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Risk and Crisis Communication in Poultry Agribusiness: A Systematic Literature Review of Disease Outbreak Management and Supply Chain Resilience in Developing Countries

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Abstract. *Poultry agribusiness is a key driver of food security and rural economic development in developing countries. However, the sector remains vulnerable to infectious diseases such as avian influenza and Newcastle disease, which can disrupt production systems and supply chain continuity. Although previous studies have examined poultry disease control, biosecurity, and supply chain disruption, evidence on how risk and crisis communication supports outbreak management and resilience in developing-country poultry agribusiness remains fragmented. This study applied a systematic literature review (SLR) approach under PRISMA guidelines to synthesize risk and crisis communication strategies in poultry disease management and their contribution to supply chain resilience. Only seven relevant studies published between 2020 and 2025 met the inclusion criteria and were analyzed using the PICO framework. Quality assessment using the Mixed Methods Appraisal Tool (MMAT), combined with systematic data extraction in Microsoft Excel 2021, was conducted to improve methodological transparency and consistency. The novelty of this review lies in integrating communication strategies, enabling and constraining factors, digital tools, One Health perspectives, and public–private collaboration within a single analytical synthesis. The findings indicate that participatory, transparent, and coordinated communication can support disease prevention and crisis preparedness, particularly when strengthened by stakeholder trust, policy support, training, and accessible information channels. However, limited digital literacy, inadequate infrastructure, and cultural barriers may reduce communication effectiveness. Overall, this review highlights the need for inclusive communication systems and collaborative governance to strengthen poultry supply chain resilience in developing countries, while recognizing that the small evidence base limits broad generalization.*

Keywords: *Disease outbreak management, One health, Poultry agribusiness, Risk communication, Supply chain resilience*

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INTRODUCTION

The poultry sector is a cornerstone for food security and economic growth in many developing countries. Poultry products, particularly chicken meat and eggs, serve as crucial sources of affordable animal protein for vast populations, especially low-income communities (Alders et al., 2007). Demographic expansion, urbanization, and shifting consumer preferences have driven rapid growth in poultry agribusiness, ranging from smallholders to large commercial systems (Hennessey et al., 2021). The resilience of poultry supply chains is vital not only for sustaining domestic food availability but also as an economic engine supporting rural livelihoods and employment for millions in these regions (Bhandari et al., 2011). Despite its socioeconomic importance, the sector faces persistent structural challenges that threaten the sustainability of production, distribution, and market access.

Infectious disease outbreaks such as avian influenza (AI) and Newcastle disease (ND) present severe and recurrent risks to poultry industries in developing countries. These highly contagious diseases have the potential to devastate flock populations, disrupt production, and impose substantial economic losses on both smallholders and large-scale producers alike (Alders et al., 2007). Transmission of poultry diseases can quickly overwhelm local and national supply chains, undermining food security and destabilizing markets (Crovato et al., 2024). Moreover, the interconnectedness of supply networks and live animal trade fosters the rapid dissemination of pathogens across regions and even international borders (Tekola et al., 2017). Failure to detect outbreaks early and to manage crises effectively can result in prolonged shortages of poultry products, increased food prices, and significant volatility in farmers' incomes (Brioudes & Gummow, 2016). Recent empirical evidence shows that poultry disease outbreaks have economic consequences beyond flock mortality. Crovato et al. (2024) indicated that farmers' economic capacity and willingness to implement biosecurity practices influence avian influenza prevention, while Hennessey et al. (2021) emphasized that intensive poultry production and distribution systems may become more fragile when disease risks are not supported by adequate communication and coordinated response. Therefore, poultry disease outbreaks can disrupt production costs, market access, supply continuity, and the resilience of poultry value chains in developing countries.

The management of disease and crisis response in the poultry sector is frequently complicated by key structural barriers endemic to developing countries. These include limited information infrastructure, low levels of digital literacy among farmers and supply chain actors, and weak coordination among stakeholders (Crovato et al., 2024; Hennessey et al., 2021). Disease monitoring and early warning systems often rely on manual reporting methods, human resources, and informal networks that delay or distort critical information flows (Antoshchuk et al., 2025). Training and education around biosecurity are frequently sporadic and insufficient, widening gaps in knowledge and practices at the grassroots level. Social factors such as traditional husbandry practices, economic hardship, and risk apathy further impede the widespread adoption of protective measures and collective response mechanisms (Soares et al., 2025). These persistent obstacles highlight the urgency for improved information management and stakeholder engagement throughout the supply chain.

