



Assessment of Poultry Drug Information Sources and Level of Compliance among Farmers in Abuja FCT, Nigeria

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Abstract

This study assessed the sources of poultry drug information and level of compliance among farmers in Abuja FCT, Nigeria. Multistage sampling technique was used select 165 poultry farmers from Gwagwalada and Bwari area councils for this study. The findings revealed that majority of farmers (60%) were between 30-50 years old, 70% had secondary education or higher, and 80% were male. Majority 82.4% have primary education, with a mean of 8 years of formal education. The result also revealed that Enrofloxacin, Oxytetracycline, Doxycycline, Furazolidone, NeocerylR, and Gentamycin were the major drugs utilized by poultry farmers. However, administering drugs using the recommended route and technique ($\bar{X}=2.50$), Maintain accurate records of drug administration ($\bar{X}=2.50$), store drugs in a cool dry place and protect them from sunlight ($\bar{X}=2.40$) and avoid using drugs for non-approved indications or as growth promoters ($\bar{X}=2.40$) had high level of compliances of poultry drug information among the farmers in the study area. Furthermore, age, level of education, farming experience, compatibility, relative advantage, complexity, training received and farmers' perception were the factors influencing the level of compliance to poultry drug information and level of farmer's access to information' in the study area. Poultry farmers in Abuja FCT demonstrate moderate to high compliance with drug usage guidelines, influenced by education, experience, and access to information. Therefore, it is recommended that targeted training programme and improved access to veterinary information should be promoted by the extension organization to enhance compliance and responsible drug use among poultry farmers.

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Introduction

Nigeria's poultry sub-sector has emerged as one of the fastest growing and most commercialized segments of the livestock industry in the country (Adene and Oguntade, 2019; Adedeji *et al.*, 2020) ^[2, 3]. With an estimated poultry population of 137.6 million, consisting of 84% local breeds and 16% exotic breeds (FAOSTAT, 2022) ^[1]. According to FAOSTAT 2022 ^[1], the Nigeria has a poultry population of about 180 million birds that produce about 400,000 and 850,000 tonnes of eggs as of December 2020, respectively. Additionally, National Bureau of statistics (NBS) (2022) reported that the sector contributes 6 -8 % to real GDP annually about 30% to the agricultural GDP making it the largest producer of poultry eggs and fourth largest poultry meat producer in Africa. The remarkable growth of Nigeria's poultry industry can be attributed to various factors, including the country's rapidly growing human population and the increasing demand for poultry products. Also, poultry farming offers significant advantages, with its high feed conversion rate leading to efficient production of meat and eggs (Yusuf *et al.*, 2019) ^[4]. Moreover, the relatively low initial investment required for poultry production compared to other livestock ventures, coupled with appreciable returns on investment has further contributed to the sector's popularity among rural families (Okoli *et al.*, 2019) ^[6]. For many rural families in Nigeria, poultry farming serves as both an important source of food and income, contributing to sustainable livelihoods and poverty alleviation (Ogunleye *et al.*, 2019) ^[5]. The sector's accessibility and profitability have encouraged widespread participation among smallholder farmers, further driving its growth and development.

As a result, poultry farming has become deeply integrated into rural communities, playing a crucial role in ensuring food security and economic stability. Despite its potential contributions to the national economy, the poultry industry in Nigeria faces numerous challenges that impede its growth. These challenges include low capital base, inefficient management practices, disease outbreaks, housing inadequacies, and marketing constraints (Nwanta, 2020) [7]. Among these challenges, diseases remain a significant threat to boosting poultry production in the country (Fraser *et al.*, 2021) [8]. The success and sustainability of poultry farming depend not only on efficient production practices but also on effective disease management and medication protocols. Poultry diseases can result in reduced productivity, economic losses and potential food safety risks. Therefore, access to accurate and reliable information on poultry drugs, their proper use and compliance with medication protocols are essential for maintaining flock health, ensuring food safety, and safeguarding public health.

