"Smallholder Swine Biosecurity Practices in Nueva Valencia, Guimaras: Implications for Disease Prevention and Extension Program Design"

Julius T. Vergara[1], Erma T. Conde[2]

Guimaras State University

DOI: https://doi.org/10.51244/IJRSI.2026.130300008

Received: 06 March 2026; Accepted: 12 March 2026; Published: 24 March 2026

ABSTRACT

Biosecurity plays a critical role in preventing disease outbreaks and ensuring sustainable swine production, particularly among smallholder farmers who often operate with limited resources and veterinary support. This study assessed biosecurity and disease prevention practices among smallholder swine raisers in Nueva Valencia, Guimaras, to provide a basis for developing targeted extension programs. A quantitative descriptive–analytical research design was employed, and data were collected from 50 registered swine raisers through a structured questionnaire administered through personal interviews. Results revealed that the majority of farms operate as breeding–fattening units (82%), indicating integrated smallholder production systems. Most respondents obtained replacement stocks from farmers within the same barangay (68%), while a large proportion relied on borrowed or hired breeding boars (66%). Commercial feeds or pellets were the dominant feed source (86%), and most farmers practiced daily cleaning of pigpens (74%). However, none of the respondents reported using disinfectants during cleaning, indicating a critical gap in farm biosecurity practices. Additional analysis suggests that the movement of animals between farms and the absence of disinfection protocols may increase the risk of disease transmission, including highly contagious diseases such as African Swine Fever (ASF). The findings highlight important structural and behavioral constraints influencing biosecurity adoption in smallholder systems. Strengthened extension interventions focusing on improved sanitation protocols, controlled breeding practices, and safe animal sourcing are necessary. Collaboration among local government units, veterinary services, and agricultural extension institutions will be essential to enhance farmer knowledge, strengthen biosecurity adoption, and sustain swine production in the municipality.

Keywords: animal health**,** disinfectant, pig management, sanitation, signs, symptoms

INTRODUCTION

Disease prevention in swine production is fundamental to maintaining animal health, farm productivity, and the long-term sustainability of livestock systems. Infectious diseases such as African Swine Fever (ASF), Porcine Reproductive and Respiratory Syndrome (PRRS), and Porcine Epidemic Diarrhea (PED) have caused major disruptions to global and regional swine industries, particularly in smallholder production systems where biosecurity practices are often limited (Agrawal et al., 2023; Moraes et al., 2023; Plavšić, 2023). In the Philippines, backyard and smallholder swine production constitutes a large share of national pork supply, yet these systems commonly operate with limited veterinary supervision, informal animal movement networks, and variable adoption of disease prevention practices (Uy & Uy, 2023).

Biosecurity is widely recognized as one of the most effective approaches for preventing disease introduction and transmission in livestock farms. It encompasses practices that reduce the risk of pathogen entry, spread within farms, and transmission between farms (Juszkiewicz et al., 2023). Previous studies in Philippine livestock systems have emphasized the importance of farm-level biosecurity, including controlled animal sourcing, sanitation practices, and movement restrictions (Tanquilut et al., 2020). However, evidence suggests that smallholder farmers often adopt only partial biosecurity measures due to economic constraints, limited awareness, or lack of access to technical guidance.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

Understanding existing farm practices is essential for designing effective extension interventions that address the realities of smallholder production systems. Extension programs are most effective when they are grounded in empirical evidence on farmer behavior, resource constraints, and local production structures (Nicholson et al., 2020). Assessing current biosecurity practices provides critical insights into where knowledge gaps exist and what barriers prevent farmers from adopting recommended disease prevention measures.

Despite the growing importance of biosecurity in the context of ASF outbreaks in the Philippines, there remains limited localized research documenting biosecurity practices among smallholder swine raisers in many rural municipalities. In particular, little empirical evidence exists regarding how farmers source animals, manage breeding systems, or implement sanitation protocols at the farm level.

This study therefore assessed biosecurity and disease prevention practices among smallholder swine raisers in Nueva Valencia, Guimaras. By examining existing practices and identifying critical gaps, the study aims to generate evidence that can guide the design of targeted extension programs, strengthen farm-level biosecurity, and support sustainable swine production systems in the municipality.

