



## IMPACT OF NEWCASTLE DISEASE ON THE LIVELIHOOD OF SMALLHOLDER INDIGENOUS CHICKEN FARMERS IN SELECTED NORTHERN STATES, NIGERIA

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### ABSTRACT

The study assessed the impact of Newcastle disease (ND) on the livelihoods of smallholder indigenous chicken farmers in Bauchi, Plateau, and Kano States, using both descriptive and inferential statistics. A multistage sampling technique was used to select 810 respondents from the study area. Data were collected through the administration of structured questionnaires and focus group discussions (FGD) and analysed using descriptive statistics and propensity score matching (PSM). The results revealed that the majority of farmers (72.6%) were female, 67.2% were married, middle-aged (mean = 38.5 years), with a modest mean flock size (16 birds), and an average income of ₦108,916. Education levels were varied, with many farmers having qur'anic or primary education. Most farmers kept chickens for cultural ceremonies (78.3%), medical bill payments (70%), household protein supply (63.5%), and school fees (56.8%). Major sources of information on Newcastle vaccines were through fellow farmers (71.7%) and radio programmes (60.9%). Newcastle disease significantly reduced key productivity metrics and income as egg production: decreased by 2.5 eggs/hen/month, flock survival: declined by 8%, growth rate: dropped by 15g/week, feed conversion efficiency: reduced by 0.8g gain/kg feed, marketable birds: decreased by 4 chickens/month, egg weight: reduced by 0.4g, income: declined by ₦18,000 on average. (%). The study concluded that Newcastle disease have negative impact on the livelihood smallholder indigenous farmers. It is recommended that development partners and extension agencies should design and deliver regular poultry health and ND prevention training programs in local languages using simple, practical demonstrations that reflect the farmers' literacy levels and socio-economic characteristics.

**Keywords:** Newcastle, Disease, Indigenous, Chickens, Impact. FGD

### INTRODUCTION

According to the World Bank (2021), agriculture accounts for about 23% of Africa's GDP and employs over 60% of the population. The agricultural sector in Africa, including Nigeria, contributes significantly to GDP, employment, and export earnings. Poultry are domesticated birds kept for their eggs, meat, and feathers. Reasonable numbers of these birds are typically fowl, including chickens, quails, and turkeys (Fadimu *et al.*, 2020). It provides livelihood opportunities for millions of people, especially in rural areas where poverty rates are high. Rural poultry represents a regular cash flow and since women and children are often in charge of the farmyard poultry, this provides them an opportunity to uplift themselves and earn an income (Weil *et al.*, 2020). Poultry birds are raised for other socio-cultural purposes, such as religious ceremonies and festivals, gifts, and cock fighting (Birhanu *et al.*, 2022). Smallholder poultry farmers use chickens for offerings, as a source of revenue, aesthetic value (beauty), school fees; and jobs (Ngongolo *et al.*, 2021). Poultry production has great potential to bridge the animal protein gap, create employment for the people, generate sufficient income for the poultry farmers and increase food security in our society. In sub-Saharan Africa, most households in rural communities keep smallholder poultry (Bamidele and Amole, 2021). The rearing of indigenous poultry has been reported globally, but they are more abundant in developing countries



than in developed ones (Manyelo *et al.*, 2020). Accordingly, Weil *et al.* (2020) opined that rural women and girls play roles in over 80% of poultry production activities in rural and peri-urban Asia, Sub-Saharan Africa, and other developing countries. Thus, Desta (2021) described chicken production as a very significant asset to rural women which acts as a mitigating strategy against poverty in Sub-Saharan Africa due to rapid production cycles and low input requirements.

A highly contagious viral infection, Newcastle disease (ND) has a major effect on avian species, especially domestic chickens. This Infectious poultry disease is a key factor driving low productivity of village poultry production systems (Bessell *et al.*, 2020). Africa's rural livelihoods are severely impacted by ND outbreaks, which result in severe financial losses and food shortages (Iyiola-Tunji *et al.*, 2022). In addition, smallholder chicken farming is an important part of the agricultural economy in Northern Nigeria, making a substantial contribution to socioeconomic stability, revenue generation, and food security. Providing a source of animal protein and acting as a financial safety net during hard times, particularly in chicken rearing, is intricately woven into the cultural and economic fabric of rural communities (Ibrahim *et al.*, 2021). However, the frequent ND outbreaks seriously jeopardise this important industry, threatening smallholder farmers' livelihoods and worsening rural poverty.

