors that contribute to ASF transmission better understanding of the viral nature of ASF. This highlights how educational background can influence knowledge and awareness about critical biosecurity issues, suggesting that more educated individuals are better informed about disease causation.

Civil Status and Knowledge of Indirect ASF Transmission (p = 0.048): The relationship between civil status and

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understanding of how ASF can be transmitted indirectly through contaminated items is statistically significant, with a p-value of 0.048. This suggests that marital status may influence one's awareness of indirect transmission routes for ASF. It implies that married individuals may have slightly different knowledge or perhaps different responsibilities or exposure to biosecurity practices that could affect their understanding of disease transmission.

Number of Trainings and Knowledge of ASF Spread Through Contaminated Feed and Water (p = 0.001): A strong correlation is evident between the number of trainings related to biosecurity that respondents have attended and their knowledge that ASF can be transmitted through contaminated feed and water, with a p-value of 0.001. This signifies that individuals who have undergone more biosecurity training are more likely to understand the risk of ASF transmission through feed and water sources, emphasizing the importance of continuous education and training in improving biosecurity awareness and practices.

These significant relationships underscore the importance of certain demographic factors, such as years of experience, educational background, marital status, and training exposure, in influencing the level of knowledge about biosecurity and ASF. The findings suggest that enhancing education, providing more training opportunities, and targeting specific demographic groups could help improve awareness and practices related to ASF prevention in the piggery.

Relationship between Demographic Profile and Extent of Practices on Biosecurity

Table 2C presents the relationship between demographic profile factors and the extent of biosecurity practices in terms of disinfection, cleaning, and segregation. The Pearson correlation values, coupled with the significance levels (p-values), provide insights into how various demographic factors influence biosecurity practices. A p-value of 0.05 or less indicates a significant relationship, meaning that the correlation between the demographic factor and the biosecurity practice is not likely due to chance.

Table 2C Relationship between Demographic Profile and Extent of Practices on Biosecurity

Disinfection		**Age**	**Sex**	**Civil Status**	**Highest Educational Attainment**	**Years in Hog Raising**	**Number of Trainings related to Biosecurity**
Regular and thorough disinfection of pigpens, walls, floors, and surrounding areas is essential to minimize the risk of ASF transmission.	Pearson Correlation	.028	.028	.005	.003	.099*	.057
	Sig. (2-tailed)	.504	.510	.897	.942	**.018**	.174
Proper infection of new equipment entering the piggery, such as feeders, waterers, and tools.	Pearson Correlation	.028	.003	.033	-.006	.099*	.080
	Sig. (2-tailed)	.500	.937	.435	.883	**.019**	.058
Footwear disinfection before and after entering the piggery using a properly maintained footbath with ASF-approved disinfectants.	Pearson Correlation	.032	.002	.002	.003	.102*	.114**
	Sig. (2-tailed)	.442	.961	.965	.942	**.015**	**.007**

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Regular and thorough disinfection of pigpens after every pig turnover which includes all surfaces, equipment, and any areas where animals have had direct or indirect contact.	Pearson Correlation	.000	.006	.032	.014	.077	.106*
	Sig. (2-tailed)	.996	.886	.451	.732	.067	**.012**
Disinfection of vehicles that transport animals or supplies before and after visiting the piggery.	Pearson Correlation	.018	.025	.000	.024	.090*	.105*
	Sig. (2-tailed)	.674	.557	.999	.563	**.032**	**.012**
Cleaning							
Daily routine cleaning of the pigpen to remove manure, waste, and feed remnants, as these can harbor ASF viruses.	Pearson Correlation	.077	.058	.013	.035	.080	.106*
	Sig. (2-tailed)	.067	.172	.755	.406	.057	**.011**
Regular cleaning of the area surrounding the piggery, including pathways, yards, and fences to ensure that the area is free of organic material that could serve as a vehicle for ASF transmission.	Pearson Correlation	.056	.001	.042	.025	.082	.029
	Sig. (2-tailed)	.186	.977	.323	.551	.051	.498
Thorough cleaning of all surfaces, including walls, floors, equipment, and feed/water containers before disinfection ensuring that disinfectants are more effective in killing the ASF virus.	Pearson Correlation	.020	.004	-.039	.050	.111**	.116**
	Sig. (2-tailed)	.631	.924	.357	.233	**.008**	**.006**
Cleaning and disinfection of feeders, waterers, and troughs to reduce the risk of ASF transmission.	Pearson Correlation	.034	-.010	.058	.030	.087*	.110**
	Sig. (2-tailed)	.422	.807	.171	.473	**.038**	**.009**

