Short Research Article

Analysis of Climate Change Perception on Poultry Production in Imo State, Nigeria

ABSTRACT

This study aims at analyzing climate change perception on poultry production in Imo state, Nigeria. Data used for the study were obtained using structured questionnaire from eighty four (84) respondents who were randomly selected from twelve villages in the study area. Data were analyzed using descriptive statistics, multiple regression models and likert scale. Findings revealed that the mean age of the respondents was 45years, mean household size was 6 persons, 60% were male, mean years of experience was 9.1years, majority of them attended tertiary education. The multiple regression analysis showed that ambient temperature, humidity, rainfall distribution, mortality and feed unavailability were statistically significant at 10% level of probability and were the key determinants of effect of climate change. The coefficient of multiple determination R^2 was 0.725544 which implies that 72.55% variation in poultry output was accounted for by the regressors variables while the remaining 27.5% was due to random disturbance. From the distribution of poultry farmers according to perception of climate change, the result showed that 89% and 74% of the poultry farmers were aware that climate change has effect on egg and meat production, and also feed grain availability respectively. 90% of them were aware that high sunshine has adverse effect on egg production, also, 74% and 71% of them were aware that high temperature and low rainfall leads to low egg quality. The study therefore recommended that relevant and up-to-date information on climate change should be made available to poultry farmers.

Keywords: climate change, perception, Awareness, Determinants, Poultry Production

Introduction

In Nigeria, the poultry sector contributes about 58.2% of total livestock production (Amos, 2006). It also contributes over 25% of agricultural Gross Domestic Products Action Plan for Poultry Commodity Transformation (APPCT, 2012). Poultry are domestic fowls raised for food which include turkey, chicken, duck, quail, ostrich, goose etc. They are efficient converters of feed to egg and meat within a short period and the most environmentally efficient animal protein production system. In terms of nutritive value, poultry egg rank second to cow milk (Amos, 2006). It is rich in vitamins, essential amino acids, and minerals such as vitamin A, B6, B12,

foliate, iron, chlorine, zinc etc. Recent research has reported that poultry eggs contain Lutein and Zeaxanthin which lowers the risk of Age-related Macular Degeneration (AMD) that causes blindness in adults above 65years of age. According to Mammo (2011), poultry production sector is characterized by its industrialization, fast growth in consumption and trade than any other agricultural sector in Nigeria and the whole world. This is because of increase in population growth which accounts for the rise in the demand for animal protein mostly in the urban areas. Food and Agriculture Organization (FAO), 2014) reported that growth in population, economics and income are gearing the tendencies towards high consumption of animal protein in many developing countries including Nigeria, thus, Poultry production is no doubt one of the essentials for alleviating poverty and the blight of protein deficiency in Nigeria and other developing countries (Bukunmi and Yusuf 2015) and Nayak et al., (2015).

Climate change has become a threat not only on the poor and developing economies but also to the developed as well. The adverse effect of climate change is not felt by humans alone but crops and animals as well. Climate change has been reportedly defined by several authors and agencies as a shift in average weather condition of a place or, a consistent change in climate factors such as temperature, rainfall, humidity and soil moisture owing to a variation in composition of atmospheric gases (Alade and Ademola, 2013). It causes rise in temperature which encourages fungal and bacterial growth and this greatly affects livestock and crops thus leading to reduction in productivity. Poultry production has become a major source of animal protein. According to Heise et al, (2015), the return on poultry production is high and the cost of production per unit output when compared to other types of livestock is very low however, there is a record of greater losses and deficiency in its production as a result of low feed intake, low efficiency in feed conversion to meat and egg and low level of adaptive capabilities of the farmers to the adverse effect of climate change which consequently affect their performances and productivity (Tamiru and Fekadu 2019). Also, Adebisi et al., (2017) stated that climate change determines the level of feed intake of poultry as ingestion of feed is directly related to heat production as a result, any change in feed intake and energy density in their diet will alter the amount of heat produced by the birds which affects their growth, leading to low income of the famers. This agrees with Ashish et al, (2019) and Sanou et al., (2017) who stated that poultry production in Nigeria has been stressed by heat from climate change which causes death of chickens and reduces poultry production performance thereby decreasing the return from the enterprise.