Furthermore, fellow farmers serve as important sources of practical knowledge and firsthand experience in poultry production. Through informal networks and community-based organizations, farmers share insights, tips, and advice on medication practices, contributing to collective learning and knowledge exchange within the farming community. Agricultural input suppliers, such as feed stores and veterinary pharmacies, offer access to a wide range of poultry drugs and medications, along with information on their proper use and dosage.

The poultry sub-sector in Abuja, Nigeria, is a vital component of the agricultural landscape, contributing significantly to food security, income generation and livelihoods for many farmers. However, the sector faces persistent challenges related to the management of poultry diseases and the proper use of drugs for treatment and prevention. Despite the importance of adopting effective medication practices, there exists a notable gap in understanding poultry drug information, sources of information and the level of compliance among farmers in Abuja.

Methodology

The study was conducted in FCT Abuja, Nigeria. Abuja is the capital city of Nigeria located at coordinate 9.0765° North and 7.3986° East in the centre of Nigeria. However, the total population in the State are over 2,590,000 people. National Population Commission of Nigeria (NPCN, 2016) from 2016 population census. But, going by the annual population growth rate of 3.5 percent in Nigeria, the population of Niger State was projected to be 2,952,000 people (NPCN, 2016) in the year 2020. Climate classification features a tropical wet and dry climate. The FCT experiences three weather conditions annually. This includes a warm, humid rainy season and a blistering dry season (Shrestha *et al.*, 2019) [9]. In between the two seasons, there is a brief interlude of harmattan occasioned by the northeast trade wind, with the main feature of dust haze and dryness. The rainy season begins from April and ends in October, when daytime temperatures reach 28°C to 30°C and nighttime lows hover around 22°C to 23°C. In the dry season, daytime temperatures can soar as high as 40°C and nighttime temperatures can dip to 12 °C. Even the chilliest nights can be followed by daytime temperatures well above 30 °C. The high altitudes and undulating terrain of the FCT act as a moderating influence on the weather of the territory (Shrestha *et al.*, 2019) [9]. In this study Multistage, sampling technique was used to select 165 registered poultry farmers from the study area. Data were collected using semi-structured

questionnaire and analysis was conducted using descriptive statistics and inferential statistics such as Heckman's two-step regression models which is to examine the factors influencing farmers access to information and level of compliance to poultry drug information respectively. which was specified as follows:

Heckman Two-Steps Probit Regression

The algebraic representation of the Heckman's probit selection model is gives as:

$$M_1 = (\beta_1 x_1) + e, \quad (1)$$

Where:

M_1 = Perception by the i th farmers access to information.

X_1 = the vector of explanatory variables of probability of i th farmers' farmers access to information β_1 = Vector of the parameter estimates of the regressors hypothesized to influence the probability of farmers access to information.

e = error term

Consequently, implicit form of the linear specification for the Heckman's probit selection model is given as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}, X_{16}) \quad (2)$$

Thus, its explicit form is expressed as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + e \quad (3)$$

Where Y = access to information (1= High access; 0= Low access)

X_1 = Age (in years)

X_2 = Marital status (married=1, otherwise=0)

X_3 = Level of education (number of years spent in school)

X_4 = Stock size (Numbers)

X_5 = Size of poultry farm (number of hectares)

X_6 = poultry experience (number of years)

X_7 = Household size (total number of people in the house)

X_8 = Extension visits (number of visits received)

X_9 = Cooperative membership (member=1, otherwise=0)

X_{10} =Farm income (in naira)

X_{11} =Credit (amount received (Naira)

X_{12} = Sources of information (Numbers)

X_{13} = Cosmopolitiness (Numbers of state travel outside abuja)

$b_1 - b_{13}$ = coefficients of independent variable

b_0 = Constant term

e = error term

In the Heckman's probit (outcome) model, the regressand is the level of compliance to poultry drug information of the farmers. This was also regressed on the same set of explanatory variables to those that influence farmers' access to information. The algebraic specification of the Heckman's probit regression model is given as:

$$T_i = (\beta_1 x_1) + e, \quad (4)$$

Where:

T_1 = Level of compliance to poultry drug information.