Risk and crisis communication thus emerges as a pivotal factor in successful outbreak management in developing country poultry agribusiness. Effective communication encompasses not only technical information transfer but also the cultivation of mutual understanding, trust, and active participation across the entire supply chain (Soares et al., 2025; Voss et al., 2012). Strategic approaches include ongoing biosecurity education, vaccination advocacy, coordinated crisis drills, and timely alerts disseminated via both formal and informal channels (Crovato et al., 2024). Participatory methods and collaborative multi-actor networks have proven essential to fostering preparedness and community resilience in the face of disease threats (Voss et al., 2012). Nonetheless, empirical evidence on how these strategies are practically implemented and which factors most influence their success remains fragmented and context-dependent across developing regions (Sarikaya & Erbaydar, 2007). The novelty of this systematic literature review lies in its comprehensive synthesis of how risk and crisis communication strategies intersect with enabling and hindering factors, innovative tools, and collaborative partnerships along the poultry agribusiness supply chain in developing countries. This review not only collates evidence across diverse regions and scales but also identifies critical knowledge gaps, offering an integrative analytical framework to enhance decision-making communication systems in low and middle-income contexts. By highlighting the evolving role of digital technology, community education, and

intersectoral governance, this study advances a new contribution to building resilient food systems and crisis preparedness in the poultry sector, a pressing imperative in a world facing zoonotic epidemic risks, climate change, and global economic uncertainty (Antoshchuk et al., 2025; Tekola et al., 2017; Hennessey et al., 2021). Based on this background, this study addresses three research questions: (1) What risk and crisis communication strategies have been applied in poultry disease outbreak management in developing countries? (2) What enabling and constraining factors influence the effectiveness of these communication strategies? and (3) How do digital innovation, One Health perspectives, and multi-actor collaboration contribute to poultry supply chain resilience during disease-related crises?

LITERATURE REVIEW

Risk and Crisis Communication Strategies in Poultry Disease Management

Risk and crisis communication strategies are integral to effective poultry disease management, as highlighted by numerous studies. Successful disease control hinges on seamless cooperation and communication among poultry producers, veterinarians, and various experts, facilitating timely diagnosis, treatment, and containment measures (Lister, 2010). This communication is best structured as a three-way dialogue involving all stakeholders to promote poultry health and welfare comprehensively (Lister, 2010). Participatory disease surveillance further empowers local farmers by encouraging open communication and knowledge sharing, allowing them to actively contribute to the design and implementation of health and production programs (Musa et al., 2013). Therefore, communication is not just a one-way information transfer but a dynamic, participatory process that demands flexibility and adaptability from all involved parties (Bagnol et al., 2016).

Innovation and Collaboration for Supply Chain Resilience

Innovation and collaboration play pivotal roles in enhancing supply chain resilience, particularly in the poultry agribusiness sector in developing countries. Collaborative models involving government agencies, the private sector, farmers, and donor organizations form the backbone of efforts to stabilize supply chains during crises. Public-private partnerships (PPPs) are especially effective in ensuring the efficient flow of goods and agile risk management, thus mitigating disruptions caused by disease outbreaks or market fluctuations (Tariq, 2025). Additionally, multi-stakeholder

governance frameworks inclusive of agricultural enterprises, NGOs, and consumers encourage sustainable practices and collective responsibility, which strengthen the agricultural supply chain's resilience (Cao & Tao, 2025).

Enabling and Constraining Factors in Risk Communication Effectiveness

Effective risk communication in poultry agribusiness is shaped by a variety of enabling and constraining factors that significantly influence its success. Key supporting factors include social trust, where confidence in information sources fosters compliance with health measures; this trust is underpinned by transparency and credibility from stakeholders and authorities (Cairns, De Andrade, & MacDonald, 2013; Oliveira, Costa, & Freitas, 2023). Training farm workers and community volunteers is another vital enabling factor, as demonstrated by successful community health volunteer programs in Kenya, which improved both information dissemination and community engagement (Mwaniki et al., 2025). Policy backing, such as legal frameworks and clear leadership models seen in regions like South Korea, enhances communication effectiveness by integrating risk management into formal preparedness plans (Hong, 2024). Moreover, the One Health approach that encourages the integration of veterinary, environmental, and human health sectors facilitates real-time information exchange, improving biosecurity and collective disease prevention efforts (Vaillancourt, 2009). Conversely, several barriers limit the effectiveness of communication strategies. Low digital literacy, especially in rural settings, impedes the uptake of digital communication platforms necessary for timely warnings and risk information (Ross et al., 2024; Latonero & Shklovski, 2010). Weak communication infrastructure exacerbates these limitations, with inadequate channels diminishing message reach and timeliness, as observed in disaster responses in countries like Iran (Fathollahzadeh et al., 2024). Inter-agency misalignment and poor coordination result in inconsistent messages and inefficient resource utilization, further complicated by cultural resistance based on traditional beliefs and misinformation, which hinder behavioral change and risk mitigation (Geurts et al., 2023; Kebede et al., 2020).

RESEARCH METHODS

This study employs the Systematic Literature Review (SLR) method as the primary approach to collect, analyze, and integrate relevant research findings related to the predetermined theme. The use of SLR was chosen for its strength in providing a structured

and unbiased framework, while also allowing researchers to conduct a critical evaluation of existing literature to comprehensively address the research questions. Through this approach, various research outcomes from different contexts and conditions can be examined, resulting in more holistic and applicable conclusions (Moher et al., 2009). The review process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which serve as an international standard for conducting and reporting systematic reviews in a transparent and structured manner. The application of the PRISMA protocol ensures that each stage of the study, from developing the search strategy, selecting articles, extracting information, to analyzing and synthesizing data, is conducted in a standardized, consistent, and traceable way. Quality assessment using the Mixed Methods Appraisal Tool (MMAT) with systematic data extraction using Microsoft Excel 2021 was performed to ensure methodological transparency, accuracy, and reliability of the extracted information. Beyond ensuring transparency in research procedures, the use of this guideline also facilitates future replication of the study by other researchers (Page et al., 2021).