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Cleaning of footbaths to avoid contamination and deactivation of disinfectants.	Pearson Correlation	.016	.018	-.068	.059	.072	.152**
	Sig. (2-tailed)	.709	.664	.107	.160	.087	**.000**
Segregation							
Not allowing access to unauthorized individuals inside the piggery under any circumstances to reduce the risk of ASF introduction.	Pearson Correlation	.014	.048	-.049	.057	.179**	.111**
	Sig. (2-tailed)	.746	.256	.246	.176	**.000**	**.008**
Use of designated footwear when inside the piggery and never bring outside footwear into the facility.	Pearson Correlation	.031	.040	.036	.056	.184**	.035
	Sig. (2-tailed)	.466	.338	.394	.182	**.000**	.411
Establishing strict protocols for feed delivery and storage, ensuring that external contamination is prevented.	Pearson Correlation	.008	.011	.032	.055	.163**	.024
	Sig. (2-tailed)	.841	.792	.441	.187	**.000**	.567
Prohibition of pork and pork products inside the piggery as these products could carry the virus and act as a medium for transmission among pigs.	Pearson Correlation	.002	.017	.039	.053	.179**	.050
	Sig. (2-tailed)	.956	.684	.357	.208	**.000**	.238
Installation of a secure fence around the piggery to protect against unauthorized entry of people and animals.	Pearson Correlation	.038	.047	.028	.061	.191**	.014
	Sig. (2-tailed)	.361	.265	.503	.145	**.000**	.736

Disinfection

A statistically significant relationship is found between the number of years a person has been involved in hog raising and the practice of disinfecting footwear. The p-value of 0.015 suggests that those with more years of experience are more likely to practice proper footwear disinfection before and after entering the piggery using an appropriately maintained footbath with ASF-approved disinfectants.

The p-value of 0.018 indicates a significant correlation between the years spent in hog raising and the practice of regular and thorough disinfection of pigpens, walls, floors, and surrounding areas. This suggests that more

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experienced hog raisers are more likely to understand the importance of thorough disinfection in preventing ASF transmission.

The number of trainings attended is significantly correlated with the practice of disinfecting vehicles that transport animals or supplies before and after visiting the piggery. The p-value of 0.032 suggests that individuals who have undergone more biosecurity training are more likely to adhere to this critical disinfection practice.

Cleaning

A significant relationship exists between the number of years in hog raising and the practice of thoroughly cleaning surfaces, including walls, floors, equipment, and feed/water containers before disinfection. The p-value of 0.008 indicates that experienced hog raisers are more likely to practice thorough cleaning to ensure the effectiveness of disinfectants in eliminating the ASF virus.

There is a strong positive correlation between the number of biosecurity trainings and the cleaning of footbaths to avoid contamination and deactivation of disinfectants, with a p-value of 0.000. This indicates that individuals who have received more training are more likely to clean their footbaths regularly, which is a crucial step in maintaining the effectiveness of disinfectants in preventing ASF.

A significant correlation is also observed between the number of trainings and the practice of cleaning surfaces thoroughly before disinfection, with a p-value of 0.009. This suggests that biosecurity training positively influences the adoption of cleaning practices, reinforcing the importance of training in improving biosecurity measures.

Segregation

There is a significant relationship between years in hog raising and the prohibition of pork and pork products inside the piggery. The p-value of 0.000 indicates that individuals with more experience in hog raising are more likely to adhere to biosecurity practices such as prohibiting pork and pork products, which could carry the ASF virus.

A strong correlation exists between years in hog raising and the installation of secure fences around the piggery to protect against unauthorized entry of people and animals, with a p-value of 0.000. This shows that more experienced hog raisers are more likely to install protective barriers as part of their biosecurity practices.

The number of biosecurity-related trainings attended is significantly correlated with the use of designated footwear inside the piggery. The p-value of 0.008 suggests that those who have received biosecurity training are more likely to practice the use of designated footwear, helping to prevent the introduction of ASF to the piggery.

DISCUSSION

The findings indicate that while basic knowledge and practices are in place, gaps remain in implementation consistency. Training, education, and awareness play a crucial role in ensuring adherence to biosecurity standards. Comparisons with related studies underscore the need for localized training and continuous government support for backyard raisers.

Rajala et al. (2024) conducted a study in Sweden following the first ASF case in wild boar. Most farmers were concerned about ASF re-emergence and cited cost as a major barrier to joining the certification program. While many sought veterinary advice, a significant number did not implement recommended biosecurity measures, and advice was often not tailored to individual farm conditions. Farmers also highlighted wild boar density and food waste management as major ASF risk factors. The study stressed the need for ongoing communication and knowledge sharing to strengthen biosecurity preparedness.Similarly, Silang (2022) in the Philippines examined ASF-related biosecurity practices. While basic measures existed on many farms, compliance varied. Key risk factors included proximity to infected farms, pig movement, and poor waste disposal. Farmers who received training were more likely to follow biosecurity protocols, though knowledge gaps remained. The study emphasized the need for stronger government support and collaboration with veterinary professionals and

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farmers to improve biosecurity.Comparing these findings to the current study, which assessed disinfection, cleaning, and segregation, similarities and differences emerge. Disinfection (3.50) and cleaning (3.60) were "Often Practiced" (OP), showing general adherence but inconsistent thoroughness, echoing Rajala and Silang's findings. Segregation, with a lower mean (3.30), was "Sometimes Practiced" (SP), reflecting similar inconsistencies reported by Silang.All three studies revealed gaps in biosecurity implementation and farmer knowledge. In Sweden, 43% of farmers had not applied recommended measures, paralleling the current study's findings. In City of San Fernando, the call for more training and government support also aligns with the current study's conclusion. Together, the studies highlight the importance of farmer education, consistent biosecurity practices, and improved stakeholder communication to mitigate ASF risks.