X_1 = the vector of explanatory variables of probability of i th level of compliance to poultry drug information

β_1 = Vector of the parameter estimates of the regressors hypothesized to influence the probability of level of

compliance to poultry drug information.

e = Error term

Thus, implicit form of the linear specification for the Heckman's outcome model is given as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}) \quad (5)$$

The explicit form is expressed as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} \quad (6)$$

Where

Y= level of compliance (score)

X₁= Age (in years)

X₂= shortest distance to veterinary services (km)

X₃= Level of education (number of years spent in school)

X₄= Availability of drugs (Numbers)

X₅= Size of poultry farm (number of hectares)

X₆= poultry experience (number of years)

X₇= Household size (total number of people in the house)

X₈= Extension visits (number of visits received)

X₉= Cooperative membership (member=1, otherwise=0)

X₁₀=Farm income (in naira)

X₁₁=Credit (amount received (Naira)

X₁₂= Sources of information (Numbers)

X₁₃= Cost of drugs (Naira)

b₁ – b₁₃= coefficients of independent variable

b₀= Constant term

e= error term.

Results and Discussion

Socio-economic characteristics of the respondents

Age of the respondents: Table 1 reveals that the majority of poultry farmers (59.4%) fall within the age range of 31-40 years, with an average age of 42 years. This indicates that poultry farming is predominantly managed by individuals in

their prime working years, who are likely to possess the physical and mental capacity to handle the demands of poultry farming effectively. The significant representation of farmers in this age group suggests a stable and experienced workforce, which can positively influence productivity and farm management practices.

Sex and Marital Status of the Respondents: Furthermore, the gender distribution shows a notable predominance of male farmers, with 75.2% of the respondents being male. This male dominance in poultry farming could be attributed to cultural or societal norms that may favour men in agricultural roles, especially in more labour-intensive tasks like poultry farming. Regarding marital status, 68.5% of the poultry farmers are married, which often correlates with a stable family structure that can contribute to the availability of family labour and shared responsibilities in managing farm operations. Married individuals may also have a stronger economic motivation to engage in poultry farming to support their families.

Household Size of the Respondent: The result in Table 1 shows that a significant proportion of poultry farmers (62.4%) have a household size ranging between 1-5 members, with an average household size of 7 suggesting that the study area is dominated by farmers with medium household sizes. Respondent with larger households may have more available labour for farm activities, which is crucial for the labour-intensive nature of poultry farming. Family members can assist in daily tasks such as feeding, cleaning and monitoring the health of poultry. However, larger household sizes also imply a greater financial burden on the household head, potentially leading to resource allocation challenges where income from poultry farming may need to be distributed across more individuals, thus reducing the amount available for reinvestment into the farm. This is similar to the study of Adedeji *et al.* (2020) [3] who reported that most arable crop farmers in Nigeria had large household size.

Table 1: Distribution of Socio-Economic Characteristics of Respondents

Variables	Frequency	Percentage	Mean
Age			
Less than 21	5	3.0	
21-30	33	20.0	
31-40	98	59.4	42 years
41-50	29	17.6	
Sex			
Female	41	24.8	
Male	124	75.2	
Marital status			
Married	113	68.5	
Single	22	13.3	
Divorce	12	7.3	
Widow	18	10.9	
Household size			
1-5	103	62.4	7
6-10	28	17.0	
11-15	34	20.6	
Formal education			
non formal	11	6.7	8
Primary	136	82.4	
Secondary	6	3.6	
Tertiary	12	7.3	

Source: Field survey, 2024

Formal Education of the Respondent: Table 1 showed that a majority (82.4%) have primary education, with a mean of 8 years of formal education. Education plays a pivotal role in enhancing farmers' ability to adopt new technologies, manage their farms effectively and engage in more profitable farming practices. Farmers with higher educational levels are more likely to access and comprehend extension services, utilize farm records, and apply modern poultry management practices, which can lead to increased productivity. The predominance of primary education suggests that while most farmers have basic literacy and numeracy skills, there may be limitations in accessing more complex agricultural knowledge and technologies. This is tandem with the study of Yusuf *et al.* (2019) ^[4], who reported that majority of subsistence farmers were non-literate.