Due to inadequate access to veterinary care, lack of knowledge about disease prevention and financial limitations, many smallholder farmers still struggle to manage ND successfully despite these efforts (Mustapha *et al.*, 2022). In a similar vein, many smallholder indigenous chicken farmers lack the knowledge and resources necessary to apply biosecurity measures. To effectively create interventions and support systems that increase smallholder farmers' resilience to ND outbreaks, it is imperative to understand the obstacles and constraints they confront (Abubakar *et al.*, 2023). Newcastle disease vaccines are preventive measures that protect chickens from getting ill, and they are likely to be seen as unnatural, as they are man-made (Bearth *et al.*, 2022). If chickens have been vaccinated and they are again exposed to the actual disease-causing organism, the immune system is prepared to fight the infection (Steve, 2020). These vaccines are not only incredibly effective but also very affordable and will protect a bird that lays eggs, producing more chickens and, in this way, making a very substantial contribution to rural household nutrition and income levels (Wilson, 2021).

Consequently, assessing the impact of ND on the livelihood of smallholder indigenous chicken farmers in Bauchi, Plateau, and Kano States is a very important task that must be accomplished. However, few empirical studies on the subject were in place, thus, the need to provide information on the impact of Newcastle disease on the livelihood of smallholder indigenous chicken farmers in selected northern states, Nigeria. This study aimed to;

- i. describe the socio-economic characteristics of the smallholder indigenous chicken farmers in the study area;
- ii. examine the motivations for rearing indigenous chickens by smallholder farmers;
- iii. assess the sources of information on ND available to smallholder indigenous chicken farmers and;
- iv. determine the impact of ND on the productivity and income of smallholder indigenous chicken farmers in the study area

## **METHODOLOGY**

### **The Study Area**

Northern Nigeria is situated between latitudes 7 and 14°N and longitudes 30 and 15°E. It has common borders with arid areas namely Niger Republic in the north and north-west, the northern part of Benin Republic in the west, and northern Cameroon in the east, except the south where it shares boundaries with southern Nigeria which is wetter. Northern Nigeria covers about 75 percent of the area of Nigeria. It has an area of about 692, 826 square kilometres, and more than 400,000 square kilometres of it are arable land (Nmadu, 2014). The productivity of this arable land has been enhanced through the development of numerous dam/irrigation projects, thus making it an important producer of much of Nigeria's food needs. The proximity of the northern fringes of the study area to the Sahara Desert and its border with the wetter southern Nigeria results in rainfall varying significantly across



the area from the southern part to the north. Lokoja typifies this in the southern border with 7 months of the rainy season and 200 days of rain, and Katsina in the extreme north with a rainy season of between 3 and 4 months, and 80 days of rain (Chima *et al*, 2008). Equally, the average annual rainfall has a mean of more than 1200mm in the south and less than 300mm in the far north, except in high-altitude areas (Chima *et al*, 2008).

### Sampling Procedure and Sample Size

The sampling method used is the multistage sampling technique. The first stage involved a purposive sampling of 3 bordering States (Bauchi, Kano and Plateau) based on the prevalence of ND infestations across; North-east, North-west, and North-central zones of Nigeria respectively. The second stage was a random selection of 9 LGAs previously affected by ND from each state, making a sample of 27 LGAs. In stage three, 9 villages from each selected LGA in every state was purposively chosen based on reported positive incidences of ND, giving a sample of 27 villages. Finally, from a total of 4,011 samples, 20% (810 respondents) represented the sample size for the study.

### Data Collection

Primary data for the study were collected by the use of pre-tested questionnaire on a kobo collect tool and focus group discussions (FGD), for triangulation of results.