Search Strategy

The literature search for this systematic review was performed using two primary databases, Google Scholar and Scopus, focusing on publications from 2020 to 2025, with the final search completed in October 2025 to ensure the inclusion of the most up-to-date studies. Google Scholar was selected because it provides broad coverage of scholarly publications, including journal articles, conference papers, and institutional reports that are relevant to developing-country contexts. Scopus was used because it offers indexed, peer-reviewed, and multidisciplinary literature with stronger bibliographic control, allowing the search results to be traced and screened more systematically. Web of Science and PubMed were not included as primary databases because the scope of this review focuses not only on biomedical or veterinary disease aspects, but also on communication strategies, agribusiness systems, and supply chain resilience. Therefore, Google Scholar and Scopus were considered appropriate to capture both scientific and interdisciplinary literature related to risk communication, poultry disease management, and agribusiness resilience.

Various keyword combinations such as communication, poultry, supply chain resilience, disease and developing countries were applied to enhance the coverage of

relevant literature. In Google Scholar, the search used the query ("poultry" OR "chicken") AND ("risk communication" OR "crisis communication") AND ("disease outbreak" OR "avian influenza" OR "Newcastle") AND ("supply chain resilience" OR "agribusiness") AND ("developing countries" OR "low- and middle-income countries"). For Scopus, the search formulation applied is ("risk communication" OR "crisis communication" OR "communication strategy" OR "emergency communication" OR "information dissemination" OR "stakeholder communication") AND ("poultry" OR "chicken" OR "poultry industry" OR "poultry agribusiness" OR "poultry sector") AND ("disease outbreak" OR "avian influenza" OR "bird flu" OR "infectious disease" OR "zoonotic disease" OR "epidemic response") AND ("developing countries" OR "low- and middle-income countries" OR "LMIC" OR "Asia" OR "Africa" OR "Latin America"). This systematic search strategy was designed to capture comprehensive and contextually relevant references through the use of diverse keyword combinations and database-specific adjustments, ensuring that the findings would provide strong support for a thorough analysis of the research topic.

Data Analysis and Extraction

The inclusion criteria in this study include: (1) studies that specifically examine risk and crisis communication strategies in the context of poultry agribusiness or livestock disease outbreaks in developing countries; (2) studies that analyze communication mechanisms, early warning systems, collaboration, or supply chain resilience related to disease management in the poultry sector; (3) studies published between 2020 and 2025 in peer-reviewed journals, conference proceedings, or institutional reports written in English; and (4) studies that explore factors influencing communication effectiveness, such as information infrastructure, digital literacy, and coordination among actors within the poultry supply chain. The exclusion criteria consist of: (1) studies that focus on non-poultry sectors or livestock production without connection to communication or crisis management; (2) research conducted exclusively in developed countries without contextual relevance to developing nations; (3) publications before 2020 or non-academic materials, including blogs, editorials, or unverified reports; and (4) studies that only discuss technical or biological aspects of disease control, such as vaccination or genetic improvement, without addressing communication, collaboration, or resilience dimensions.

After duplicate articles were removed, the initial screening of titles and abstracts was conducted by one researcher using the predefined inclusion and exclusion criteria to ensure consistency in the early selection stage. To reduce the risk of selection bias, the results of this initial screening were then reviewed independently by three authors during the eligibility assessment. Any differences in judgment regarding article eligibility were discussed among the authors until consensus was reached. When uncertainty remained, the final decision was made by referring back to the research objectives, inclusion criteria, exclusion criteria, and relevance of each study to risk communication, crisis communication, poultry disease management, and supply chain resilience. Finally, data extraction was conducted collaboratively by the authors using a structured data extraction form, ensuring the systematic organization and reliability of the information gathered for analysis. To further ensure the credibility of the selected studies, a methodological quality assessment was conducted using the Mixed Methods Appraisal Tool (MMAT). The assessment focused on the clarity of research questions, adequacy of data collection, appropriateness of data analysis, support for interpretation, and discussion of integration or limitations, as presented in Table 1.

