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Use of Informal Newcastle Disease Vaccine Information Sources among Backyard Poultry Farmers in Plateau State, Nigeria

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Abstract

This study examined the determinants of informal NDV I_2 vaccine information use among backyard poultry farmers in Plateau State, Nigeria. A sample of 369 local chicken farmers was selected using multistage sampling, and data were collected through a structured questionnaire. Data analysis involved percentages, binary logistic, and multinomial logistic regression. Results showed that 77.5% of respondents accessed vaccine information through informal sources, mainly family members (80.2%), agro-input dealers (64.0%), and other poultry farmers (49.1%). Cultural beliefs (OR=052) and cost considerations (OR=0.37) significantly influenced reliance on informal channels. Decomposition of informal source selection further rev ealed that cultural beliefs and traditional norms (RRR=0.63, 0.58 and 0.71), accessibility, and social proximity (RRR=1.34) were key factors in the selection of sources. Overall, cultural beliefs, cost, and accessibility determined the poultry farmer's reliance on informal sources. It is recommended that governments integrate trusted informal sources into animal health communication and adopt culturally sensitive, low-cost delivery methods to improve uptake of the NDV I_2 vaccine. Policy interventions should also focus on expanding grassroots veterinary extension systems to collaborate with existing informal channels.

Keywords: NDV I_2 vaccine, informal information, backyard poultry.

Introduction

Poultry production is one of the fastest-growing and most economically important livestock subsectors worldwide, contributing significantly to food security, improved nutrition, poverty reduction, and rural livelihoods. The sector provides an affordable and readily available source of high-quality animal protein through meat and eggs, while creating employment and income opportunities for millions of households, particularly in low- and middle-income countries. In recent years, increasing population growth, rapid urbanisation, and rising consumer demand for animal-source foods have continued to drive expansion in the poultry industry. Consequently, poultry production has become an important component of sustainable agricultural development and a strategic pathway for improving

household welfare and strengthening national food systems (FAO, 2023; OECD & FAO, 2024).

Poultry production is an integral component of African agriculture, providing food, income, and livelihood opportunities for millions of rural households. Across the continent, village or backyard poultry systems predominate because they require relatively low capital investment and can be managed within traditional production systems. Indigenous chickens are particularly valued for their resilience and their contribution to household nutrition, women's empowerment, and poverty alleviation. Despite these benefits, productivity remains low due to poor husbandry practices, inadequate veterinary services, weak biosecurity, and the persistent occurrence of infectious diseases (FAO, 2023; Wong et al. 2022). Among these, Newcastle Disease is consistently recognised as the leading cause of mortality in village poultry, often causing devastating flock losses that undermine household food security and rural incomes. Although vaccination has proven effective in reducing disease outbreaks, limited access to veterinary services, inadequate farmer awareness, and weak extension delivery continue to hinder effective disease control in many African countries (WOAH, 2024).

Nigeria has one of the largest poultry industries in Africa, comprising both commercial enterprises and extensive backyard production systems that contribute significantly to household nutrition, employment, and national food security. Indigenous chickens are widely kept by rural households because they require minimal inputs and serve as an important source of income and financial security. However, the productivity of these systems continues to be constrained by recurrent disease outbreaks, inadequate extension support, poor access to veterinary services, and limited dissemination of animal health information. Newcastle Disease remains one of the most important infectious diseases affecting poultry in Nigeria, causing substantial economic losses through high mortality, reduced productivity, and increased production costs. Although the thermostable NDV I_2 vaccine provides a practical and affordable option for controlling the disease in rural poultry systems, its adoption has remained uneven, partly because many farmers still have limited access to timely and reliable vaccine information.

Plateau State is one of Nigeria's major agricultural states, where backyard poultry production plays an important role in supporting rural livelihoods. Productivity of local chicken suffers due to diseases and limited access to veterinary and extension services (Balami et al., 2022). However, despite ongoing efforts to promote NDV I_2 vaccination, many backyard poultry farmers continue to rely on informal communication networks for vaccine-related information. While informal sources such as family members, fellow farmers, and agro-input dealers can facilitate information exchange, they may also contribute to inconsistent or incomplete dissemination of animal health information. Empirical evidence on the factors influencing farmers' reliance on these informal information sources in Plateau State remains limited, creating an important knowledge gap that this study seeks to address.

