International Livestock Research Institute (ILRI)

Internship report

Impact of biosecurity training on farm management practice in Nigeria

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Introduction

Highly pathogenic avian influenza (HPAI) is an infectious disease in poultry and can result in high mortality in domestic poultry. Infections in poultry occur as a result of direct contact with infected birds. These could be prevented by good husbandry, nutrition and vaccination. The government has put in place measures to improve poultry farming such as training farmers on biosecurity measures, improving quarantines and live bird markets, vaccination and provision of compensation to affected farmers.

The study was carried out Nigeria with an aim of assessing the effectiveness of biosecurity training among the poultry farmers. A total of eight states were included in the study. These were later grouped into four clusters where each cluster comprised of a high risk state paired with a low risk state so that we had:

- Cluster A: Ogun /Lagos and Oyo
- Cluster B: Anambra and Enugu
- Cluster C: Plateau and Nassarawa
- Cluster D: Kano and Jigawa

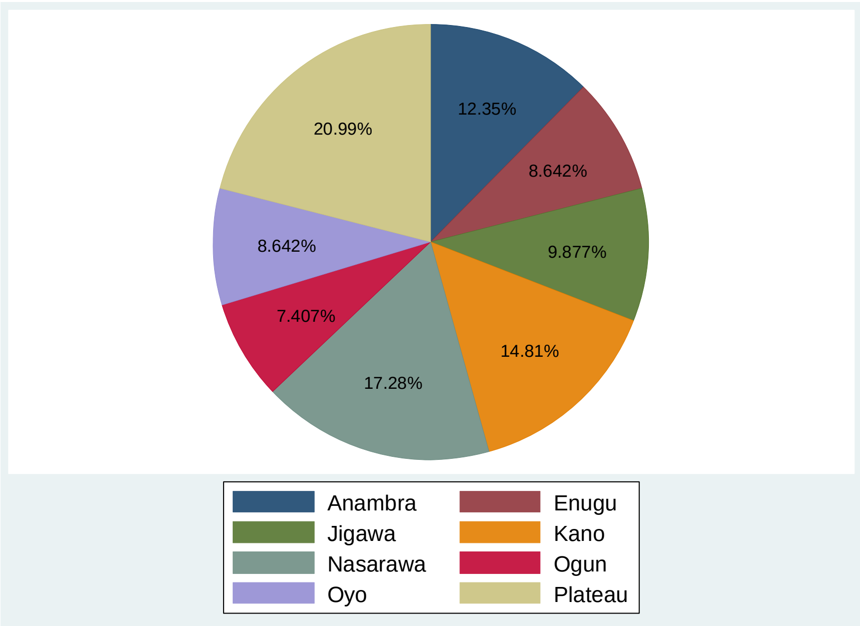


Figure 1: Proportion of farmers interviewed in each state.

With the aid of secondary data farmers that were trained on biosecurity practices were identified. The households were further classified into four categories:

- Trained- Infected
- Trained- Uninfected
- Untrained- Infected
- Untrained- Uninfected

From the four categories, three farmers were singled out in each state to hive an overall sample size of 96 farms. A total of 82 poultry farmers participated in the survey.

Methodology

Data validation and verification

The data was originally in access then imported into STATA 11.1 for analysis. The data contained three categories of variables; those that described the farm and respondent characteristics, the independent variables and the outcome variables (biosecurity related variables).All the variable names were not clear hence renamed.

Those that were missing labels were labelled for comprehensibility. Variables like city, town and village had to be dropped because they had very few records thus did not give sufficient information. Location was then used in place of these variables as it had more records and also covered a lot of information about the above stated dropped variables.

Individual responses especially string entries in the open ended questions were verified with invalid ones being dropped and others summarised to make sense. In cases where the respondent was allowed to give more responses outside the list of those provided, such entries too were verified where most of them that had close meaning to those in the choices were fitted into the most likely option.

The data was also checked to identify irrelevant entries for instance where a farmer gave a negative answer to a question then further gives a positive answer to a question related to that which he had earlier on responded to negatively, entries of this sort were dropped.

Ambiguous entries were deleted these included cases where counts for animals or workers were given as decimal numbers take for instance the number of poultry attendants on a farm.

Generating new variables

Other procedures involved in cleaning the data included combining multiple response variables and generating new ones for example the variable on farmers' sources of veterinary services was recorded as a set of indicator variables, one for each possible response, these variables were combined and a new one generated so that we had 4 sets of variables representing the sources of veterinary services

Table 1: New combined variables generated indicating the farmers' source of veterinary services

Source of veterinary services	Percentage
Government vet	44 (n=33)
Resident farm vet	5 (n=4)
Private vet	47 (n=35)
Private vet and government vet	4 (n=3)

Coding

The data cleaning process further involved procedures such as encoding string variables to numeric as STATA does not recognize string variables.

