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Assessment of Cyber Risk Exposures of Poultry Farmers in Accessing Digital Finance in Oyigbo Local Government Area Rivers State, Nigeria

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Abstract
This study examined the assessment of cyber risk exposure of poultry farmers in accessing digital finance in Oyigbo Local Government Area, Rivers State, Nigeria. Specific objectives include to describe the socio-economic characteristics of poultry farmers in accessing digital finance, analyzed the factors that influence the level of cyber security literacy among poultry farmers and examined the perception of poultry farmers in accessing digital finance. Data were collected with the aid of questionnaires, administered to ninety (90) poultry farmers. The data were analyzed using descriptive statistics and multinomial logit regression. The study shows that majority (66.7%) were male, majority (85.5%) married and six (6) at average member of the family, with mean age of 39.2 years. The result of multinomial logistic regression shows that age, household size, educational level, farming status and annual savings were statistically significant influencing the levels of adoption of cyber security measures in accessing digital finance by poultry farmers. The study therefore recommends that Government, NGOs and financial institution should educate farmers on the importance of cybersecurity; farmers should be educated on the importance of using secure Wi-Fi connections and avoid using public Wi-Fi for sensitive transactions; farmers should use of strong and unique passwords for financial accounts.

Keywords: Cyber risks, Cybersecurity, digital finance, poultry farmers, Rivers State

1.0 Introduction
Cybersecurity risk, sometimes referred to as cyber risk, is associated with the possible negative effects on businesses and the nation that may arise from the loss of information, data, or information systems' availability, confidentiality, or integrity (Kelley, 2023). Even though information has long been seen as a vital resource, the digital revolution has increased an organization's reliance on information, information processing, and information technology. Thus, a range of events or incidents that have some bearing on information technology may have a detrimental influence on the organization's business operations or mission, with consequences ranging from trivial to disastrous. Since cyber risk encompasses more than just the unfavourable outcomes of operations and service delivery that could lead to an organization's demise or decline in value, it is more widely defined. Assets, impacts, threats, and likelihood are the four basic forces of risk management that also relate to cyber risk (Li and Liu, 2021). Impact is the term used to describe the loss or harm to an asset. Assets can be both tangible and immaterial objects with value. But although likelihood is the erratic member of the group, threats are external to control because they symbolize enemies and their means of attack. They are employed to ascertain whether and when a threat will manifest, materialize, and cause harm. Even though they can never be completely controlled, likelihoods can be moulded and impacted to control the risk.

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More than ever, farmers and other agricultural operators are utilising technology (USDA, 2022). Technological advancements have brought forth new risks in addition to new opportunities, productivity gains, and connectedness. Right now, one of the biggest risks to the world economy is cybercrime. It is imperative to acknowledge that safeguarding the information technology assets of the agriculture sector is of equal significance to that of our country's banking, healthcare, and retail sectors. Any bird that has economic worth to humans as a source of meat, eggs, and fibre is referred to as poultry. To produce table eggs, good layer birds must be used in the egg production process (Aroyehun, 2023). Eggs are one of the main sources of animal protein in the human diet. Poultry contributes significantly to the population's animal protein needs because it produces meat and eggs quickly and delivers high returns (Oji and Chukwuma, 2007).

According to Food and Agricultural Organisation (2013) of the United Nations (FAO), eggs are the most economically produced animal protein and come in second place to cow milk in terms of nutritional value. Agriculture is increasingly becoming a target for bad actors as it gets more integrated into the global internet. Agricultural enterprises, organisations, and field workers all need to be aware of the dangers that could be directed towards them. A distinct sampling population is provided by farmers, agribusiness owners, and other people working in or connected to the agricultural industry. It could be difficult to distinguish between using a computer for work and play. The home office might double as the farm's office, just like in other small business sectors. One computer that is used for social networking, gaming, and personal purposes may also be used to file farm taxes, access the cooperative website for the local farm, or finish USDA e-forms. Cyberattacks can have catastrophic effects on both organisations and the people who fall prey to fraud. It can have a variety of effects on agricultural enterprises, such as financial losses or the disclosure of private information. The hazards rise as farms depend more on technologies like GPS, remote sensing, and unmanned aerial vehicles. Cybercriminals are getting more and more crafty and cunning, constantly coming up with new ways to uncover weaknesses in technology security and use them to steal money, data, or passwords. Businesses of all kinds are at serious risk from cybercrime. Cybercriminals have targeted farmers, so it's critical to understand the risks and make investments in our own cyber security.

