



EFFECTS OF CLIMATE CHANGE ON POULTRY PRODUCTION IN IMO STATE, NIGERIA

Egwuonwu Helen Adeola

Department of Agricultural Economics, Extension and Rural Development,
Faculty of Agriculture, Imo State University, Owerri.

Email: egwuonwu.helen@yahoo.com

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ABSTRACT: *This study analyzed the effects of climate change on poultry production in Imo State, Nigeria. A multi-stage sampling procedure was used in selecting one hundred and twenty (120) poultry farmers for the study. The data for the study were collected using a structured questionnaire, and the data generated were analyzed using frequency, percentages, mean, and multiple regression analysis. The results show that all the poultry farmers (100%) were aware of climate change, with radio (91.67%) being the major source of awareness and information on climate change. Perceptions of climate change on poultry production were climate change leads to disease outbreak ($\bar{x} = 3.67$), that high temperature make birds feed less and drink more water ($\bar{x} = 3.57$) and flooding of poultry farms ($\bar{x} = 3.53$). The major effects of climate change on poultry production were perceived as high costs on poultry production activities ($\bar{x} = 3.42$), low quantity and quality of egg production ($\bar{x} = 3.17$), high temperature and low rainfall conditions reducing the quality of grains ($\bar{x} = 3.15$), and high temperature makes birds feed less and drink more ($\bar{x} = 3.15$). The variables such as educational level, access to credit facilities, extension contact, and membership of association were found to be statistically significant at 5% level of probability with perceived effects of climate change on poultry production. The study concludes that poultry farmers were aware of climate change and perceived the effects of climate change in poultry production correctly. Therefore, efforts should be made to minimize human actions that contribute immensely to the occurrence of climate change, such as deforestation, bush burning, and piling of poultry waste without disposing of them on time and properly, should be discouraged.*

KEYWORDS: Climate Change, Climate Variability, Perceived Effects, Poultry, Poultry Production.



INTRODUCTION

Poultry plays a significant role by contributing to the economic, nutritional, and socio-cultural aspects of households' livelihoods in many developing countries, including Nigeria. Poultry includes fowl, turkey, duck, goose, ostrich, guinea, etc., which render not only economic services but contribute significantly to human food as a primary supplier of meat, egg, raw materials to industries, a source of income and employment to people compared to other domestic animals (Mozdziak, 2019). Poultry production, as a major subsector of agriculture has provided the teeming population with a supply of needed animal protein in terms of meat and egg production all over the world (Abioja & Abiona, 2021). When compared to other domesticated animals, poultry animals provide not only economic services but also significantly contribute to human food as a major supplier of meat, eggs, and raw materials to industries (feathers, waste products), a source of income for people, and a source of employment (Agyare et al., 2018). Products from poultry, such as meat and eggs, provide a potential source for meeting the basic and dietary needs of humans. However, poultry farming is being threatened by climate change, especially in Africa, where the necessary structures to tackle the menace are non-existent.

The Intergovernmental Panel on Climate Change (IPCC) (2020) defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global and/or regional atmosphere and which is in addition to natural climate variability observed over comparable time periods. There is growing evidence that poultry farmers in Nigeria perceive climate change as a significant challenge to their productivity and profitability (Adebayo & Adeola, 2019). Climate variation affects poultry production by reducing poultry yield and nutritional quality of feeds, increasing disease and disease-spreading pests, reducing water availability, and making it difficult for birds to survive (Akinseye et al., 2018). Climate change alters global disease distribution, affects poultry feed intake, encourages outbreak of diseases which invariably affect poultry output (egg and meat), and also costs of production (Guis et al., 2011). Epidemic of disease becomes inescapable; diseases such as coccidiosis, fowl typhoid, haemorrhagic syndrome, chronic respiratory disease, fowl pox, and bronchitis will thus multiply (Sejian et al., 2016). But also exacerbate the vulnerability of smallholder poultry farmers who often lack access to climate-smart technologies, veterinary care, and extension services (Eze et al., 2020). Climatic stressors not only threaten poultry output.

Given that there is an increase in the acknowledgement of climate change impacts by farmers most involved in poultry farming. There remains a gap, as many findings have been done on climate change, but there is little empirical evidence on the perception of farmers on the effect of climate change on poultry production in Imo State, where climate-related disruptions are becoming rampant. Adequate knowledge of climate change by poultry farmers and a good perception of the effect on poultry production can allow the farmers to reduce the climatic factors that hinder the expansion of poultry production. Also, take necessary precautions in planning to minimize loss or even to use it to his or her advantage.