### Data Analysis

The inferential and descriptive-analytical tools were used to achieve the objectives of the study. Descriptive statistical tools such as mean, percentages, frequency distributions and ranking were used to achieve objectives i ii and iii, while propensity score matching was used to address objective v. The explicit form of the model is as follows:

$$e(X_i) = \Pr(z_i=1|X_i)$$

and

$$\Pr(z_i, \dots, z_n | X_1, \dots, X_n) = \prod_{i=1}^n e(X_i)^{z_i} \{1 - e(X_i)\}^{1-z_i}$$

Where:

$z = 1$ , for the respondents that adopted vaccination

$z = 0$ , for the respondents that did not adopt vaccination and,

$X_i$  the vector observed for the  $i^{\text{th}}$  subject i.e. Poultry Production

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Respondents

The results in Table 1 revealed that higher proportion of female respondents in Plateau, with 74.1%, and slightly lower proportions in Bauchi (70.7%) and Plateau (25.9%) with a combined female representation (72.6%). This pattern of female dominance in indigenous chicken farming is similar to what was reported in studies by Mayanja *et al*. (2022). However, it is worth noting that the female respondents still represent a significant proportion, pointing to a potential area for gender-sensitive interventions in extension services. The variation across states may reflect localised cultural and economic factors that have been explored in recent literature, emphasising the need for context-specific approaches in agricultural development. Mayanja *et al*. (2022). The results also revealed that a considerable number of respondents in each state received Quranic education and primary education, there is also a notable share of those with secondary education. In Bauchi (17.8%) had no formal education compared to (12.6%) in Plateau and (20.7%) in Kano with a combined figure of (17.0%). The relatively high percentages of respondents with Quranic education (24.0%) suggest that informal education channels play a crucial role in disseminating knowledge in these regions. This educational profile is in line with recent observations by Chukwu and Eze (2024), who noted that educational background in rural Nigeria often determines the mode and extent of agricultural practices adopted, particularly in disease management and biosecurity measures.

The results further revealed that majority (69.3%, 67.4% and 64.8%) of the respondents were married in Bauchi, Plateau, and Kano, with a pooled percentage of 67.2%. The relatively smaller proportions of singles, widows, and divorced respondents may suggest that family support systems are prevalent and may influence farming practices and risk management strategies, a point that has been



documented in research by Okeke and Lawal (2020) regarding the role of household dynamics in agricultural productivity.

In addition, the results revealed that 48.9%, 45.9% and 51.5% of the respondents in Bauchi, Plateau, and Kano were members of a cooperative societies, which yields a combined 48.8%. This level of cooperative engagement is consistent with the work of Adekunle *et al.* (2022), who highlighted the role of cooperative societies in providing access to resources and technical support, which is particularly important in managing disease risks such as Newcastle disease. The results further revealed that 64.8%, 59.3% and 68.9% of the respondents in Bauchi, Plateau, and Kano hand contact with animal health providers, giving a combined average of 64.3% of respondents in the study area having access to animal health providers. The relatively high levels of AHP contact suggest a growing awareness among farmers about the importance of veterinary services, a trend also noted in a study by Mohammed and Suleiman (2023), who emphasized that regular veterinary interactions can significantly reduce disease incidence. The small differences across states may reflect the varying accessibility of veterinary services in these regions.

**Table 1a:** Distribution of Respondents Based on Qualitative Socio-economic Characteristics

Variables	Bauchi (n=270)%	Plateau (n=270)%	Kano (n=270)%	Combined (n=810)%
<b>Sex</b>				
Female	70.7	74.1	72.9	72.6
Male	29.3	25.9	27.1	27.4
<b>Education level</b>				
Non formal education	17.8	12.6	20.7	17.0
Quranic	24.8	20.7	26.3	24.0
Primary	21.5	25.2	19.6	22.1
Secondary	23.7	28.9	22.6	25.1
Tertiary	12.2	12.6	10.7	11.9
<b>Marital status</b>				
Single (1)	18.1	20.0	22.2	20.1
Married (2)	69.3	67.4	64.8	67.2
Widow (3)	7.8	8.5	9.3	8.5
Divorced (4)	4.8	4.1	3.7	4.2
<b>Cooperative membership</b>				
Yes (1)	48.9	45.9	51.5	48.8
No (0)	51.1	54.1	48.5	51.2
<b>Animal health provider Contact</b>				
Yes (1)	64.8	59.3	68.9	64.3
No (0)	35.2	40.7	31.1	35.7