Objectives of the Study

1. To assess the biosecurity disease prevention practices of smallholder swine raisers in Nueva Valencia Guimaras.
2. To target extension programs for smallholder swine raisers.

Significance of the Study

This study on the biosecurity and disease prevention practices of smallholder swine raisers is significant as it provides an evidence-based foundation for developing targeted extension programs aimed at improving animal health management and productivity. By identifying existing practices, gaps, and challenges in biosecurity, vaccination, and disease monitoring, the study will help swine raisers enhance their knowledge and adopt more effective disease prevention strategies, leading to reduced mortality and increased income. The findings will also guide extension workers and agricultural practitioners in designing need-based training programs and technical interventions, while informing local government units and policymakers in strengthening animal health systems, surveillance, and biosecurity regulations. Furthermore, the study contributes to the academic community by enriching existing literature on livestock health and extension services, thereby supporting sustainable swine production and promoting science-based decision-making in the sector.

Limitation of the Study

This study has several limitations that should be considered when interpreting the findings. First, the sample size was limited to the 50 registered swine raisers in Nueva Valencia, which reflects the local production structure but may limit the generalizability of results to other municipalities or provinces with different farming systems.

Second, the study relied primarily on self-reported data, which may be subject to recall bias or social desirability bias. Farmers may unintentionally misreport practices or provide responses that they believe are expected by researchers.

Third, the study focused on reported biosecurity practices rather than direct observational verification of farm conditions. As such, actual implementation of some practices may differ from reported responses.

Finally, the study examined biosecurity practices but did not directly measure disease outcomes, productivity indicators, or farm profitability, which could provide stronger evidence linking specific practices to animal health outcomes.

Future research may address these limitations by incorporating observational farm assessments, larger geographic samples, and longitudinal monitoring of disease incidence and farm productivity.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

METHODOLOGY

Research Design

This study employed a descriptive–analytical research design using quantitative methods. Descriptive statistics such as frequency counts and percentages were used to summarize existing biosecurity practices among swine raisers. To provide deeper insights into possible relationships between farm characteristics and biosecurity practices, exploratory cross-tabulations were also considered to examine potential associations among key variables such as farm type, breeding practices, and sanitation management.

The study utilized a structured questionnaire adapted from the Universities Federation for Animal Welfare (UFAW) biosecurity assessment tool (2022), which has been widely used to evaluate animal welfare and biosecurity practices in livestock production systems.

Research Locale

The Municipality of Nueva Valencia in the Province of Guimaras served as the primary focus of this study. Nueva Valencia is one of the five municipalities of Guimaras and is located in the southern part of Guimaras Island. It is composed of twenty-two (22) barangays, which include both coastal and inland communities that support diverse agricultural and fisheries-based livelihoods. The municipality is largely rural in classification, with the majority of its barangays engaged in farming, fishing, and livestock production, including swine raising. Nueva Valencia is known for its extensive agricultural areas, which contribute significantly to the local economy and food production of the province. Its geographical location and reliance on agriculture make it an appropriate site for assessing biosecurity and disease prevention practices among smallholder swine raisers, as these practices directly influence animal health, productivity, and community livelihood sustainability.

Research Participants

A purposive sampling technique was used to identify respondents based on the official list of registered swine raisers obtained from the Municipal Agriculture Office of Nueva Valencia. The study included all 50 registered swine raisers, effectively covering the entire known population of backyard swine producers in the municipality..

Research Instrument

The survey questionnaire was subjected to expert validation to ensure clarity, relevance, and appropriateness for the local context. Experts in veterinary science, livestock production, and agricultural extension reviewed the instrument to determine whether the items adequately captured the biosecurity and disease prevention practices of smallholder swine raisers. The researcher utilized the Universities Federation for Animal Welfare (UFAW) (2022) questionnaire.