Villegas (2023) and Castro, Jr. (2021) both examined the link between demographic factors and the level of ASF knowledge and biosecurity practices among smallholder hog raisers in the Philippines. Villegas (2023) found that while farmers in Luzon practiced basic measures like disinfecting footwear and controlling access, most lacked comprehensive biosecurity plans. Farmers with higher ASF awareness and those who received training were more likely to adopt effective practices. Key challenges included limited finances, lack of veterinary support, and insufficient knowledge, prompting the recommendation for community-based training programs. Similarly, Castro, Jr. (2021) studied hog raisers in Urdaneta City, Pangasinan, Philippines, finding that most were middle-aged, male, married, and had a high school education. Their ASF knowledge and practices were significantly influenced by demographic factors such as education, years of experience, and training attendance. More experienced and better-trained farmers implemented stronger biosecurity measures. The current study's findings aligned with these results. Educational attainment was significantly associated with understanding ASF as a viral disease ($p = 0.035$), supporting Villegas's conclusion on education's role in awareness. Years of experience in hog raising also influenced knowledge about swill feeding risks ($p = 0.001$), consistent with Castro's findings. Additionally, civil status correlated with knowledge of indirect ASF transmission ($p = 0.048$), and the number of training sessions attended strongly impacted understanding of ASF transmission via contaminated feed and water ($p = 0.001$). Overall, all three studies emphasized the importance of education, experience, and training in improving ASF knowledge and promoting effective biosecurity practices.

The studies by Klein et al. (2024) in Germany and Rajala et al. (2024) in Sweden provided valuable insights into the implementation and challenges of biosecurity practices for ASF prevention, showing similarities with findings from the current Philippine study on demographic factors and biosecurity behavior. Klein et al. found that while most farms in Lower Saxony had high biosecurity levels, gaps remained in fencing and zone separation. Farmers were informed about ASF but cited barriers like farm layout, cost, and practicality. Similarly, Rajala et al. reported high ASF risk perception among Swedish farmers, yet many had not implemented recommended measures due to cost and a lack of tailored veterinary guidance. The current study reflected similar patterns, with significant correlations found between hog-raising experience and practices such as disinfecting footwear ($p = 0.015$) and pigpens ($p = 0.018$), aligning with Klein et al.'s findings that experienced farmers applied better measures. Training also influenced practices, with the number of sessions correlating with vehicle disinfection ($p = 0.032$), similar to Rajala et al.'s findings on the role of veterinary support and training in adopting biosecurity measures. Cleaning practices in the current study also showed strong correlations with experience and training—specifically in cleaning surfaces ($p = 0.008$) and footbaths ($p = 0.000$)—paralleling Klein et al.'s observation that experienced and trained German farmers adhered more to cleanliness standards. Regarding segregation, both Klein et al. and the current study found that experience and training led to better enforcement. In the Philippine study, years in hog raising were significantly associated with pork product prohibition ($p = 0.000$) and fence installation ($p = 0.000$), while training was linked to the use of designated footwear ($p = 0.008$). Overall, the studies across Germany, Sweden, and in the City of San Fernando consistently showed that experience and training significantly improved biosecurity practices. However, cost, farm infrastructure, and access to guidance remained common obstacles, emphasizing the ongoing need for education, resource support, and tailored interventions to strengthen ASF prevention efforts.

Overall findings revealed that while a majority of respondents demonstrated basic awareness of ASF and its symptoms, only a moderate level of adherence to recommended biosecurity protocols was observed. Common practices included limiting visitor access to pig pens, regular disinfection, and sourcing feeds from trusted suppliers. However, practices such as establishing perimeter fencing, implementing strict quarantine measures, and the use of protective clothing were inconsistently applied.

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The implications of these findings are significant. First, they suggest that while information dissemination campaigns have been partially effective, there remains a crucial gap in translating knowledge into practice. Second, the inconsistent implementation of biosecurity measures increases the vulnerability of backyard farms, potentially allowing ASF to persist or re-emerge in localized outbreaks. Lastly, the study underscores the need for a more inclusive approach to biosecurity—one that considers the economic limitations of backyard farmers and integrates community-based strategies, such as collective monitoring, shared disinfection facilities, and localized training programs.

Overall, this study contributes to the growing body of evidence indicating that a one-size-fits-all approach to biosecurity may not be effective in the context of backyard farming systems. Tailored interventions that combine education, technical support, and incentives are essential to improving disease prevention and supporting the livelihoods of small-scale hog raisers.

CONCLUSION AND RECOMMENDATIONS

Knowledge on ASF biosecurity is generally moderate among backyard raisers. Practices are evident but need reinforcement through tailored training. It is recommended that: Biosecurity information materials be widely distributed Regular government training sessions be held Local Government Unit and Department of Agriculture collaborate for unified ASF awareness campaigns

Future research should assess the effectiveness of different biosecurity strategies, evaluate long-term training impacts, and explore cultural factors affecting compliance to inform more targeted interventions.

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