**Source:** (Field survey,2025)

(Figures in parenthesis are percentages)

The age distribution shows that across the three states, a substantial proportion of respondents fall within the productive age groups, with 23% Bauchi falling under 30 years, Plateau (23.0%), and Kano slightly higher (24.8%), resulting in a combined figure (23.6%). The predominance of respondents in the 30–39 and 40–49 age brackets in all three states indicates a mature yet active farming population, which is consistent with findings by Adewale *et al.* (2023), who noted that middle-aged farmers are more likely to adopt innovations in indigenous chicken management practices. The mean age across the states was 38.5 years, suggesting that the study participants are generally at an age where experience and capacity for decision-making converge, a factor also highlighted by Ibrahim and Abdullahi (2024), in their work on rural agrarian livelihoods. The results also showed that many respondents fell into the mid-range experience categories. In Bauchi (16.3%) had less than 5 years of experience, (24.8%) had between 5 - 9 years, (26.7%) had between 10 - 14 years, and (18.9%) had between 15 - 19 years, while (13.3%) had 20 or more years of experience.



Plateau and Kano follow a similar trend, with Plateau having a slightly higher percentage in the <5 years category and Kano exhibiting a robust group in the 10–14 years bracket. The combined mean experience was 11.8 years. These findings resonate with the work of Ibrahim and Abdullahi (2024), who argued that moderate to high levels of experience in indigenous chicken keeping are associated with better management practices, particularly in mitigating the impact of infectious diseases like Newcastle disease. In terms of flock size, the results indicate that smallholder farmers typically maintain relatively modest numbers of birds. The group with fewer than 10 birds comprises 83 respondents (30.7%) in Bauchi, 78 (28.9%) in Plateau, and 87 (32.2%) in Kano, with a combined total of 248 (30.6%). The frequency distribution across flock size categories reveals that the majority of farmers keep between 10 and 19 birds, with a combined total of 268 (33.1%), which is a finding that complements earlier studies such as those by Bello *et al.* (2022), who observed that smaller flocks are often managed more intensively and can be more vulnerable to disease outbreaks if biosecurity is compromised. The average flock size across the states was 16.3 birds, indicating a consistent trend in indigenous chickens' management practices across the surveyed regions.

The results indicated that 39.3% of the respondents in Bauchi had household size of within 5–9 person while 37.8% and 40.4% in Plateau and Kano fell in the same group with an average 39.1%. The mean household size across the states was 7.9 persons, a figure that is comparable to findings in recent demographic studies of rural Nigeria (Uche & Eze, 2023). This information is critical because household size can affect labour availability for farm activities and the overall economic resilience of smallholder farmers. Finally, the mean farm income of smallholder chicken farmers was ₦108,916, this implies that while there is a range in earnings, the central tendency is toward the lower-middle income level. These income patterns are consistent with recent studies (e.g., Ibrahim *et al.*, 2024) that report low to moderate incomes among smallholder indigenous chicken farmers, which in turn may constrain their capacity to invest in disease control measures and improve overall biosecurity.

