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Swine Industry: Challenges and strategies during African Swine Fever (ASF) outbreak in Occidental Mindoro

Baguinon, Princess Marjorie P.
Divine Word College of San Jose, Philippines (princessmarjoriebaguinon787@gmail.com)
Galay-Limos, Jenny A.
Divine Word College of San Jose, Philippines (jennygalay05@gmail.com)

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Abstract

In the Philippines, African Swine Fever has posed one of the most serious threats to the swine industry in decades. Thus, this aimed to examine the challenges and strategies of swine entrepreneurs during the African Swine Fever (ASF) outbreak in Occidental Mindoro. A sequential exploratory design was employed to describe the challenges and coping strategies of the 310 swine entrepreneurs in the province. The themes derived from the interviews served as the basis for the quantitative phase. The findings revealed that swine entrepreneurs faced challenges related to financial constraints, market disruption, and market volatility. Meanwhile, strategies such as collaboration, biosecurity, and strategic marketing were widely practiced to cope with the crisis. Statistical analysis indicated a significant relationship between the challenges encountered and the strategies employed. Moreover, the results indicated that swine entrepreneurs encountered considerable market disruptions, particularly due to restrictions on the movement of pigs and pork products, which limited their ability to sell and distribute their swine. Thus, swine entrepreneurs were greatly affected by market volatility, as fluctuations in pork prices and unstable market demand created uncertainty and financial risks during the ASF outbreak. The results highlighted the importance of strengthening support programs, improving biosecurity awareness, and enhancing collaboration among stakeholders to build resilience in the swine industry during disease outbreaks. This study recommends that the Department of Trade and Industry and the Department of Agriculture provide capacity-building activities on strategic marketing, product diversification, and the development of value-added pork products to help swine entrepreneurs sustain their income despite market disruptions.

Keywords: African Swine Fever, swine entrepreneurs, financial constraints, market disruptions, strategic marketing

Swine Industry: Challenges and strategies during African Swine Fever (ASF) outbreak in Occidental Mindoro

1. Introduction

The swine industry plays a vital role in ensuring global food security, providing income for millions of rural households, and supporting national economies. Within the swine sector, the industry is particularly significant due to the high demand for pork, which remains one of the most widely consumed meats worldwide. However, the global pork industry has faced tremendous challenges due to African Swine Fever (ASF)—a highly contagious viral disease that affects both domestic and wild pigs. Since its resurgence in 2018, ASF has rapidly spread across countries in Asia, Europe, and Africa, leading to massive production losses, trade disruptions, and economic instability. As Brown et al. (2024) emphasize, ASF not only threatens food supply but also imposes severe restrictions on trade and movement, thereby disrupting global pork markets and livelihoods.

In the Philippines, ASF has posed one of the most serious threats to the swine industry in decades. The disease has caused significant economic losses, particularly among small and medium-scale farmers who rely on pig farming as their main source of income. Data from the Philippine Statistics Authority (2021) show a drastic decline in swine production and total swine inventory between 2019 and 2021, accompanied by fluctuating pork prices and supply shortages. To control the spread of ASF, the government implemented strict measures, including quarantine protocols, movement restrictions, and depopulation of infected herds. While these interventions were necessary for disease containment, they also triggered market disruptions that limited access to markets and inputs, constrained farmer mobility, and reduced the profitability of swine operations.

The effects of ASF have been strongly felt in Mindoro Island, part of the MIMAROPA region. On January 22, 2024, the Department of Agriculture's Bureau of Animal Industry (BAI) confirmed new ASF cases in three towns of Occidental Mindoro—San Jose, Sta. Cruz and Rizal—prompting immediate culling, surveillance, and strict movement control (Department of Agriculture 2024). Similar incidents were recorded in Oriental Mindoro, particularly in Naujan, Calapan, and Baco, where outbreaks had previously occurred. Under DA regulations, any municipality with a confirmed case is placed under a "red zone," prohibiting the transport of hogs within or out of the area to contain the virus. These restrictions, though essential for biosecurity, have placed significant strain on local entrepreneurs who depend on continuous trading and access to supply chains for their livelihoods. Many small-scale farmers have faced financial hardships due to depopulation, reduced demand, and limited recovery assistance. Despite global and national studies highlighting the epidemiological and economic effects of ASF, a research gap persists in understanding how swine farmers at the community level—especially in affected areas such as Occidental and Oriental Mindoro—adapt and survive amid these disruptions. Previous research has focused heavily on the disease's biological control and national trade implications, often overlooking the human dimension: the experiences, coping strategies, and resilience of local farmers navigating uncertainty and loss. Thus, this study aimed to explore the lived experiences, adaptive responses, and survival strategies of swine entrepreneurs in Mindoro. By highlighting their challenges and innovations during the ASF outbreak, the research sought to contribute to the development of sustainable recovery strategies and policies that strengthen resilience in the Philippine swine sector.

Statement of the Problem - This study aimed to explore the challenges encountered and the strategies employed by swine entrepreneurs during the African Swine Fever Outbreak. Specifically, it aimed to answer the following questions: (1) What are the challenges encountered by the swine entrepreneurs during the African Swine Fever Outbreak in Occidental Mindoro? (2) What strategies did swine entrepreneurs practice during the African Swine Fever Outbreak? (3) What is the profile of swine entrepreneurs in terms of number of pigs, location, and capitalization? (4) What is the extent of the challenges encountered by the swine entrepreneurs in terms of financial constraint, market disruption, and market volatility? (5) What is the extent of the strategies employed by the swine

entrepreneurs during the African Swine Fever outbreak in terms of Collaboration, Biosecurity, and Strategic Marketing? (6) Is there a significant relationship between the challenges encountered and the strategies employed by the swine entrepreneurs? (7) Is there a significant relationship between the profile of swine entrepreneurs and the strategies employed by the swine entrepreneurs? (8) What program may be proposed to develop new strategies to lessen the impact of the African Swine Fever Outbreak??

Significance of the Study - This study is significant because it sought to provide a deeper understanding of how swine entrepreneurs in Occidental Mindoro survived and adapted during the African Swine Fever (ASF) outbreak. By examining the challenges they faced and the strategies they implemented, this research offers valuable insights to strengthen the swine industry's resilience against future disease outbreaks. The findings of this study are expected to benefit the following groups: swine entrepreneurs. The results will help them identify effective coping strategies and biosecurity practices to reduce production losses, protect their herds, and improve business continuity during disease outbreaks. For Local Government Units (LGUs) and Policymakers, the study provides evidence-based recommendations to guide the development of localized policies, financial support programs, and disease management interventions to minimize the socio-economic impact of ASF. For veterinary and Biosecurity Agencies: Insights from this research can help in designing training programs, awareness campaigns, and technical assistance tailored to the needs of small- and medium-scale entrepreneurs in the province. For Researchers and Academics: This study addresses a research gap by examining localized, community-level responses among swine entrepreneurs during ASF outbreaks. It can serve as a reference for future research on resilience in the swine industry, disaster preparedness, and the protection of rural livelihoods. For Consumers and the General Public: A more resilient swine industry ensures a stable pork supply and contributes to food security, benefiting the wider community.

Scope and Delimitation of the Study - This study focused on identifying the challenges encountered and the survival strategies employed by swine entrepreneurs affected by the African Swine Fever (ASF) outbreak in Occidental Mindoro. The respondents in this study were swine entrepreneurs who experienced ASF-related losses, such as pig mortality, production stoppages, or market disruptions, during the outbreak. The study is limited to swine entrepreneurs whose primary source of livelihood is swine raising. Other swine entrepreneurs involved in cattle, goat, or poultry production were excluded from the study because ASF affects only swine. Furthermore, the study included only respondents engaged in swine production at the time of the ASF outbreak and who directly experienced its effects. The study did not cover epidemiological data on ASF strains, laboratory analyses, or veterinary interventions beyond what respondents reported. The findings are based on survey responses and interviews, which may be affected by recall bias or respondents' willingness to disclose financial and operational information. Despite these delimitations, the researcher made efforts to cover a representative sample of affected swine entrepreneurs in Occidental Mindoro to ensure that the results provide a realistic understanding of the challenges, strategies, and potential programs that can help improve the resilience of the swine industry during similar outbreaks.