The integrity, productivity, and safety of activities in these agricultural enterprises are seriously threatened by cybersecurity concerns in chicken farms (Brockotter, 2021). Poultry farms are susceptible to a range of cyber risks due to their growing reliance on digital technologies and interconnected systems. These vulnerabilities can lead to negative outcomes such as financial losses, compromised food safety, and disruptions in operations. Computer networks and systems are used in poultry farms to control functions like feeding programs, temperature regulation, and data gathering. On the other hand, unauthorised users who manage to get access to these systems may change configurations, interfere with normal operations, or steal confidential data. Large volumes of data, such as customer and supply chain details, production records, and other information, are handled by poultry farms. This data could be compromised by a cyberattack, which could have negative effects on reputation, cause financial losses, and possibly even result in legal repercussions. Automated systems are frequently used in poultry farms to handle waste, feed, and ventilation. Cyberattacks directed against these systems have the potential to cause interruptions, which could jeopardise animal care, reduce productivity, and result in monetary losses. Hence, assessing cyber risk exposure of poultry farmers in accessing digital finance in Oyigbo Local Government Area Rivers State, Nigeria is imperative to close this knowledge gap. The specific objectives are to:

i. describe the socio-economic characteristics of poultry farmers in the study area.
ii. identify the various sources of cyber risks faced by poultry farmers in the study area.
iii. identify cybersecurity management strategies adopted by poultry farmers in the study area.
iv. examine the socio-economic factors that influence adoption of cybersecurity management strategies among poultry farmers in the study area.

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2.0 Methodology

This study was carried out in Oyigbo Local Government Area (LGA) in Rivers state, Nigeria. Oyigbo LGA is located in coordinate's latitude 4˚45N-4˚60N and longitude 6˚50E-8˚00E, with geographical area of 260 km^2 (National Population Census of Nigeria NPC, 2006). A two-stage sampling procedure was employed in the selection of the poultry farmers for this study. The first stage was purposive selection of three communities based on high concentration of economic activities which are poultry-based and availability of financial institutions. The second stage is a purposive selection of thirty (30) poultry farmers who have access to internet from their devices from each community, making it a total of ninety (90) poultry farmers for the Study.

The Data for this study were collected from primary source with the aid of questionnaire and secondary sources of information used include journals, articles, internet and books. Data were analyzed using descriptive statistics and multinomial logit model to achieve the objectives. Multinomial logistic regression is used to model nominal outcome variables, in which the log odds of the outcomes are modelled as a linear combination of the predictor variables. The adoption of cybersecurity practice was measured using 18-item statements captured with a Yes and No responses, Responses were pooled and scores were categorized as thus: 0-4 (Low adoption=1); 5-9 (Moderate adoption = 2); 10 -14 (High adoption =3); 15-18 (Very high adoption=4) which determines the odd of a poultry farmer being in one of the four levels of adoption of cybersecurity practices. Therefore, the dependent variables were coded with the following values:1 for Low adoption, 2 for Moderate adoption, 3 for High adoption and 4 for Very high adoption of cybersecurity practices. It is therefore of a categorical nature, with numbering arbitrarily assigned so that it does not imply order of magnitude.

Model Specification

The model assumes that poultry farmers adopt cybersecurity practices that maximize their utility (McFadden, 1974). The model can be expressed as follows:

$$pr[Y_i = j] = \frac{exp\left(\beta_j' X_j\right)}{\Sigma_{j=0}^{J} exp\left(\beta_j' X_j\right)} \quad (1)$$

Where;

$Pr[Y_i = j]$is the probability of very highly, highly or moderately adopting cybersecurity practices, with low adoption as the reference category.

