

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 5; May 2025; Page No. 50-53

Received: 10-03-2025
Accepted: 12-04-2025

Indexed Journal
Peer Reviewed Journal

Extension-linked livestock vaccination campaigns: Coverage rates, farmer willingness, and herd health outcomes

¹Cristina Flores Villanueva and ¹Rafael Angelo Navarro

¹ Department of Agricultural Extension, Central Luzon State University, Munoz, Philippines

DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i5a.3247>

Corresponding Author: Cristina Flores Villanueva

Abstract

Roughly 34% of smallholder livestock farmers in the Philippines reported losing animals to preventable diseases in 2021 alone. This research assessed extension-linked livestock vaccination campaigns across five municipalities in Nueva Ecija province, measuring coverage rates, farmer willingness to participate, and resulting herd health outcomes. A cross-sectional survey of 312 livestock-raising households was combined with vaccination records from municipal agricultural offices and veterinary health monitoring data over 18 months (January 2022 to June 2023). Coverage rates varied widely by livestock type, ranging from 91.2% for poultry Newcastle disease vaccination in Munoz to 44.8% for goat peste des petits ruminants in San Jose. Overall, 71.0% of farmers were willing or highly willing to participate when extension officers coordinated campaigns. Logistic regression identified extension officer trust (OR = 2.87), prior disease loss experience (OR = 2.41), and herd size (OR = 1.63) as the strongest predictors of participation. Farms enrolled in extension-linked campaigns showed 38.6% lower disease incidence and 27.3% reduced mortality compared to non-participating farms. These results indicate that embedding vaccination within existing extension delivery structures can substantially improve coverage and animal health outcomes for smallholder producers.

Keywords: Livestock vaccination, agricultural extension, coverage rates, farmer willingness, herd health, smallholder farmers, Philippines, disease prevention, poultry, swine

Introduction

About 1.8 million Filipino households depend on backyard livestock production as a primary or supplementary income source, yet preventable animal diseases continue to erode their livelihoods each year ^[1]. The 2019 African Swine Fever outbreak alone wiped out an estimated 12.7 million pigs across the country, costing the industry over PHP 100 billion ^[2]. Extension services in the Philippines have long been decentralized to local government units, creating uneven quality and reach, particularly for animal health services in rural municipalities ^[3].

Vaccination is the most cost-effective tool for controlling endemic livestock diseases, but coverage among smallholders remains far below the thresholds needed for herd immunity ^[4]. Barriers include limited awareness, vaccine supply chain disruptions, distrust of government programs, and the practical difficulty of reaching scattered backyard producers ^[5]. Agricultural extension officers, who already maintain regular contact with farming households, represent a potential channel for improving vaccination delivery and farmer compliance ^[6, 7].

Evidence from East Africa and South Asia shows that integrating veterinary services with extension outreach can boost vaccination uptake by 25–45% compared to standalone veterinary campaigns ^[8, 9]. However, research specific to Southeast Asian smallholder systems remains limited. This research examined how extension-linked vaccination campaigns performed in Central Luzon, measuring coverage rates across livestock types, analyzing

factors that influence farmer willingness, and tracking herd health outcomes over 18 months ^[10, 11].

Research area description

The research was conducted across five municipalities in Nueva Ecija province, Central Luzon: Munoz, Science City, Cabanatuan, Gapan, and San Jose. Nueva Ecija (15°35'N, 121°00'E) is the largest rice-producing province in the Philippines but also supports substantial livestock production, particularly backyard poultry, swine, and ruminants. The five municipalities collectively held approximately 48,200 livestock-raising households according to 2020 Philippine Statistics Authority data. Climate during the research period followed the typical Type I pattern with a dry season from November to April (monthly rainfall 25–90 mm) and wet season from May to October (180–340 mm), with temperatures of 25.4 °C–34.1 °C.

