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AN APPRAISAL OF TRADITIONAL INCUBATION AND HATCHING METHODS OF INDIGENOUS POULTRY EGGS IN KWARA STATE, NIGERIA

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Abstract

This study was conducted to assess traditional incubation and hatching methods of indigenous poultry eggs, and the level of knowledge of poultry farmers in Kwara State of Nigeria. A multi-stage sampling procedure was used to select 80 household poultry keepers who were interviewed using structured questionnaires for data collection. Four Local Government Areas (LGAs) were randomly selected while a non-probability snow-ball technique was used to select five households who are known for rearing indigenous chickens. The results showed the mean age of poultry keepers in the study area was 51±8 and the mean flock size in the study was 21±5.chickens About 11.2% of the respondents keep poultry as a source of income and 7.5 % raise chickens solely for consumption while 87.5% keep chickens for both consumption and income purposes. 71.2% of respondents keep chicken eggs for incubation and hatching for replacement purposes. The mean income from sales of poultry products was 2,800±149 NGN (US$7.7). The result further showed that 52.8% of the farmers had a low level of knowledge while 32.4% had a moderate level of knowledge and only 14.8% of them had a high level of knowledge about the process of traditional incubation and hatching methods. The ordered logistic regression model results showed that, age 0.128 (p=0.00611), annual income 0.000212 (p=0.0193) and years of formal education 0.5318 (p=0.0121) influenced the likelihood of higher level of knowledge about the processes of incubation and hatching of eggs of indigenous chicken of the respondents. Predator, inadequate funds, and theft are the major constraints faced by the poultry keepers in the study area. There is a need for more empirical studies by animal breeders and extension service providers to give proper orientation to the poultry keepers on the process of incubation and hatching of eggs for rapid multiplication of indigenous poultry birds to improve food and nutritional security for a sustainable development.

Key words**:** *poultry farming, hatching strategies, Indigenous knowledge*

INTRODUCTION

Indigenous poultry production is a common family poultry management in Africa and more than 80% of the total population of birds is raised in the rural areas [11]. The poultry may range freely in the household environment for feed and may get supplementary feeds from the keepers [18].
Rearing of indigenous poultry is common in rural communities because of the easy of establishment for low-income families and its maintenance where they scavenge for feed and from kitchen wastes [16]. Its importance in rural household nutritional security and poverty alleviation has given it the attention in the last decade in most African Development Programmes [12]. They play a significant role in the livelihoods of most rural families in Africa. Many studies had proved the importance of indigenous poultry production in terms of contribution to income, improved nutritional status and improvement in food security for rural households of various African countries [13]; [9]; [2]; [15]; [4].
[14] noted that natural incubation is the most commonly used method for replacing and increasing the size of flocks by the use of broody hens. These broody hens must be provided with a dark and quiet place for

laying and incubation and keepers must prepare appropriate environments for brooding. The increase and multiplication of these chickens is then essential. [2] listed the following factors that are important for successful natural incubation. These include; availability of feed and water for the hen, absence of external parasites on the broody hen, eggs must be stored under a controlled environment (Temperature between 12 and 14 ^{0}C, the humidity of between 75 to 85 %and storage period should not be longer than seven days); extra fertile eggs introduced under the hen from elsewhere should be introduced at dusk and finally, the eggs must be tested for fertility after one week by holding them up to a bright light. A completely clear egg is infertile. The authors further indicated that hatchability of 80 % of egg set is normal but a range of between 75 and 80 % is considered satisfactory.

There is a paucity of information on traditional incubation and hatching methods of indigenous poultry eggs since its rearing has been considered as a side-line agricultural activity. Therefore, the objectives of this study were: to assess the socio-economic characteristics of indigenous poultry keepers in the study area; determine the knowledge of farmers about testing techniques of fertility of indigenous poultry eggs as a traditional incubation and hatching method and determine the level of indigenous knowledge of the poultry keepers about processes involved in incubation. Sound knowledge of such indigenous practices will guide the design of intervention programmes to increase the yield and outputs of indigenous poultry production systems.

MATERIALS AND METHODS

This survey was carried out in Kwara State of Nigeria. The study area is known for its agriculture and cultural activities. There are 16 Local Government Areas (LGAs) in the State. A multi-stage sampling procedure was used. At the first stage, 25% of the total LGA was proportionately selected (Isin; Edu; Oyun; and Moro) LGA. In the second stage, four villages were randomly selected from each LGA and at the last stage, the non-probability snowball technique was used to select five respondents to represent their household in each village. In the end, 80 respondents who were keepers of indigenous chicken were interviewed. Data were collected using well-structured open-ended questionnaires

Data management and statistical analysis

Data collected were summarised using SPSS Version 21.0 Package to interpret the socio-economic status of the respondents using frequency count, percentages and charts. Inferential statistics which included ordered logistic regression and correlation analysis were used in the study. The hypothesis tested was that there is no significant influence of selected socio-economic characteristics and farmers' knowledge of incubation and hatching processes.