**Table 1b:** Distribution of Respondents Based on Quantitative Socio-economic Characteristics

Variables	Bauchi (n=270)%	Plateau (n=270)%	Kano (n=270)%	Combined (n=270)%
<b>Age (years)</b>				
<30	23.0	23.0	24.8	23.6
30–39	30.7	30.0	30.7	30.5
40–49	24.4	24.8	23.7	24.3
50–59	13.3	12.6	12.2	12.7
≥ 60	8.5	9.6	8.5	8.9
<b>Mean (years)</b>	<b>39.2</b>	<b>38.5</b>	<b>37.9</b>	<b>38.5</b>
<b>Farming experience (years)</b>				
< 5 years	16.3	18.5	15.9	16.9
5–9 years	24.8	23.0	26.3	24.7
10–14 years	26.7	24.4	27.4	26.2
15–19 years	18.9	20.0	17.4	18.8
≥ 20 years	13.3	14.1	13.0	13.5
<b>Mean (years)</b>	<b>11.7</b>	<b>12.3</b>	<b>11.5</b>	<b>11.8</b>
<b>Flock size</b>				
< 10	30.7	28.9	32.2	30.6
10–19	33.3	35.2	30.7	33.1
20–29	23.0	24.4	23.0	23.5
≥ 30	13.0	11.5	14.1	12.8
<b>Mean</b>	<b>16.2</b>	<b>15.7</b>	<b>17.0</b>	<b>16.3</b>
<b>Household size (persons)</b>				
< 5	28.5	30.7	26.7	28.6
5–9	39.3	37.8	40.4	39.1
10–14	23.7	22.2	24.1	23.3
≥ 15	8.5	9.3	8.9	8.9
<b>Mean (persons)</b>	<b>7.8</b>	<b>8.1</b>	<b>7.9</b>	<b>7.9</b>
<b>Farm income (₦)</b>				
< ₦50,000	14.4	16.7	14.1	15.1
₦50,000–99,999	29.3	28.1	30.7	29.4
₦100,000–149,999	24.4	25.6	23.0	24.3
₦150,000–199,999	16.3	15.6	17.4	16.4
≥ ₦200,000	15.6	14.1	14.8	14.8
<b>Mean (₦)</b>	<b>108,473</b>	<b>102,927</b>	<b>115,348</b>	<b>108,916</b>

**Source:** (Field survey,2025)

(Figures in parenthesis are percentages)

### Motivations for Rearing Indigenous Chickens by Smallholder Farmers

The results in Table 2 revealed that majority (75.2%, 78.50% and 81.10% ) of the respondents in Bauchi, Plateau and Kano, respectively, kept their local chicken for celebration like Sallah and Christmas with a cumulative percentage of 78.30% in the study area. This finding is in tandem with the observations of Adeniran *et al.* (2023), who note that indigenous chickens often serve as a key component in communal and family events, reflecting both the cultural significance of chicken meat in traditional festivities/ceremonies and its relatively affordable cost compared to larger livestock such as goats or cattle. Similarly, high proportion of farmers reported using chickens to pay for medical bills. Majority (70.00%) across the three states indicated that selling or bartering chickens contributes to covering healthcare expenses. This pattern aligns with Bello *et al.* (2021), who highlight the reliance of smallholder households on liquid assets, such as indigenous chickens, for urgent financial needs. The slightly higher percentage in Plateau (72.60%) may be attributed to variations in healthcare infrastructure and costs, as well as the socio-economic context of local government areas, which often shapes how farmers prioritise income-generating strategies. The home consumption of indigenous chickens' products for family protein emerged as another important motivation, as 63.50% of the respondents in the study area kept their chicken for that purpose. This



aligns with studies by Mohammed and Suleiman (2023) that emphasise the role of backyard chickens in enhancing household nutrition, particularly in regions where protein intake may be inadequate. In Kano, 178 farmers (65.90%) reported this motivation, reflecting a slightly higher emphasis on meeting household dietary needs. This could be due to a combination of cultural preferences and market factors that encourage consumption over sale.

School fees are another significant driver, mentioned 56.80% of the respondents across the study area. Many households, especially those in rural areas, rely on indigenous chickens' sales to supplement their educational expenditures, a finding that is consistent with the work of Ibrahim *et al* (2024). The ability to sell chickens on short notice, coupled with their relatively quick turnover, provides a flexible means for families to address school-related costs. The percentages in Bauchi (55.20%), Plateau (58.50%), and Kano (56.70%) suggest that, despite small variations, this practice is a widespread strategy for coping with educational expenses. The results also showed that 54.20% of the respondents in the study area kept chicken for income generation. This reinforces the idea that smallholder indigenous chickens' production serves as a form of livelihood diversification. This is in line with Chukwu and Eze (2024), who argue that smallholder farmers often combine multiple on-farm and off-farm activities to reduce economic vulnerability. Kano shows the highest percentage (58.50%), possibly due to relatively stronger market networks and higher demand for indigenous chickens' products in the state. Similarly, the purchase of food staples, reported by 366 farmers (45.20%), further indicates that indigenous chickens' sales serve as a regular source of cash flow, allowing households to maintain food security even when crop harvests are insufficient or delayed.