Various Types of Poultry Drugs Utilized By Poultry Farmers

The results in Table 2 present the various types of poultry drugs utilized by poultry farmers it revealed that Enrofloxacin, Oxytetracycline, Doxycycline, Furazolidone, Neoceryir, and Gentamycin were the major drugs utilized by

poultry farmers. Furazolidone is another drug with a 100% usage rate, indicating its significance in poultry farming. It is an antibacterial and antiprotozoal agent commonly used to treat gastrointestinal infections and coccidiosis in poultry. The complete reliance on Furazolidone by all surveyed farmers suggests that it is a trusted and effective option for managing these common poultry diseases. However, like Enrofloxacin, the universal use of Furazolidone highlights the importance of ensuring proper dosage and administration to prevent resistance and ensure the continued effectiveness of this drug in the long term. Doxycycline is utilized by 97% of the poultry farmers, making it one of the most widely used antibiotics in the study area. Doxycycline is known for its effectiveness against a broad range of bacterial infections, including respiratory and systemic infections in poultry. The high usage rate reflects its importance in maintaining poultry health, especially in preventing and treating infections that could significantly impact productivity. The extensive use of Doxycycline also points to the challenges farmers face in managing bacterial diseases, emphasizing the need for ongoing education about proper antibiotic use and the risks of resistance.

Table 2: Various types of poultry drugs utilized by poultry farmers

Drugs used	Frequency (165)	Percentage (%)
Enrofloxacin	165	100.0
Oxytetracycline	157	95.2
Colistin	112	67.9
Doxycycline	160	97.0
Tylosin	113	68.5
Furazolidone	165	100.0
NeocerylR	146	88.5
Flumequine	115	69.7
Gentamycin	156	94.5
Furazolidone	133	80.6
Neomycin	126	76.4

Source: Field survey, 2024

Oxytetracycline, with a 95.2% usage rate, is another major drug utilized by poultry farmers. It is a broad-spectrum antibiotic effective against a variety of bacterial infections and is often used to treat respiratory and enteric diseases in poultry. The widespread use of Oxytetracycline suggests that it is a critical component of disease management strategies among poultry farmers. Its effectiveness and relatively low cost make it a popular choice. However, as with other antibiotics, the high usage rate underscores the need for responsible use to avoid the development of antibiotic resistance, which could compromise its effectiveness in the future. NeocerylR is used by 88.5% of poultry farmers, indicating its role as a key therapeutic agent. This drug is likely favored for its efficacy in treating specific bacterial infections or other conditions prevalent in poultry farming. The substantial reliance on NeocerylR reflects its perceived effectiveness and the trust that farmers place in this medication. The high adoption rate also suggests that it is

readily available and accessible to farmers, making it a convenient option for managing poultry health.

Level of Compliance to Poultry Drug Information

Table 3 present the results of poultry farmer's compliance to poultry drug information. It revealed that the poultry farmers agreed to all the provided poultry drugs information. However, the highest level of compliance was observed in the administration of drugs using the recommended route and technique, with a weighted mean of 2.5. This suggests that poultry farmers are highly diligent in following veterinary guidelines when it comes to how they administer medications to their flocks. Proper administration is crucial for ensuring the efficacy of the drugs and minimizing the risk of resistance or adverse effects. The high compliance level indicates that farmers understand the importance of using drugs correctly, which is essential for maintaining the health and productivity of their poultry.