J is the number of adoption level in the choice set.

$j = 0$ is low adoption level.

X_i is a vector of the predictor (exogenous) variables.

$\beta_j$is a vector of the estimated parameter.

The parameters of this model were estimated using the Maximum Likelihood approach (MLE). The MLE requires that the independence of irrelevant alternatives (IIA) assumption be satisfied.

The options *J*s (representing the dependent variables) are as follows: 1 = low; 2 = moderate; 3= high and 4 = very high. The base is low while the other three levels of moderate, high and very high were compared with low.

The multinomial logit model can be estimated with set of coefficients $\beta^{(1)}$,$\beta^{(2)}$, $\beta^{(3)}$, and $\beta^{(4)}$

$$Pr(Z = 1) = \frac{e^{x\beta(1)}}{e^{x\beta(1)}e^{e\beta(2)}e^{x\beta(3)}} \quad (2)$$

$$Pr(Z = 2) = \frac{e^{x\beta(2)}}{e^{x\beta(1)}e^{e\beta(2)}e^{x\beta(3)}} \quad (3)$$

$$Pr(Z = 3) = \frac{e^{x\beta(3)}}{e^{x\beta(1)}e^{e\beta(2)}e^{x\beta(3)}} \quad (4)$$

$$Pr(Z = 4) = \frac{e^{x\beta(4)}}{e^{x\beta(1)}e^{e\beta(2)}e^{x\beta(3)}} \quad (5)$$

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The model however is unidentified in the sense that there is more one solution to $\beta^{(1)}$,$\beta^{(2)}$, $\beta^{(3)}$ and $\beta^{(4)}$ that leads for the same probabilities for Z = 1, Z = 2, Z = 3 and Z = 4. To identify model, one of the $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ and $\beta^{(4)}$ is arbitrarily set to 0, which is refers to as reference or base category.

The relative probability of Z = 4 to the base category is

$$\frac{\Pr(z=4)}{\Pr(z=1)} = e^{x\beta(4)} \quad (6)$$

This ratio is called the relative risk and assume that X and $\beta_k^{(1)}$ are vectors equal to (X_1, X_2,……..,X_k) and ($\beta_1^{(1)}$,$\beta_1^{(1)}$, ……$\beta_k^{(1)}$,respectively, the ratio of relative risk for one unit change in Xi relative to the base category is then stated as;

$$\frac{e_1^{\beta}(1)\,X_1+\cdots\ldots\beta_1^{(1)}\,(1+X_1+)+\ldots..+\beta_K^{(1)}xk}{e_1^{\beta}(1)\,X_1+\cdots+\beta_1^{(1)}X_1\ldots\ldots\ldots\ldots+\beta_K^{(1)}xk} = e_1^{\beta(1)} \quad (7)$$

The Xs' represent independent variables which are described as follows:
X_1 = Age (years)
X_2 = Household size (number)
X_3 = Educational status (years)
X_4 = Marital status (married= 1, single = 0)
X_5 = Gender (Dummy; male = 1, female = 0)
X_6 = Business experience (years)
X_7 = Flock size (number)
X_8 = Annual farm income (Naira)
X_9 = Annual savings (Naira)
X_{10} = Farming status (full-time = 1, part-time = 0)
u = Stochastic error term.

3.0 Results and Discussion

Table 1: Socio-economic characteristics of the poultry farmers in the study area

Variables	Frequency	Percentage
Gender		
Male	60	66.7
Female	30	33.3
Age (years)		
30-40	8	20
41-50	39	43.3
51-60	22	24.4
61-70	7	7.8
Mean	39.2	
Marital status		
Single	12	13.3
Married	77	85.5
Level of educational status		
Non-formal Education	18	20.0
Primary	39	43.3
Secondary	29	32.2
Tertiary	7	7.7
Mean	9.7	
Family size		
1-3	12	13.3