Data Gathering Procedure

The researchers obtained authorization to perform the study using a letter addressed to the relevant municipality office, specifically the Department of Agriculture (DA) office. Data were collected through face-to-face interviews conducted by the researchers and trained enumerators. Interviews were conducted using the local dialect to ensure that respondents clearly understood the questions. This approach also allowed enumerators to clarify responses and improve the reliability of the data collected.

RESULTS AND DISCUSSIONS

Disease Prevention Practices

Farm Types

Table 1 presents the distribution of swine farm operations among respondents in Nueva Valencia, Guimaras. The majority of the farms operate as breeding–fattening units, accounting for 41 respondents or 82% of the total.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

This indicates that most swine raisers in the area manage both breeding and grow-out activities within the same farm system. Meanwhile, fattening units represent 16% (8 respondents), where farmers focus solely on raising purchased piglets until market weight. No respondents reported operating breeding-only farms, while one respondent (2%) did not provide a response. The predominance of breeding–fattening operations suggests that swine production in the area is largely characterized by smallholder integrated production systems, where farmers maintain breeding stock and raise piglets within the same facility to maximize resource use and maintain a continuous supply of pigs for market.

From a biosecurity and disease prevention perspective, the prevalence of integrated breeding–fattening systems has important implications for disease management. Keeping breeding animals and growing pigs in the same farm environment may increase the risk of pathogen transmission across age groups, particularly when housing, sanitation, and animal movement are not strictly regulated. Such conditions may facilitate the spread of infectious diseases, including those that can significantly affect swine production such as African Swine Fever. On the other hand, fattening operations that regularly introduce piglets from external sources also face disease risks associated with the introduction of infected animals if proper quarantine and health screening measures are not practiced. These findings highlight the need for strengthened biosecurity protocols and targeted extension programs, focusing on improved farm hygiene, controlled animal sourcing, and farmer education to reduce disease risks and enhance the sustainability of swine production systems in the municipality.

As reported by Tanquilut et al., (2020), that for a backyard breeder-to-finisher operation in the Philippines, a pragmatic, evidence-based strategy centers on robust, adaptable biosecurity practices complemented by age-appropriate vaccination, vigilant health monitoring, and structured but scalable sanitation and movement controls. Drawing on quantitative biosecurity assessments in the Philippines, practical breeder health management guidance (Emous & Steentjes, 2022; Sadek et al., 2023), and community biosecurity concepts (Giasuddin et al., 2022), the recommended approach emphasizes local adaptation, ongoing monitoring, and collaboration with veterinary services and farmer networks to build resilient swine health and productivity.

Table 1. Types of operation of swine farms.

Types	Frequency	Percent
Breeding Unit	0	0.0
Breeding Fattening	41	82.0
Fattening Unit	8	16.0
No Response	1	2.0
Total	50	100.00

Replacement Stocks

Table 2 presents the sources of replacement stocks among swine raisers in Nueva Valencia, Guimaras. The data indicate that the majority of respondents obtain their pigs from farmers within the same barangay, accounting for 34 respondents or 68%. This is followed by 14 respondents (28%) who acquire pigs from farmers in another barangay, while a small proportion, 2 respondents (4%), purchase pigs from the market. These results suggest that swine raisers primarily rely on informal local networks of farmers as their main source of replacement stocks. Such practices are common in smallholder swine production systems, where farmers exchange or purchase piglets within their community due to accessibility, lower transportation costs, and established trust among producers.

From a biosecurity and disease prevention perspective, the sourcing of pigs primarily from nearby farmers has both advantages and potential risks. Obtaining pigs within the same barangay may reduce stress associated with long-distance transport and allow farmers to observe the health status of animals before purchase. However, the frequent movement of pigs between farms within the community may also facilitate the local spread of infectious diseases, particularly when health certification, quarantine procedures, and vaccination records are not strictly followed. The movement of pigs from other barangays and markets further increases the risk of introducing pathogens into farms, including serious diseases such as African Swine Fever. These findings highlight the need for strengthened biosecurity awareness and extension interventions, particularly in promoting safe animal

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

sourcing, quarantine of newly acquired pigs, and coordination with local veterinary services to prevent disease transmission within swine-producing communities.