2. Methodology

Research Design - This study employed an exploratory sequential design, which combines qualitative and quantitative approaches to better understand how swine entrepreneurs in Occidental Mindoro survived the African Swine Fever (ASF) outbreak. This design follows a two-phase process, starting with qualitative data collection and analysis, followed by a quantitative phase that is based on the initial findings (Creswell & Plano Clark, 2018). In the first phase, a qualitative approach was used to explore the lived experiences of swine entrepreneurs, particularly the challenges they faced and the survival strategies they adopted during the ASF outbreak. The insights gathered from this phase served as the foundation for developing the quantitative research instrument. In the second phase, a quantitative descriptive-correlational design was conducted to determine the level of challenges encountered, the extent of survival strategies implemented, and the relationship between these variables. By integrating both methods, the study achieved a more comprehensive understanding of the phenomenon, combining rich experiential insights with measurable evidence.

Respondents of the Study - For the qualitative phase, the respondents of the study were twenty (20) swine entrepreneurs who were affected by the African Swine Fever (ASF) outbreak in Occidental Mindoro. A purposive sampling technique was used in the qualitative phase to ensure that participants had rich, meaningful experiences related to the outbreak. This phase included active swine entrepreneurs, cooperative leaders, and local agricultural officers who were knowledgeable about the industry's condition before, during, and after the ASF crisis. Moreover, the researcher personally approached the identified swine entrepreneurs in their respective barangays and requested their voluntary participation in a short interview regarding their experiences, challenges, and coping strategies during the ASF outbreak. The respondents selected for the qualitative phase were excluded from the questionnaire administration during the quantitative phase to avoid duplicate responses.

For the quantitative phase of the study, the respondents were selected from the total population of two thousand nine hundred thirty-nine (2,939) swine entrepreneurs affected by African Swine fever in Occidental Mindoro. The list of affected swine entrepreneurs was obtained from the Provincial Veterinary Office. The sample size was determined using the Raosoft Sample Size Calculator with a 5% margin of error and a 95% confidence level. Based on the computation, the required sample size for the study was Three Hundred Forty (340) respondents. These respondents were selected through a stratified random sampling technique to ensure fair representation of swine entrepreneurs affected by ASF in the province. During the distribution of the survey questionnaires, only three hundred ten (310) out of the three hundred forty (340) targeted respondents agreed to participate in the study. These swine entrepreneurs willingly answered the survey, and their responses provided the primary quantitative data for analyzing the impact of the African Swine Fever outbreak on swine entrepreneurs in Occidental Mindoro.

Research Instrument - In the qualitative phase, the researcher utilized a semi-structured interview guide as the main data-gathering instrument. This tool was designed to explore in-depth the experiences, coping mechanisms, and survival strategies of swine entrepreneurs affected by the African Swine Fever (ASF) outbreak in Occidental Mindoro. The interview questions were formulated based on the study's conceptual framework and were reviewed by a research adviser. Responses from participants were recorded, transcribed, and analyzed using thematic analysis, which allowed the researcher to identify recurring patterns, themes, and insights relevant to the challenges and strategies of swine entrepreneurs. For the quantitative phase, a researcher-developed questionnaire served as the study's main instrument. It was patterned after the conceptual framework and its relation to the research problem. The questionnaire items were based on the respondents' qualitative responses. The first part of the questionnaire consisted of a profile of swine entrepreneurs in terms of the number of pigs, location, and capitalization. The second part assessed the extent of challenges encountered by swine entrepreneurs in terms of financial constraint, market disruption, and market volatility, as well as the degree to which survival strategies such as collaboration, biosecurity, and strategic marketing were practiced. Participants were given two days to complete the questionnaire and return it to the researcher. Respondents were asked to rate each statement based on the set Likert scale, as it determined the level of job satisfaction of the respondents toward their employment outcomes: 5 - True of me to a very great extent; 4 - True of me to a great extent ; 3 - True of me to a moderate extent; 2 - Slightly true of me; 1 - Not true of me.

In addition, questionnaires at each initial stage were presented to a group of specialists for validation before the survey was distributed for reliability testing. The researcher must tap the expertise of the three (3) professors from the graduate school program of Divine Word College of San Jose and two (2) from Occidental Mindoro State College. Upon validation, the researcher began formulating the final copy of the questionnaire, incorporating all suggestions. A group of 30 respondents was asked to answer the 34-item researcher-made questionnaire, which was administered once. Reliability analysis using Cronbach's Alpha measures the internal consistency of a scale, essentially how closely related a set of items is as a group. A Cronbach's Alpha value of 0.70 or higher is generally considered the threshold for acceptable or good reliability, indicating that the survey instruments used are consistently measuring their intended constructs. The analysis was performed on a sample size of 30 cases, with a 100% validity rate and no cases excluded. The internal consistencies, based on standardized items for all six constructs, exceeded the 0.70 benchmark, and the results are presented in Table 1.

Table 1
Result of Reliability Analysis

Items	Number of Items	Reliability Coefficients*	Analysis
I. Challenges Encountered			
A. Financial Constraint	6	0.769	High Reliability
B. Market Disruption	6	0.718	High Reliability
C. Market Volatility	5	0.766	High Reliability
II. Survival Strategies Employed			
A. Collaboration	5	0.947	Very High Reliability
B. Biosecurity	6	0.872	High Reliability
C. Strategic Marketing	6	0.782	High Reliability

*Based on standardized items

The construct of strategic marketing had the highest reliability in this dataset, with an alpha of .818. This is closely followed by collaboration at .813. These scores suggest that the items used to measure these variables are highly cohesive and provide very stable results. Market volatility (0.766) and Financial Constraint (0.769) both demonstrate high reliability. Biosecurity (0.706) and market disruption (0.718) yielded the lowest alpha scores in the group, though they remain well above the 0.70 cut- off. While these scales are reliable, they exhibit slightly more variance between items than the collaboration or strategic marketing scales. The results indicate that all six scales used in this study possess high internal consistency. The data suggest that the measurement scales are dependable and that the items within each scale consistently measure the same underlying concepts. Since every construct surpassed the required threshold, the instrument can be used for further statistical analyses.

Data Gathering Procedure - Before conducting the study, the researcher sought permission from the Office of the Municipal Agriculturist and other concerned local government agencies in Occidental Mindoro to distribute questionnaires and conduct interviews among swine entrepreneurs. Upon approval, the researcher personally visited the nine selected municipalities to coordinate with agricultural officers and local officials to help identify qualified respondents. The purpose of the study was explained clearly to all participants, and their informed consent was obtained before data collection. For the qualitative phase, the researcher conducted interviews and focus group discussions with selected swine entrepreneurs, cooperative leaders, and agricultural officers. These sessions were guided by open-ended questions that aimed to gather insights into their experiences, coping mechanisms, and survival strategies during the African Swine Fever (ASF) outbreak. Notes were taken, and, when permitted, conversations were audio-recorded to ensure accuracy and completeness of the data. For the quantitative phase, a total of five (5) days was allotted; validated and reliable questionnaires were personally distributed to the respondents. The researcher, with the assistance of designated local officials, ensured that all respondents answered the questionnaires completely and honestly. The data collection focused on the extent of the challenges they encountered—such as financial constraints, market disruption, and market volatility—and the strategies employed, including biosecurity, collaboration, and strategic marketing. After all the data had been gathered, the researcher checked the questionnaires for completeness and accuracy before proceeding to the data analysis stage. Confidentiality and ethical considerations were strictly observed throughout the process to ensure that participants' responses were treated with respect and used solely for academic purposes.

Statistical Treatment of the Data - For the qualitative phase, thematic analysis was employed to interpret responses gathered from interviews and open-ended questions. This method was chosen because it enabled the identification, analysis, and interpretation of recurring themes and patterns within the participants' narratives. The researcher systematically coded and categorized the qualitative data, enabling the emergence of meaningful themes related to the challenges faced by swine entrepreneurs and the coping mechanisms they adopted during the African Swine Fever (ASF) outbreak. Through this process, the researcher uncovered underlying insights, perceptions, and lived experiences that numerical data could not fully capture. Thematic analysis complemented the quantitative results by providing contextual depth and a richer understanding of how swine entrepreneurs responded to the crisis.