Climate change is one of the major problems facing livestock production, through the spread of diseases in poultry production (Edame *et al*, 2011). According to Elijah and Adedapo (2006) as reported by Adebisi et al.,(2017) there exist some environmental conditions that affect poultry health, performance and productivity, these include temperature, relative humidity, light, sunshine prevailing at a given time, housing system, ventilation etc., moreover, high rainfall and relative humidity provides environment conducive for breeding of parasites which causes outbreak of disease thus, poultry are vulnerable to these occurrences as a result of climate change and this greatly influence their rate of meat and egg production. (Guis *et al* (2011) also reported that change in climate alters global spread of disease which affects poultry feed intake, promotes outbreak of diseases which invariably affects poultry output (egg and meat) and also cost of production.

Climate change is a primary determinant of agricultural productivity, however, farmers' adaptive capacity and knowledge on its scourging effect towards crop and animal productivity is very low. Therefore it has become pertinent to examine poultry production perception of climate change as to further analyze its position so as to combat its challenges and increase performance and productivity of poultry sector in the study area. Based on these aforementioned issues the following specific objectives which are to examine the socio-economic characteristics of poultry farmers, analyze the effect of climate change on poultry production and to determine poultry farmers' perception on climate change in Imo State were prompted.

Materials and Methods

The study was conducted in Imo state. It consists of twenty seven (27) local government areas (Obasi *et al*, 2015). Imo state is situated in the South Eastern part of Nigeria. Imo State lies within the latitude $4^{0}45^{1}$N and $7^{0}15^{1}$N and longitude $6^{0}50^{1}$E and $7^{0}25^{1}$E with land area of about 5,100km^{2} (National Bureau of Statistics, 2014). It is bordered by Abia state on the East, River Niger and Delta state on the West, by Anambra State to the North and Rivers State to the South. It has an annual rainfall varying from 1,500mm to 2,200mm, an average annual temperature above 20^{0}C and an annual relative humidity of 75% with humidity reaching 90% in rainy season (National Bureau of Statistic, 2014). The estimated population is 4.8 million and the population density varies from 230-1,400 people per square kilometre (National Bureau of Statistics, 2014). The major occupations in Imo state are trading, civil service and agriculture

(Obasi *et al*, 2015). Most households cultivate food crops such as cassava, cocoyam, yam, maize, melon, okra and vegetables (green, fluted pumpkin, water-leaf and bitter leaf), etc. and rear livestock especially poultry and goats (Obasi *et al*, 2015).

The study made use of primary data which was collected with the aid of well-structured questionnaire, personal interview and observation while the secondary information was gotten from journals and relevant literatures. Data was analyzed using descriptive statistics such as mean, frequency distribution tables and percentages, Ordinary least squares regression model and Likert scale. Ordinary Least Squares Regression Analysis is a statistical tool used for evaluating the relationship between one or more independent variables X_1, X_2……. X_8, to a single continuous variable Y. According to Iheke and Igbechina (2016), he used ordinary least square regression to analyze the effect of risks on poultry production. The ordinary least squares model is expressed implicitly as:

$Y = a + X_1b_1 + X_2b_2 + X_3b_3 + \ldots + Xnbn + e$

Where, Y = dependent variables (output)

X_1= ambient Temperature

X_2 = humidity

X_3 = rainfall

X_4 = wind speed and direction

X_5 = mortality

X_6 = feed availability

e = stochastic error term

Results and Discussion

Table 1: socioeconomic characteristics of poultry farmers in the study area

Variables	Frequency	Percentage
Age		
24-33	20	23.81
34-43	19	22.62
44-53	21	25.00
54-63	14	16.67
64-73	10	11.90
Mean age=45.2years		
Gender		
Female	34	40.48
Male	50	59.52
Years spent in school		
O	2	2.38
1-6	8	9.52
7-12	17	20.24
13-18	57	67.86
Mean=13.7years		
Household size		
1-5	44	52.38
6-10	31	36.90
11-15	6	7.14
16-20	3	3.57
Mean=6 persons		
Marital status		
Single	23	27.38
Married	41	48.81
Divorced	8	9.52
Widow	12	14.29
Experience in poultry enterprise		
1-7	40	47.62
8-14	25	29.76
15-21	14	16.67
22-27	3	3.57
28-34	2	2.38
Mean=9.3years		

Source: Field Survey Data, 2019.