Therefore, this study seeks to investigate the perceived effects of climate change on poultry production, focusing on how farmers in Imo State experience and respond to climatic variation. This study ascertained awareness of poultry farmers on climate change; ascertained the sources of information of poultry farmers to climate change in the study area; identified observable climate change in poultry production; examined the poultry farmers' perceived effects of



climate change in the study area and; ascertained the adaptation measures strategies of reducing/alleviating the effect of climate change. The study examined the relationship between the socio-economic characteristics of poultry farmers and their perceived effects of climate change on poultry production in the study area

METHODOLOGY

This study was conducted in Imo State, Nigeria. The state is bordered on the east and northeast by Abia State, the south by Rivers State, the north by Anambra State, and the south by Rivers State. The State lies between latitudes $5^{\circ} 45' N$ and $6^{\circ} 35' N$ of the equator and longitude $6^{\circ} 35' E$ and $7^{\circ} 28' E$ of the Greenwich Meridian (Nigerian Meteorological Agency (NiMET), 2020). Imo State has a population density ranging from 230 per square kilometer in the Oguta/Egbema districts to roughly 1400 per square kilometer in the Mbaise, Mbano, Orlu, and Mbaitoli areas (National Bureau of Statistics, 2020). All the poultry farmers in Imo State constituted the study's population. A Multistage sampling procedure was used in the selection of the poultry farmers. Stage one, the two Agricultural zones (Orlu and Owerri) were purposively selected based on the concentration of the poultry farms in Imo State. Stage two involved random selection of three Local Government Areas (namely: Mbatoli, Njaba, Orlu, Ohaji Egbema, Ikeduru and Owerri West). Thirdly, two communities were randomly selected (Mbieri, Ogbaku, Umuaka, Ekwe, Amaifeke, Umuna, Mgbirichi, Umuagwo, Akabo, Amaimo, Oforola and Okolochi) to give a total of twelve communities. Fourthly, ten poultry farmers were selected from each of the communities to give a total of one hundred and twenty (120) poultry farmers for the study. The sampling frame was the list of all the poultry farmers in the selected communities, and the list was collected from Imo State extension units of the Imo State Agricultural Development Programme (ADP).

The primary data were collected using a structured questionnaire and an interview schedule. The questionnaire was validated using face and content validation by the lecturers in the Faculty of Agriculture. The data collected were analyzed using descriptive statistical tools such as frequency counts, percentages, and means to realize all the objectives. The perception of climate change on poultry production and perceived effects of climate change on poultry production were captured using a four-point Likert-type rating of Strongly Agreed = 4, Agreed = 3, Disagreed = 2, Strongly Disagreed = 1 to obtain the mean responses of perception and perceived effects of climate change on poultry production in the area. This was then divided by the number of scales to obtain the discriminating index, e.g., $(4+3+2+1)/4 = 2.50$ cut-off point. A mean score value of equal to or greater than 2.5 implies agreement with the statement while a mean score below 2.5 implies disagreement with the statement. Multiple regression analysis was used for testing the null hypotheses. The explicit form of the model was stated as follows:

$$Y = f(X_1, X_2, X_4, X_5, X_6, X_7, X_{8e_i})$$

Y = Perceived effects of climate change on poultry production (Total rated scores)

X_1 = Age (years)

X_2 = Marital Status (Male = 1, Female = 0)



X_3 = Farm size (hectares)

X_4 = Household size (Number of persons)

X_5 = Educational level (Number of years spent in school)

X_6 = Monthly Farm income (Naira)

X_7 = Membership of cooperative (member = 1, non-member = 0)

X_8 = Extension contact (number of visits)

ε_i = error term

RESULTS AND DISCUSSION

Socio-economic characteristics of the poultry farmers

Table 1 indicates the socio-economic characteristics of poultry farmers in the study area. From the results, the poultry farmers in the area were mainly female (56.67%), had a mean age of 43.67 years, 46.67% of the poultry farmers had a tertiary education, average years of farming experience in poultry farming was 8.37 years. The average household size was 7 persons, the majority (46.67%) of the poultry farmers were practicing intensive system for poultry management, the majority (73.75%) of the poultry farmers were members of cooperative society, 81.67% of the respondents had contact with extension workers, average income was ₦392,833.33, and the majority (60.00%) of the respondents did not have access to credit facilities.