Generating indices

Scores used ranged from 0 (worst biosecurity practice) to 4 (best biosecurity practice). A new variable containing the sum of the scores of the biosecurity related variables was generated. Principle component analysis was used to get a small set of variables which were uncorrelated with each other hence avoid the problem of multicolinearity. Normally, when using principle component analysis, cases that have a missing record are automatically deleted, to avoid such loss of data, all the missing entries in the biosecurity related variables were recoded to zero after which principle components were derived.

Table 2: List of biosecurity related variables and the values of the first principle component

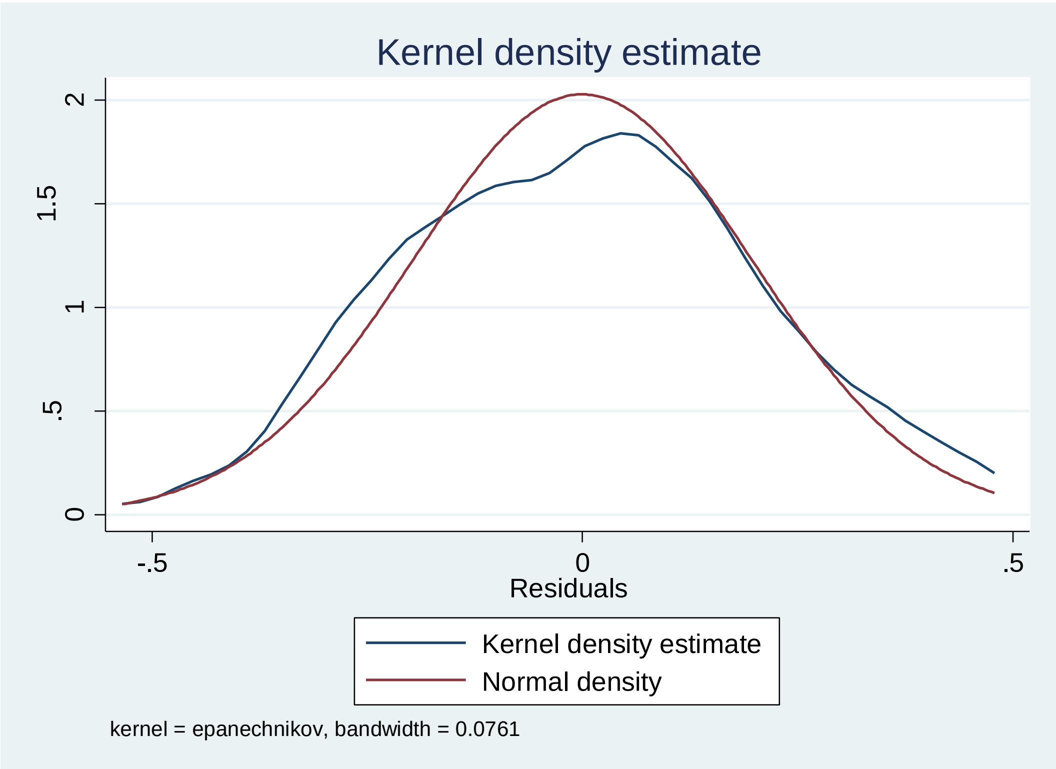
Variable	**First principle component**
othervisfarm1	0.1977
visother1	0.1800
freq_recvis1	0.0976
acespprem1	0.2816
acespen1	0.1913
fenceprem1	0.2498
fbath_ent	0.3445
fbath_rplnsh1	0.3547
fbathpen1	0.3279
freqrep_fbath1	0.2932
wal_material1	0.1637
floor_mat	-0.1400
roof_mat	-0.2273
phouse_clean	0.2206
poult_contact	0.2608
carc_dispose	-0.0336
sel_broil	-0.0758
sel_splayers	0.0118
consider_rplstoc	-0.2424
frequent_vis	0.1489

Note: Each of these values were multiplied with the corresponding biosecurity related variable then summed to generate a new variable which was used as an index to measure the level of implementation.