For the quantitative phase, the data gathered from the survey were carefully organized, coded, and tabulated

for analysis. To address the study's objectives, descriptive statistics were used. Specifically, the weighted mean was employed to describe the extent of the challenges encountered by swine entrepreneurs (in terms of financial constraint, market disruption, and market volatility) and the degree to which survival strategies (such as collaboration, biosecurity, and strategic marketing) were practiced during the ASF outbreak in Occidental Mindoro. To test the study's hypotheses, Warp PLS V7 was used to examine the significant relationship between the challenges faced by swine entrepreneurs and the strategies they employed during the ASF outbreak. Warp PLS is an appropriate statistical tool for testing complex relationships between variables, and it helped assess the strength and direction of the relationships between the challenges (financial constraints, market disruptions, and market volatility) and the strategies (collaboration, biosecurity, and strategic marketing). A significance level of 0.05 was used to decide whether to accept or reject the null hypothesis, which posits that there is no significant relationship between the challenges experienced and the survival strategies adopted by the respondents. All statistical computations were performed using WarpPLS V7 and other relevant software to ensure accuracy and reliability of the results. The findings from the quantitative analysis, enriched by insights drawn from the thematic analysis of the qualitative data, provide a deeper understanding of the coping mechanisms and lived experiences of the swine entrepreneurs.

Ethical Considerations - Ethical considerations are the cornerstone of this study, guiding every aspect of the research journey. From the treatment of human subjects to data handling and intellectual property rights, ethical integrity remains paramount. This study is committed to upholding the highest ethical standards to ensure the credibility and validity of its findings. The researcher guaranteed that the data were untraceable to anybody other than the researcher. Additionally, respondents were informed that the findings would be presented in a research paper and may be published in a peer-reviewed journal, but their identities would remain anonymous. The researcher certified that the research did not harm respondents and that the information was used appropriately. The researcher guaranteed that the respondent’s participation in the study was entirely voluntary and that they may withdraw at any moment. No further data collection or analysis occurred beyond this point, and all existing data were collected. On the first page of the survey form, a consent letter described the study’s major components and what was expected of them as respondents. They had consented to this, indicating their complete understanding of their involvement in this research project.

3. Results and Discussions

The participants' initial responses were recorded, transcribed, tabulated, and coded to extract significant themes, which are presented in the initial thematic map. The map serves as the starting point of the qualitative analysis and guides the development of deeper interpretations and discussions. Based on the coding process, several themes emerged that describe the challenges encountered by swine entrepreneurs during the African Swine Fever (ASF) outbreak in Occidental Mindoro, including economic struggles, policy restrictions, market fear, and adaptive strategies.

The theme of economic struggle reflects the financial difficulties swine entrepreneurs faced during the outbreak. Many participants described how the ASF outbreak led to increased expenses and decreased income, resulting in financial losses. One participant shared, “To be honest, our expenses increased, and our income decreased, and there were restrictions due to the shortage of swine supply caused by the large number of pigs being slaughtered every day.” The final thematic map presents the refined themes that emerged after a deeper analysis of the coded responses of the swine entrepreneurs. The themes were consolidated into a major thematic category: challenges encountered during the African Swine Fever (ASF) outbreak. This theme reflects the various difficulties swine entrepreneurs in Occidental Mindoro have experienced as a result of the ASF crisis. Under the theme challenges encountered, three major subthemes were identified: financial constraint, market disruption, and market volatility. Financial constraints reflect the economic hardships experienced by the respondents, including reduced income, mounting debt, rising operational expenses, and financial losses. The findings indicate that many swine entrepreneurs struggled to sustain their businesses as the ASF outbreak reduced their primary source of livelihood. This supports the study by Chenais Eva et al. (2019), which stated that ASF outbreaks significantly affect the

economic stability of smallholder pig farmers due to production losses and limited market opportunities.

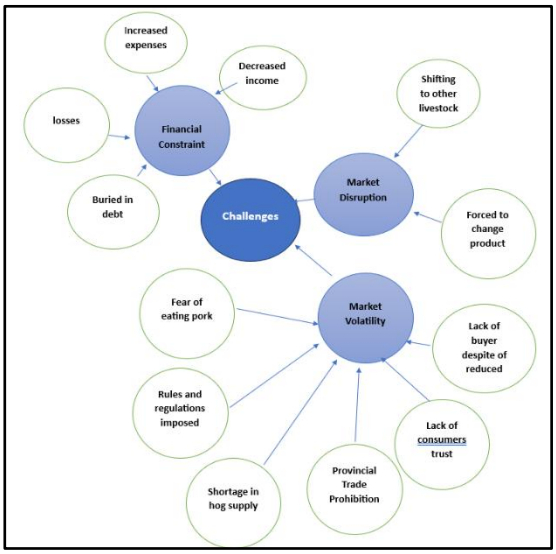

Figure 1. Initial Thematic Map of Challenges Encountered by the Swine Entrepreneurs

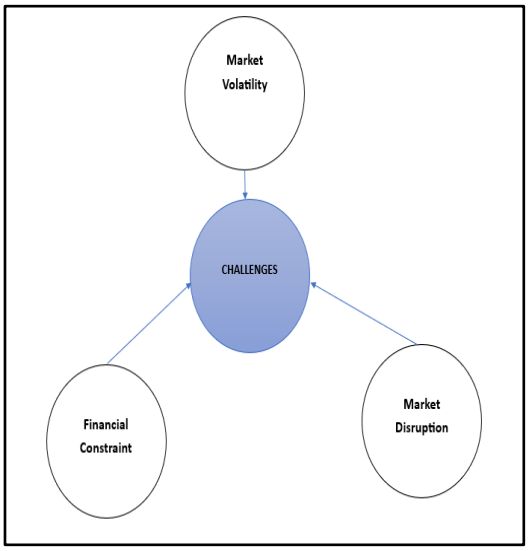

Figure 2. Final Thematic Map of Challenges Encountered by the Swine Entrepreneurs

Market disruption highlights the effects of government regulations, trade restrictions, and limitations on pig movement, which have significantly disrupted the swine industry's supply chain. The implementation of quarantine measures and restrictions on the transport of pigs contributed to reduced trading activities and limited access to markets for swine entrepreneurs. According to Fernandez-Colorado et al. (2024), strict disease control policies, such as movement restrictions and quarantine measures, are necessary to prevent the spread of ASF. Still, they also disrupt the swine trade and negatively affect farmers' livelihoods. Market volatility, on the other hand, refers to the unstable market conditions caused by declining consumer demand and the public's fear of consuming pork products during the ASF outbreak. Several respondents mentioned that even healthy pigs were difficult to sell because consumers were afraid to purchase pork products. This situation led to reduced sales and additional financial losses for the swine entrepreneurs. Studies have shown that disease outbreaks in the swine sector can significantly affect consumer confidence, leading to fluctuations in market demand and pork prices (Chenais et al., 2019). Overall, the findings indicate that the ASF outbreak created significant economic and market-related challenges for swine entrepreneurs. These challenges highlight the vulnerability of small-scale swine enterprises to animal disease outbreaks and emphasize the need for effective support systems, disease management strategies, and market stabilization efforts to help farmers sustain their livelihoods during such crises.

The theme "Strategies Employed" includes the subthemes biosecurity, strategic marketing, and collaboration. Swine entrepreneurs adopted these strategies in response to the challenges brought about by the African Swine Fever (ASF) outbreak. The findings indicate that entrepreneurs implemented various preventive, adaptive, and cooperative measures to sustain their livelihood and minimize the impact of the disease on their businesses. The first subtheme, biosecurity, refers to the preventive measures implemented to reduce the risk of ASF transmission within farms. These measures include sanitation practices, farm-gate disinfection, the use of protective clothing, and restricting visitors from entering the farm premises. The implementation of strict biosecurity practices is considered one of the most effective ways to prevent and control the spread of ASF. According to the Food and Agriculture Organization, strict farm biosecurity measures, such as controlled farm access, sanitation procedures, and disinfection protocols, are an essential strategy for minimizing the risk of ASF infection on pig farms (FAO, 2020).

The second subtheme, strategic marketing, highlights the adaptive business strategies employed by swine entrepreneurs to cope with financial losses during the outbreak. Some respondents adjusted their product prices, diversified their product lines, or sold alternative goods to maintain income and sustain their livelihoods. Product

diversification and price adjustments are common strategies among small-scale entrepreneurs during economic disruptions, as they help businesses remain operational despite declining demand for their primary products. Studies have shown that diversification of products and income sources helps farmers reduce financial risk during swine disease outbreaks (Dione et al., 2020).