The result from the table above shows that majority of the farmers were male with mean age of 45.2year, this implies that poultry farmers are still at their active age and have uneven gender distribution. The table also showed that majority 67.86% of the farmers spent up to 13-18 years in school implying that they are literate farmers with average household size of 6persons.The table also revealed that majority of the famers' were married and has average farming experience of 9.3years.

Table 2

Variables	Frequency	Percentage
Size of poultry		
<=500	30	35.71
501-1000	18	21.43
1001-1500	10	11.90
1501-2000	12	14.29
>2000	14	16.67
Mean=250 birds		
Types of poultry system		
Deep litters	75	89.29
Free range	7	8.33
Battery cage	2	2.38
Source of capital		
Personal savings	40	47.62
Cooperatives	2	2.38
Bank	2	2.38
Family	31	36.90
Friends	6	7.14
Money lenders	3	3.57
Source of labour		
Family	26	30.95
Hired	24	28.57
Both	34	40.48
Membership of cooperative		
Yes	55	65.48
No	29	34.52

Source: field survey data, 2019.

The table above also shows that majority (89.29%) of the farmers uses deep litter system of poultry production, with average poultry size of 250 birds. This implies that deep litter system is the most favorable system to use in the study area. The result also reveals that 47.62% of the farmers use personal savings as their major source of capital. This implies that farmers have low access to credit facilities therefore their production is mainly on subsistence bases. The table also shows that 40.48% of the farmers use both family and hired labor implying that they have more advantages than those that use only one source of labor. 65.48% of the farmers belong to cooperatives.

Table 3: Regression results of the effect of climate change on poultry production

Variables	Linear	Exponential+	Semi-log	Double-log
Constant	-44.78882	5.438987	-2186.269	3.805063
	(-0.0146)	(7.5460)	(-0.6444)	(5.3450)
Ambient Temperature	-2031.055	-1.389814	1341.447	-2.821556
	(-2.6487)***	(-2.1340)**	(0.4843)	(-4.8546)***
Humidity	1300.083	0.59761	1947.9577	0.361906
	(0.8458)	(1.6517)*	(3.6294)***	(1.1224)
Rainfall Distribution	428.9926	0.736218	227.7349	-0.179186
	(0.2440)	(1.7787)*	(0.1278)	(-0.4791)
Wind-speed	-896.1609	-0.102871	-526.5912	0.160484
	(-0.6684)	(-0.3259)	(-0.3899)	(0.5664)
Mortality	-10.439902	-0.01077	840.3008	-0.611492
	(-2.0666)**	(-9.0580)***	(1.3865)	(-4.8088)***
Feed availability	314.8407	0.652438	-14.26986	0.411722
	(0.2180)	(1.9195)**	(-0.0099)	(1.3572)
R-squared	**0.623139**	**0.725544**	**0.547144**	**0.552305**
Adjusted R-squared	**0.539812**	**0.656508**	**0.528082**	**0.528803**
S.E. of regression	**5834.311**	**1.373337**	**5762.183**	**1.208996**
Sum squared resid.	**2.59E+09**	**143.3401**	**2.52E+09**	**111.0871**
Log likelihood	**-833.8509**	**-140.4466**	**-832.8184**	**-129.8681**
F-statistic	**9.300043**	**11.818527**	**6.626696**	**8.024151**

Source: Field Survey Data, 2019
***** = sign @ 1%, ** = sign @ 5% and * = sign @ 10%.**
T-values are reported in parentheses
+ = Lead equation.

From the above table, it could be seen from the result that output of the exponential form gave the best result in terms of number and sizes of significant parameter estimates and largest R^2 hence was therefore chosen as the lead equation. Out of the six regressors, five namely ambient temperature, humidity, rainfall distribution, mortality and feed unavailability were statistically significant at 10% level of probability. The coefficient of multiple determination R^2 is 0.725544, implying that 72.55% variation in the poultry output was accounted for by the predictor/regressors variables, hence the remaining 27.5% was due to random disturbance. The F-statistics value of 11.818527 was significant, an indication of overall significance of the regression. The coefficients of humidity, rainfall distribution and feed availability were found to have positive relationship with poultry output at 10% level of probability. This implies that

increase in these variables increases the production output while ambient temperature and mortality reduces the output.