Newcastle Disease (ND) is one of the most harmful diseases affecting poultry globally. It spreads easily and leads to significant economic losses. The disease remains common in many African countries, where low vaccination rates and weak animal health systems hinder effective control (WOAH, 2024; Ahmed et al., 2024). In Nigeria, ND is seen as a major challenge for village poultry production. It causes high mortality rates and reduces productivity in rural flocks (Ahmed et al., 2024). Studies from Plateau State show that Newcastle Disease Virus is still present among

village chickens. This situation highlights the need for improved disease control measures (Balami et al., 2022).

The thermostable Newcastle Disease Vaccine I_2 (NDV I_2) has been developed as a practical and affordable control option for village poultry, as it is suitable for rural areas where cold-chain storage is unavailable (Ahmed et al., 2024). However, for farmers to successfully adopt this vaccine, they need reliable information about how to handle, administer, and schedule it. Research shows that low technology adoption among farmers is attributable to limited access to agricultural information (Torgerson & Muñoz-Gómez, 2024; FAO, 2022). Limited access to agricultural information largely influences farmers' decision-making and can reduce their motivation to improve productivity. In many rural communities, limited contact with extension services forces farmers to depend on informal information sources (Abate, 2025; Abdulrahman et al., 2022). These sources include family members, fellow farmers, agro-input dealers, community leaders, and local networks for guidance on poultry health management (Olumoyegun & Olumoyegun, 2024). Understanding what drives farmers to rely on these informal sources is crucial for increasing NDV I_2 use and improving Newcastle Disease control among backyard poultry farmers in Plateau State, Nigeria.

Specifically, the study sought to:

i. identify the informal sources of NDV I_2 vaccine information used by backyard poultry farmers in Plateau State;
ii. determine the factors influencing farmers' reliance on informal NDV I_2 vaccine information sources; and
iii. analyse the factors influencing farmers' selection of specific informal NDV I_2 vaccine information sources.

Methodology

The study was carried out in Plateau State. The State lies between latitudes 8°24′N and 10°30′N, and longitudes 8°32′E and 10°38′E. Rural poultry production in the state is predominantly extensive, making Newcastle Disease a major constraint to productivity, food security and income generation. The population comprised all rural household village poultry farmers in Plateau State who keep local chickens under extensive or semi-extensive management systems.

A multistage sampling procedure that combined purposive and simple random sampling methods was employed to select a representative sample. In the first stage, the three agricultural zones in the State were selected (Northern zone, Central Zone and Southern Zone). In the second stage, there was purposive selection of three extension blocks with high concentrations of poultry rearing from each of the three agricultural zone. These included Jos-North, Jos-South and Riyom from the Northen zone; Bokkos, Mangu and Kanke from the Central Zone and the Southern Zone includes Wase, Qau'an Pan and Mikang. The third stage involved randomly selecting two extension cells from each of the chosen extension blocks, resulting in eighteen extension cells: Fubor and Maigemu in the Jos-North block, Kuru and Gyel in the Jos-South block, Riyom general and Ganawuri in the Riyom block, Bokkos central and Daffo in the Bokkos block, Mangu Halle and Panyam in the Mangu block, Kabwir and Ampang-East in the Kanke block, Wase and Kadarko in the Wase block, Doemak and Kwa in the Qua'an pan block and Garkawa and Tunkus in the Mikang block. In the fourth stage, two villages from each extension cell with high local chicken production were randomly selected. In the final stage, 369 rural poultry-

keeping farmers were randomly selected from the villages, out of 4,610 population provided.

Percentages were used to achieve the various sources of NDV-I_2 information (objective 1), while binary multinomial logistic regression was used to determine factors influencing backyard poultry farmers' reliance on informal sources of NDV I_2 information (objective 2) and multinomial logistic regression was used to analysed factors influencing farmers' selection of specific informal NDV I_2 information sources (objective 3).