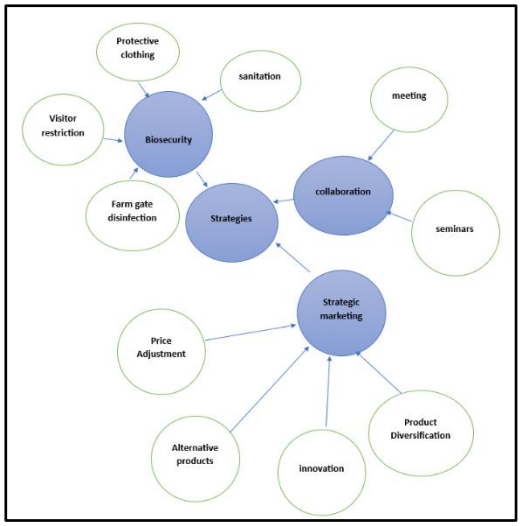

Figure 1. Initial Thematic Map of Strategies Employed by the Swine Entrepreneurs

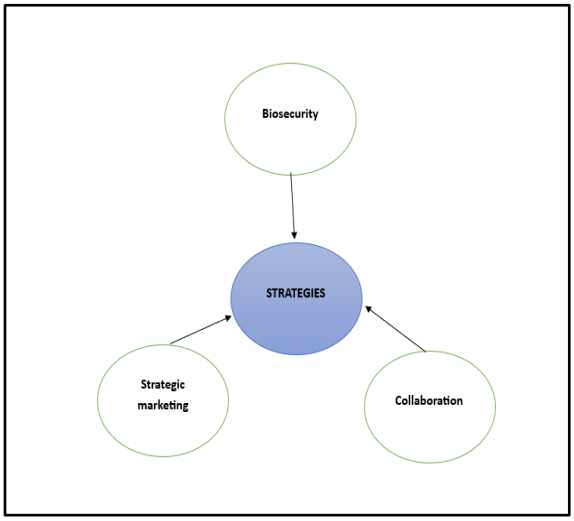

Figure 2. Final Thematic Map of Strategies Employed by the Swine Entrepreneurs

The third subtheme, collaboration, reflects the importance of cooperation among swine entrepreneurs, government agencies, and other stakeholders in addressing the ASF crisis. Respondents mentioned attending meetings and seminars and coordinating with local authorities and fellow farmers to obtain information and guidance regarding ASF prevention and control. Collaboration and knowledge sharing are crucial for managing swine diseases, as they help farmers adopt appropriate control measures and improve their preparedness during outbreaks. According to the World Organization for Animal Health, cooperation among farmers, veterinary authorities, and local governments plays a significant role in strengthening disease control measures and improving the resilience of swine industries during disease outbreaks.

Table 2

Profile of Swine Entrepreneurs in terms of Number of Pigs, Location, and Capitalization (n=310)

Number of Pigs	Frequency	Percent
3 – 8	47	15.2
9 – 14	112	36.1
15 – 20	108	34.8
21 – 26	37	11.9
27 – 32	6	1.9
Location		
Paluan	12	3.9
Abra de Ilog	26	8.4
Mamburao	41	13.2
Sta. Cruz	38	12.3
Sablayan	25	8.1
Calintaan	21	6.8
Rizal	46	14.8
San Jose	54	17.4
Magsaysay	47	15.2
Capitalization		
Below P100,000	64	20.6
P100,000-P349,999	242	78.1
P350,000-P599,999	1	0.3
P600,000-P849,999	2	0.6

Number of Pigs	Frequency	Percent
3 – 8	47	15.2
9 – 14	112	36.1
P850,000-P1,100,000	1	0.3
Total	310	100.0

Table 2 presents the profile of swine entrepreneurs in terms of the number of pigs they raise, location, and Capitalization. Of the 310 respondents, the majority raised 9–14 pigs, accounting for 112 respondents (36.1%). The results suggest that swine production among the respondents is largely small-scale, possibly due to limitations in capital, space, and production resources. This pattern is consistent with the findings of Delsart et al. (2020), who reported that pig farming systems vary widely in herd size, ranging from small farms with fewer than 10 pigs to large commercial operations with thousands of animals. Their study also emphasized that production systems differ in terms of housing conditions and management practices, which can influence the number of pigs raised on a farm.

The findings of the present study also support the observations of the Food and Agriculture Organization (2018) and Thornton (2020), who noted that in many developing countries, pig production is commonly practiced by smallholder farmers who raise fewer than 10-20 pigs. These small herd sizes are often integrated with household livelihood activities and serve as an additional source of income and food security for rural families. This situation may explain why most respondents in the present study fall into the lower herd-size categories. Furthermore, Lapar et al. (2014) explained that herd size in Southeast Asian pig farming systems is largely influenced by farmers' production objectives, available labor, and financial capacity. Many smallholder farmers maintain relatively small pig populations due to limited resources and capital investment. Despite their small scale, these farms continue to contribute significantly to local pork production and rural economies. In addition, Maksym et al. (2022) emphasized that the number of pigs raised in a farm directly affects production efficiency and profitability. Their study suggested that optimizing herd size according to available resources, technological capacity, and market conditions can improve the economic performance of pig enterprises. This implies that swine entrepreneurs may adjust the number of pigs they raise depending on their financial capability and management capacity. Overall, the results of this study confirm that the majority of swine entrepreneurs operate small-scale pig farming enterprises, which aligns with previous studies indicating that available resources, management capacity, and economic conditions generally limit herd size in developing regions.

In terms of location, the largest number of respondents came from San Jose, with 54 (17.4%). The findings indicate that swine entrepreneurs are distributed across different municipalities of Occidental Mindoro, with a greater concentration in San Jose, Magsaysay, and Rizal. This distribution may be influenced by the availability of agricultural land, access to markets, and the presence of farming communities where swine production is common. These municipalities are known for their agricultural activities, which may provide favorable conditions for swine production. The results support the observations of Villanueva and Sulabo (2018), who reported that raising native pigs is commonly practiced by small-scale farmers as a supplementary source of income and food for household consumption. Similarly, Ordanel et al. (2024) noted that studies on the profile and production practices of native pig entrepreneurs highlight their important role in supporting rural livelihoods and local economies. The presence of swine entrepreneurs across different municipalities suggests that pig raising remains an accessible livelihood for rural households. In addition, the traditional nature of pig production described by Falculan (2021) may also explain the widespread distribution of pig entrepreneurs across rural areas. The study noted that many native pig farms are located in upland or rural communities, where pigs are raised in simple housing structures and fed locally available feed. Such conditions make pig raising suitable for areas with limited capital and infrastructure. Overall, the results indicate that swine entrepreneurs in Occidental Mindoro are widely distributed across municipalities, with higher concentrations in areas where agricultural activities are more prominent. This pattern supports previous studies, which suggest that pig raising is commonly practiced in rural communities as a small-scale livelihood supported by family knowledge, local resources, and traditional management practices.

In terms of capitalization, of the 310 respondents, the majority reported ₱100,000–₱349,999, accounting for 242 respondents (78.1%). These results indicate that most swine entrepreneurs in the study operate with moderate to low levels of capital investment, suggesting that pig farming in the area is largely small-scale. The findings support the study of Dela Cruz and Dela Cruz (2019), which reported that swine entrepreneurs in the Philippines commonly operate backyard piggery enterprises with capital investments ranging from ₱50,000 to ₱200,000. Their study emphasized that many pig farmers rely on personal savings or small loans to finance their operations, highlighting the relatively low capital required to start small-scale swine production. This is consistent with the present study, where the majority of respondents reported capitalization within a similar range. The results are also comparable with findings from other countries where smallholder pig farming is common. Nguyen et al. (2020) found that swine entrepreneurs in Vietnam typically invest VND 50–200 million (approximately USD 2,000–8,500) in pig farming operations. These investments are often supported by family resources, government subsidies, or cooperative systems, allowing farmers to gradually expand their production capacity. Similarly, Ouma et al. (2018) reported that pig farmers in Kenya typically operate with capital investments ranging from KES 100,000 to 500,000, often obtained from savings or profits from crop farming. Their study highlighted that pig farming in rural areas is often integrated with other agricultural enterprises to sustain operations despite limited financial resources. Overall, the findings suggest that the majority of swine entrepreneurs in the study area operate small to medium-scale piggery enterprises with limited financial resources. This pattern is consistent with previous studies indicating that swine production in developing countries is commonly practiced by smallholder farmers who rely on modest capital investment, family labor, and locally available resources to sustain their operations.