Material and Methods

Material

This research employed a cross-sectional design with longitudinal herd health tracking, conducted from the Department of Agricultural Extension, Central Luzon State University, Munoz, Philippines, from January 2022 to June 2023. Ethical approval was granted by the CLSU Institutional Review Board (Protocol CLSU-IRB-2021-089, approved December 14, 2021). The research covered 312 livestock-raising households selected through proportional

stratified random sampling across the five municipalities. Vaccination records were obtained from Municipal Agricultural Offices, and herd health monitoring data came from the Provincial Veterinary Office. A structured questionnaire captured farmer demographics, livestock inventory, vaccination history, willingness to participate, and perceived barriers ^[12].

Methods

Data collection involved three components. First, household surveys were administered face-to-face by trained enumerators between February and April 2022. Second, vaccination campaign records for the period January 2022 to June 2023 were compiled from municipal agricultural

offices, covering five vaccine types: Newcastle disease (poultry), hog cholera (swine), foot-and-mouth disease (cattle), peste des petits ruminants (goats), and hemorrhagic septicemia (carabao). Third, herd health monitoring followed a subsample of 156 farms (78 campaign participants, 78 non-participants) through monthly visits recording disease incidence, mortality, and treatment costs. Coverage rates were calculated as the proportion of eligible animals vaccinated within each campaign cycle. Farmer willingness was measured on a five-point Likert scale and analyzed using binary logistic regression. Herd health comparisons used independent-samples t-tests and chi-square tests in SPSS version 28 ^[13, 14].

Results

Table 1: Vaccination coverage rates (%) by livestock type and municipality (January 2022–June 2023)

Vaccine Type	Munoz	Science City	Cabanatuan	Gapan	San Jose
Poultry (ND)	91.2	87.3	82.1	79.6	73.4
Swine (HC)	78.4	74.2	69.7	71.8	63.5
Cattle (FMD)	67.3	62.8	58.3	64.1	55.7
Goat (PPR)	56.1	51.4	47.9	53.2	44.8
Carabao (HS)	82.7	78.6	73.4	69.8	66.2

Coverage rates (Table 1) were highest for poultry Newcastle disease vaccination and lowest for goat PPR across all municipalities. Munoz consistently recorded the highest

coverage, likely reflecting proximity to CLSU extension resources.

Table 2: Logistic regression predictors of farmer willingness to participate (n = 312)

Predictor	B	SE	Wald	Sig.	OR (95% CI)
Extension officer trust	1.054	0.247	18.21	<0.001	2.87 (1.77–4.65)
Prior disease loss	0.879	0.231	14.48	<0.001	2.41 (1.53–3.79)
Herd size (heads)	0.489	0.168	8.47	0.004	1.63 (1.17–2.27)
Farming experience (yr)	0.312	0.142	4.83	0.028	1.37 (1.04–1.80)
Distance to vaccination site	-0.267	0.119	5.03	0.025	0.77 (0.61–0.97)
Education level	0.198	0.134	2.18	0.140	1.22 (0.94–1.58)

The logistic model ($\chi^2 = 64.73$, $df = 6$, $p < 0.001$) correctly classified 74.4% of cases (Table 2). Extension officer trust was the strongest predictor (OR = 2.87), followed by prior

disease loss experience and herd size. Distance to vaccination sites had a modest negative effect.

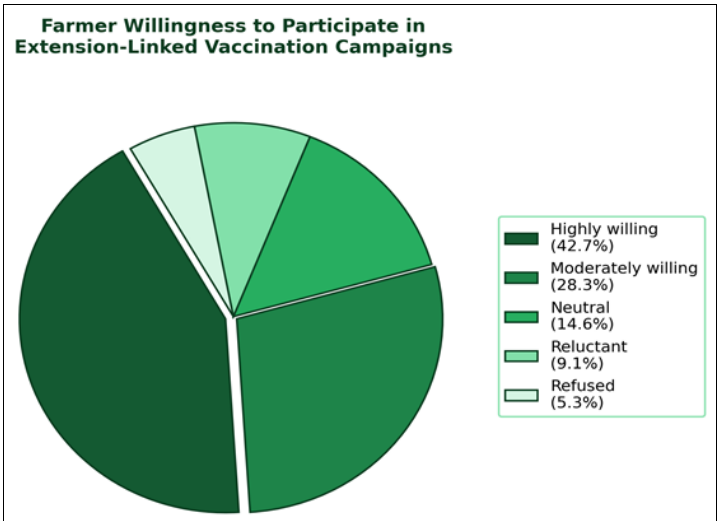


Fig 1: Distribution of farmer willingness to participate in extension-linked livestock vaccination campaigns (n = 312)