As discussed by Tanquilut et al., (2020), Giasuddin et al., (2022), Emous & Steentjes, (2022), Vaillancourt et al., (2022) and Bowes, (2007) that replacing stock should be conceived as part of an integrated disease-prevention strategy that includes biosecurity, vaccination, sanitation, and worker/visitor management. The literature consistently emphasizes source quality as a core component of disease risk reduction, complemented by on-farm measures to limit introduction and spread.

Table 2. Source of replacement stocks.

Sources	Frequency	Percent
Farmer from barangay	34	68.0
Farmer from another barangay	14	28.0
Market	2	4.0
Other	50	100.00

Availability of Breeding Boar

Table 3 presents the utilization of breeding boars among swine raisers in Nueva Valencia, Guimaras. The finding that 66% of farmers rely on borrowed or hired breeding boars highlights an important structural feature of smallholder swine production systems. Maintaining a breeding boar requires additional resources for feeding, housing, and management, which may not be economically feasible for many small-scale producers.

While boar sharing offers economic advantages, it also increases the potential for disease transmission between farms. Movement of breeding animals between farms can facilitate the spread of pathogens through direct animal contact or contaminated equipment (Baudon et al., 2015; Makovska et al., 2023).

From a biosecurity perspective, communal breeding practices create interconnected networks of farms that may accelerate disease spread during outbreaks. These findings highlight the need for extension interventions that promote safer breeding management practices, including health monitoring of breeding animals, sanitation protocols during mating services, and the exploration of alternative breeding services such as artificial insemination programs.

Table 3. Utilization of breeding boars.

Breeding Boar Used	Frequency	Percent
Own boar	7	14.0
Lone/hired a boar	33	66.0
No response	10	20.0
Total	50	100.0

Feeding

Table 4 presents the types of feed used by swine raisers in Nueva Valencia, Guimaras. The data show that the majority of respondents, 43 farmers or 86%, utilize commercial feeds or pellets in feeding their pigs. This is followed by 6 respondents (12%) who use mash feed, while only 1 respondent (2%) reported using homemade feed (laon). The predominance of commercial feeds suggests that most farmers prefer commercially formulated diets due to their convenience, balanced nutrient composition, and availability in local agricultural supply stores. Commercial feeds are generally designed to meet the nutritional requirements of pigs at different growth stages, which can contribute to improved growth performance and productivity in swine production systems.

From a biosecurity and disease prevention perspective, the use of commercial feeds may also contribute to safer feeding practices, as these feeds are typically produced under regulated manufacturing standards that reduce the

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

risk of contamination. In contrast, the use of homemade feeds or food waste, although practiced by a small proportion of farmers, may pose potential health risks if not properly processed or handled. Improperly managed feed materials can serve as carriers of pathogens that may contribute to disease transmission within swine populations, including serious diseases such as African Swine Fever. Therefore, extension programs should emphasize proper feed management, safe feed sourcing, and hygienic feed storage practices to minimize contamination risks and support better herd health management among swine raisers in the municipality.

Effective feeding management is a critical component of biosecurity and disease prevention in swine production systems. Proper feed sourcing, handling, and storage help minimize the risk of introducing pathogens into pig farms. Farmers are encouraged to use commercially formulated feeds obtained from reputable suppliers, as these are typically processed under regulated conditions that ensure nutritional balance and reduce contamination risks. In contrast, feeding pigs with untreated food waste, swill, or improperly prepared homemade feeds may increase the likelihood of pathogen transmission, particularly if the feed ingredients originate from unknown or contaminated sources. Proper feed management also includes maintaining clean feeding equipment, preventing contact between feed and manure, and ensuring that feed storage areas are protected from rodents, insects, and other potential disease vectors. These practices are essential in maintaining herd health and reducing the likelihood of disease outbreaks within swine farms (FAO, 2020).

Table 4. Feed types used.