Table 3 presents the mean extent of challenges encountered by swine entrepreneurs and presents the overall level of difficulties experienced by the respondents in operating their swine enterprises. The table shows that the overall mean is 3.81, which is interpreted as High. This indicates that swine entrepreneurs generally experience significant challenges in managing and sustaining their businesses. The high overall mean suggests that various external and operational factors strongly affect the stability and performance of swine enterprises. Among the indicators, market volatility obtained the highest composite mean of 3.84, interpreted as High. This finding indicates that fluctuations in market prices and unstable demand greatly affect swine entrepreneurs. Changes in the prices of feeds, swine products, and other production inputs may create uncertainty for farmers and make it difficult for them to plan their production and financial strategies. This implies that many swine entrepreneurs are vulnerable to sudden changes in the market environment, which can reduce profitability and increase the risk of financial losses.

Table 3

Mean Extent of the Challenges Encountered by the Swine Entrepreneurs in terms of Market Disruption and Market Volatility

Financial Constraint	Weighted Mean	Interpretation
1. My income from swine raising significantly decreased during the ASF outbreak.	4.32	Very High
2. I experienced difficulty purchasing feeds, medicine, and other farm inputs.	3.65	High
3. I was unable to reinvest in pig production after ASF due to financial losses.	3.85	High
4. I relied on loans or credit to sustain my farming operations.	3.15	Moderate
5. I did not receive sufficient financial assistance from the government or private sector.	3.56	High
6. The ASF outbreak greatly affected my ability to recover my capital.	4.01	High
Composite Mean	3.76	High
Market Disruption		
1. The ASF outbreak restricted my ability to transport and sell pigs.	3.77	High
2. Quarantine checkpoints made it difficult to access markets and buyers.	3.91	High
3. There was a sudden decline in consumer demand for pork products.	3.89	High
4. I encountered unstable or fluctuating pork prices in the market.	3.83	High
5. The movement restrictions led to the loss of my regular customers.	3.81	High
6. I experienced delays or cancellations of deliveries due to ASF restrictions.	3.80	High
Composite Mean	3.83	High

Market Volatility		
1. Pork prices were unstable and changed unpredictably during the ASF outbreak.	3.91	High
2. The unstable prices made it difficult to plan my farm operations.	3.90	High
3. I faced losses because of fluctuating feed and supply costs.	3.87	High
4. The uncertainty in market prices caused financial stress.	3.82	High
5. Volatile pork prices discouraged me from restocking my farm.	3.68	High
Composite Mean	3.84	High
Overall Mean	3.81	High

Scale: 4.20-5.00 Very High; 3.40-4.19 High; 2.60-3.39 Moderate; 1.80-2.59 Low; 1.00-1.79 Very Low

Meanwhile, market disruption recorded a composite mean of 3.83, also interpreted as High. This result suggests that disruptions in the supply chain, transportation, and distribution of swine products are common among respondents. Events such as disease outbreaks, movement restrictions, and reduced consumer demand can interrupt the normal flow of production and marketing activities. These disruptions may lead to delays in selling swine products, reduced income, and additional operational costs for farmers. Similarly, financial constraint obtained a composite mean of 3.76, which is likewise interpreted as High. This indicates that limited financial resources remain a major challenge for swine entrepreneurs. Farmers often face difficulties in securing sufficient capital for feeds, veterinary services, housing, and other production requirements. Limited access to financial support, loans, or credit facilities may also hinder their ability to expand their operations or recover from losses caused by external factors such as disease outbreaks and market instability.

Several studies in the literature support the study's findings. According to Hamilton et al. (2018), swine farmers face significant financial challenges during disease outbreaks, particularly due to production losses, restrictions in animal movement, and reduced market demand. These conditions often lead to decreased income and financial instability among swine entrepreneurs. Similarly, Brown et al. (2024) emphasized that disease outbreaks and market disruptions increase production costs and require farmers to invest in additional biosecurity and disease-control measures, further straining their financial resources. Furthermore, Plavšić et al. (2019) explained that disruptions in the swine sector can affect the entire supply chain, leading to price fluctuations and market instability. These changes can create uncertainty for farmers and increase risk in swine production. In addition, You (2021) highlighted that market volatility and disease-related disruptions significantly influence the economic performance of the swine industry, affecting both production levels and market supply. Overall, the results indicate that financial constraints, market disruption, and market volatility are major challenges experienced by swine entrepreneurs. The consistently high mean scores across all indicators suggest that these challenges significantly influence the sustainability, profitability, and growth of swine enterprises. Addressing these issues may require improved financial support, stable market systems, and stronger disease management and supply chain strategies to help swine entrepreneurs maintain and expand their operations.

Table 4

Mean Extent of Strategies in terms of Collaboration, Biosecurity, and Strategic Marketing

Collaboration	Weighted Mean	Interpretation
1. I participated in meetings or discussions with other farmers to share information.	3.50	High
2. I coordinated with local government or veterinary officers during the ASF outbreak.	3.70	High
3. I received support or assistance from cooperatives or farmer groups.	2.92	Moderate
4. I joined community programs related to ASF recovery or livelihood.	3.19	Moderate
5. Collaboration with other farmers helped me recover from ASF impacts.	3.32	Moderate
Composite Mean	3.32	High
Biosecurity		
1. I implemented disinfection measures to prevent ASF spread on my farm.	3.64	High
2. I controlled the entry of visitors and vehicles into my farm.	3.45	High
3. I isolated or quarantined sick pigs immediately.	3.77	High
4. I properly disposed of dead pigs or waste materials.	3.89	High
5. I regularly monitored the health condition of my pigs.	4.01	High
6. I attended trainings or orientations about ASF prevention and control.	3.60	High
Composite Mean	3.73	High

Strategic Marketing		
1. I explored new markets or alternative buyers for my pork products.	3.74	High
2. I adjusted the prices of my products to attract buyers during ASF.	3.68	High
3. I created or sold value-added products such as longganisa or tapa.	2.89	Moderate
4. I used online platforms or social media to sell pork products.	3.28	Moderate
5. I offered discounts or promotions to maintain customer loyalty.	3.42	High
6. I applied innovative marketing practices to sustain income despite ASF.	3.47	High
Composite Mean	3.41	High
Overall Mean	3.49	High

Scale: 4.20-5.00 Very High; 3.40-4.19 High; 2.60-3.39 Moderate; 1.80-2.59 Low;1.00-1.79 Very Low

Table 4 shows the mean extent of strategies across collaboration, biosecurity, and strategic marketing. The results show that the overall mean is 3.49, which is interpreted as High. This indicates that swine entrepreneurs generally adopted various strategies to cope with the challenges brought by the outbreak. The high overall mean suggests that farmers actively implemented measures to sustain their swine operations, protect their animals, and maintain business stability despite the disease-related risks and disruptions. Among the indicators, biosecurity obtained the highest composite mean of 3.73, interpreted as High. This finding indicates that swine entrepreneurs strongly implemented biosecurity measures in their farms during the outbreak. Such practices may include restricting farm visitors, disinfecting equipment and facilities, isolating newly purchased animals, and maintaining proper sanitation throughout the farm. The high mean suggests that farmers recognize the importance of preventive measures to control the spread of the disease and protect their swine from infection. Meanwhile, strategic marketing recorded a composite mean of 3.41, which is also interpreted as High. This implies that swine entrepreneurs employed marketing strategies to manage the effects of the outbreak on their business operations. These strategies may include adjusting pricing, identifying alternative buyers or markets, and modifying sales practices to ensure a steady income despite market disruptions. The finding suggests that farmers adapted their marketing approaches in response to changing market conditions during the crisis.

On the other hand, collaboration obtained a composite mean of 3.32, interpreted as Moderate. This indicates that although some swine entrepreneurs collaborated with fellow farmers, government agencies, and agricultural organizations, the level of cooperation was not as strong as in the other strategies. Some farmers may have limited opportunities to participate in collaborative activities, or they may rely more on individual farm management practices rather than collective action. The findings of the study are supported by several related studies, which emphasize the importance of adaptive strategies during swine disease outbreaks. According to Brown et al. (2024), farmers often strengthen biosecurity measures as a primary response to prevent the spread of diseases in swine farms. Effective biosecurity practices help reduce the risk of infection and protect animal health, thereby minimizing economic losses. Similarly, Hamilton et al. (2018) explained that swine entrepreneurs adopt various strategies, such as improving farm management practices, strengthening disease-prevention systems, and adjusting marketing approaches, to cope with the economic and operational challenges posed by disease outbreaks.