Table 1. Quality Assessment of Included Studies Using the Mixed Methods Appraisal Tool (MMAT)

No	Authors & Year	Study Type	Criterion 1: Research Question Clearly Defined	Criterion 2: Data Collection Adequate	Criterion 3: Data Analysis Appropriate	Criterion 4: Interpretation Supported by Data	Criterion 5: Integration / Limitations Discussed	MMAT Score (%)	Quality Category
1	Gupta et al. (2021)	Quantitative (Survey)	Yes	Yes	Yes	Yes	Partial	80	High
2	Wignjadiputro et al. (2020)	Mixed-methods	Yes	Yes	Yes	Yes	Yes	100	High
3	Innes et al. (2022)	Qualitative (Policy Review)	Yes	Yes	Yes	Yes	Partial	80	High
4	Si et al. (2021)	Quantitative (Field Survey)	Yes	Yes	Yes	Yes	Partial	80	High
5	Robi et al. (2023)	Mixed-methods (Survey + Interview)	Yes	Yes	Yes	Yes	Yes	100	High
6	Chapot et al. (2024)	Qualitative (Needs Assessment)	Yes	Yes	Partial	Yes	Partial	60	Moderate
7	Otieno et al. (2023)	Quantitative (Field Survey)	Yes	Yes	Yes	Yes	Partial	80	High

Scoring interpretation:

- Each criterion scored as “Yes” = 20%, “Partial” = 10%, “No” = 0%.
- MMAT total = (Sum of scores / 5) × 100%.
- High quality: ≥80%, Moderate: 60–79%, Low: <60%.

Summary:

- 5 of 7 studies achieved high methodological quality (≥80%), demonstrating strong research design and analytical rigor.
- 1 study (Chapot et al., 2024) showed moderate quality, mainly due to limited analytical depth and incomplete discussion of limitations.
- Overall, the body of evidence is considered robust and methodologically sound, supporting the synthesis and conclusions drawn in this SLR.

RESULTS AND DISCUSSION

The research framework of this systematic literature review was structured using the PICO model (Population, Intervention, Comparison, Outcome) to clearly define the analytical scope and ensure methodological consistency. This approach facilitates the identification of key elements within the literature, emphasizing how risk and crisis communication strategies in poultry agribusiness contribute to disease outbreak management and supply chain resilience in developing countries, as summarized in Table 2.

Table 2. PICO Framework

Component	Description
P (Population/Problem)	Poultry agribusiness actors in developing countries facing disease outbreaks
I (Intervention/Exposure)	Risk and crisis communication strategies, early warning systems, and collaborative innovations in the poultry supply chain
C (Comparison)	Areas or cases with low or ineffective communication strategies or limited collaboration (if applicable)
O (Outcome)	Improved disease outbreak management, enhanced supply chain resilience, and more effective coordination among actors

The PRISMA guidelines were followed to carry out the identification, selection, and screening of studies, enabling a systematic tracking of the articles retrieved, filtered, and analyzed (Page et al., 2021). Subsequently, the methodological quality of the selected articles was evaluated using the Mixed Methods Appraisal Tool (MMAT), which serves as an instrument for assessing the validity of various types of research designs.

