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 themean age of the respondents was 45 years, 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 hasadverse 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

Comment [RK1]: 27.45%

Comment [RK2]: About 90%

Comment [RK3]: C captital

Comment [RK4]: P capital

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 affectslivestock and crops thus leading to reduction in productivity. Poultry production has become a major source ofanimal 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 thefarmers 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

Comment [RK5]: . Fullstop than coma e.g. al.,

Comment [RK6]: Sameas RK5

64 chickens and reduces poultry production performance thereby decreasing the return from the
65 enterprise.

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

74 that change in climate alters global spread of disease which affects poultry feed intake, promotes
75 outbreak of diseases which invariably affects poultry output (egg and meat) and also cost of
76 production.

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

85 **Materials and Methods**

86 Thestudy   wasconductedinImostate.
87 Itconsistsoftwentyseven(27)localgovernmentareas(Obasi*etal,*2015).   Imostate
88 issituatedintheSouth   Easternpartof   Nigeria.Imo   Statelieswithinthelatitude$4^0 45^1$Nand
89 $7^0 15^1$Nandlongitude$6^0 50^1$Eand $7^0 25^1$Ewith land area of about 5,100km^2(National Bureau of
90 Statistics,2014).   Itis   borderedbyAbiastateontheEast,River   NigerandDelta
91 stateontheWest,byAnambraStatetotheNorthandRiversStatetotheSouth.
92 Ithasanannualrainfallvaryingfrom 1,500mmto2,200mm,anaverageannual temperatureabove20^0C

3

93 andanannualrelative humidity of 75%withhumidity reaching 90% in rainy season(National

94 Bureau of Statistic, 2014). The

95 estimatedpopulationis4.8millionandthepopulationdensityvariesfrom230-1,400peopleper

96 squarekilometre(NationalBureau ofStatistics,2014).Themajoroccupations inImo state are trading,

97 civil service andagriculture (Obasi*et al*, 2015). Most households cultivatefood crops such as

98 cassava, cocoyam, yam, maize, melon, okra and vegetables (green,flutedpumpkin,water-leafand

99 bitter leaf),etc.andrear livestockespecially poultryandgoats(Obasi*etal*,2015).

100 The study made use of primary data which was collected with the aid of well-structured

101 questionnaire, personal interview and observation while the secondary information was gotten

102 from journals and relevant literatures. Data

103 wasanalyzedusingdescriptivestatisticssuchasmean,frequency

104 distributiontablesandpercentages,Ordinary least squares regression model and Likert scale.

105 Ordinary Least Squares Regression Analysis is a statistical tool used for evaluating the

106 relationship between one or more independent variables $X_1, X_2\ldots\ldots X_8$, to a single continuous

107 variable Y. According to Iheke and Igbechina (2016), he used ordinary least square regression to

108 analyze the effect of risks on poultry production. The ordinary least squares model is expressed

109 implicitly as:

110 $Y = a + X_1b_1 + X_2b_2 + X_3b_3 +\ldots+ Xnbn + e$

111 Where, Y = dependent variables (output)

112 X_1= ambient Temperature

113 X_2 = humidity

114 X_3 = rainfall

115 X_4 = wind speed and direction

116 X_5 = mortality

117 X_6 = feed availability

118 e = stochastic error term

4

119

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

5

126 in school implying that they are literate farmers with average household size of 6persons.The

127 table also revealed that majority of the famers' were married and has average farming experience

128 of 9.3years.

129 **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.

130 The table above also shows that majority (89.29%) of the farmers uses deep litter system of

131 poultry production, with average poultry size of 250 birds. This implies that deep litter system is

132 the most favorable system to use in the study area. The result also reveals that 47.62% of the

133 farmers use personal savings as their major source of capital. This implies that farmers have low

134 access to credit facilities therefore their production is mainly on subsistence bases. The table also

135 shows that 40.48% of the farmers use both family and hired labor implying that they have more

136 advantages than those that use only one source of labor. 65.48% of the farmers belong to

137 cooperatives.

138

139

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

7

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

Comment [RK9]: not bold

If mean ≥ 1.5, we agreed otherwise disagree.