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4-6	47	50
7-9	27	30
10	5	5.6
Mean	6	
Farming status		
Full-time	75	83.3
Part-time	15	16.7
Breeds of birds		
Broiler	72	80.0
Layer	18	20.0
Business experience		
1-3	42	46.7
4-6	31	34.4
7-8	9	10.0
9-11	5	5.6
Mean	4.4	
Average annual income (₦)		
100,000-500,000	65	72.2
500,001-1,000,000	20	22.2
Annual savings (₦)		
10,000-100,000	81	90.0
100,001-200,000	7	7.8
200,001-300,000	1	1.1
500,001-1,000,000	1	1.1
Financial Institutions used by Agripreneurs		
Commercial Banks	67	74.4
Agricultural Bank	5	5.56
Microfinance Bank	18	20.0

Source: Field survey (2023)

Socio economic characteristics of poultry farmers

Table 1 displays the socioeconomic characteristics of the poultry farmers. According to the results, there were more men than women among the poultry farmers, about 66.7% of them were men and 33.3% were women. According to the study, the mean age of the poultry producers was 39.2 years, with 43.3% falling into the 41–50 age range and 24.4% falling into the 51–60 age range. This suggests that the poultry producers were within the productive age range. Majority (85.5%) were married among the poultry farmers. Education statistics shows that 43.3% and 32.2% had primary education and secondary education respectively, with mean years to attain the level of education of 9.7 years. This indicates that the poultry farmers could write and use digital effectively. About 50.0% and 30% has family size of 4-6 and 7-9 members respectively with mean family size of six (6) members. Majority (83.3%) took poultry farming as full-time business and source of their livelihood, with majority (80.0%) on broiler farming and mean farming experience of 4.4 years.

Commercial banks (74.4%) remain the dominant formal institutions providing finance to poultry, 20.% got their finances from microfinance banks and 5.56% obtained by agricultural bank

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Table 2: Cyber risks experienced by poultry farmers in accessing digital finance

Risk Variables	Yes		No	
	F	%	F	%
When I clicked on a link in an email that looked like it was from my bank, I was asked to enter my bank account information right away. I did this, and money was taken out of my account.	6	6.7	84	93.3
After I quickly replied to a text message (SMS) with my bank account details, money was taken out of my account.	15	16.7	75	83.3
My bank account information was exposed when I visited a malicious website, which gave thieves access to my account and enabled them to take money out of it.	3	3.2	87	96.8
Someone close to me took money out of my account using my ATM card.	9	10.0	81	90
I was confronted by robbers who took my money after I had withdrawn it from an ATM.	1	1.1	89	98.9
I was notified via text message that my ATM card had been disabled and that I needed to call the number provided to have it reinstated. I did as instructed, and money was taken out of my account once I gave my card information.	4	4.44	86	95.56
Despite the fact that my effort to send money using my mobile application was unsuccessful due to network issues, my account was debited.	73	81.1	17	18.9
When using my bank's USSD code, I consistently receive an error notice prior to a successful transaction.	80	88.9	10	11.1
I made payment with POS and transaction was not approved yet I was debited.	55	61.1	35	38.9
After a caller posing as a customer service representative from my bank informed me that I had altered my password without authorization, my online banking account was temporarily blocked. Money was taken out of my account after I provided them with my login credentials so they could unlock it.	12	13.3	78	86.7
After submitting my ATM/debit card details and making a transaction on a fraudulent website, money was taken out of my account without the products I had ordered being delivered.	0	0	100	100

Note: F = Frequency; % = Percentage
Field survey, 2023

Cyber risks experienced by poultry farmers in accessing digital finance

Table 2 lists the cyber threats that poultry farmers face. According to 6.7% of the poultry farmers, they received emails that seemed to be from their bank asking them to provide their bank account information as soon as possible via a link in the email. They did so, and money was then taken out of their account. About 16.7% of the poultry farmers reported that they had received text messages asking for their bank account information in order to give an immediate solution, and that after providing it, money had been taken out of their account. Additionally, 3.2% of respondents acknowledged that they had visited a malicious website on their devices, which exposed the system's stored bank account information and made it possible for criminals to take money out of their accounts. According to the analysis's findings, roughly 9% of the chicken producers said that a family member had taken money out of their accounts using their ATM cards without their permission. This suggests that farmers should keep their banking information

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private. This corroborates the findings of Yousafzai, Pallister, and Foxal (2003), who found that one issue with using internet banking is the lack of security in securing personal information.