The study utilised cross-sectional survey data collected from 369 backyard poultry farmers. The dependent variable was reliance on informal NDV I_2 information, coded as yes (1) or no (0). Independent variables included group membership and peer learning, trust in information sources, cultural beliefs and traditional norms, accessibility and social proximity, and cost considerations were measured by yes/no (binary). While the binary logistic regression model was appropriate for analysing factors influencing reliance on informal information sources in general, the multinomial model provided additional insight into how these factors affect farmers' choice among different informal channels. The similarity in the direction and significance of key variables across both models lends credibility to the empirical results and strengthens confidence in the study's conclusions.

The model is specified as:

Logit (Informal sources of NDVI_2 vaccine information) = $\beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_nX_n+\varepsilon$ … (2)

Where:

- β_1 - β_5 = regression coefficients;
- X_1 - X_5 represent all the factors (group membership, cultural beliefs and traditional norms, accessibility and social proximity, trust and cost consideration);
- β coefficients measure the strength and direction of influence of each factor.

Regression results are presented using odds ratios, confidence intervals, and significance levels.

Validity of the draft questionnaire was revised by consulting three experts in veterinary extension who are knowledgeable about the assessed constructions. The experts were implored to appraise the effectiveness of each question in measuring the constructs.

Results and Discussion

Table 1 shows that 77.5% of backyard poultry farmers rely on informal sources for NDV I_2 vaccine information, which is consistent with findings that limited extension and veterinary outreach restrict access to formal animal health information in low-income and rural areas (Rivera-Gomis et al., 2025; FAO, 2022). Accessibility and proximity strongly influence this reliance, as farmers often turn to those within their immediate social and geographic circles for information (Fasina et al., 2024), a pattern also observed by Eze et al. (2024), who noted that physical closeness and ease of interaction shape livestock farmers' information-seeking behaviour. Farmers frequently use multiple informal sources to acquire information on the Newcastle disease vaccine, as these sources are timely and reliable for their animal health management needs; using multiple sources is considered more effective than relying on a single one (Wale and Mkuna, 2023). To better disseminate animal health

information, leveraging existing community structures such as local networks, storytelling, and demonstrations is recommended, with trust and social influence identified as key factors for information uptake and behavioural change (Acosta et al., 2022; Nowak et al., 2021; Lohmann & Albarracin, 2022).

Furthermore, the study's findings, as presented in Table 1, reveal a clear pattern on reliance on informal information sources as it emerged among NDV I_2 users. The findings indicate that family members were the most frequently reported informal source of NDV I_2 vaccine information, with 80.2% of respondents obtaining information through this channel. This suggests that family networks play a central role in information exchange among backyard poultry farmers and may significantly influence farmers' decisions regarding this vaccine use. This aligns with Nowak et al. (2021) who found that discussions at the family level can significantly shape vaccine perceptions and hesitancy,

Agro-input dealers were identified by 64.0% of respondents as an important informal source for rural poultry farmers seeking NDV I_2 related information. Their importance may stem from their regular interaction with farmers and their accessibility in rural areas. This finding shows that agro-input dealers play a key role in spreading information among backyard poultry farmers. Similar findings have been reported by Narayanan et al. (2021) and Shankar et al. (2024), who noted that agro-input dealers often serve as accessible sources of information for farmers. About half of the respondents got information from fellow poultry farmers (49.1%) and community leaders (48.0%). This suggests that peer interactions and community networks are important for sharing animal health information. These sources help farmers exchange experiences and practical knowledge.

Farmers often see their peers as trustworthy and relatable sources. Communication among them is effective in encouraging vaccine use and improving animal health practices. Trust within social networks is a major factor in accepting new farming practices, especially when formal extension services are limited (Abdulai, 2023). Informal networks strengthen and localize information that starts with formal channels, improving the spread and credibility of vaccine information in rural communities.