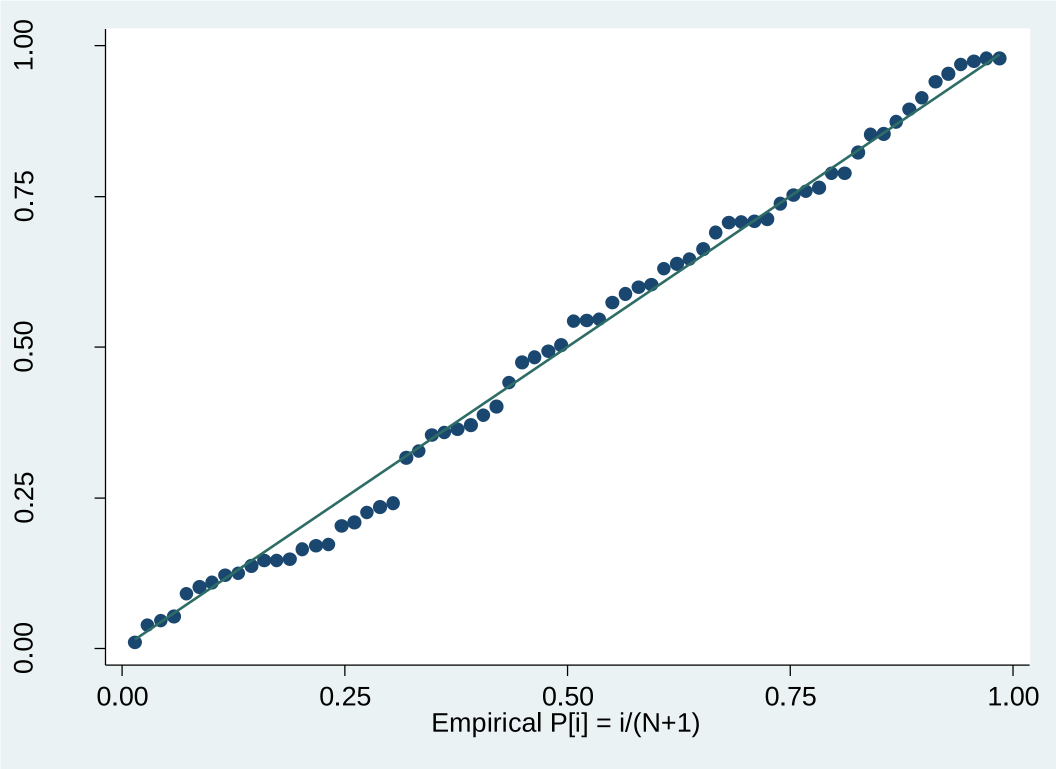
Normally, the first principle component explains the most variation in the data so using the factor scores from the first principal component analysis as weights; a dependent variable was constructed for each farm. The indices derived were relative measures of the implementation of the biosecurity measures, the higher the index the higher the implementation of the biosecurity measures. This variable was used as the dependent variable in the regression model. To test whether training had an influence on the biosecurity practices mixed models were used having biosecurity index, training, gender age, distance of closest poultry farms and number of chicken kept as the fixed effects and state as the random effect.

Model diagnostics

To validate the model, residuals were first obtained and the check for normality performed on the model's residuals using the command **knorm**. The results obtained showed indications of normality.



The pnorm command was also used and the result obtained also indicated that the model's residuals had a normal distribution.



Source: http://www.ats.ucla.edu/stat/stata/whatstat/whatstat.htm

Pearson's chi-square tests were used to test for the association between the training status and use of biosecurity practices taught.

Results

Majority of the respondents (62% n=49) were males. Of the farmers interviewed the most dominant were those aged 31 years and above and only 5(6%) below 30 years. The number of birds kept were categorised into 4 groups (Table 3).

Table 3: Number of chicken kept per category

Category	Number of chicken kept	Percentage
1	Less than 320	24.39 (n=20)
2	321-1150	23.17 (n=19)
3	1151-2500	26.83 (n=22)
4	2500 and above	25.61 (n=21)

Only 20(24.39%) farmers kept less than 20 chickens while majority kept more than 320, indicating that large scale poultry farming is a common practice among the farmers. Most farmers (82% n=63) cited eggs as their main chicken production type. Of those interviewed Fifty seven per cent (n=45) of the respondents' poultry had not been infected with HPAI in the past while thirty eight per cent (n=30) had been infected.it was also noted that a further 87 %(n=68) of the respondents had never vaccinated their poultry against Highly Pathogenic Avian Influenza. On the contrary, a greater number (94% n=75) said they had used vaccines to control Fowl cholera and Gumboro diseases.