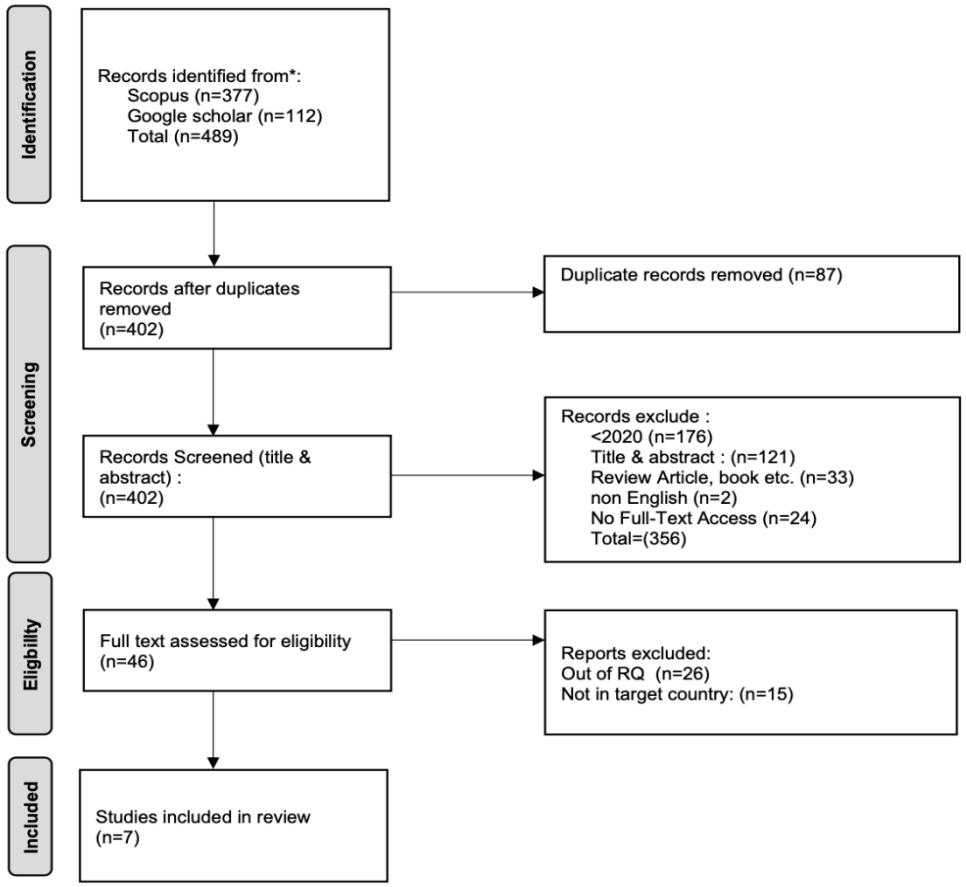

Figure 1. PRISMA flow diagram of the study selection process

The PRISMA flow diagram outlines a systematic screening process. The literature identification stage began with searches in two major academic databases, Scopus (n = 377; 77.1%) and Google Scholar (n = 112; 22.9%), resulting in 489 initial records. After removing 87 duplicates (17.8%), 402 records proceeded to title and abstract screening. A total of 356 studies were excluded due to publication before 2020 (n = 176), irrelevance to the topic (n = 121), review or non-journal publications (n = 33), non-English language (n = 2), and inaccessible full text (n = 24). At the eligibility stage, 46 articles underwent full-text evaluation, of which 26 were excluded for being outside the research scope and 15 for not fitting the target country criteria. Finally, only seven studies met the inclusion criteria, yielding a final inclusion rate of 1.4%. This limited evidence base indicates that risk and crisis communication in poultry agribusiness remains an underexplored topic in developing-country contexts. Therefore, the findings should be interpreted as an indicative synthesis rather than a basis for broad generalization across all developing

countries. Differences in infrastructure, digital literacy, institutional capacity, and poultry production systems may influence how communication strategies are implemented and how effectively they support outbreak management and supply chain resilience. Nevertheless, the included studies provide relevant empirical and theoretical insights that address the three research questions: (1) implementation of risk and crisis communication strategies during poultry disease outbreaks, (2) determinants influencing communication effectiveness within constraints of infrastructure, digital literacy, and actor coordination, and (3) collaborative innovations enhancing poultry supply chain resilience and crisis preparedness in developing contexts.

Table 3. General Characteristics of Included Studies

No	Authors & Year	Country / Region	Study Type	Main Focus	Type of Disease / Issue
1	Gupta et al. (2021)	Bangladesh	Field survey / Quantitative	Farmers' decisions on biosecurity and disease prevention	Avian Influenza
2	Wignjadiputro et al. (2020)	Indonesia	Case study / Mixed-methods	Pandemic preparedness and multi-actor coordination	Avian Influenza
3	Innes et al. (2022)	Thailand	Policy review / Qualitative	One Health approach and cross-sector coordination	Avian Influenza / Zoonosis
4	Si et al. (2021)	China	Field survey / Quantitative	Contract commitment system and information sharing	Livestock epidemics
5	Robi et al. (2023)	Ethiopia	Survey / Mixed-methods	Knowledge, attitudes, and practices on vaccination	Avian Influenza / Newcastle Disease
6	Chapot et al. (2024)	Indonesia	Needs assessment / Qualitative	Capacity and management for poultry production and health	Avian Influenza / Multi-disease
7	Otieno et al. (2023)	Kenya	Field survey / Quantitative	Adoption of biosecurity practices among smallholder farmers	Avian Influenza / Newcastle Disease

Based on the synthesis of the selected studies, a conceptual framework was developed to illustrate how risk and crisis communication strategies interact with enabling factors and innovation mechanisms to enhance poultry supply chain resilience.