Table 1: Informal sources of NDV-I_2 information

Sources	Percentage (%)
Access to informal information sources on the use of NDV I_2	77.5
Family members	80.2
Fellow poultry farmers	49.1
Community leaders	48.0
Agro-input dealers	64.0
Local traders	39.8

Note: *Multiple responses recorded. Source: Field survey, 2024.

Determinants of Reliance on Informal NDV I_2 Vaccine Information Sources

The findings in Table 2, show that cultural beliefs and traditional norms (OR = 0.52) and cost consideration (OR = 0.37) significantly influenced farmers' reliance on informal NDV I_2 information sources. Holding other factors constant, cultural beliefs and traditional norms significantly influenced farmers' reliance on informal NDV I_2 information sources. The odds ratio of 0.52 indicates that changes in this variable were associated with a 48% reduction in the odds of relying on informal information sources than those who reported that cultural beliefs did not influence them. This finding suggests that respondents who acknowledged the influence of cultural beliefs may have become more cautious about relying exclusively on informal advice and may instead seek information from a wider range of sources. This finding differs from studies, Wong et al. (2022), Lunkuse et al. (2024), Rodrigues & Terra (2024) and Skoczek et al. (2025) that reported greater reliance on informal networks among farmers with strong traditional orientations, highlighting the context-specific nature of information-seeking behaviour, that is farmers with adherence to traditional beliefs are more likely to use informal channels, signifying socio-cultural factors play a pivotal role in information-seeking behaviour. Sex dynamics as qualitative observations, may also influence access: male farmers enjoy greater mobility and training access, while women face cultural barriers that limit participation (Bose et al., 2021). Farmers' information choices may be influenced by prevailing community values, traditional knowledge systems, and socially accepted sources of advice.

Cost consideration significantly influenced farmers' reliance on informal NDV I_2 information sources. The odds ratio of 0.37 suggests that the variable was associated with a 63% reduction in the likelihood of relying on informal information sources than those who did not. This imply that economic considerations are important in determining where farmers obtain vaccine information. Information channels perceived as expensive or involving additional costs may discourage their use. This observation is in agreement with Rivera-Gomis et al. (2025) who found that famers who see cost as a barrier are more likely to rely on informal sources. Hidden costs like transportation, time, and social obligations may further push farmers toward informal information (Abate, 2025). Women are especially affected due to lower willingness or ability to pay for information services, making community-based sources more vital (Fabregas, 2022; Pasteur et al., 2024).

Resource availability such as farm income predicts willingness to pay for information, while high costs discourage formal information seeking and drive reliance on informal narratives, which may not always align with scientific evidence (Moss et al., 2024; Wong et al., 2024). Perceptions of disease risk and competing household needs also influence whether farmers invest in formal vaccine information (Wilson, 2021).

Conversely, group membership and peer learning, trust in information sources, and accessibility and social proximity did not significantly influence reliance on informal information sources. This means that effectiveness of farmer groups depends on internal cohesion and the quality of shared information (Izuchukwu et al., 2021). This indicates further that although these factors may facilitate information exchange, they were not key determinants of farmers' reliance on informal NDV I_2 vaccine information in the study area.

Table 2: Determinants of reliance on informal NDV I_2 vaccine information sources

Variables	β	SE	OR
Group membership & peer learning	-.168	0.32	0.85
Trust in information source	-.014	0.29	0.99
Cultural beliefs & traditional norms	-.664**	0.15	0.52
Accessibility & social proximity	-.023	0.30	0.98
Cost consideration	-.999**	0.11	0.37
Constant	3.504	.750	21.820

Source: Field survey, 2024. **Note:** ****P < 0.05** SE= Standard error, OR= Odd ratio

Decomposition of Informal Sources Selection

Table 3 indicates that cultural beliefs and traditional norms are consistent determinants of farmers' choices among informal information sources, influencing not just whether informal channels are used, but which specific sources such as family, community leaders and fellow poultry farmers are deemed credible. Accessibility and social proximity play a key role in selecting informal sources, particularly relatives, as regular social interaction and ease of communication enhance informal exchanges. Geographic remoteness, limited infrastructure, and a scarcity or inadequate of extension staff further reinforce reliance on local networks (Yu & Gambrah, 2024; FAO, 2022).