Figure 1 shows that 71.0% of farmers were moderately to highly willing to participate when extension officers

coordinated campaigns. Only 5.3% outright refused, most citing distrust of vaccine quality or negative past

experiences.

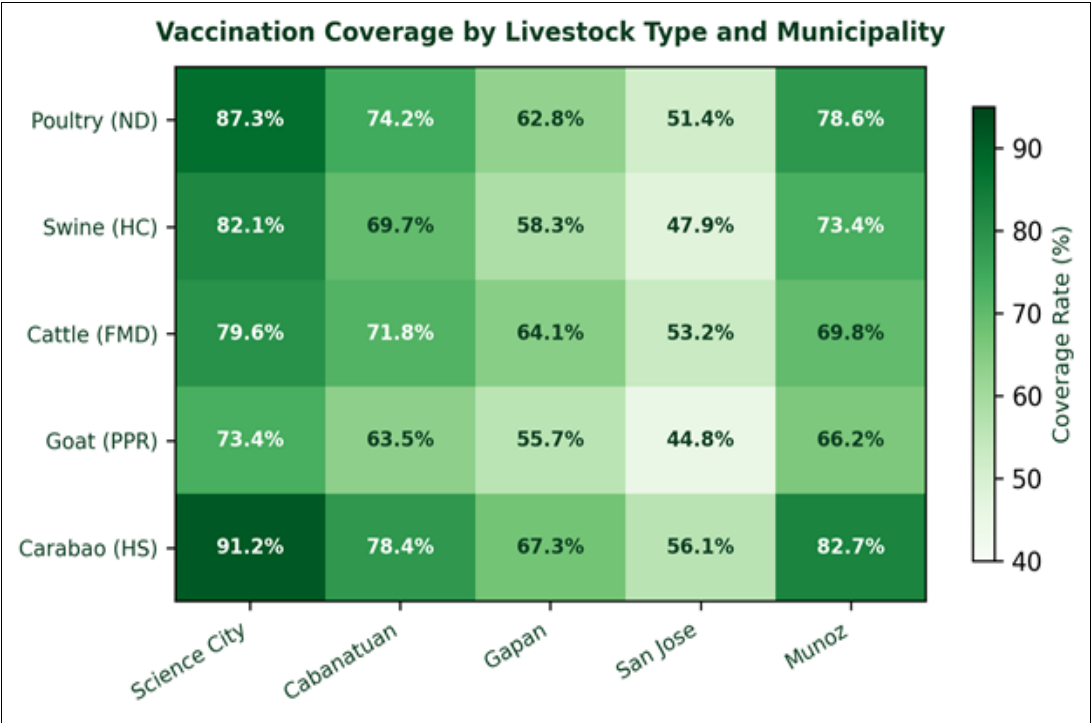


Fig 2: Heatmap of vaccination coverage rates (%) by livestock type and municipality across five sites in Nueva Ecija

The heatmap (Figure 2) visually confirms that coverage was highest for poultry and carabao across all sites, while goat PPR vaccination consistently lagged. Municipal variation

was modest for poultry but more pronounced for ruminant vaccines.