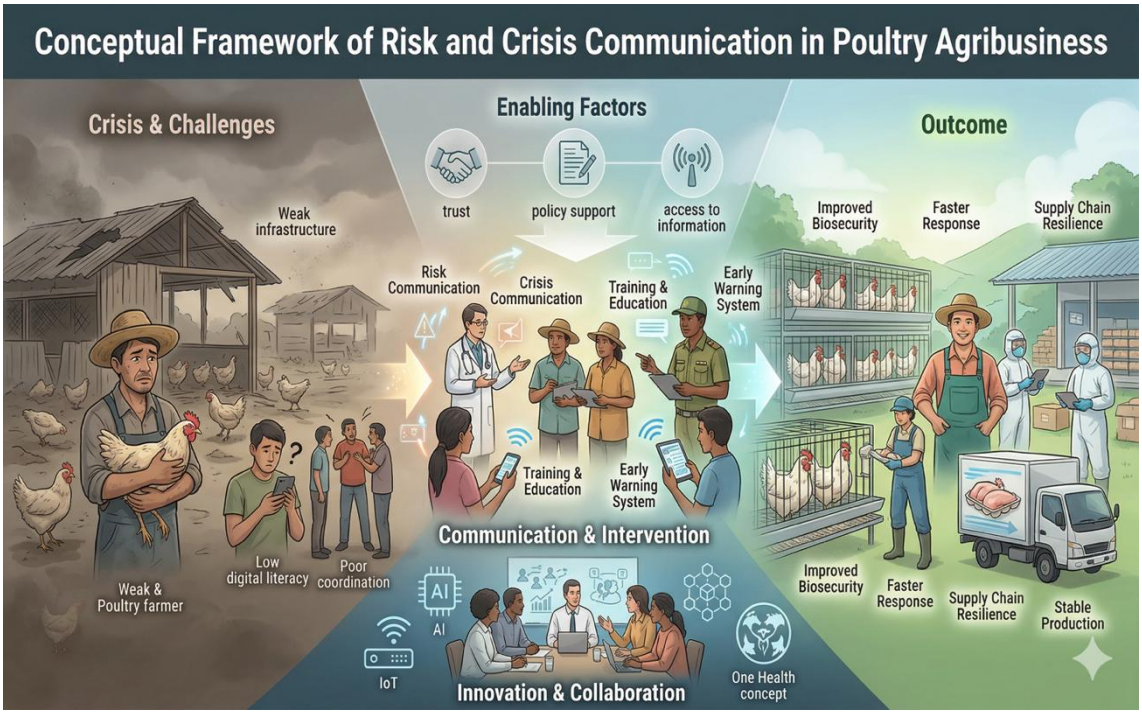

Figure 2. Conceptual Framework of Risk and Crisis Communication in Poultry Agribusiness

Figure 2 illustrates the interaction between key challenges, communication strategies, enabling factors, and resilience outcomes. The framework highlights that effective communication, supported by trust, policy, and access to information, plays a central role in improving biosecurity, accelerating outbreak response, and strengthening supply chain resilience. However, these relationships may vary across developing-country contexts. In areas with weak infrastructure and limited digital literacy, communication strategies may depend more heavily on direct extension, farmer training, and community-based networks. In contrast, settings with stronger institutional coordination may be better positioned to integrate early warning systems, One Health coordination, and digital information platforms. Thus, the framework should be understood as a flexible analytical model rather than a uniform pathway that operates identically across all poultry agribusiness systems.

Risk and Crisis Communication Strategies in Poultry Disease Management

Risk and crisis communication strategies are integral to effective poultry disease management, as highlighted by numerous studies. Successful disease control hinges on seamless cooperation and communication among poultry producers, veterinarians, and various experts, facilitating timely diagnosis, treatment, and containment measures

(Lister, 2010). This communication is best structured as a three-way dialogue involving all stakeholders to promote poultry health and welfare comprehensively (Lister, 2010). Participatory disease surveillance further empowers local farmers by encouraging open communication and knowledge sharing, allowing them to actively contribute to the design and implementation of health and production programs (Musa et al., 2013). Therefore, communication is not just a one-way information transfer but a dynamic, participatory process that demands flexibility and adaptability from all involved parties (Bagnol et al., 2016).

The impact of these communication strategies on poultry disease management is significant. For instance, avian influenza control relies heavily on effective education, behavioral change, vaccination programs, and coordinated surveillance, all of which require public awareness and strategic communication efforts (Sims & Swayne, 2016). Advanced technological innovations like deep learning for early disease detection have shown remarkable improvements over traditional manual methods, underlining the growing role of technology in enhancing communication and disease management (Liu et al., 2023). Despite these advancements, communication strategies face considerable challenges. Poultry farmers encounter managerial, economic, and psychosocial barriers that impair biosecurity practices implementation (Crovato et al., 2024). Additionally, insufficient access to quality vaccines and veterinary services further compounds disease management difficulties, especially in rural settings where training and knowledge dissemination are limited (Enahoro et al., 2021).

Engagement of multiple stakeholders emerges as a crucial component in overcoming these challenges. Strengthening stakeholder cooperation not only improves biosecurity skills but also fosters shared responsibility and informed decision-making in the poultry sector (Crovato et al., 2024). Comprehensive understanding of host-pathogen interactions through immunogenomic research further supports strategic communication by enabling targeted interventions (Lillehoj et al., 2007). Overall, the reviewed literature elucidates that while communication strategies form the backbone of disease management in poultry, continuous efforts in stakeholder participation, technological adoption, and addressing systemic barriers are essential for sustained success.

Table 4. Risk and Crisis Communication Strategies

No	Study	Communication Strategy	Target Audience	Channel / Media	Effectiveness / Notes
1	Gupta et al. (2021)	Farm-level extension and biosecurity training	Poultry farmers	Workshops, leaflets, field demonstrations	Improved biosecurity adoption decisions
2	Wignjadiputro et al. (2020)	Pandemic simulation and multi-actor coordination	Local government, farmers, community	Exercises, briefings, local media	Enhanced cross-sector preparedness
3	Innes et al. (2022)	One Health policy coordination and briefings	Government, health sector, farmers	Policy briefs, coordination meetings	Strengthened cross-sector risk understanding
4	Si et al. (2021)	Contract commitment system and information sharing	Farmers, cooperatives	Contract documents, regular meetings	Reduced information asymmetry, improved disease control
5	Robi et al. (2023)	Vaccine and biosecurity education	Farmers	Workshops, leaflets, consultations	Increased knowledge and practices
6	Chapot et al. (2024)	Needs assessment and management recommendations	Farmers, government	Surveys, reports	Identified infrastructure and capacity gaps
7	Otieno et al. (2023)	Biosecurity training	Smallholder farmers	Field demonstrations, printed materials	Promoted biosecurity adoption