Comment [RK10]: not bold

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 tohigh 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

200 need to educate the poultry farmers more about the effects posed by climate change on poultry
201 production and possible means of combating the problem of climate effect on poultry production.
202
203
204 **References**

205 Action Plan for Poultry Commodity Transformation in Nigeria (APPCT) (2012).*Poultry*
206 *transformation Report*.Federal Ministry of Agriculture and Rural Development, Abuja**,**
207 Nigeria .Pp 1-30.

208 Adebi, G.L, Oyebode L.A and Owosibo I.I (2017). Perceived effects of climate change on
209 commercial poultry farming in oyo state, Nigeria. Agricultural & Veterinary Sciences
210 Vol.1, No.3, 2017, pp.163-171

211 Adesiji, G.B., Baba, S.T., and Tyabo, I.S.(2012). Effects of Climate change on poultry
212 production in Ondo State. Russian Journal of Agricultural and Socio-Economic Sciences,
213 2(14).

214 Alade, O.A. and Ademola, A.O. (2013).Perceived Effect of Climate Variation on Poultry
215 Production in OkeOgun Area of Oyo State.Journal of Agricultural Science, vol.5, No.10.

216 Amos, T.T (2006), Analysis of Backyard Poultry Production in Ondo State, Nigeria.
217 InternationalJournal of Poultry Science, 5(3), 247 – 250.

218 Ashish R, Ranajana S, Indu D, Abudul R and Shiwani T (2019). Effect of Heat Stress on Poultry
219 Production and their Managemental Approaches.International Journal of Current
220 Microbiology and Applied Sciences

221 Bukunmi, F.R and Yusuf, H.A (2015).Analysis of socio-Economic Factors Influencing Poultry
222 Egg production among poultry farmers in Ondo State, Nigeria. British Journal of
223 Applied Science and Technology, 10(3):1-7.

224 Edame G.E,;Ekpenyong V.; Fonta W M. and E.J.E Duru, (2011). Climate Change, Food Security
225 and Agricultural Productivity in Africa: Issues and policy directions. *International*
226 *Journal of Humanities and Social Science Vol. 1 No. 21 [Special Issue -*
227 *December 2011]* 205
228

229 Elijah, O.A., Adedapo, A. (2006). The effect of climate change on poultry productivity in Ilorin,
230   Kwara State, Nigeria, *International Journal of Poultry Science*, 5(11), 1061-1068.
231

232 Food and Agriculture Organisation.(FAO), (2014).The State of World Fisheries and Aquaculture
233   2006. Rome, FAO: 162pp

234 Guis, H.; Caminade, C.; Calvete, C.; Morse, A.P.; Tran, A. and M. Baylis, (2011), Modelling
235   Theeffects of past and future climate on the risk of bluetone emergence in
236   Europe.*Journal of RuralSociology Interface* 10. 1098/rsif.2011.0255 India
237   Council of Agricultural Research (ICAR), 2010 -11 annual Report Pp 13.

238 Heise H, Alexandra C, and Ludwig T(2015).The Poultry Market in Nigeria: Market Structures
239   and Potential for Investment in the Market. International Food and Agribusiness
240   Management (IFAMA) Review volume 18special issue A, 2015.

241 NationalBureauof   Statistics.(2014).ImoState   Information.Retrieved
242   fromhttp://nigerianstat.gov.ng/information/details/Imo.

243 National Action Plan for Egg and Poultry -2022 for doubling farmers Income by
244   2022. Department of Animal Husbandry, Dairying & Fisheries Ministry of
245   Agriculture & Farmers Welfare Government of India

246 Nayak G.D, Behura N.C, Sardar K.K and Mishra P.K (2105).Effect of climatic
247   variables on production and reproduction traits of colored broiler breeder
248   poultry.

249 Obasi,P.C.,Henri-Ukoha, O.N., Anosike&Ibekwe, U.C.(2015). Netreturns tocassava -based
250 cropmixturesinImostate,Nigeria.*EuropeanJournal ofAgricultureandForestry Research*,3(1),15-
251   21.

252 Sanuo A, Bukola O, SawedaL .T and Thomas R (2017).Climate change and the poultry value
253   chain in nigeria:Issues, emerging evidence, and hypotheses.Nigerian Journal of
254   Agricultural Economics (NJAE). Volume 7(1), 2017: Pages 45-53.

255 TamiruLemi and FedaduHailu (2019).Effects of Climate Change Variability on
256 Agricultural Productivity.Natural Resource Management Specialized in Forest and Nature
257   Management, Ethiopia.
258
259

260
261
262

263