Table 3: Level of compliance to poultry drug information

Level of compliance	Low	Moderate	High	Mean
Administering drugs using the recommended route and technique	18(10.9)	44(26.7)	103(62.4)	2.5*
Maintain accurate records of drug administration	19(11.5)	43(26.1)	103(62.4)	2.5*
Store drugs in a cool dry place and protect them from sunlight	28(17.0)	37(22.4)	100(60.6)	2.4*
Avoid mixing drugs with other medications or chemicals	15(9.1)	73(44.2)	77(46.7)	2.4*
Avoid using drugs for non-approved indications or as growth promoters	25(15.2)	53(32.1)	87(52.7)	2.4*
Using clean, sterile equipment when administering drugs	33(20.0)	43(26.1)	89(53.9)	2.3*
Avoiding using drugs that are not specifically approved for poultry	31(18.8)	47(28.5)	87(52.7)	2.3*
Monitoring birds closely for any adverse reactions or side effects after drug administration	42(25.5)	30(18.2)	93(56.4)	2.3*
Using the correct dosage for the weight of the bird and the severity of the disease	63(38.2)	22(13.3)	80(48.5)	2.1*

Source: Field survey, 2024 * = high compliance

Maintaining accurate records of drug administration also scored a weighted mean of 2.5, reflecting high compliance. Keeping detailed records is vital for tracking the use of medications, ensuring proper dosages, and providing essential information in case of any adverse reactions. It also helps in monitoring withdrawal periods to prevent drug residues in poultry products, which is critical for food safety. The high compliance rate in record-keeping suggests that farmers are aware of its importance, likely due to its role in both disease management and regulatory compliance. Storing drugs correctly, with a compliance mean of 2.4, shows that farmers understand the importance of preserving the efficacy of medications. Improper storage can lead to the degradation of drugs, reducing their effectiveness and potentially leading to treatment failures. The high level of compliance here indicates that farmers are taking necessary precautions to ensure that their drugs remain potent and effective.

Avoiding the mixing of drugs with other medications or chemicals also shows a high compliance level, with a weighted mean of 2.4. This practice is crucial to prevent drug interactions that could reduce the efficacy of treatments or cause harm to the poultry. The high adherence to this guideline reflects a good understanding among farmers of the risks associated with improper drug handling. Finally, the compliance level for avoiding the use of drugs for non-approved indications or as growth promoters also stands at 2.4. This indicates that farmers are generally aware of the regulations and guidelines surrounding the appropriate use of medications. Misusing drugs can contribute to the development of antibiotic resistance and poses a significant risk to both animal and human health. The high compliance rate suggests that farmers are adhering to best practices and regulatory requirements, thereby contributing to safer and more sustainable poultry farming practices. This is similar to the study of Oluwole *et al.* (2020) ^[11] who reported that farmers with better knowledge of poultry diseases and the appropriate use of drugs are more likely to comply with recommended practices. They found that educational interventions significantly improved farmers' understanding

and compliance, suggesting that increasing awareness through training and extension services is crucial. Access to veterinary services also plays a significant role in compliance. Nwanta *et al.* (2020) ^[7] found that farmers with regular access to veterinary professionals were more likely to follow recommended drug usage guidelines.

Factors influencing the level of compliance to poultry drug information and level of farmer's access to information

Table 4 present the result of Heckman analysis on factors influencing the level of compliance to poultry drug information and level of farmer's access to information. The computed lambda value of 1.8784 suggests a strong association between these factors and compliance levels. The Rho value of 0.1802, though relatively low, indicates a moderate correlation between the variables. The sigma value of 0.3750 implies that there is a reasonable level of variability in compliance levels, which can be attributed to differences in access to information among the farmers.

In respect to level of compliance, the coefficient of formal education (0.0388) is positive and significant at the 0.10 level, indicating that as the level of formal education increases, there is a corresponding increase in the compliance with poultry drug information. This suggests that more educated farmers are likely better at understanding and adhering to drug use guidelines, as they might have better comprehension of the instructions provided. Education equips farmers with the ability to read and interpret labels and dosage instructions, which is essential for the safe and effective use of poultry drugs. The coefficient for farming experience (0.0192) is positive and significant at the 0.05 level, showing that greater experience in farming positively influences compliance with poultry drug information. Experienced farmers may have developed a better understanding of the importance of following proper drug administration protocols, possibly due to lessons learned from past mistakes or from observing the outcomes of poor compliance.