The knowledge score was determined with the use of maximum and the minimum score to determine the range. The least score was 12 points while the maximum was 30. The range was 18 (i.e. 30-12= 18). The range was divided into three since knowledge was grouped into high, moderate and low. The result, 6 was obtained. This was added to 12 to make 18, also added to 18 to make 24 and to 24 to make 30. Then, knowledge scores were grouped into 12-18 (low), 18-24 (moderate) and 24-30 (high). The respondents whose scores fell within these intervals were described as exhibiting the corresponding level of knowledge.

RESULTS AND DISCUSSIONS

Respondents' profile and socio-economic characteristics

Results in Table 1 show that many (78.80%) of the respondents' for the study were females and others (21.20%) were males. This is comparable with the report of [17] that reported that 78% of men and 22 % of women keep village chicken in Nigeria. [5] also noted that village fowls kept in Nigeria are largely owned by women (86%) compared with 14 % male keepers. These results indicated that, poultry keeping is traditionally the role of women in many developing countries. This

implies that women are mostly the owners of chickens in households and this could result in improved household's nutrition.

Table 1. Distribution of respondents' personal and socio-economic characteristics of poultry keepers

Variable	Frequency	Percentage	Mean
Sex			
Male	16	21.20	
Female	63	78.80	
Age			
< 40.00	9	11.25	51±12
40.00 - 59.00	55	68.75	
60.00+	16	20.00	
Primary occupation			
Farming	20	25	
Trading	24	30	
Artisan	6	7.5	
Civil service	27	33.70	
Others	3	3.8	
Years of formal education			
No formal Education	26	32.5	7±3
1-6	18	22.5	
7-13	23	28.8	
13+	13	16.2	
Number of birds			
<10	13	16.25	21±9
10-20	24	30.00	
21-30	32	40.00	
>30	11	13.75	
Type of breed			
Local	76	95	
Local and exotic	4	5	
Reasons for keeping birds			
Income	9	11.20	
Income and consumption	64	80.00	
Income and cultural	1	1.20	
Consumption alone	6	7.50	
Income from birds/month (naira)			
>1,000	7	9.45	NGN 2,800±149 (7.7USD)
1,000-10,000	51	68.92	
10,001 and above	16	21.63	
How often do you hatch eggs			
Rarely	23	28.8	
Occassionally	57	71.2	

Source: Field survey 2019.
Note: (360) NGN was equivalent to 1 USD.

Further results from the survey showed that few (11.25%) of the respondents who owned chicken are youth of less than 40 years of age. The majority (68.75) of them were between 40 and 59 years old and only 20 percent were older than 59 years of age. Local poultry production is not of interest to the youth in the study area, showing that, local birds are largely owned by aged people in the area. The mean age of poultry farmers in the study area was 51±8. The result of respondents' primary occupation revealed that 25 percent of the respondents were farmers, 30% were traders, 7.5% were artisans while 37.5% of them were civil servants. The educational background in terms of years of formal education of the respondents showed that about 33 percent of the respondents had no formal education, 22.5 percent had between 1 and 6 years of formal education, 28.8 percent had between 7 and 12 years of formal education while 16.2 percent had over 12 years of formal education. The mean years of formal education were 7.73±3 years.

Flock size

The proportion of the respondents that has less than 10 birds was 16.25 percent, while 30 percent had between 10 and 20 flock sizes, 40 percent had between 21 and 30 flock size but only 13.75 percent of the respondents' had more than 30 birds. The mean flock size in the study was 21±5. Unlike the report of [11] who indicated that the flock size generally ranged from 5 to 20 fowls per African village household. Almost (95%) of the respondents keep just a local breed of chicken (Yoruba and Fulani ecotypes} while the remaining 5 % of them keep exotic breeds together with their local chicken. This indicates that there is need for breed conservation of these two ecotypes (Yoruba and Fulani) since majority of the household still keeps them under the backyard systems.

Respondents showed their preference for the local breed (Yoruba and Fulani ecotypes) as 67.5 percent indicated that they have quick returns from keeping them, 32.5 percent of the respondents said they are easy to maintain and raise, they incubate and hatch their eggs without any serious technical procedure compared to the exotic stocks.