The digital divide also exacerbates the situation, as limited access to mobile internet and agricultural platforms restricts the use of formal digital information. Economic and infrastructural barriers, including the cost of smartphones, data, and training, make formal digital avenues less accessible and push farmers toward informal networks for NDV I_2 information (Okoronkwo et al., 2025; Tahmasebi, 2023). Informal sources are immediate, ingrained in daily life, and generally free, making them the most practical and socially relevant channels for rural farmers.

Table 3: Decomposition of informal sources selection

Variables	Family members vs Agro-input Dealers (Ref.)	Community Leaders vs Agro-input Dealers (Ref.)	Fellow Poultry Farmers vs Agro-input Dealers (Ref.)
Group membership & peer learning	0.92 (0.61)	1.08 (0.69)	0.97 (0.64)
Trust in information source	1.05 (0.58)	0.96 (0.55)	1.02 (0.60)
Cultural beliefs & traditional norms	0.63** (0.21)	0.58** (0.19)	0.71* (0.24)
Accessibility & social proximity	1.34* (0.44)	1.29 (0.41)	1.12 (0.36)
Cost consideration	0.81 (0.28)	0.76 (0.25)	0.88 (0.31)

Note: Values are Relative Risk Ratios (RRR) with standard errors in parentheses. Reference category = Agro-input dealers. *p < 0.10, **p < 0.05. Source: Field survey, 2024.

Conclusion and Recommendations

This study identified family members, agro-input dealers, fellow poultry farmers, and community leaders as the major informal sources of NDV I_2 vaccine information among backyard poultry farmers in Plateau State. This underscores the central role of interpersonal and community-based communication in the dissemination of animal health information. The study further revealed that cultural beliefs and traditional norms, together with cost considerations, significantly influenced farmers' use of informal information sources, whereas accessibility and social proximity, trust in information sources, and group membership were not significant determinants.

The findings recommend the need for veterinary extension programmes to work more closely with trusted community-based information networks in disseminating NDV I_2 vaccine information. Strengthening the capacity of agro-input dealers and other influential local actors to provide accurate vaccine guidance, while delivering culturally sensitive messages and improving access to veterinary advisory services, could enhance the uptake of NDV I_2 vaccination among backyard poultry farmers and contribute to more effective Newcastle Disease control.

References

Abate, M. A. (2025). Constraints of access to agricultural information in Africa: *A* systematic review. 2025(1), 4980057. https://doi.org/10.1155/tswj/4980057

Abdulai, A. (2023). Information acquisition and the adoption of improved crop varieties. *American Journal of Agricultural Economics*, 105(4), 1049-1062. https://doi.org/10.1111/ajae.12419

Abdulrahman, O. L., Gafaru, B. O., Kayode, A. O., Busari, I. Z., & Koloche, I. M. (2022). Awareness of poultry farmers on biosafety practices against infectious diseases in Kano State, Nigeria. *Journal of Agricultural Extension, 26*(2), 1–10. (https://journal.aesonnigeria.org/index.php/jae/article/view/3058

Acosta, D., Ludgate, N., McKune, S. L., & Russo, S. (2022). Who has access to livestock vaccines? Using the social-ecological model and intersectionality frameworks to identify the social barriers to peste des petits ruminants vaccines in Karamoja, Uganda. *Frontiers in Veterinary Science*, *9*, 831752. https://doi.org/10.3389/fvets.2022.831752

Ahmed, R., Das, S., Sharma, A., Deka, P., Nath, M. K., Lahkar, D., Arif, S. A., Brahma, D., & Hazarika, R. (2024). Advancements in Newcastle disease vaccination: Evaluating traditional and thermostable vaccines for enhanced control and efficacy. *Journal of Advances in Biology & Biotechnology*, *27*(9), 81–89. https://doi.org/10.9734/jabb/2024/v27i91276