In addition, another interesting dimension is the cultural role of indigenous chickens, evident 34.60% of the respondents who keep chickens as gifts for social obligations. Gift-giving in many rural Nigerian communities is closely tied to social capital and reciprocal support systems (Bello *et al.*, 2021). Chickens are convenient gifts because they are easy to transport and store compared to larger livestock. The distribution across states remains relatively similar, indicating that this social practice is prevalent in all three regions. Also the results revealed that 24.90% of the respondents kept chicken for manure, this highlights the multi-functionality of chickens in integrated farming systems. Adeniran *et al.* (2023) observe that indigenous chicken manure can significantly improve soil fertility, which is particularly beneficial in regions with limited access to chemical fertilisers. Hobby or leisure interest, reported by 19.40% overall, reflects a more personal motivation. Although this figure is relatively low, it suggests that some farmers value indigenous chicken rearing for non-economic reasons, such as enjoying the process of keeping birds. Other reasons for keeping the chicken was purchase of farm inputs as reported 18.00% of the respondents. This illustrates how smallholder farmers use indigenous chickens' sales to acquire essential agricultural resources like seeds, fertilisers, or tools. This finding aligns with Mohammed and Suleiman (2023), who indicate that flexible, small-scale livestock assets can be readily liquidated to finance cropping activities. Finally, rituals, dowry, and other cultural uses were mentioned by 14.10% of respondents, underscoring the ceremonial importance of chickens in bride-price traditions or religious observances. This cultural significance has been documented by Chukwu and Eze (2024), who found that indigenous chickens often play a symbolic role in various rites of passage and community gatherings.



**Table 2:** Distribution of Respondents Based on Their Motivations for Rearing Indigenous Chickens

Purpose of Keeping Indigenous Chickens	Bauchi (n=270)%	Plateau (n=270)%	Kano (n=270)%	Combined (N=810)	Rank
Celebrations (festival/ceremony)	75.2	78.5	81.1	78.3	1 <sup>st</sup>
Medical bills	69.3	72.6	68.1	70.0	2 <sup>nd</sup>
Home consumption (family protein)	63.3	61.1	65.9	63.5	3 <sup>rd</sup>
School fees	55.2	58.5	56.7	56.8	4 <sup>th</sup>
Income (general cash needs)	50.7	53.3	58.5	54.2	5 <sup>th</sup>
Purchase staple foods	44.8	47.4	43.3	45.2	6 <sup>th</sup>
Gift (social obligations)	34.4	32.6	36.7	34.6	7 <sup>th</sup>
Manure (farm use)	24.4	26.7	23.7	24.9	8 <sup>th</sup>
Hobby (leisure/interest)	18.9	17.4	21.9	19.4	9 <sup>th</sup>
Purchase farm inputs	16.7	19.6	17.8	18.0	10 <sup>th</sup>
Rituals/dowry/other cultural use	14.4	15.6	12.2	14.1	11 <sup>th</sup>

**Source:** (Field survey, 2025)

(Figures in parenthesis are percentages)

**Sources of Information on Newcastle Disease among Smallholder Indigenous Chicken Farmers**

The results can be seen in Table 3 revealed that majority (71.70%) of the respondents in the study area received information on Newcastle vaccines through fellow farmers. This findings by Ayele *et al.* (2022), who emphasized the critical role of informal networks in disseminating livestock health information in Sub-Saharan Africa, especially where formal veterinary services are limited. Peer learning among farmers is often rooted in trust and shared experiences, making it a credible and accessible source of knowledge. It also aligns with the findings of Aremu *et al.* (2023) in a study titled “Social Capital and Poultry Health Management in Nasarawa State” which reported that 69% of respondents relied on information from fellow farmers for managing poultry diseases, implying that informal farmer networks are trusted and influential. Integrating peer educators and farmer-to-farmer extension models can enhance the diffusion of ND information. The findings also showed that 60.90% of the respondents received information on ND vaccines through radio. This finding agrees with several recent studies that have identified radio as a vital channel for disseminating agricultural and veterinary information in rural Nigeria (Adeniran *et al.*, 2023; Okoro & Balogun, 2022). The high reliance on radio may be attributed to its wide reach and affordability, particularly in remote areas where access to other media may be limited. According to Asiabaka *et al.* (2023), radio remains one of the most effective mass media tools for reaching rural audiences with timely and localized agricultural information. Its wide accessibility and low cost make it an ideal medium for delivering public awareness messages on animal health.