About 11.2 % of the respondents keep poultry for commercial purposes and as a source of income and 7.5 % raise chickens solely for consumption while 87.5 percent keep chickens for both consumption and income purposes although one respondent indicated that his purpose for raising local chicken was for cultural reasons. These results tallies with

the findings of [19] that, in Ethiopia, income generation and household consumption are the main production objectives of keeping local chicken stocks. 71.2 % of respondents indicated that chicken eggs are often incubated aiming at replacing the off-take and loss of chicken from the flock. This finding is close to [19] in the study of the village chickens production system in Ethiopia who reported that over half of eggs produced are incubated to replace the old stocks.

Income

Village poultry keepers who rear chicken for solely income and those that keep for income and other reasons indicated the annual income they realized from the sale of chicken and eggs. 9.45 percent realized less than 1,000 NGN (2.8 USD) while around 70 percent of them realized between 1,000 to 10,000 as annual income from sales, interestingly, 21.63 percent of them get income above 10,000 NGN (27.8 USD) from the sale of chicken and eggs. The mean income from sales of poultry products was 2,800±149 NGN (7.7 USD).

Knowledge of farmers about traditional methods of incubation and hatching of indigenous poultry eggs.

Table 2 shows the absolute figures and percentages (figures in parenthesis) of respondents on various levels of farmer's knowledge about processes of preparing of fertile eggs for incubation and hatching. Most respondents indicated that they have had about the processes as listed in the Table 2. Only few indicated that they have no knowledge, other options: seen and performed, seen and performed by self and possess mastery are as shown in Table 2. This reveals that, farmers in this study area need appropriate training in order to improve their capacity to carry out the processes involved in incubation and hatching under traditional system of poultry production.

Table 2. Process of traditional methods of incubation and hatching of indigenous poultry eggs

Process of traditional methods preparing of eggs for incubation	No knowledge	Heard about	Seen and performed	Performed myself	Possess mastery	Rank
Egg selection by age	2 (2.5)	66(82.5)	11(13.75)	0	1(1.25)	1st
Washing with warm water	3(3.75)	65(81.25)	8(10)	2(2.5)	2(2.5)	2nd
Egg selection by age and size	4(5)	60(75)	9(11.25)	2(2.5)	5(6.25)	3rd
Washing with cold and warm and cleaning with cloths and other material	10(12.5)	58(72.5)	10(12.5)	1(1.25)	1(1.25)	4th
Eggs selection by size	5(6.25)	42(52.5)	12(15)	10(12.5)	11(13.75)	5th
Washing with cold water	5(6.25)	24(30)	22(27.5)	14(17.5)	15(18.75)	6th
Cleaning with cloth or other materials	9(11.25)	15(18.75)	15(18.75)	26(32.5)	15(18.75)	7th
Egg Treatment	13(16.25)	14(17.5)	27(33.75)	20(25)	6(7.5)	8th

Source: Data collected from field survey 2019.

Absolute figures for the respondent's levels of knowledge about testing techniques of fertility of eggs for incubation are as shown in Table 3. Most of the respondents had no knowledge about these practices; few indicated that they heard about it, others responded that, they have seen and performed it, performed by self and some indicated possession of mastery of the testing techniques.

Table 3. Testing techniques of fertility of eggs for traditional methods of incubation of indigenous poultry eggs

Testing Techniques of fertility of eggs for incubation	No knowledge	Heard about	Seen and performed	Performed myself	Possess mastery
Visual examination through sunlight	45	24	6	4	1
By weighing eggs	43	34	2	0	1
By breaking egg sample	34	35	4	1	6
Shaking	33	5	12	18	12
Floating eggs in water	24	6	10	21	19

Source: Data from the field survey 2019.

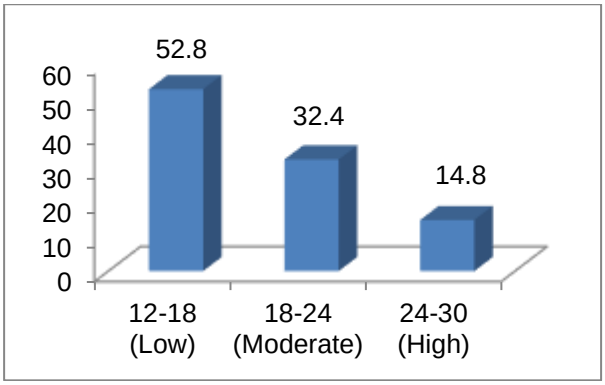

Fig.1. Level of indigenous farmers' knowledge of processes involved in incubation.
Source: Field survey, 2019.