Balami, A. G., Wungak, Y. S., Bata, S. I., & Gang, S.-U. (2022). Seroprevalence of Newcastle disease virus antibodies in village chickens in the three senatorial zones of Plateau State, Nigeria. *Sokoto Journal of Veterinary Sciences*, 20(2), 119–124. https://doi.org/10.4314/sokjvs.v20i2.6

Bose, U., Arun, T., & Arun, S. (2021). Do information networks benefit households with female heads. *Economic Modelling*, *103*, 105613. https://doi.org/10.1016/J.ECONMOD.2021.105613

Ezeh, C. C., Nalado, A., & Ezeh, O. H. (2024). Information seeking behaviour of poultry farmers in Zaria and environs. *Nigerian Journal of Animal Production*, 233–236. https://doi.org/10.51791/njap.vi.7533

Fabregas, R. (2022). Digital Agricultural Extension for Development (pp. 187–219). Springer eBooks. https://doi.org/10.1007/978-3-030-86065-3_8. Assessed 10/01/2026.

Food and Agriculture Organisation. (2022). The state of food and agriculture 2022. Leveraging automation in agriculture for transforming agrifood systems. Rome, FAO. *https://doi.org/10.4060/cb9479en*

Food and Agriculture Organisation. (2023). *World Food and Agriculture – Statistical Yearbook 2023*. Food and Agriculture Organization of the United Nations. https://www.fao.org Retrieved 24/01/2026.

Fasina, O.O., Tehinloju O.A., Owolabi K. E. and Adesida I.E. (2024). Perception of cassava and maize farmers on the effectiveness of agricultural information channels in Southwest, Nigeria. *Journal of Agricultural Extension*, 28(4) 13-19

Izuchukwu, A., Erezi, E., & Emeka, E. D. (2023). Assessing the impact of farmer-to-farmer communication networks on knowledge sharing and adoption of sustainable agricultural practices in Africa. *International Journal of Agriculture and Earth Science*, 9,58-76 https://doi.org/10.56201/ijaes.v9.no4.2023.pg58.76

Lohmann, S., & Albarracin, D. (2022). Trust in the public health system as a source of information on vaccination matters most when environments are supportive. *Vaccine*, *40*(33), 4693–4699. https://doi.org/10.1016/j.vaccine.2022.06.012

Lunkuse, F., Munene, J. C., Ntayi, J. M., Sserwanga, A., & Kagaari, J. R. K. (2024). ICT acceptance, language use and information culture as tools for enhancing information literacy within smallholder maize farmers in Uganda. *The Bottomline*. https://doi.org/10.1108/bl-03-2023-0075

Moss, E., Eiden, A. L., Hartley, L., Carrico, J., Farkouh, R., Poston, S., Hufstader Gabriel, M., Hundt Golden, A., & Bhatti, A. (2024). Factors Impacting Vaccine Uptake Among Adult Medicaid Beneficiaries: A Systematic Literature Review. *Health Affairs Scholar*. https://doi.org/10.1093/haschl/qxae143

Narayanan, T. J., Pushpa, J., Velusamy, R., Prabhakaran, K., & Amarnath, J. S. (2021). training needs of agri input dealers. *International Journal of Current Microbiology and Applied Sciences*, 10(01), 3036–3041. https://doi.org/10.20546/IJCMAS.2021.1001.353

Nowak, S. A., Gidengil, C. A., Gidengil, C. A., Parker, A. M., & Matthews, L. J. (2021). Association among trust in health care providers, friends, and family, and vaccine hesitancy. *Vaccine*, *39*(40), 5737–5740. https://doi.org/10.1016/J.VACCINE.2021.08.035

Nwanta, J. A., Ali-Balogun, J. K., Umoh, J. U., Abdu, P. A., & Ajogi, I. (2021). Management of losses and Newcastle disease in rural poultry in Kaduna State, Nigeria. *Nigerian Journal of Animal Production*, 33(2), 274–285. https://doi.org/10.51791/NJAP.V33I2.937

Organisation for Economic Co-operation and Development (OECD & Food and Agriculture Organisation of the United Nations (FAO), (2024). OECD-FAO Agricultural Outlook 2024-2033. PARIS: OECD Publishing. https://doi.org/10.1787/4c5d2cfb.en Retrieved 12/07/2026