After using an automated teller machine (ATM), 1.1% of respondents reported being harassed by criminals. This might be because they use the ATM during odd hours when it is free to use due to the long line, leaving them open to thugs and crooks. About 4.44% of the poultry farmers in the study area also confirmed that they had been the victims of criminals who sent them text messages claiming that their ATM cards had been deactivated and that they needed to call someone at the number provided in the message to reactivate them. They did so, and after giving the person their card information for reactivation, money was taken out of their accounts. When using their mobile bank application, 81.1% of poultry farmers reported unsuccessful transactions. These transactions were attributed to network problems, but money was still taken out of their account. This is consistent with some of the factors that Aboobucker and Bao (2018) listed as impeding the adoption of internet banking, where network problems were mentioned. Additionally, 61.1% reported that funds were deducted for POS transactions that were not authorised. About 13.3% of people got a call from an unidentified person posing as a customer service agent from their bank, informing them that their online banking account had been temporarily locked because they were suspected of requesting a password change without authorisation. They were then asked to provide their login credentials to unlock the account, which they did, and money was taken out of their accounts. None consented to shop on a bogus website, where they submitted their ATM or debit card information and had their money taken out of their account without getting the item they had paid for.

Table 3: Cybersecurity measures adopted by the poultry farmers

Variables	Yes		No	
	F	%	F	%
I'm especially cautious when using my internet banking system	52	57.8	38	42.2
I ignore and delete any emails or texts that ask for my online banking credentials.	63	70.0	27	30.0
I avoid clicking on links in emails that seem dubious.	74	82.2	16	17.8
I get in touch with my bank to confirm any information I find online or through text messages on my online account.	77	85.6	13	14.4
I frequently check the balance and history of my accounts.	74	82.2	16	17.8
I no longer use birthdates, addresses, or other phrases or figures that would be simpler for hackers to figure out as passwords.	78	86.7	12	13.3
My bank accounts don't all have the same passwords.	71	78.9	19	21.1
I don't visit the ATM after late hours or use lonely ATMs.	82	91.1	8	8.9
For my mobile banking, I currently utilise two-factor authentication (OTP and PIN).	89	88.0	11	12.0
I call my bank right away to block my account if I lose or misplace my ATM card.	74	82.2	16	17.8
I installed antivirus software to protect my computer against viruses, keyloggers, and other dangerous apps.	76	84.4	14	15.6
I don't use public WiFi or unprotected private networks for my internet business.	80	88.9	10	11.1
I only download apps from authorized app stores.	75	83.3	15	16.7
I contact my bank as soon as I see notifications of an unlawful debit.	78	86.7	12	13.3
I often and routinely request my account statement.	77	85.6	13	14.4
I only make purchases online using PREPAID CARDS.	74	82.2	16	17.8
I stop web browsers from storing my online banking login credentials.	78	86.7	12	13.3

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I make sure my bank's website is authentic before inputting my login credentials.	78	86.7	12	13.3

Note: F = Frequency; % = Percentage, Field survey, 2023

Cybersecurity measures adopted by the poultry farmers

The result from Table 3 shows that about 70% of the poultry farmers block, ignore and delete irregular email and text communications that has to do with their bank details hence preventing risk due to phishing. Approximately 86.7% of the poultry farmers agreed that they stay in touch with their bank regarding information obtained online or by SMS pertaining to their bank account, while 91.1% of them confirmed that they no longer use lonely ATMs or visit the ATM at strange hours. About 57.8% of respondents confirmed that they now exercise extra caution whenever they wish to access their online banking platform in order to avoid being targeted by predators as a result of their experience with these threats.