Feed type	Frequency	Percent
Feeds/pellets	43	86.0
Mash	6	12.0
Homemade (laon)	1	2.0
Total	50	100.0

Cleaning Practice

Table 5 presents the frequency of cleaning pigpens among swine raisers in Nueva Valencia, Guimaras. The results show that the majority of respondents, 37 farmers or 74%, reported cleaning their pigpens every day, indicating that routine sanitation is commonly practiced among swine raisers in the area. Meanwhile, 4 respondents (8%) clean their pigpens three times a day, and only 1 respondent (2%) reported cleaning twice a day. However, 8 respondents (16%) did not provide a response. The predominance of daily cleaning practices suggests that most farmers recognize the importance of maintaining a clean housing environment for their pigs, which contributes to better animal welfare and improved production performance.

From a biosecurity and disease prevention standpoint, regular cleaning of pigpens plays a critical role in minimizing the accumulation of manure, feed residues, and other waste materials that may harbor disease-causing pathogens. Proper sanitation helps reduce the presence of harmful microorganisms and vectors that can contribute to the spread of infectious diseases such as African Swine Fever. Farms that practice more frequent cleaning, such as two or three times per day, may have better control over environmental contamination, particularly in intensive or confined production systems. Nevertheless, daily cleaning alone may not be sufficient if not accompanied by proper disinfection, waste management, and drainage systems. These findings highlight the importance of strengthening extension programs that promote comprehensive biosecurity practices, including regular sanitation, proper disposal of waste, and the use of disinfectants to further reduce disease risks in swine farms within the municipality.

Cleaning and disinfection (C&D) between pig batches is a central component of internal biosecurity and is widely recognized as a critical control point for reducing pathogen persistence and transmission within pig holdings. Across diverse geographic contexts, studies consistently demonstrate that effective C&D between batches lowers environmental contamination, reduces carriage of enteric pathogens, and can contribute to lower disease incidence in subsequent batches (Martelli et al., 2017; Beato et al., 2022)Makovska et al., 2024;

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue III March 2026

Table 5. Frequency of cleaning the pigpen.

Number per Day	Frequency	Percent
2 times a day	1	2.0
3 times a day	4	8.0
Everyday	37	74.0
No response	8	16.0
Total	50	100.0

Disinfection

Table 6 presents the use of chemicals during pigpen cleaning among swine raisers in Nueva Valencia, Guimaras. One of the most striking findings of the study is the complete absence of disinfectant use among all 50 farms surveyed. While most farmers reported cleaning pigpens regularly, sanitation practices appear to rely primarily on physical cleaning methods such as washing or flushing with water. Previous studies emphasize that cleaning alone is often insufficient to eliminate pathogens from livestock environments, particularly viruses that can persist on surfaces and equipment (Kobusch et al., 2020; Juszkiewicz et al., 2023).

Several factors may explain the absence of disinfectant use among farmers. First, limited awareness of the importance of chemical disinfection may contribute to the perception that routine washing is adequate for maintaining pigpen hygiene. Second, the cost and availability of disinfectants in rural areas may discourage farmers from adopting such practices. Third, farmers may lack technical knowledge regarding proper disinfectant selection, dilution, and application procedures.

These findings suggest that extension programs should not only promote the use of disinfectants but also demonstrate practical and affordable disinfection methods suitable for smallholder systems.

Table 6. Use of chemicals during cleaning.

Use of chemicals	Frequency	Percent
Yes	0	0.0
No	50	100.0
Total	50	100.0

Strengthened Extension Program Implications

The findings of this study provide important guidance for the development of targeted extension programs for smallholder swine raisers in Nueva Valencia. Extension interventions should prioritize improving farmer knowledge of basic biosecurity principles, particularly the role of disinfectants in preventing disease transmission. Demonstration-based training programs showing proper disinfection techniques, recommended disinfectant products, and cost-effective sanitation practices may help encourage adoption among farmers.

Given the widespread reliance on borrowed or hired breeding boars, extension programs should also address the risks associated with communal breeding practices. Training modules may include proper sanitation before and after mating services, health screening of breeding animals, and the potential benefits of controlled breeding programs or artificial insemination services.

The finding that most farmers source pigs from nearby farms suggests that disease transmission risks are closely linked to local animal movement networks. As such, extension programs should target clusters of farms within barangays, promoting community-level biosecurity practices such as coordinated vaccination schedules, improved quarantine procedures for newly acquired animals, and strengthened collaboration with local veterinary services.