Table 1: Socio-economic characteristics of the poultry farmers

Socio-economic Characteristics	Frequency/Mode	Percentage	Mean
Sex	Female	56.67%	43.67years
Age (years)	41 – 50 years	33.33%	
Marital status	Single	75%	
Educational level	Tertiary	46.67%	8.37 years
Years of experience	6-9years	45.00%	
Household size	7-9 persons	48.34%	7 persons
Poultry system management	Intensive system	46.67%	
membership of a cooperative society	Member	73.75%	₦392,833.33
Extension contact	Contact	81.67%	
Annual income	₦300,000 - ₦499,000	50.00%	
Access to credit	Non- access	60.00%	

Source: Field survey, 2024



Awareness and Sources of Information on Climate Change

Table 2 reveals that all the poultry farmers (100%) were aware of climate change and had adequate sources of information on climate change. The findings revealed that there were many sources of information on climate change in poultry farming in the study area. Some of the respondents had information on climate change from more than one source. The majority of the respondents (91.67%) got information on climate change through the radio. While 75.00% and 63.33% of the respondents got information on climate change from friends and relatives and extension workers. Other sources of information on climate change were from television (60%), social media/internet (53.33%), personal observation/experience (36.67%), fellow poultry farmers (33.33%), and newspaper (16.67%). This finding shows that farmers had good knowledge of climate change. The finding is in line with Ifeanyi-Obi et al. (2017) that farmers' sources of awareness and information on climate change are mainly through radio and friends. Also, George (2010) identified personal contacts, family and friends as the main sources of information on climate change.

Table 2: Distribution of poultry farmers based on awareness and sources of information on climate change

Awareness and Source of information of climate change	Frequency*	Percentage
Awareness of climate change	120	100.00
Radio	110	91.67
Friends/Relatives	90	75.00
Extension workers	76	63.33
Television	72	60.00
Social media/internet	64	53.33
Personal observation/experience	44	36.67
Fellow poultry farmers	40	33.33
News papers	20	16.67

Source: Field survey, 2024; *Multiple responses recorded

Perception of climate change on poultry production

Results in Table 3 reveal that climate change leads to disease outbreaks ($\bar{x} = 3.67$; S.D = 0.96), high temperatures make birds feed less and drink more water ($\bar{x} = 3.57$; S.D = 0.93), and flooding of poultry farms ($\bar{x} = 3.53$). Climatic changes affect the growth of the poultry birds ($\bar{x} = 3.48$; S.D = 1.04), and climatic changes affect the quality of eggs laid ($\bar{x} = 3.06$; S.D = 0.16), which were rated high and had an acceptable overall discriminatory score. Therefore, it becomes clear that the poultry farmers were able to understand and perceive climate change correctly in the area. Aroyedun (2023) observed that climate change results in poultry production contributing to changes in temperature that lead to heat stress in poultry. However, the standard deviations (S.D) values of the perception of climate change in poultry production indicate that the poultry farmers varied in their responses. The grand mean for perception of poultry farmers on climate change in poultry production was 3.37 which is above the discriminatory score ($\bar{x} \geq 2.50$). This result significantly confirmed that there were different perceptions of climate change in poultry production in the area.

**Table 3 Distribution of poultry farmers based on perception of climate change on poultry production**

Perception of climate change	Mean	S.D
Climatic changes affect the quality of eggs laid	3.06*	0.16
Climatic changes affect the rate of feed intake	2.88*	0.45
Flooding of poultry farms	3.53*	1.30
Climatic changes affect the growth of the poultry birds	3.48*	1.04
High temperatures make birds feed less and drink more water	3.57*	0.93
Climate change leads to disease outbreaks	3.67*	0.96

Grand mean = 3.37; *High Perception; Source: Field survey, 2024.

Perceived effect of climate change on poultry production

The result of the poultry farmers' distribution based on the perceived effect of climate change in the area is computed in Table 4. The various attributes were rated in a 4-point Likert-type rating scale with Strongly Agreed (4), Agreed (3), Disagreed (2), and Strongly Disagreed (1). Findings show that most (10) of all the (14) items were rated high and had an acceptable overall discriminatory score. For instance, poultry farmers perceived effect of climate change on poultry production as high costs on poultry production activities ($\bar{x} = 3.42$; S.D = 0.74), low quantity and quality of eggs production ($\bar{x} = 3.17$; S.D = 0.80), High temperature and low rainfall conditions reduces quality of grains ($\bar{x} = 3.15$; S.D = 0.86), High temperature makes birds feed less and drink more ($\bar{x} = 3.15$; S.D = 0.80), Decrease in weight gain ($\bar{x} = 2.97$; S.D = 0.83), Pest infestation and spread of diseases ($\bar{x} = 2.87$; S.D = 0.95), Soft egg shell formation, $\bar{x} = 2.90$; S.D = 0.77), High temperature and low rainfall have resulted to high feed availability ($\bar{x} = 2.85$; S.D = 0.98), Climate change affects egg and meat production ($\bar{x} = 2.83$; S.D = 0.74), prices of feed –grain are usually high during hot and dry seasons ($\bar{x} = 2.73$; S.D = 0.01).