Table 4 shows that risk and crisis communication strategies in poultry disease management operate through different but interconnected mechanisms. Farm-level training and biosecurity education mainly function by translating technical disease-prevention messages into practical actions that can be understood and applied by farmers. In contrast, pandemic simulations, One Health briefings, and multi-actor coordination are more relevant for strengthening institutional preparedness and clarifying the roles of government, veterinary authorities, farmers, and community actors during disease-related crises. Information sharing through contracts and regular meetings also plays an important role in reducing information asymmetry, particularly where farmers depend on cooperatives or formal supply chain arrangements. A critical implication of these findings is that communication effectiveness cannot be separated from the context in which the strategy is implemented. Strategies based on printed materials, workshops, and field demonstrations may be more suitable for smallholder farmers with limited digital access, while policy briefings, simulations, and digital tools require stronger institutional capacity

and coordination. Therefore, risk and crisis communication should not be viewed as a single standardized intervention, but as a context-sensitive process that must be adapted to farmers' literacy, trust in information sources, available infrastructure, and the level of collaboration among actors. This interpretation helps explain why communication strategies may support disease prevention and supply chain resilience in some settings but remain less effective where resources, coordination, or trust are limited.

Enabling and Constraining Factors in Risk Communication Effectiveness

Effective risk communication in poultry agribusiness is shaped by a variety of enabling and constraining factors that significantly influence its success. Key supporting factors include social trust, where confidence in information sources fosters compliance with health measures; this trust is underpinned by transparency and credibility from stakeholders and authorities (Cairns, De Andrade, & MacDonald, 2013; Oliveira, Costa, & Freitas, 2023). Training farm workers and community volunteers is another vital enabling factor, as demonstrated by successful community health volunteer programs in Kenya, which improved both information dissemination and community engagement (Mwaniki et al., 2025). Policy backing, such as legal frameworks and clear leadership models seen in regions like South Korea, enhances communication effectiveness by integrating risk management into formal preparedness plans (Hong, 2024). Moreover, the One Health approach that encourages the integration of veterinary, environmental, and human health sectors facilitates real-time information exchange, improving biosecurity and collective disease prevention efforts (Vaillancourt, 2009). Conversely, several barriers limit the effectiveness of communication strategies. Low digital literacy, especially in rural settings, impedes the uptake of digital communication platforms necessary for timely warnings and risk information (Ross et al., 2024; Latonero & Shklovski, 2010). Weak communication infrastructure exacerbates these limitations, with inadequate channels diminishing message reach and timeliness, as observed in disaster responses in countries like Iran (Fathollahzadeh et al., 2024). Inter-agency misalignment and poor coordination result in inconsistent messages and inefficient resource utilization, further complicated by cultural resistance based on traditional beliefs and misinformation, which hinder behavioral change and risk mitigation (Geurts et al., 2023; Kebede et al., 2020).

Comparative studies between developing countries, such as Bangladesh and Kenya, reveal differential impacts of these factors. Bangladesh struggles primarily with infrastructure deficits and cultural resistance, while Kenya benefits significantly from community training initiatives despite financial and logistical challenges (Ross et al., 2024; Mwaniki et al., 2025). Theories like the Diffusion of Innovation (Lee, 2024) emphasize spreading adoption through social networks and communication channels, while Crisis and Emergency Risk Communication (CERC) theory (Reynolds & Shenhar, 2009) highlights the critical role of timely, credible, and audience-tailored messaging in managing risks. Together, these theoretical frameworks support designing nuanced communication strategies that adapt to contextual enablers and barriers.

Table 5. Enabling and Inhibiting Factors for Communication Effectiveness

No	Study	Enabling Factors	Inhibiting Factors	Notes
1	Gupta et al. (2021)	Hands-on training, practical demonstrations	Low literacy, limited information access	Local government support was critical
2	Wignjadiputro et al. (2020)	Multi-actor coordination, simulation exercises	Limited infrastructure	Adequate communication tools required
3	Innes et al. (2022)	One Health policy support	Poor cross-sector communication	Training for health sector and farmers needed
4	Si et al. (2021)	Contract documents, routine meetings	Limited information, hierarchical communication	Information asymmetry reduced effectiveness
5	Robi et al. (2023)	Educational workshops, printed materials	Limited access to vaccines	Follow-up support needed
6	Chapot et al. (2024)	Surveys and reports	Limited information infrastructure	Capacity and infrastructure gaps must be addressed
7	Otieno et al. (2023)	Field demonstrations	Limited resources	Logistic support essential for biosecurity adoption

Innovation and Collaboration for Supply Chain Resilience

Innovation and collaboration play pivotal roles in enhancing supply chain resilience, particularly in the poultry agribusiness sector in developing countries. Collaborative models involving government agencies, the private sector, farmers, and donor organizations form the backbone of efforts to stabilize supply chains during crises. Public-private partnerships (PPPs) are especially effective in ensuring the efficient flow of goods and agile risk management, thus mitigating disruptions caused by disease outbreaks or market fluctuations (Tariq, 2025). Additionally, multi-stakeholder governance frameworks inclusive of agricultural enterprises, NGOs, and consumers

encourage sustainable practices and collective responsibility, which strengthen the agricultural supply chain's resilience (Cao & Tao, 2025).