Okoronkwo, I.E., Ndinechi, K.C., Joseph, C.O., and Uwandu, C.N. (2025). Utilisation of digital technologies among rural farmers in Imo State, Nigeria. *Journal of Agricultural Extension,* 29(4), 56-67. https://dx.doi.org/10.4314/jae.v29i4.7

Olumoyegun, A. T., & Olumoyegun, B. (2024). Benefits derived from social group membership by poultry farmers in Ondo state, Nigeria. *Journal Agrisep*, 23(1), 297-312 https://doi.org/10.31186/jagrisep.23.01.297-312

Pasteur, K., Diana, A., Yatcilla, J. K., Barnard, S., & Croney, C. C. (2024). Access to veterinary care: evaluating working definitions, barriers, and implications for animal welfare. *Frontiers in Veterinary Science*, 11,1335410. https://doi.org/10.3389/fvets.2024.1335410

Rivera-Gomis, J., Serrano-Jara, D., & Berezowski, J. (2025). Scoping review on farmer information sources for animal health. *Preventive Veterinary Medicine*, *246*, 106732–106732. https://doi.org/10.1016/j.prevetmed.2025.106732

Rodrigues, E. R., & Terra, A. L. (2024). Expanding information behaviour boundaries: A study with religious leaders. *IFLA Journal*, 50(1), 170-183. https://doi.org/10.1177/03400352231219664

Shankar, R., Bose, D. K., & Mazhar, S. H. (2024). Role perception of agro input dealers in providing agro advisory services to the farmers in Gaya, Bihar, India. *Asian Journal of*

Agricultural Extension, Economics and Sociology, 42(10), 45–49. https://doi.org/10.9734/ajaees/2024/v42i102561

Skoczek, W., Janecka, J., Hofman, M., Górski, J. K., & Gajewski, W. (2025). The social determinants of vaccine hesitancy: a review of global evidence. *International Journal of Innovative Technologies in Social Science*, 3(47)). https://doi.org/10.31435/ijitss.3(47).2025.3819

Tahmasebi, F. (2023). The digital divide: a qualitative study of technology access in rural communities. *AI and Tech in Behavioural and Social Sciences,*1(2), 33-39. https://doi.org/10.61838/kman.aitech.1.2.6

Torgerson, P. R., & Muñoz-Gómez, V. (2024). *Prevalence data on chicken diseases in low-resource settings. 43*, 39–47. https://doi.org/10.20506/rst.43.3516

Wale, E., & Mkuna, E. (2023). Smallholder satisfaction with the quality of agricultural information, and their preferences among the sources: Empirical evidence from KwaZulu-Natal, South Africa. *Journal of Agriculture and Food Research*, *14*, 1-9. https://doi.org/10.1016/j.jafr.2023.100715

Wilson, R.T. (2021). An overview of traditional small-scale poultry production in low-income, food-deficit Countries. *Annals of Agricultural & Crop Science*, 6(3): 1077. https://austinpublishinggroup.com/agriculture-crop-sciences/fulltext/aacs-v6-id1077

World Organisation for Animal Health (WOAH), (2024). *Newcastle Disease Factsheet*. World Organisation for Animal Health. https://www.woah.org

Wong, J. T., de Haan, N., & Alders, R. (2022). Cultural determinants of vaccination decisions in village poultry systems. *Frontiers in Veterinary Science,* 9, 876543. https://doi.org/10.3389/fvets.2022.876543

Wong, L. P., Lee, H. Y., Alias, H., Zimet, G., Liu, T., Lin, Y., & Hu, Z. (2024). Cost-based COVID-19 vaccination and willingness to pay: A post-pandemic review. *Human Vaccines & Immunotherapeutics*, 20(1), 2313860. https://doi.org/10.1080/21645515.2024.2313860

Yu, Q., & Gambrah, P. P. (2024). information network among farmers: a case study in Ghana. *Sage Open*, 14(1), 21582440241228696. https://doi.org/10.1177/21582440241228696