Additionally, 82.2% of poultry producers request a statement of their transactions and periodically review their bank account history. This is to maintain the bank's and the agripreneur's confidence. When their ATM card was missing, 82.2% of poultry farmers called their bank right away to deactivate it. In a similar vein, about 82.2% of poultry farmers check in with their bank on a regular basis to make sure everything is in order and to identify any attempts to hack their account. In order to reduce cybersecurity risks, about 86.7% of the poultry farmers in the study area agreed that they no longer use birthdates, addresses, or other information that could be easily guessed by hackers. They also said that they don't use the same passwords for all of their bank accounts. Approximately 82.2% of poultry farmers said they no longer click on links in emails that seem dubious, and 86.7% of them said that they check the legitimacy of the bank website before entering their information.

Table 4: Multinomial logit results for the determinants of levels of adoption of cybersecurity practices among poultry farmers in the study area

Variables		B	Std. Error	Wald	Sig.	Exp(B)/Odd Ratio
Moderate Adoption	Intercept	-2.145	1.746	1.510	.219	
	Gender (X_1)	-.464	.772	.362	.547	.629
	Age (X_2)	.084*	.044	3.564	.059	1.088
	Marital status (X_3)	.405	.991	.167	.683	1.499
	Household size (X_4)	.115*	.069	2.813	.094	1.122
	Educational Status (X_5)	-.142**	.073	3.812	.051	.868
	Farming status (X_6)	-1.729	1.321	1.712	.191	.178
	Farming Exp (X_7)	.091	.173	.276	.600	1.095
	Annual income (X_8)	-.001	.004	.109	.741	.999
	Annual savings (X_9)	-.008	.013	.362	.547	.992
	Flock size (X_{10})	-.004	.003	2.305	.129	.996
High Adoption	Intercept	2.382	2.621	.826	.363	
	Gender (X_1)	-.071	1.093	.004	.948	.931
	Age (X_2)	-.075	.076	.975	.323	.927
	Marital status (X_3)	-.603	1.391	.188	.664	.547
	Household size (X_4)	-.060	.229	.068	.795	.942
	Educational Status (X_5)	-.268***	.103	6.763	.009	.765
	Farming status (X_6)	.581	1.103	.278	.598	1.788
	Farming Exp (X_7)	.289	.192	2.257	.133	1.335
	Annual income (X_8)	.000	.000	.002	.962	1.000

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	Annual savings (X_9)	-.009	.013	.400	.527	.992
	Flock size (X_{10})	.000	.003	.022	.881	1.000
Very High Adoption	Intercept	-5.895	4.611	1.635	.201	
	Gender (X_1)	-.481	1.845	.068	.794	.618
	Age (X_2)	.103	.107	.925	.336	1.109
	Marital status (X_3)	-1.025	1.903	.290	.590	.359
	Household size (X_4)	-.173	.381	.207	.650	.841
	Educational Status (X_5)	.072	.177	.166	.684	1.075
	Farming status (X_6)	3.485**	1.597	4.761	.029	32.634
	Farming Exp (X_7)	.309	.353	.769	.381	1.363
	Annual income (X_8)	.000	.000	.002	.962	1.000
	Annual savings (X_9)	-.068*	.036	3.445	.063	.935
	Flock size (X_{10})	.006	.005	1.301	.254	1.006
	LR Chi square	51.461				
	Prob >chi square	0.000				
	Pesudo R^2	0.520				

Note: ***, **, * means significant at 1%, 5% and 10% respectively

Determinants of levels of adoption of cybersecurity practices among poultry farmers in Oyibo Local Government Area.

Results of the analysis on the major determinants of levels of adoption of cybersecurity practices among poultry farmers in the study area are presented in Table 4. The results are aimed at comparing moderate adoption, high adoption and very high adoption of cybersecurity practices with the base category, which is low adoption of cybersecurity practices. The result of the analysis indicates that the overall model with a log likelihood chi square ratio of 51.461 is significant at 1% suggests that the model has a strong explanatory power. It rejects the null hypothesis that all coefficients are zero. The Nagelkerke R-square value of 0.520 indicates that the combined effects of all the independent variables in the model explained 52 percent of the variation in the adoption of cybersecurity practices.