Farm registration

Majority of the farmers (68% n=48) had registered their farms, they went on and suggested that they had registered their farms as the government required them to do so. It was also noted that most of these farm registrations took place in years 2006 and 2007.

Biosecurity training

48 out of 78 farmers (62%) had attended a training workshop focussing on poultry biosecurity. Lessons learnt and implemented on farms from these workshops as indicated by the farmers included:

- Fencing of poultry premises.
- Putting up a footbath and replenishing the disinfectant used in it.
- Vaccination of poultry.
- Cleanliness of poultry houses
- Restriction of visitors to the farm.
- Proper disposal of carcasses.
- Separation of poultry and other animals
- Provision of protective clothing to staff.

When further asked if the indicated biosecurity measures they had implemented on the farms were still in place, majority of the farmers had the above measures still in place. Only 8 out 51 (15%) farmers had not been able to train someone else using the knowledge they had obtained from these courses.

Training and response to outbreaks

Thirty eight per cent (n=31) of the farmers interviewed cited they had had a HPAI outbreak or suspected HPAI infections on their farms in 2006(n=14 48%) and 2007(n=15 52%).A higher proportion of trained farmers (n=17 74%) reported the outbreaks/suspicions to the authorities. Eighty eight per cent (n=30) of all the farmers that had outbreaks on their farms said that the HPAI team made a follow-up on the outbreak/suspicion after reporting. Both trained and untrained farmers had the carcasses sampled. Of the infected farms, thirty two per cent (n=9) indicated that the carcasses were sampled by NAICP desk officers, response team (32% n=9), state/private veterinarians (18% n=5), NVRI (14% N=4) and other (4% n=1). The types of samples collected as indicated by the farmers in decreasing order include:

- Carcasses(54% n=14)
- Blood and carcasses(19% n=5)
- Carcasses, swabs and blood(8% n=2)
- Carcasses, blood and serum(4% n=1)

Field team performance on the farms

Out of 35 farms,28(80%) were disinfected by the field team during the first outbreak, PPE equipment was used in 30 farms(86%) and culls were conducted in the surrounding area in 21 farms(60%)

Summary of the variables used to generate the indices

Association between farmers

Biosecurity practice		Trained	Untrained	P value
Sharing of farm implements.		4.17%(2)	0	Fisher's exact P= 0.771
Other poultry farmers visit the farm.		50%(24)	43.33%(13)	Chi2=0.3938 P=0.821
Farm visits by owner and workers to other poultry farms.		20%(9)	24.14%(7)	Chi2=1.2744 P=0.529
Frequency of visits to other farms.	1. At least once every week	7.14%(3)	7.14% (2)	Fisher's exact P= 0.326
	2. At least once every 2 weeks	0	7.14% (2)	
	3. At least once every month	4.76% (2)	0	
	4. Once in a long time	4.76%(2)	11.11%(3)	
	5. Never	83.33% (35)	74.07% (20)	
Frequency of visits from other farms.	1. At least once every week	39.58%(19)	40%(12)	Fisher's exact P= 0.272
	2. At least once every 2 weeks	2.08%(1)	6.67%(2)	
	3. At least once every month	8.33%(4)	0	
	4. Once in a long time	27.08%(13)	36.67%(11)	
	*5. Never	20.83%(10)	10%(3)	

*There was no association between the training status of the farmers and sharing of farm implements. Regardless of the training status, both trained and untrained farmers shared farm implements.

*Despite training, farmers still received visitors from other farms. Similarly both trained and untrained farmers visited other poultry farms in the area. Training did not influence these two practices.

*There was no association between the training status of the farmers and the frequency of the visits.

Access to poultry

BIOSECURITY PRACTICE	TRAINED	UNTRAINED	Chi-square statistic.
Visitors can easily access poultry premises.	51.06%(24)	50%(15)	Chi2=0.009 P=0.996
Visitors can easily access to poultry pen.	8.51%(4)	23.33%(7)	Chi2=3.3461 P=0.188
Presence of a fence or gate around the poultry premises.	*73.33%(33)	67.86%(19)	Chi2=6.0730 P=0.048
Presence of a footbath at the entrance to the farm.	35.42%(17)	27.59%(8)	Chi2=1.4422 P=0.486
Presence of a footbath at the entrance of each pen.	53.19%(25)	58.62%(17)	Chi2=1.7301 P=0.421

*There was a significant association between training status and fencing of the poultry premises. A higher proportion of trained farmers (73.33% n=33) as compared to untrained farmers (67.86% n=19) had a fence or gate around their poultry premises.