Furthermore, Plavšić et al. (2019) noted that disease outbreaks can disrupt the swine supply chain and market system, forcing farmers to adapt their marketing strategies to sustain their businesses. These adjustments may include seeking alternative distribution channels and implementing flexible selling strategies to respond to fluctuating market demand. Overall, the results indicate that swine entrepreneurs actively implemented several strategies—particularly biosecurity and strategic marketing—to mitigate the effects of the African Swine fever outbreak. While collaboration among farmers and institutions was present, it was practiced at a relatively moderate level. Strengthening cooperative efforts, together with improved disease prevention and adaptive marketing strategies, may further enhance the resilience and sustainability of swine enterprises during future disease outbreaks.

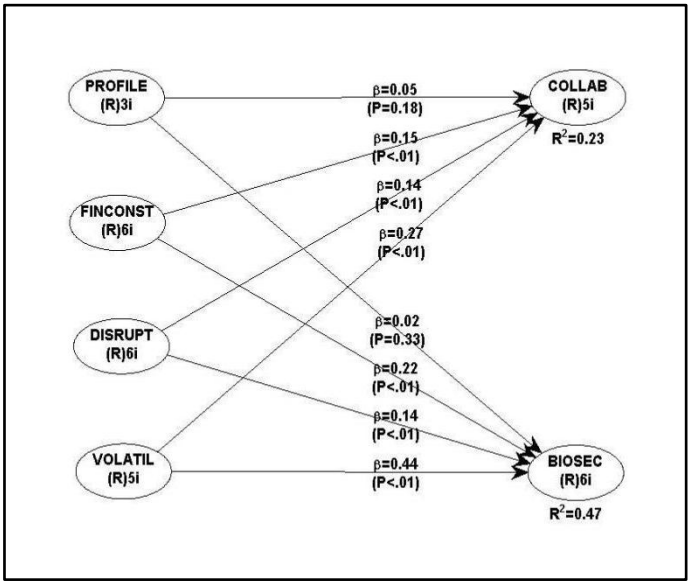

Figure 3. Structural Model of the Relationship Between Swine Entrepreneurs' Profile, Challenges Encountered, and Strategies Employed

The structural model shown in Figure 3 uses path analysis to illustrate how the swine entrepreneurs' profile and the challenges they encounter: financial constraint (FINCONS), market disruption (DISRUPT), and market volatility (VOLATIL) influence the specific strategies they adopt (endogenous variables). The impact on biosecurity practices is explained by 47% (R2=0.47) of the variance in the combined challenges in market volatility, market disruption, financial constraints, and profile. Collaboration, as an important strategy, is also influenced by the challenges encountered with the model, which explains 23% of its variance (R2=0.23). The model also reports beta coefficients ranging from 0.02 to 0.44, with significance levels from p<.01 to p=.33. The structural model suggests that market volatility is the most influential factor in swine entrepreneurs' adaptation of business strategies, particularly in improving biosecurity and seeking collaboration. Interestingly, the entrepreneurs' profile has less influence than that of the external market pressures they face.

Table 5

Beta Coefficients of the Paths and p-values for Ho

Paths	Beta (β) Coefficient	*p*-value*	Standard Error	Effect Size**	Interpretation
Ho_1: Swine Entrepreneurs' Profile→Strategies Employed (Excluded in the Emerging Model)					
Ho_2: Challenges Encountered→Strategies Employed					
FINCONS→COLLAB	0.160	0.002	.055	.056	Small
FINCONS→BIOSEC	0.215	<0.001	.055	.105	Small
DISRUPT→COLLAB	0.147	0.004	.056	.059	Small
DISRUPT→BIOSEC	0.141	0.006	.056	.079	Small
VOLATIL→COLLAB	0.264	<0.001	.055	.111	Small
VOLATIL→BIOSEC	0.441	<0.001	.053	.279	Medium

*Significant at p<0.05

** Effect size coefficient: 0.02 – small, 0.15 – medium, 0.30 – large

The structural model is analyzed using path coefficients and p-values to test the two hypotheses, with the results presented in Table 14. The analysis focuses on how swine entrepreneurs' profiles and the challenges they face shape their strategies in the swine industry. The path analysis reveals that while the profile of swine entrepreneurs does not significantly influence the strategies they employ, the challenges they encounter are powerful drivers of strategic adaptation. Specifically, the relationship between profile and both collaboration and biosecurity was found to be statistically non-significant. This suggests that the factors: location, capital invested, and number of pigs raised, do not dictate strategic choices employed. Conversely, all challenges that were tested: financial constraints, market disruption, and market volatility showed a significant positive impact on the strategies adopted. Market volatility came out as the strongest predictor, exerting a highly significant influence on both

collaboration and biosecurity. Furthermore, financial constraints significantly help in the adoption of biosecurity measures and collaboration. Market disruption also maintains a significant positive relationship with both strategic outcomes. The findings are supported by Hamilton et al. (2018), who emphasized that swine farmers often adjust their management practices and disease-prevention strategies in response to economic and operational challenges arising from disease outbreaks. The study explained that farmers adopt preventive and adaptive strategies to minimize losses and sustain production during periods of uncertainty.

Path analysis was employed to test the null hypotheses, H01 and H02. The first analysis supported the null hypothesis regarding the relationship between the swine entrepreneurs' profile and the strategies employed. This indicates that factors such as location, the number of pigs raised, and the amount of capital invested in the business do not significantly influence the likelihood that an entrepreneur will adopt specific collaborative or biosecurity measures. According to Mehmedi et al. (2025) in Economic Perspectives on Farm Biosecurity: Stakeholder Challenges and swine Species Considerations, the adoption of biosecurity practices in swine farms remains uneven across different production systems. The authors explain that the implementation of biosecurity is often influenced more by economic perceptions, behavioral attitudes, and institutional barriers than by farm characteristics such as location, herd size, or capital investment. Farmers may hesitate to adopt biosecurity measures due to perceived high costs, labor and time requirements, and uncertainty about the benefits of such practices.

In contrast, the results of the second analysis led to the rejection of the null hypothesis regarding the impact of challenges on business strategies. All tested paths were statistically significant. The findings suggest that the external environment, specifically financial pressures and market instability, is a vital component in implementing biosecurity and collaborative strategies. On the whole, these findings indicate that external industry pressures, rather than internal entrepreneurs' profiles, provide primary channels for implementing collaborative and biosecurity strategies in the swine industry. Studies in swine management show that external economic and industry pressures strongly influence farmers' strategic decisions, including the adoption of biosecurity practices. Mehmedi et al. (2024) explained that financial pressures, market uncertainties, and the perceived economic risks associated with disease outbreaks play a critical role in motivating farmers to implement biosecurity measures. Their research highlights that farmers often adopt such strategies not because of their personal characteristics, but because of external incentives, regulatory pressures, and the economic consequences of disease outbreaks in the swine sector. Similarly, Postma et al. (2016) found that biosecurity implementation among pig farmers is largely influenced by perceived disease risk, market requirements, and external advisory systems, rather than individual demographic characteristics of the farm owners. The study emphasized that disease outbreaks and industry regulations often push farmers to strengthen their biosecurity practices. In addition, Laanen et al. (2014) reported that economic risks, production losses, and external disease threats significantly affect farmers' willingness to adopt preventive strategies in pig farming. Their findings indicate that farmers respond to industry-level challenges, such as the threat of infectious diseases and market disruptions, by strengthening farm management and biosecurity systems.

Furthermore, Dione et al. (2017) observed that in smallholder pig systems, the adoption of disease control and collaborative strategies is often influenced by external environmental factors, including disease outbreaks, veterinary guidance, and market demands. These pressures encourage farmers to cooperate and implement preventive measures to protect their livelihoods. Overall, these studies support the idea that external industry pressures—such as financial constraints, market instability, and disease risks—serve as primary drivers of biosecurity and the implementation of collaborative strategies. At the same time, internal characteristics of entrepreneurs play a less significant role in shaping these decisions.

