## Analysis of Poultry production perception of Climate Change in Imo State, Nigeria

**ABSTRACT**

The study aims at analyzing poultry production perception of climate change 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 44.9years, mean household size was 5.8 persons, 59.7% 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 89.29% and 73.81% of the poultry farmers are aware that climate change have effect on egg and meat production, and also feed grain availability respectively. 90.47% of them are aware that high sunshine have effect on egg production, while 73.8%, 67.86% and 71.43% are aware that high temperature and low rainfall leads to low egg quality, results to high food availability and reduces quality of grains respectively.The study therefore recommended that relevant and up-to-date information on climate change should be available to poultry farmers.

**Keywords:** Analysis, climate change, Poultry production, perception, Imo state.

**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 (APPCT, 2012). Poultry birds 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 of time and the most environmentally efficient animal protein production system. In terms of nutritive value, poultry egg rank second to cow milk (Amos, 2006). According to Mammo

34  (2011), poultry production sector is characterized by its industrialization, fast growth in

35  consumption and trade than any other agricultural sector in Nigeria and the whole world at large.

36  This is because of increase in population growth which accounts for the rise in the demand for

37  animal protein mostly in the urban areas. FAO (2014) reported that growth in population,

38  economics and income are gearing the tendencies towards high consumption of animal protein in

39  many developing countries including Nigeria, thus, Poultry production is no doubt one of the

40  essentials for alleviating the blight of protein deficiency in Nigeria and other developing

41  countries (Bukunmi and Yusuf 2015).

42  Climate change is a major threat to sustainable growth and development in Nigeria and Africa at

43  large by reducing agricultural production and worsening food security AFT (2007). It has

44  become a challenging issue across the globe for a long time now and the sad truth is that it has

45  come to stay. The adverse effect of climate change is not felt by humans alone but crops and

46  animals as well. Climate change has been reportedly defined by several authors and agencies as a

47  shift in average weather condition of a place or more so, a consistent change in climate factors

48  such as temperature, rainfall, humidity and soil moisture owing to a variation in composition of

49  atmospheric gases (Alade and Ademola, 2013).

50  Climate change has become a threat not only on the poor and developing economies but also to

51  the developed as well. It affects the socioeconomics of humans, livestock and crops. It causes

52  rise in temperature which encourages fungal and bacterial growth and this greatly affects

53  livestock and crops thus leading to reduction in productivity. Poultry production has become a

54  major source of animal protein, as it accounts for a good source of vitamins A, $B_1$, $B_2$ and D with

55  minerals such as Ca, Fe and P makes it a choice of high nutrient and low caloric value. Research

56  has shown that the return on poultry production is high and the cost of production per unit output

57  when compared to other types of livestock is very low however, there is a record of greater

58  losses in its production as a result of low feed intake and low efficiency in feed conversion to

59  meat and egg which consequently affects their health and productivity. Adebisi et al., (2017)

60  stated that climate change determines the level of feed intake of poultry bird as ingestion of feed

61  is directly related to heat production as a result, any change in feed intake and energy density in

62  their diet will alter the amount of heat produced by the birds which affects the growth animal

63  leading to low income of the famers.

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

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

83 **Materials and Methods**

84 The study was conducted in Imo state. It consists of twenty seven (27) local government areas
85 (Obasi *et al,* 2015). Imo state is situated in the South Eastern part of Nigeria. Imo State lies
86 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
87 about 5,100km$^2$ (National Bureau of Statistics, 2014). It is bordered by Abia state on the East,
88 River Niger and Delta state on the West, by Anambra State to the North and Rivers State to the
89 South. It has an annual rainfall varying from 1,500mm to 2,200mm, an average annual
90 temperature above $20^0$C and an annual relative humidity of 75% with humidity reaching 90% in
91 rainy season (National Bureau of Statistic, 2014). The estimated population is 4.8 million and
92 the population density varies from 230-1,400 people per square kilometre (National Bureau of
93 Statistics, 2014). The major occupations in Imo state are trading, civil service and agriculture

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

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

106 $Y = a + X_1b_1 + X_2b_2 + X_3b_3 + ... + Xnbn + e$

107 Where, Y = dependent variables (output)

108 $X_1$ = ambient Temperature

109 $X_2$ = humidity

110 $X_3$ = rainfall

111 $X_4$ = wind speed and direction

112 $X_5$ = mortality

113 $X_6$ = feed availability

114 e = stochastic error term

115

116 **Results and Discussion**

117 **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** | | |

118 **Source: Field Survey Data, 2019.**

119 The result from the table above shows that majority (59.52%) of the farmers were male with

120 mean age of 45.2year, this implies that poultry farmers are still at their active age and have

121 uneven gender distribution. The table also showed that majority 67.86% of the farmers spent up

122 to 13-18 years in school implying that they are literate farmers with average household size of

123 6persons.The table also revealed that majority of the famers' were married and has average

124 farming experience of 9.3years.

125 **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.**

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

134

135

**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

152 increase in these variables increases the production output while ambient temperature and

153 mortality reduces the output.

154

155 **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 |

156 **Source: Field Survey Data, 2019**

157 **If mean ≥ 1.5, we agreed otherwise disagree.**

158

159 The above table showed the perception of poultry farmers on climate change in Imo state, about

160 45.24% of them strongly agreed that climate change affect egg and meat production, 44.05% of

161 them agreed that climate change affect egg and meat production, about 10.71% of them disagree

162 that climate change affect egg and meat production. On the perception about high temperature

163 make birds to feed less and drink more, 58.33% of them strongly agreed, 32.14% of them agreed,

164 9.52% of disagreed respectively. About 36.90% of them responded that they strongly agreed and

165 agreed respectively that that high temperature and low rainfall lead to low egg quality, 22.62% of

166 them disagreed and 3.57% of them strongly disagreed that high temperature and low rainfall lead

167 to low egg quality.

168 About 35.71% of them strongly agreed, 25% of them agreed, 21.43% of them disagreed and
169 17.86% of them strongly disagreed that high sunshine affect egg production respectively. On the
170 issue of high temperature and low rainfall resulting to high food availability, about 22.62% of
171 them strongly agreed, 45.25% of them agreed, 28.57% of strongly disagreed and 3.57% of them
172 disagreed respectively. In the same vein, about 26.19%, 33.33%, 38.10% and 2,38% of them
173 strongly agreed, agreed, strongly disagreed and disagreed respectively that prices of feed grains
174 increases during the hot and dry seasons.

175 About 26.10%, 45.24%, 20.24% and 8.33% of them strongly agreed, agreed, strongly disagree
176 and disagreed that high temperature and low rainfall conditions reduces quality of grains
177 respectively. Finally, on the issue of climate change affecting feed grains availability, 27.38%,
178 46.43%, 16.05% and 7.14% of them strongly agreed, agreed, disagreed and strongly disagreed
179 respectively. This implies that poultry farmers have unfavorable perception to climate change in
180 the study area which suggests that they would also have positive attitude to adapting to climate
181 change with a view to increasing their level of poultry production. This further attests to the
182 unfavorable perceptions that farmers have of the various effects of climate change on their
183 enterprise in the area.

184 **Conclusion**
185 The study revealed that majority of the respondents are aware of the climate change and hence,
186 most likely to make observation on how it affect poultry production pattern, effects of climate
187 change which results in temperature fluctuation, increased in sunshine intensity and global
188 warming has a negative effects on poultry production which many at times results to high
189 mortality rate of the chickens, low egg and meat production and prices of feed grains are usually
190 high in hot and dry seasons as result of effects of climate change which may affect cost of
191 production and number of birds to raise for egg and meat production in the farm.
192

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

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