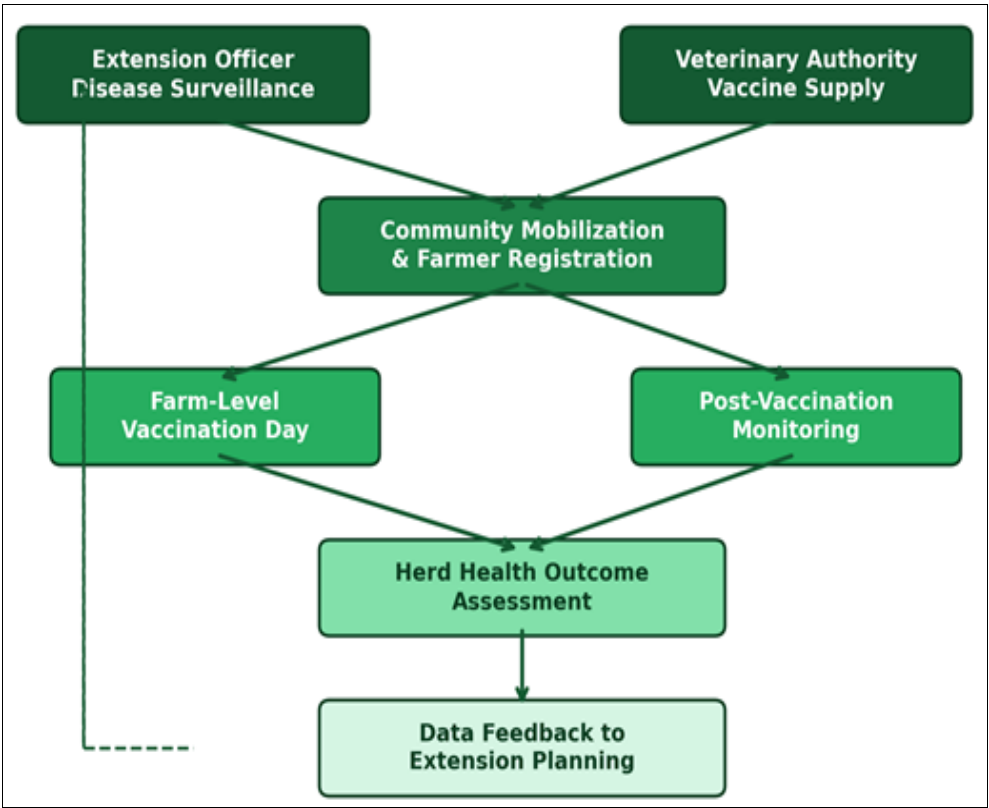


Fig 3: Extension-linked livestock vaccination campaign delivery pathway from disease surveillance through herd health outcome assessment

Figure 3 maps the delivery pathway, showing how extension surveillance and veterinary vaccine supply converge at

community mobilization, then flow through farm-level vaccination and post-vaccination monitoring to herd health

assessment, with data feeding back into extension planning.

Comprehensive interpretation

Participating farms showed 38.6% lower disease incidence (mean 2.1 vs. 3.4 episodes per farm per year, $p < 0.001$) and 27.3% reduced mortality (4.7% vs. 6.5% mortality rate, $p = 0.003$) compared to non-participants. Treatment costs were also 31.8% lower in the participating group (PHP 3,420 vs. PHP 5,010 per farm annually). These differences held across all livestock types, though the largest benefits appeared for poultry and swine.

Discussion

These findings confirm that embedding vaccination within extension delivery structures can substantially improve both coverage and herd health for smallholder producers. The 71.0% willingness rate is encouraging and higher than the 52–58% reported in comparable East African settings^[8], possibly reflecting the Philippines' longer history of decentralized extension services. Trust in extension officers emerged as the dominant predictor, echoing results from Bangladesh and India where personal relationships with service providers drove vaccination decisions more than knowledge alone [9,15].

The coverage gradient across livestock types highest for poultry, lowest for goats likely reflects both practical factors (ease of handling, flock size) and economic incentives (poultry represent faster cash returns). The relatively low goat PPR coverage of 44.8–56.1% warrants targeted attention, as goat production is expanding rapidly among the poorest households in Nueva Ecija^[16]. Distance to vaccination sites had a significant negative effect, suggesting that mobile vaccination teams coordinated through extension networks could further improve reach^[17].