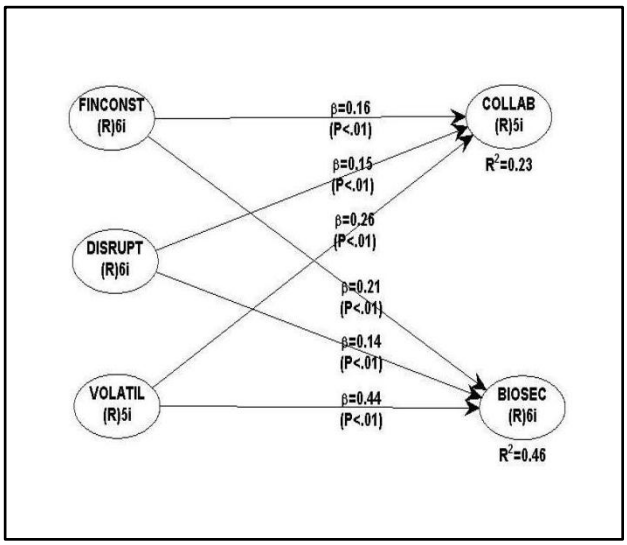

Figure 4. The Emerging Model of the Relationship Between Swine Entrepreneurs' Profile, Challenges Encountered, and Strategies Employed

The emerging model in Figure 4 illustrates how external challenges in the swine industry influence the business strategies of swine entrepreneurs. The emerging model effectively explains a substantial percentage of the variance in the strategies employed by the entrepreneurs, a variance attributable to industry challenges. The model already removed the non- significant relationships to focus on the significant variables affecting the strategies employed in the swine industry. In terms of biosecurity, the model explains 46% of the variance (R2 = 0.46), indicating that challenges in the swine industry are major contributors to biosecurity practices. In collaboration strategies, the model explains 23% of the variance (R2=0.23) in collaborative efforts, suggesting that while challenges matter, other factors not included in the model may also influence the decision to collaborate. Notably, all significant values are less than .01, and the beta coefficients denoting the strength of the relationships ranged from 0.14 to 0.44.

Table 6

Standardized Estimates of the Path in the Emerging Model

Hypothesis	Standardized Estimates (β)	Standard Error	*p*-value*	Effect Coefficient**	Effect Size
Ho: Financial Literacy→Sustainable Development					
FINPLAN→DEBTPAY	0.204	0.060	<0.001	0.105	Small
FINPLAN→SOCBEN	0.119	0.061	0.026	0.041	Small
CASHMGT→BMGTDEC	0.378	0.059	<0.001	0.245	Medium
CASHMGT→DEBTPAY	0.196	0.061	<0.001	0.109	Small
CASHMGT→SOCBEN	0.229	0.060	<0.001	0.100	Small
LOANMGT→BMGTDEC	0.368	0.059	<0.001	0.238	Medium
LOANMGT→DEBTPAY	0.310	0.059	<0.001	0.178	Medium
LOANMGT→SOCBEN	0.187	0.061	<0.001	0.078	Small

*Significant at p≤ 0.05

** Effect size coefficient: 0.02 – small, 0.15 – medium, 0.30 – large

The beta coefficients of the paths shown in Table 5 identify the significant structural relationships between the challenges faced by swine entrepreneurs and the strategies they implement to sustain their businesses. In the second hypothesis test, market volatility emerged as the strongest predictor in the model, exerting a highly significant influence on biosecurity with a medium effect size of .279. It also significantly influences collaboration, suggesting that price changes and market fluctuations compel entrepreneurs to protect their business biosecurity and resource-sharing. Market disruption showed consistent significant paths to both collaboration and biosecurity. While these paths are significant, they have small effect sizes (.059 and .079), indicating they are meaningful but less dominant than volatility. Financial constraints significantly impact biosecurity and collaboration with small effect sizes of .056 and .105. In the swine industry, external challenges are significant predictors of the strategic

efforts in biosecurity and collaboration. Postma et al. (2016) emphasized that disease outbreaks and market pressures can motivate pig farmers to improve biosecurity practices and collaborate with other industry stakeholders. The authors explain that entrepreneurs often respond to external threats by strengthening preventive measures and sharing information or resources with other farmers.

Furthermore, Dione et al. (2017) observed that financial constraints and market disruptions influence smallholder farmers' decisions to adopt collaborative strategies and disease-prevention practices. Farmers facing economic pressure tend to cooperate with other entrepreneurs and adopt cost-effective biosecurity measures to reduce risks and sustain production. The statistical analysis provides sufficient evidence to reject the null hypothesis regarding the relationship between the challenges faced by swine entrepreneurs and their employed strategies, confirming that external challenges are significant drivers of the strategies employed in the swine industry. The statistical analysis provides sufficient evidence to reject the null hypothesis that there is no relationship between the challenges faced by swine entrepreneurs and the strategies they employ. The results confirm that external challenges significantly influence entrepreneurs' strategic responses in the swine industry. This finding is consistent with the study of Mehmedi et al. (2024), which emphasized that economic pressures, market instability, and disease risks strongly influence farmers' decisions to adopt biosecurity practices. Their study explained that when swine entrepreneurs face uncertain market conditions and financial risks, they tend to invest more in preventive measures to safeguard production and reduce potential economic losses.

Table 7

Proposed Program to develop strategies to prevent the impact of the African Swine Fever Outbreak

Objectives	Strategies	Budget	Persons Involved	Time Frame	Resources	Success Indicator
To strengthen awareness and knowledge of swine entrepreneurs about African Swine Fever prevention	Conduct seminars and information campaigns for swine entrepreneurs about ASF transmission, prevention, and biosecurity practices	₱300 per head	Municipal Agriculture Officer, Veterinary Officers, Barangay Officials, and swine entrepreneurs	January – February	Training materials, LGU support, and seminar venue	Increased awareness and knowledge among swine entrepreneurs about ASF prevention
To improve farm biosecurity measures in swine farms	Conduct workshops and farm visits to demonstrate proper sanitation, disinfection, and waste management practices	₱300 per head	Veterinary Officers, Agriculture Technicians, and Swine Farm Owners	February – March	Disinfectants, protective equipment, and training guides	Improved biosecurity practices implemented in swine farms
To establish an early detection and reporting system for ASF cases	Develop a reporting system where farmers can immediately report suspected ASF cases to the LGU or veterinary office	₱300 per head	LGU Officials, IT Personnel, Veterinary Office, Barangay Officials	March	Communication tools, reporting forms, and mobile communication platforms	Faster reporting and response to suspected ASF cases
To support affected swine entrepreneurs and minimize economic losses	Provide assistance programs such as financial aid, alternative livelihood training, and access to government support programs	₱300 per head	LGU, Department of Agriculture, Veterinary Office, swine entrepreneurs	April	Government funds, training materials, and a partnership with the DA	Reduced economic impact on swine entrepreneurs affected by ASF

To strengthen coordination among government agencies in controlling the ASF outbreak	Conduct coordination meetings and planning workshops among the LGU, DA, veterinary offices, and farmer groups	₱300 per head	LGU Officials, Department of Agriculture, Veterinary Office, Farmer Associations	Quarterly	Meeting venues, coordination plans, and program guidelines	Improved collaboration and faster response to ASF outbreaks
To promote sustainable swine farming practices	Provide mentoring programs and training on improved swine farming systems and disease prevention techniques	₱300 per head	Agriculture Officers, Veterinary Experts, and Swine Farmers	May – June	Training modules, farm demonstration areas	Adoption of sustainable and disease-resistant swine farming practices

The proposed program aims to strengthen the capacity of swine entrepreneurs to prevent, detect, and respond to African Swine fever (ASF) through education, improved biosecurity practices, coordinated reporting systems, and economic support initiatives. African Swine fever is a highly contagious viral disease that affects domestic and wild pigs and can cause serious economic losses in the swine industry. It is considered a highly consequential foreign animal disease that threatens pork production and supply chains in many countries (Cochran, 2023). Because there is currently no effective vaccine for ASF, prevention through strict biosecurity and disease awareness remains the most effective strategy for controlling the virus's spread (Aliro et al., 2022). One of the program's major components is to strengthen swine entrepreneurs' awareness and knowledge of ASF prevention. Seminars and information campaigns were conducted to educate farmers about ASF transmission, symptoms, and preventive practices. Municipal agriculture officers, veterinary personnel, and barangay officials facilitate these activities. Educational outreach is important because farmers and stakeholders play a key role in preventing disease outbreaks through proper farm management and disease preparedness programs (Cochran, 2023). Providing accessible and practical knowledge helps swine entrepreneurs recognize the importance of early prevention and responsible animal management. The second component of the program focuses on improving farm biosecurity practices. Workshops and farm visits were conducted to demonstrate proper sanitation procedures, disinfection practices, waste management, and controlled access to pig farms. Veterinary officers and agriculture technicians will guide swine entrepreneurs in implementing practical biosecurity measures that minimize the risk of disease transmission. Biosecurity has been widely recognized as the most important preventive measure in ASF control, especially in the absence of an effective vaccine (Aliro et al., 2022). Implementing proper hygiene practices, restricting animal movement, and ensuring safe carcass disposal are essential strategies in preventing the spread of the virus. Another important component of the program is the establishment of an early detection and reporting system for ASF cases. The system will allow farmers to quickly report suspected ASF cases to the local government unit or veterinary office using communication tools and reporting forms. Early reporting is essential to ensure rapid response and containment measures to prevent further spread of the disease. According to Cochran (2023), unmonitored animal movement and inadequate disease reporting can contribute to the rapid spread of ASF within the swine industry.