For the first set of coefficients, which is comparing low adoption and moderate adoption of cybersecurity practices, three variables were statistically significant. These variables were age (0.084, $p<0.10$), household size (0.115, $p<0.10$) and educational status (-0.142, $p<0.05$). The odd ratio of age is 1.088 which indicates that for every one unit increase in age, the odd of a farmer practicing moderate adoption of cybersecurity changed by a factor of 1.088. Because the odd ratio is greater than one, it means that an increase in age, farmers are more likely to practice moderate adoption of cybersecurity than the low adoption which is the reference category.

The odd ratio (1.122) of household with positive coefficient is greater than one which indicates that for a unit increase in household size, farmers are more likely to practice moderate adoption of cybersecurity. The odd ratio (0.868) of educational status is less than one, and also it has a negative coefficient, this implies that less educated farmers are more likely to practice low adoption which is the reference category than moderate adoption of cybersecurity. This conforms to expectation because uneducated farmers may not have requisite knowledge on cybersecurity practices.

For the second set of coefficients which is comparing low adoption and high adoption of cybersecurity practices among poultry farmers, only one variable is statistically significant, and that is educational status (-0.268, $p<0.01$). Educational status has a negative coefficient with odd ratio (0.765) less than one, this implies that a unit decrease in education, farmers are more likely to practice the reference category (low adoption) than the high adoption.

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For the third set of coefficients, which is comparing low adoption and very high adoption of cybersecurity practice among poultry farmers in the study area, two variables were statistically significant. They were farming status (3.485, p>0.05) and annual savings (-0.068, p<0.10). The odd ratio (32.634**)** of farming status been greater than one with positive coefficients, this implies that full time poultry farmers in the study area are more likely to practice very high adoption of cybersecurity practices than low adoption which is the reference category. Annual savings has a negative coefficient with odd ratio (0.935) less than one. This implies that poultry farmers who save less are more likely to practice low adoption than the very high adoption in the study area.

4.0 Conclusion and Recommendations

The cybersecurity practices used by poultry producers in Oyigbo LGA, Rivers State, Nigeria, were evaluated in this study. According to the multinomial analysis, the primary determinants of the degree of cybersecurity practice assessment among poultry farmers in the study region are age, household size, educational attainment, farming status, and annual savings. The risks that poultry farmers face while implementing these cybersecurity measures include the possibility of fraudsters posing as bank agents and requesting account details, as well as receiving email and SMS alerts asking for quick account details. Additionally, the time it takes for unsuccessful funds transfers to be returned, the banks' slow response to concerns about electronic banking risks, the fact that there aren't many ATMs and those that are are frequently crowded, making poultry farmers vulnerable to criminal activity by using them at odd hours. The study therefore, recommends that:

i. As a result of the growing market popularity and importance of developed banking products and services to all customers, banking service providers ought to think about offering innovative technologies that are economical for both customers and bank operations. Famers should be encouraged to use secure and up-to-date devices for financial transactions, and avoid public computers or untrusted devices. As well as promote the use of strong, unique passwords for financial accounts and advise farmers against sharing them with others.
ii. Farmers should be educated about the importance of using secure Wi-Fi connections, and advise against using public Wi-Fi for sensitive transactions. As well as regularly review their financial transactions to detect any unauthorized activity promptly.
iii. Government and financial institution bodies should train farmers to recognize phishing attempts and avoid clicking on suspicious links or sharing personal information. There is also, a need to increase the awareness of using trusted financial apps and ensuring they are downloaded from official app stores among farmers.
iv. Government, NGOs and financial institution bodies should educate farmers about the importance of cybersecurity to create a collective sense of responsibility. As well as stress the need for regular backups of important financial data and recommend storing them offline.

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