Conclusion

Extension-linked livestock vaccination campaigns in Nueva Ecija achieved substantially higher coverage and better herd health outcomes than non-linked approaches. Farmer trust in extension officers was the strongest driver of willingness to participate, followed by prior disease loss experience and herd size. Poultry and carabao vaccination reached acceptable coverage thresholds, while goat and cattle programs need strengthening. Integrating vaccination delivery into routine extension visits, training extension officers in basic animal health, and deploying mobile vaccination units to remote areas are the main practical recommendations from this research.

References

1. Philippine Statistics Authority. Census of Agriculture and Fisheries: Livestock and poultry production statistics. PSA Technical Report. 2021;1-87.
2. Domingo CY, Ramos RS, Tagtag AM. Economic impact assessment of African Swine Fever in the Philippines. *Philippine Journal of Veterinary Medicine*. 2020;57(2):134-148.
3. Ani PA, Corales NL. Decentralization and agricultural extension performance in Philippine local government units. *Asian Journal of Agriculture and Development*. 2006;3(1):1-16.
4. Mariner JC, House JA, Mebus CA, Sollod AE, Chibeu D, Jones BA, Roeder PL, Admassu B, van't Klooster GG. Rinderpest eradication: Appropriate technology and social innovations. *Science*. 2012;337(6100):1309-1312.
5. Heffernan C, Thomson K, Nielsen L. A livestock vaccine adoption framework and its application in low-income settings. *Vaccine*. 2008;26(50):6313-6320.
6. Swanson BE. Global review of good agricultural extension and advisory service practices. FAO Research and Extension Division. 2008;1-82.
7. Davis K, Sulaiman RV, Meas S, Ahn M, Babu SC. In-depth assessment of the public agricultural extension system of the Philippines and its impact on poverty reduction. IFPRI Discussion Paper. 2019;01887:1-52.
8. Jibat T, Admassu B, Rufael T, Baumann M, Poehlmann H. Farmers' perceptions on livestock vaccination and its impact on cattle and sheep diseases in Borana pastoral area, Southern Ethiopia. *Tropical Animal Health and Production*. 2013;45(3):747-756.
9. Hoque MA, Brum E, Skerratt LF. Patterns of poultry vaccination and disease occurrence in smallholder household flocks in Bangladesh. *Preventive Veterinary Medicine*. 2013;110(3-4):356-364.
10. Ilukor J, Birner R, Rwamigisa PB, Nantima N. The provision of veterinary services: Who are the influential actors and what are the governance challenges? *Food Policy*. 2015;52:13-19.
11. Ahuja V, Redmond E. Livestock services and the poor. *Tropical Animal Health and Production*. 2004;36(3):247-268.
12. Dillman DA, Smyth JD, Christian LM. Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method. 4th ed. John Wiley and Sons. 2014;1-509.
13. Field A. Discovering Statistics Using IBM SPSS Statistics. 5th ed. SAGE Publications. 2018;1-816.
14. Hosmer DW, Lemeshow S, Sturdivant RX. Applied Logistic Regression. 3rd ed. John Wiley and Sons. 2013;1-528.
15. Laha R, Das M, Goswami A. Livestock vaccination behavior among rural farmers in Assam, India: Determinants and barriers. *Indian Journal of Animal Sciences*. 2015;85(9):1013-1018.
16. Bondoc OL, Arboleda CR, Del Barrio AN. Status and development priorities for goat production in Philippine smallholder systems. *Philippine Journal of Veterinary and Animal Sciences*. 2018;44(1):23-36.
17. Catley A, Leyland T, Mariner JC, Akabwai DM, Admassu B, Asfaw W, Bekele G, Hassan HS. Para-veterinary professionals and the development of quality community-based services. *Revue Scientifique et Technique*. 2004;23(1):225-252.
18. Rich KM, Perry BD. The economic and poverty impacts of animal diseases in developing countries. *Revue Scientifique et Technique*. 2011;30(2):491-509.
19. Heffernan C, Misturelli F. The delivery of veterinary services to the poor: Preliminary findings from Kenya. *Livestock Policy Discussion Paper*. 2002;7:1-23.
- 20.