The program also aims to provide support for swine entrepreneurs affected by ASF outbreaks. Assistance programs, including financial aid, access to government support services, and alternative livelihood training, are provided to help farmers recover from economic losses. Economic constraints and livelihood priorities often prevent farmers from implementing strict biosecurity measures, especially in small-scale farming communities (Aliro et al., 2022). Providing support programs can help reduce these barriers and encourage farmers to adopt improved disease prevention practices. In addition, the program seeks to strengthen coordination among government agencies and farmer organizations in controlling ASF outbreaks. Regular coordination meetings and planning workshops are conducted among the Local Government Unit, the Department of Agriculture, the veterinary offices, and the farmer associations. Effective collaboration among these stakeholders is essential to

ensure timely responses, effective information sharing, and coordinated disease control strategies. Finally, the program promotes sustainable swine farming practices through mentoring and training programs. Agriculture officers and veterinary experts will provide guidance on improved pig management systems and disease prevention techniques. Strengthening farmers' knowledge and practices can enhance farm resilience and help protect the swine industry from future disease outbreaks.

4. Conclusions

Based on the study's findings, the following conclusions were drawn: Swine entrepreneurs faced significant challenges during the ASF outbreak, particularly financial losses, movement restrictions, and disruptions to the pork market. The majority of swine entrepreneurs operate on a small- to medium-scale, indicating that most farmers rely on pig raising as a livelihood rather than as a large commercial enterprise. Profile of swine entrepreneurs: The findings indicate that most swine entrepreneurs operate with a limited number of pigs, suggesting that the majority of respondents are engaged in small-scale or backyard swine production systems. This reflects the common structure of pig farming in rural areas, where farmers manage a small herd primarily for livelihood and local market supply. The results show that swine entrepreneurs are distributed across several municipalities, with higher concentrations in San Jose, Magsaysay, and Rizal. This indicates that swine production is an important agricultural activity in different areas of the province and contributes to the local economy and food supply. The findings reveal that most swine entrepreneurs are from small- to medium-scale swine enterprises. This suggests that many farmers rely on limited financial resources in maintaining their swine production. Extent of the challenges encountered by the swine entrepreneurs: The findings show that swine entrepreneurs faced significant financial constraints during the African Swine Fever outbreak, as increased production costs, pig mortality, and reduced income significantly affected their ability to sustain their operations. The results indicate that swine entrepreneurs encountered considerable market disruptions, particularly due to restrictions on the movement of pigs and pork products, which limited their ability to sell and distribute their swine. The findings reveal that swine entrepreneurs were significantly affected by market volatility, as fluctuations in pork prices and unstable market demand created uncertainty and financial risks during the ASF outbreak. Extent of the strategies employed by the swine entrepreneurs during the African Swine fever outbreak: The results show that swine entrepreneurs practiced collaboration with fellow farmers, local authorities, and agricultural agencies to share information, resources, and support in managing the challenges brought about by the ASF outbreak. Swine entrepreneurs implemented biosecurity measures to prevent the spread of the disease, including improving farm sanitation, restricting farm visitors, and adopting enhanced disease-prevention practices. The results reveal that swine entrepreneurs adopted strategic marketing approaches, such as adjusting selling methods, exploring alternative markets, and more carefully managing production and sales, to cope with market challenges during the ASF outbreak. There is a significant relationship between the challenges encountered and the strategies employed, indicating that farmers develop and adopt strategies in response to these difficulties. The profile of swine entrepreneurs influences the strategies they employ, suggesting that farm size, resources, and location may affect how farmers respond to crises. There is a need to develop programs that support farmers through training, financial assistance, and improved marketing opportunities to strengthen the resilience of the swine industry.

Recommendations - Based on the findings and conclusions of the study, the following recommendations are proposed: The Department of Agriculture (DA), through the Bureau of Animal Industry (BAI), together with the Local Government Units (LGUs), may strengthen support programs for swine entrepreneurs by providing financial assistance, recovery programs, and technical guidance to help farmers cope with the financial losses and market disruptions caused by African Swine Fever (ASF). The Department of Agriculture, in coordination with the Agricultural Training Institute (ATI) and the Technical Education and Skills Development Authority (TESDA), may expand training programs and livelihood support initiatives to assist small- and medium-scale swine entrepreneurs in improving farm management practices, increasing productivity, and sustaining pig production as a stable source of income. Profile of Swine Entrepreneurs: The Department of Agriculture and Local Government Agricultural Offices may strengthen programs supporting small-scale swine production by providing technical

assistance, access to improved pig breeds, and training in better farm management practices to enhance productivity and sustainability among swine entrepreneurs with limited herd sizes. Municipal Local Government Units, particularly the Municipal Agriculture Office, may intensify area-based agricultural support programs in municipalities with active swine production to ensure equitable access to veterinary services, farmer training, and disease monitoring systems. Government financial institutions such as the Land Bank of the Philippines and the Development Bank of the Philippines, in partnership with the Department of Agriculture, may expand credit facilities, swine insurance programs, and livelihood assistance to help swine entrepreneurs improve their capital capacity and sustain their farming operations. Extent of the Challenges Encountered by the Swine Entrepreneurs: The Department of Agriculture and the Philippine Crop Insurance Corporation (PCIC) may enhance financial assistance programs, subsidy initiatives, and swine insurance coverage to help swine entrepreneurs manage production costs and recover from economic losses caused by disease outbreaks. The Department of Trade and Industry (DTI), in coordination with the Department of Agriculture and Local Government Units, may strengthen coordination with pork market stakeholders to maintain stable distribution channels for pork products even during disease outbreaks or movement restrictions. The Department of Agriculture and the Department of Trade and Industry may implement market stabilization initiatives, price monitoring systems, and improved market information dissemination to help swine entrepreneurs make informed production and marketing decisions.

Extent of the Strategies Employed by the Swine Entrepreneurs during the African Swine Fever Outbreak: Local Government Units and the Department of Agriculture may encourage the formation and strengthening of swine farmer associations or cooperatives to promote collaboration, information sharing, and collective support among swine entrepreneurs. The Bureau of Animal Industry, in coordination with Local Veterinary Offices, may implement continuous training programs on biosecurity practices, disease prevention, and farm sanitation to enhance swine farmers' preparedness for future outbreaks. The Department of Trade and Industry and the Department of Agriculture may provide capacity-building activities on strategic marketing, product diversification, and the development of value-added pork products to help swine entrepreneurs sustain their income despite market disruptions. The Department of Agriculture and the Bureau of Animal Industry should provide adaptive, challenge-based training programs to help farmers respond effectively to issues such as disease outbreaks and rising costs. LGUs and the Land Bank of the Philippines, with support from the Department of Trade and Industry, may offer profile-based assistance (financial, technical, and technological) tailored to the size and capacity of swine farmers. The Department of Agriculture, the Agricultural Training Institute, the Philippine Crop Insurance Corporation, and the Department of Trade and Industry may collaborate to deliver integrated support programs that cover training, financial aid, insurance, and market access. Future researchers may conduct further studies focusing on long-term recovery strategies and the effectiveness of government support programs in strengthening the resilience of the swine industry.

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