In addition, the results revealed that 53.90% of the respondent’s received information on the ND vaccines through the extension agents. This is based on the fact that it is a formal channel for disseminating information on animal health and targeted technical advice. This agrees with the findings of Akanbi & Ibe, 2023 which noted that 55.40% of smallholders in Ebonyi and Imo States relied on extension agents for flock health advice. other sources of information on ND vaccines were community leaders (44.60%), print media (27.80%) and social media (22.90%) .

**Table 3:** Distribution of Respondents Based on their Sources of Information on Newcastle Disease

Source of Information	Bauch (n=270)%	Plateau (n=270)%	Kano (n=270)%	Combined (n=810) %	Ranking
Fellow farmers	73.0	67.0	75.2	71.7	1 <sup>st</sup>
Radio	60.4	64.1	58.1	60.9	2 <sup>nd</sup>
Extension service contact	52.6	51.1	58.1	53.9	3 <sup>rd</sup>
Community leaders	44.8	41.9	47.0	44.6	4 <sup>th</sup>
Print media	27.4	30.4	25.6	27.8	5 <sup>th</sup>
Social media	21.9	24.4	22.6	22.9	6 <sup>th</sup>
Other sources	17.4	19.6	15.2	17.4	7 <sup>th</sup>

**Source:** (Field survey, 2025)

(Multiple responses)

### Impact of Newcastle Disease on Productivity and Income of Indigenous Smallholder Chicken Farmers

The propensity scores matching analysis detailed in Table 9 provides a comprehensive evaluation of the impact of Newcastle Disease (ND) outbreaks on key productivity metrics and income among smallholder chicken farmers. In this analysis, farmers who experienced ND outbreaks (treated group, n = 636) are compared with a control group (n = 174) who did not report such outbreaks. The results in Table 3 measured the number of eggs produced per hen per month, which showed an average treatment effect (ATT) of -2.50 eggs (SE = 0.80, p = 0.002, 95.00% CI: -4.10 to -0.90). This indicates that, on average, ND outbreaks reduce egg production by approximately 2.5 eggs per hen per month. This finding is consistent with research by Adeniran *et al.* (2023), which documented significant declines in reproductive performance following ND outbreaks, underscoring the vulnerability of smallholder systems to disruptions in production. It also revealed that the analysis of flock survival rate was detrimental as results of ND. With an ATT of -8.00 percentage points (SE = 2.00, p < 0.001, 95.00% CI: -12.00 to -4.00), the results suggest that ND outbreaks are associated with an 8% decline in flock survival. These findings are in line with Bello *et al.* (2021), who reported that ND is one of the major causes of increased mortality in indigenous chickens, directly affecting the number of productive birds available to farmers. Similarly, growth rate, quantified in grams of weight gain per week, is significantly hampered by ND, with an ATT of -15.00 grams (SE = 4.00, p = 0.001, 95.00% CI: -23.00 to -7.00). A reduction in growth rate directly affects the time required to reach market weight, thereby impacting the overall efficiency and profitability of the production system. Studies by Mohammed and Suleiman (2023) have demonstrated that ND not only reduces growth performance but also increases the variability in growth rates among birds, which complicates production planning.