Table 4 presents the result of the ordered logistic regression model used to examine the determinants of farmers' knowledge of incubation processes. The three categories of level of knowledge of incubation processes are low, moderate and high. This formed the dependent variable as ordered 1, 2 and 3 respectively. Four variables were included in the model and three were found to be statistically significant. The likelihood ratio chi square of 16.40 with a p-value of 0.0025 indicates that the model as a whole is statistically significant. The model has a log likelihood of -46.7942. Age (0.128) was positively significant with 0.00611 as p-value. This implies that an increase in the farmers' age by one unit will result in 0.128 increase in likelihood of higher knowledge of incubation processes. Older farmer have more years of experience in indigenous poultry keeping, hence higher knowledge of indigenous incubation methods.

Also, annual income has a positive statistical significance as its p-value was 0.0193. This gives the implication that an increase in income by one unit will result in 0.000212 increase in likelihood of higher knowledge of incubation processes among the farmers in the study area. Years of formal education (0.532) was positively significant because of the p value of 0.0121. This implies that an increase in the years of education by one unit will result in 0.532 increase in the likelihood of higher knowledge of incubation processes among the farmers in the study area. Number of birds owned per farmer is negatively correlated (-0.0963) with knowledge indicating that the higher the number of birds, the lesser the attention for details about processes of incubation and hatching.

Table 4. Ordered logistic regression result for determinants of farmers' knowledge of incubation processes

Variable	Coefficient	Standard error	z-test	P > |z|
Age	0.128***	0.0471	2.73	0.00611
Annual income	0.000212*	0.000111	1.76	0.0193
Years of formal education	0.532**	0.229	2.31	0.0121
Number of birds	-0.0963	0.0696	-1.38	0.166
Log likelihood = -46.7942		LR chi^2 (4) = 16.40		
Prob > chi^2 = 0.0025		Pseudo R^2 = 0.15		

Source: Field survey, 2019.

Constraints associated with indigenous poultry production

The poultry farmers identified certain constraints associated with poultry farming that influence the process of incubation and hatching of indigenous chicken eggs in the study area. The identified constraints were ranked based on severity. Results on Table 5 show that predator, inadequate fund, theft, changes in climate, hen laid eggs in unknown locations, diseases infections, marketing problems, external parasites of the hen and internal parasites were ranked 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, and 9th in the order of severity. This result is in line with the findings of [3] and [10] who reported that in the free-range and backyard poultry production system, diseases are the major limiting factor to the production of indigenous chickens but predation is a number one challenge. Also, research work in Benin Republic [8], Burkina Faso [7], Mauritania [6] reported that Newcastle is the most devastating disease in village chickens. [19] reported that price fluctuation was a marketing challenge faced by village poultry farmers. Other challenges

such as low egg production and inadequate access to and high cost of veterinary services [1] but were not identified as major challenges by the farmers in the study area.

The result in Table 5 shows that the major constraints associated with indigenous incubation of eggs in the study area were, predator, inadequate fund, theft, change in climate, and eggs laid in unknown location along other constraints ranked on the bases of highest response.

Table 5. Distribution of respondents based on the constraints associated with indigenous incubation of eggs

	Major Constraints		**Minor Constraints**		
	Frequency	Percentage (%)	Frequency	Percentage (%)	Rank
Predator	60	75.00	20	25.00	1st
Inadequate fund	50	62.50	30	37.50	2nd
Theft	37	46.25	43	53.75	3rd
Change in climate	36	45.00	44	55.00	4th
Eggs laid in unknown locations	14	17.50	66	82.50	5th
Diseases infection	12	15.00	68	85.00	6th
Marketing	8	10.00	72	90.00	7th
External parasites	5	6.25	75	93.75	8th
Internal parasites	4	5.00	76	95.00	9th

Source: Field survey, 2019.

CONCLUSIONS

This study concluded that age, income and years of education of poultry keepers influenced keeper's level of knowledge about the process of incubation and hatching of eggs of indigenous chicken. A large proportion of the poultry farmers in the study area had a low level of knowledge about the process of incubation and hatching of eggs. Appropriate training on the processes of incubation and hatching of eggs must be given to the indigenous poultry farmers. This will aid the rapid multiplication and efficient utilization of poultry birds to improve food and nutritional security for sustainable development. Further results showed that predator, inadequate fund, theft are the three major constraints facing poultry keepers in this study area.

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