Table 6. Innovation and Collaboration for Supply Chain Resilience

No	Study	Type of Innovation / Collaboration	Actors Involved	Impact on Supply Chain Resilience
2	Wignjadiputro et al. (2020)	Pandemic preparedness simulation	Government, farmers, community	Enhanced cross-sector coordination
3	Innes et al. (2022)	One Health approach	Government, health sector, farmers	Strengthened coordination and risk response
4	Si et al. (2021)	Contract system and information sharing	Farmers, cooperatives	Reduced information asymmetry, supported disease control
6	Chapot et al. (2024)	Needs assessment and management recommendations	Farmers, government	Identified capacity gaps to improve supply chain resilience
7	Otieno et al. (2023)	Biosecurity training	Smallholder farmers	Improved biosecurity practices, supported production continuity

Digital innovations serve as crucial enablers in this landscape. Technologies such as early warning applications, traceability solutions, and AI-based monitoring systems bolster transparency, data integrity, and operational effectiveness. Blockchain technology, for example, enhances data security and traceability, vital in managing disruptions and verifying product authenticity (Balobaid, Shamsudheen, & Anoop, 2024). Meanwhile, AI and the Internet of Things (IoT) optimize logistics by continuously monitoring conditions, thereby preventing spoilage and ensuring supply continuity (Lohmer, Bugert, & Lasch, 2020). These innovations not only detect emerging risks early but also provide actionable insights to stakeholders. However, the practical implementation of digital innovation in developing-country poultry systems remains challenging. Early warning applications, AI-based monitoring, blockchain, and IoT-based systems require stable internet access, reliable data collection, technical skills, and financial investment, which may not be equally available across rural poultry communities. Low digital literacy and weak communication infrastructure can also limit farmers' ability to use digital platforms effectively, particularly among smallholders who rely more on informal networks and direct extension support. Therefore, digital innovation should be introduced gradually and accompanied by farmer training, institutional support, and low-cost communication channels to avoid widening the gap between technologically advanced actors and resource-limited producers. In this context,

collaboration among government agencies, veterinary services, private companies, and farmer groups becomes essential to ensure that innovation is not only technically available but also socially accessible and practically useful.

The One Health approach further enriches supply chain resilience by integrating human, animal, and environmental health aspects. This interdisciplinary approach facilitates real-time information sharing among sectors and underscores the importance of zoonosis prevention and food safety in poultry production (Häsler et al., 2013; Standley et al., 2023). Multi-stakeholder governance models are necessary to operationalize One Health strategies effectively, fostering collaboration across sectors and geographic regions (Sangkachai et al., 2025). Best practices documented by FAO in Southeast Asia exemplify how digital tools and collaborative governance synergize to enhance supply chain resilience. These initiatives emphasize stakeholder engagement, the implementation of technological solutions, and policy support frameworks, collectively advancing supply chain stability and sustainability (Cao & Tao, 2025; FAO, 2022).

The synthesis suggests that information sharing and collaborative decision-making can improve supply chain visibility and flexibility, which are important for adapting to disruptions (Scholten & Schilder, 2015). Enhanced traceability and transparency may also support faster responses to contamination and outbreak-related risks (Balachandra & Perera, 2025), while the integration of One Health principles and multi-sector collaboration can strengthen long-term preparedness (Sangkachai et al., 2025). However, these conclusions should be interpreted cautiously because only seven studies met the inclusion criteria. This limited evidence base reduces the generalizability of the findings and suggests that the effectiveness of communication strategies, digital tools, and collaborative frameworks may vary across countries, production systems, and levels of institutional capacity. Therefore, rather than presenting a universal model, this review positions risk and crisis communication as a context-dependent strategy that requires adaptation to local infrastructure, stakeholder coordination, farmer literacy, and available resources.

CONCLUSION

Risk and crisis communication plays an important role in strengthening disease control and supply chain resilience in poultry agribusiness in developing countries. This

review shows that participatory communication, stakeholder trust, multi-actor collaboration, digital integration, and One Health-oriented coordination can support outbreak preparedness and adaptive responses. Theoretically, this study contributes by linking risk communication, crisis communication, biosecurity behavior, collaborative governance, and supply chain resilience into an integrated perspective for understanding poultry disease outbreak management. Practically, the findings suggest that policymakers should strengthen communication infrastructure and coordination mechanisms, extension services should prioritize farmer-oriented biosecurity education, and poultry industry stakeholders should improve information sharing and adopt digital tools according to local capacity. Future research should involve broader empirical studies across developing regions and evaluate the effectiveness of digital platforms, One Health coordination, and public–private collaboration during real disease-related crises.

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