Table 4: Distribution of poultry farmers according perception on climate change

Perception on climate change	strongly agreed (3)	Agreed (2)	Disagreed (1)	strongly disagreed (0)	Total	Mean	Remark
Climate change affect egg and meat production	38(45.24)	37(44.05)	9(10.71)	0(0.00)	197	2.35	Agreed
High temperature make birds to feed less and drink more	49(58.33)	27(32.14)	8(9.52)	0(0.00)	209	2.49	Agreed
High temperature and low rainfall leads to low egg quality	31(36.90)	31(36.90)	19(22.62)	3(3.57)	174	2.07	Agreed
High sunshine affect egg production	30(35.71)	21(25.00)	18(21.43)	15(17.86)	150	1.79	Agreed
High temperature and low rainfall resulted to high food availability	19(22.62)	38(45.24)	24(28.57)	3(3.57)	157	1.87	Agreed
Prices of feed-grains increases during hot and dry seasons	22(26.19)	28(33.33)	32(38.10)	2(2.38)	154	1.83	Agreed
High temperature and low rainfall conditions reduces quality of grains	22(26.19)	38(45.24)	17(20.24)	7(8.33)	159	1.89	Agreed
Climate change affects feed grain availability	23(27.38)	39(46.43)	16(19.05)	6(7.14)	163	1.94	Agreed

Source: Field Survey Data, 2019

If mean ≥ 1.5, we agreed otherwise disagree.

The above table showed the perception of poultry farmers on climate change in Imo state, about 45.24% of them strongly agreed that climate change affect egg and meat production, 44.05% of them agreed that climate change affect egg and meat production, about 10.71% of them disagree that climate change affect egg and meat production. On the perception about high temperature make birds to feed less and drink more, 58.33% of them strongly agreed, 32.14% of them agreed, 9.52% of disagreed respectively. About 36.90% of them responded that they strongly agreed and agreed respectively that that high temperature and low rainfall lead to low egg quality, 22.62% of them disagreed and 3.57% of them strongly disagreed that high temperature and low rainfall lead to low egg quality.

About 35.71% of them strongly agreed, 25% of them agreed, 21.43% of them disagreed and 17.86% of them strongly disagreed that high sunshine affect egg production respectively. On the issue of high temperature and low rainfall resulting to high food availability, about 22.62% of them strongly agreed, 45.25% of them agreed, 28.57% of strongly disagreed and 3.57% of them disagreed respectively. In the same vein, about 26.19%, 33.33%, 38.10% and 2,38% of them strongly agreed, agreed, strongly disagreed and disagreed respectively that prices of feed grains increases during the hot and dry seasons.

About 26.10%, 45.24%, 20.24% and 8.33% of them strongly agreed, agreed, strongly disagree and disagreed that high temperature and low rainfall conditions reduces quality of grains respectively. Finally, on the issue of climate change affecting feed grains availability, 27.38%, 46.43%, 16.05% and 7.14% of them strongly agreed, agreed, disagreed and strongly disagreed respectively. This implies that poultry farmers have unfavorable perception to climate change in the study area which suggests that they would also have positive attitude to adapting to climate change with a view to increasing their level of poultry production. This further attests to the unfavorable perceptions that farmers have of the various effects of climate change on their enterprise in the area.

Conclusion

The study revealed that majority of the respondents are aware of the climate change and hence, most likely to make observation on how it affect poultry production pattern, effects of climate change which results in temperature fluctuation, increased in sunshine intensity and global warming has a negative effects on poultry production which many at times results to high mortality rate of the chickens, low egg and meat production and prices of feed grains are usually high in hot and dry seasons as result of effects of climate change which may affect cost of production and number of birds to raise for egg and meat production in the farm.

Recommendation

There is dire need to intensify awareness campaign to poultry farmers on how to reduce the effects of climate change on poultry production. Extension staff and other development agencies need to educate the poultry farmers more about the effects posed by climate change on poultry production and possible means of combating the problem of climate effect on poultry production.

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261