In addition, the results revealed that feed conversion efficiency as measured based on the weight gain per kilogram of feed consumed, was also adversely affected, with an ATT of -0.80 grams (SE = 0.30, p = 0.007, 95.00% CI: -1.40 to -0.20). This implies that ND outbreaks lead to poorer feed conversion, thereby increasing production costs and reducing overall efficiency. Ibrahim and Abdullahi (2021) highlight that improved feed efficiency is critical for economic viability in indigenous chickens' production, and any factor that impairs this metric can have cascading economic consequences. It also affects the marketability of chicken which is measured based on the number of birds sold per month. There was a significant reduction with an ATT of -4.00 birds (SE = 1.20, p = 0.001, 95.00% CI: -6.40 to -1.60). This reduction reflects the direct impact of ND on the number of healthy birds available for sale, which in turn reduces income. This finding is corroborated by research from Adeniran *et al.* (2023), which has documented substantial economic losses resulting from lower marketable flock sizes during ND outbreaks. Similarly, egg quality, represented by average egg weight, also suffers a decline with an ATT of -0.40 grams (SE = 0.15, p = 0.012, 95.00% CI: -0.70 to -0.10). Although this may appear as a marginal decrease, even small reductions in egg quality can affect market prices and consumer acceptance, further influencing farmers' income. This aspect of ND's impact on egg quality has been explored in depth by Bello *et al.* (2021), who noted that suboptimal egg quality can diminish the overall value of the production output. Finally, the

findings showed that ND vaccines has direct bearing on the income of smallholder farmers with an ATT of -18,000 Naira (SE = 6,000,  $p = 0.002$ , 95.00% CI: -30,000 to -6,000). This result indicates that, on average, farmers who experience ND outbreaks earn 18,000 Naira less than those who do not. Such a decline in income reflects the cumulative effect of reduced production efficiency, higher mortality, and lower marketable outputs, which have all been highlighted in previous literature as critical challenges faced by smallholder indigenous chicken producers (Mohammed & Suleiman, 2023).

**Table 4:** Impact of Newcastle Disease on Productivity and Income of Smallholder Indigenous Chicken Farmers: (n = 810)

Outcome Variable	Affected N	Control N	ATT	SE	p-value	95% CI
Egg production (eggs/hen/month)	636	174	-2.50	0.80	0.002	(-4.10, -0.90)
Flock survival rate (%)	636	174	-8.00	2.00	0.001	(-12.00, -4.00)
Growth rate (grams/week)	636	174	-15.00	4.00	0.001	(-23.00, -7.00)
Feed efficiency (g gain/kg feed)	636	174	-0.80	0.30	0.007	(-1.40, -0.20)
Marketable chickens (number/month)	636	174	-4.00	1.20	0.001	(-6.40, -1.60)
Egg quality (av egg weight,g)	636	174	-0.40	0.15	0.012	(-0.70, -0.10)
Income(₦)	636	174	-18,000	6,000	0.002	(-30000-6000)

**Source:** (Field survey, 2025)

*ATT = Average Treatment Effect on the Treated.*

## CONCLUSION AND RECOMMENDATION

The study concludes that Newcastle disease has negative impact on the livelihood of smallholder indigenous chicken farmers in the study area. Also poultry serves multiple roles in household livelihoods, including income generation, school fees, medical bills, food provision, cultural significance, and asset accumulation. In addition, ND is the greatest threat to chickens' health and its outbreak cause substantial reductions in flock productivity, egg output, and marketability, demonstrating its critical role in undermining rural livelihoods, as ND has a statistically significant negative effect on both productivity and household income,

The following recommendations were made based on the findings:

- i. Development partners and extension agencies should design and deliver regular poultry health and ND prevention training programs in local languages using simple, practical demonstrations that reflect the farmers' literacy levels and socio-economic characteristics
- ii. Policymakers and development organizations should build gender-responsive programs that empower women through access to credit, training, and decision-making opportunities since indigenous chicken farming is predominantly managed by women.
- iii. Development partners should introduce community-based ND vaccination programs, emphasizing the heat-stable I-2 vaccine produced in NVRI, with support from government to improve vaccine adoption and coverage.
- iv. Farmers should form cooperatives to enable bulk vaccine purchases, shared veterinary services, and better market access. They should also be trained and supported by development partners and extension agencies to improve housing and restrict free-range movement to reduce ND risks.



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