Table 4: Factors influencing the level of compliance to poultry drug information and level of farmer's access to information

Variable	Level of information (Selection Model)		Level of compliance (Outcome Model)	
	Coefficient	z-value	Coefficient	z-value
Age	0.0502	2.28**	0.0100	1.18
Family labour	0.3740	1.26	-0.0269	-0.29
Formal education	0.3497	3.65***	0.0388	1.82*
Farming experience	0.0136	0.73	0.0192	2.42**
Compatibility	0.0897	0.32	0.3706	4.23***
Relative advantage	0.3768	3.37***	0.0117	0.35
Complexibility	-0.4654	-1.97*	-0.2169	-1.86*
Cost of poultry drugs	0.0265	1.18	-0.9185	-2.02**

Access to government support	0.0265	1.18	-0.0054	-0.25
Farmers perception on poultry drugs	0.0012	1.95*	0.0001	0.09
Training received	0.3166	3.99***	.0475	1.45
Constant	-3.5556	-3.60***	-.0012	-0.00
Lambda	1.8784	1.73		
Rho	0.1802			
Sigma	0.3750			

Source: Field survey, 2024 * Significant at 10%, ** significant at 5%, *** significant at 1%

The coefficient of compatibility (0.3706) was positive and statistically significant at the 0.01 level probability level. This suggests that when poultry drugs and the methods of administration are compatible with the farmers' existing practices or beliefs, compliance is higher. Farmers are more likely to follow instructions when they perceive the methods as fitting seamlessly into their current farming practices. Compatibility might relate to the ease with which drugs can be administered or the perceived alignment of the drug use with traditional practices. The coefficient of complexity (-0.2169) is significant at the 0.10 level, indicating a negative relationship between the complexity of drug information and compliance. This implies that as the complexity of administering poultry drugs increases, farmers are less likely to comply with recommended practices. Complexity might involve dosage calculations, specific storage requirements, or elaborate administration techniques that farmers find difficult to follow. Simplifying the procedures could potentially improve compliance rates.

The cost of poultry drugs has a significant negative coefficient (-0.9185) at the 0.05 level. This indicates that higher costs are associated with lower levels of compliance. When drugs are expensive, farmers might try to stretch their supplies by reducing dosages or skipping treatments, leading to non-compliance with recommended guidelines. Financial constraints can compel farmers to make decisions that compromise the effectiveness of the drugs, such as under-dosing or delaying treatments. In terms of level of farmers' access to information, the coefficient for age (0.0502) is positive and significant at the 0.05 probability level, suggesting that older farmers tend to have better access to information regarding poultry drugs. This could be because older farmers might have more established networks, longer relationships with extension agents, or greater involvement in community activities that provide access to information. Additionally, older farmers might be more trusted by peers and community members, leading to better information flow.

Conclusion and Recommendations

Based on the findings of the study, it was concluded that poultry farmers in the study areas were within their active age, married with large family size as well as moderate level of education and experienced farmers. It was also concluded that Enrofloxacin, Oxytetracycline, Doxycycline, Furazolidone were the major poultry drugs utilized in the study area. More so, poultry farmers in the study area had high compliance to poultry drug information. Lastly, formal education, farming experience, compatibility and relative advantage were the major factors influencing the level of compliance and level of information access in the study area. Therefore, it was recommended that farmers should be encouraged to join cooperatives to leverage the collective benefits, such as improved bargaining power for better pricing, easier access to credit facilities, and shared resources and knowledge. Extension services and government agencies

should promote the advantages of cooperative membership and provide support to strengthen existing cooperatives, ensuring that more farmers can benefit from these opportunities and enhance their productivity and profitability.

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