BIOSECURITY PRACTICE		TRAINED	UNTRAINED	P value
Materials used to build poultry walls.	cement block/stone	81.25%(39)	93.1%(27)	Fisher's exact P= 0.705
	off-cut wood	6.25%(3)	0	
	wood planks	6.25%(3)	3.45%(1)	
	wire mesh	2.08%(1)	0	
Materials used to build the poultry floor.	earthen	8.33%(4)	0	Fisher's exact P= 0.395
	cement	89.58%(43)	96.67%(29)	

Materials used to build the poultry roof.	Tin	64.44%(29)	77.78%(21)	Fisher's exact P= 0.708
	Thatch	4.44%(2)	0	
	Other	26.67%(12)	18.52%(5)	
Level of cleanliness of the poultry houses.	Very clean	20.83%(10)	20.69%(6)	Chi2=2.4468 P=0.485
	Clean	72.92%(35)	62.07%(18)	
	Dirty	4.17%(2)	10.34%(3)	
Possibility of poultry coming in contact with other forms of birds/animals.	Very unlikely	46.81%(22)	31.03%(9)	Chi2=2.7894 P=0.425
	Likely	42.55%(20)	55.17%(16)	
	Very likely	8.51%(4)	6.90%(2)	
Methods of disposing carcasses.	Buried	64.58%(31)	65.52%(19)	Fisher's exact P= 0.273
	Consumed	4.17%(2)	0	
	Incinerated	2.08%(1)	10.34%(3)	
	Sold	0	6.90%(2)	
	Fed to animals	12.50%(6)	3.45%(1)	
	Thrown away	10.42%(5)	10.34%(3)	
Methods of selling broilers.	Slaughter here and sell dressed	13.51%(5)	8.33%(2)	Fisher's exact P= 0.775

	Slaughter elsewhere and sell dressed	0	0	
	Sell live birds	70.27%(26)	70.83%(17)	
Methods of selling spent layers.	Slaughter here and sell dressed	4.55%(2)	3.70%(1)	Fisher's exact P= 0.658
	Slaughter elsewhere and sell dressed	0	0	
	Sell live birds	88.64%(39)	81.48%(22)	
Methods of selling eggs.	Do not raise layers	0	0	Fisher's exact P= 0.012
	Sell to traders from the farm	54.76%(23)	80.77%(21)	
	*Sell and deliver to traders	23.81%(10)	0	
	Sell to consumers from the farm	11.9%(5)	3.85%(1)	
	Take to market to sell	0	0	
Key considerations before purchasing a replacement stock.	Breed	19.57%(9)	14.81%(4)	Chi2=18.7632 P=0.281
	Breed & Health status	26.09%(12)	29.63%(8)	
	Breed & Health status & Vaccination record	6.52%(3)	14.81%(4)	
	Price	4.35%(2)	18.52%(5)	

*There was a significant association between training and the mode of selling eggs, a larger proportion of trained farmers (24% n=10) sold and delivered their eggs to traders while none of the untrained farmers practised that.

Regression analysis

biosecurit~1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_Igender_2	-.0841177	.0589447	-1.43	0.154	-.199647	.0314117
_Iage_2	.140039	.1083749	1.29	0.196	-.0723719	.3524499
_Iage_3	.2443414	.1080823	2.26	0.024	.032504	.4561787
_Iage_4	.1331707	.106934	1.25	0.213	-.0764162	.3427576
closfarm	-.0171722	.0115953	-1.48	0.139	-.0398986	.0055542
_Itraining~1	.1168565	.0564288	2.07	0.038	.0062581	.2274549
_Ichick_ca~2	.1548246	.0756477	2.05	0.041	.0065577	.3030914
_Ichick_ca~3	.3439975	.0759591	4.53	0.000	.1951204	.4928747
_Ichick_ca~4	.35348	.0836504	4.23	0.000	.1895282	.5174319
_cons	.0358164	.1120764	0.32	0.749	-.1838493	.255482

There was evidence that training (p=0.038) was significant. Farmers who had been trained on the biosecurity measures were better than the untrained ones. Those aged between 41 and 50 years were noted to be better enactors of the practices. However the gender of the farmers was not significant. Both female and male farmers had similar practices. Proximity of the other farms did not influence the implementation of the biosecurity measures taught.

Issues with the data

- The variables used to generate the indices had quite a number of missing entries.
- Poor variable names which were difficult to comprehend hence had to rename all the variables.
- Poor coding - some variables were not properly coded where codes were assigned to non-existent groups and even missing values were coded. As a result some codes had to be replaced for accuracy.

References

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