CONCLUSIONS

The study revealed that smallholder swine raisers in Nueva Valencia, Guimaras practice basic sanitation and feeding management; however, significant biosecurity gaps remain, particularly in animal sourcing, communal

breeding practices, and the absence of disinfectant use during pigpen sanitation. These practices may increase the risk of pathogen transmission within and between farms, potentially facilitating the spread of infectious diseases such as African Swine Fever. Addressing these gaps requires targeted extension interventions that focus on practical biosecurity training, improved sanitation protocols, safer breeding practices, and strengthened coordination with veterinary services. Strengthening farmer awareness and capacity through locally adapted extension programs will be essential for improving disease prevention and supporting sustainable swine production systems in the municipality.

ACKNOWLEDGEMENT

The authors would like to thank the university for funding this research study.

REFERENCES

1. Agrawal, I., Bromfield, C., & Varga, C. (2023). Assessing and improving on-farm biosecurity knowledge and practices among swine producers and veterinarians through online surveys and an educational website in Illinois, United States. Frontiers in Veterinary Science, 10. https://doi.org/10.3389/fvets.2023.1167056
2. Baudon, E., Fournié, G., Hiep, D. T., Pham, T. T., Duboz, R., Gély, M., … & Peyre, M. (2015). Analysis of Swine Movements in a Province in Northern Vietnam and Application in the Design of Surveillance Strategies for Infectious Diseases. Transboundary and Emerging Diseases, 64(2), 411-424. https://doi.org/10.1111/tbed.12380
3. Beato, M. S., D'Errico, F., Iscaro, C., Petrini, S., Giammarioli, M., & Feliziani, F. (2022). Disinfectants against African Swine Fever: An Updated Review. Viruses, 14(7), 1384. https://doi.org/10.3390/v14071384
4. Bowes, V. (2007). After the Outbreak: How the British Columbia Commercial Poultry Industry Recovered After H7N3 HPAI. Avian Diseases, 51(s1), 313-316. https://doi.org/10.1637/7627-042706r.1
5. Delfin-Bumatay, V. and Madrid, R. (2024). Impact of African Swine Fever (ASF) Outbreak on the Socioeconomic Status of Backyard Raisers in Aurora Province. Journal of Interdisciplinary Perspectives, 2(7). https://doi.org/10.69569/jip.2024.0084
6. Emous, R. v. and Steentjes, A. (2022). Optimizing the health of broiler breeder birds. Burleigh Dodds Series in Agricultural Science, 347-386. https://doi.org/10.19103/as.2022.0104.13
7. Food and Agriculture Organization (FAO). (2020). Biosecurity for Highly Pathogenic Avian Influenza: Issues and Options. Rome: FAO
8. Giasuddin, M., Ali, M. Z., Hassan, M. Z., & Karim, M. R. (2022). Community biosecurity: A new approach to reduce infectious diseases including avian influenza in commercial poultry. Bangladesh Journal of Livestock Research, 62-66. https://doi.org/10.3329/bjlr.v29i1.72034
9. Hu, Y. and Yu, Y. (2022). Scale Difference from the Impact of Disease Control on Pig Production Efficiency. Animals, 12(19), 2647. https://doi.org/10.3390/ani12192647
10. Juszkiewicz, M., Walczak, M., Woźniakowski, G., & Podgórska, K. (2023). African Swine Fever: Transmission, Spread, and Control through Biosecurity and Disinfection, Including Polish Trends. Viruses, 15(11), 2275. https://doi.org/10.3390/v15112275
11. Kobusch, I., Muller, H. A., Mellmann, A., Köck, R., & Boelhauve, M. (2020). Single Blinded Study on the Feasibility of Decontaminating LA-MRSA in Pig Compartments under Routine Conditions. Antibiotics, 9(4), 141. https://doi.org/10.3390/antibiotics9040141
12. Lager, K. M. and Buckley, A. (2019). Porcine Anti-viral Immunity: How Important Is It?. Frontiers in Immunology, 10. https://doi.org/10.3389/fimmu.2019.02258
13. Makovska, I. F., Dhaka, P., Chantziaras, I., Pessoa, J., & Dewulf, J. (2023). The Role of Wildlife and Pests in the Transmission of Pathogenic Agents to Domestic Pigs: A Systematic Review. Animals, 13(11), 1830. https://doi.org/10.3390/ani13111830
14. Makovska, I. F., Chantziaras, I., Caekebeke, N., Dhaka, P., & Dewulf, J. (2024). Assessment of Cleaning and Disinfection Practices on Pig Farms across Ten European Countries. Animals, 14(4), 593. https://doi.org/10.3390/ani14040593

15. Martelli, F., Lambert, M., Butt, P., Cheney, T., Tatone, F. A., Callaby, R., … & Smith, R. P. (2017). Evaluation of an enhanced cleaning and disinfection protocol in Salmonella contaminated pig holdings in the United Kingdom. Plos One, 12(6), e0178897. https://doi.org/10.1371/journal.pone.0178897
16. Moraes, D. C. A., Baker, A. L. V., Wang, X., Zhu, Z., Berg, E., Trevisan, G., … & Silva, G. S. (2023). Veterinarian perceptions and practices in prevention and control of influenza virus in the Midwest United States swine farms. Frontiers in Veterinary Science, 10. https://doi.org/10.3389/fvets.2023.1089132
17. Olana, K. O. A. and Baldrias, L. R. (2022). Very Low Seroprevalence of Porcine Reproductive and Respiratory Syndrome among Backyard Pigs in Leyte Province and Factors associated with S/P Ratios. Mindanao Journal of Science and Technology, 20(2). https://doi.org/10.61310/mndjstors.1016.22
18. Nicholson, C. W., Campagnolo, E. R., Boktor, S. W., & Butler, C. L. (2020). Zoonotic disease awareness survey of backyard poultry and swine owners in southcentral Pennsylvania. Zoonoses and Public Health, 67(3), 280-290. https://doi.org/10.1111/zph.12686
19. Plavšić, B. (2023). Tackling African Swine Fever and Highly Pathogenic Animal Diseases for Sustainable Meat Production and Food Security. Meat Technology, 64(2), 513-524. https://doi.org/10.18485/meattech.2023.64.2.99
20. Sadek, S. A. S., Shaapan, R. M., & Barakat, A. M. A. (2023). Campylobacteriosis in Poultry: A Review. Journal of World S Poultry Research. https://doi.org/10.36380/jwpr.2023.19
21. Schambow, R. A., Schultze, M. L., & Perez, A. M. (2025). Scoping Review of Disease Surveillance Practices and Veterinary Care Use in Small-Scale Swine Farms in the United States. Animals, 15(11), 1620. https://doi.org/10.3390/ani15111620
22. Tanquilut, N., Espaldon, M. V. O., Eslava, D., Ancog, R., Medina, C., Paraso, M. G. V., … & Dewulf, J. (2020). Quantitative assessment of biosecurity in broiler farms using Biocheck.UGent in Central Luzon, Philippines. Poultry Science, 99(6), 3047-3059. https://doi.org/10.1016/j.psj.2020.02.004
23. Thakur, K. K., Revie, C. W., Hurnik, D., & Sanchez, J. (2017). Modelling contamination of trucks used in the shipment of pigs infected with porcine reproductive and respiratory syndrome virus. Journal of Swine Health and Production, 25(4), 183-193. https://doi.org/10.54846/jshap/978
24. Uy, M. and Uy, U. G. (2023). Knowledge, Attitude and Practices of African Swine Fever (ASF) Affected Communities in the Ytawes District of Cagayan Valley, Philippines: Basis for Extension Program. International Journal of Biosciences (Ijb). https://doi.org/10.12692/ijb/22.1.35-44
25. Vaillancourt, J., Racicot, M., & Delpont, M. (2022). Improving biosecurity in poultry flocks. Burleigh Dodds Series in Agricultural Science, 107-148. https://doi.org/10.19103/as.2022.0104.05