The findings of the study revealed that poultry farmers agreed that climate change has a great effect on their poultry production. This study is in line with the studies of Adereti et al. (2021) and; Aroyehun, (2023), who identified some of the effects of climate change on poultry production, such as the reduction in production of both eggs and meat of poultry; low feed intake; reduction in quality and availability of grain thereby increasing the cost of production of poultry. Also, Abioja and Abiona (2021) noted that one major effect of climate change on poultry production is heat stress caused by high temperature which may lead to the mortality of birds.

However, Aroyehun (2023) noted that the perceived effects of climate on poultry production include a high rate of diseases and parasite incidence, soft eggshell formation, low quantity and quality of egg production, high costs of poultry production activities, reduction in feed and water intake, and an increase in poultry bird mortality. Therefore, adaptation to the damaging effects of acute climates has played a huge role in fighting the climatic impact on livestock.

**Table 4: Poultry farmers' perceived effects of climate change on poultry production**

Perceived effect of climate change	Mean	S.D
Decrease in weight gain	2.97	0.33
Soft eggshell formation	2.90	0.47
Low quantity and quality of egg production	3.17	0.65
Pest infestation and the spread of diseases	2.97	0.95
Climate change affects egg and meat production	2.83	0.74
High temperatures make birds feed less and drink more	3.15	0.80
High costs of poultry production activities	3.42	0.74
High temperature and low rainfall have resulted in high feed availability	2.85	0.28
Prices of feed–grain are usually high during hot and dry seasons	2.73	0.91
High temperature and low rainfall conditions reduce the quality of grains	3.15	0.86
Climate change affects feed grain availability	2.70	0.83
Reduction in poultry bird rate of feed consumption	2.68	0.96
High incidence of disease infestation	2.97	1.07

Source: *Field survey, 2024.*

Relationship between socio-economic characteristics of poultry farmers and perceived effects of climate change on poultry production

Findings on the relationship between socio-economic characteristics of poultry farmers and perceived effects of climate change on poultry production in the area are compiled in Table 5. A multiple regression analysis was used to analyze the dependent and independent variables. The independent variables were sex, age, marital status, educational level, household size, years of experience, management system, income, access to credit facilities, contact with extension agents, and membership of an association. The coefficient of multiple determinations (R^2) was found to be 0.776% and was statistically significant at 1% level of probability with an F-Ratio value = 21.409. This implies that poultry farmers' socio-economic characteristics had a significant influence on their perceived effects of climate change on poultry production in the area, and that the regression model has a high explanatory power. In addition, this is an indication that 77.6% of the variation in perceived effects of climate change on poultry production in the area was statistically explained by the explanatory variables, while the remaining 23.4% was explained by the stochastic variables. The marginal effect is presented as follows:

Educational Level (X_4): The coefficient of level of education was positive (0.381) and significant at 1% level of probability. This implies that an increase in the level of education leads to a significant increase in the perceived effects of climate change in the area. This is an indication that poultry farmers with a high level of education are more likely to have a higher level of perception of the effect of climate change. The higher the level of education, the more likely poultry farmers are to perceive the effect of climate change significant on poultry production. With education, the poultry farmers will know adequate adaptation strategies to



use. The study shares a view with the findings of Oyebola (2021) who reported that improved levels of education bring about positive changes in knowledge, attitude, and skills through research and extension services of the farmers.

Membership of Social Association (X_8): The coefficient of membership of social association was positive (3.013) and significant at 1% level of probability. This implies that being a member of a social association leads to a significant increase in the perceived effects of climate change on poultry production among farmers in the area. The finding indicates that poultry farmers who are members of an association will have access to better and timely information on climate change, credit and other productive resources to practice better in the area. The finding is supported by the result of Olagunju et al. (2021) who found that those farmers who are members of farmers' associations benefit from bargaining power, information flow, collective farm inputs, labour. and economies of scale.

Extension Contact (X_9): The coefficient (2.680) of extension contact was positive and significant at 1% level of probability. This implies that an increase in the magnitude of extension contact leads to a significant increase in the perceived effect of climate change in the area. This is an indication that poultry farmers who had contact with extension agents had a higher level of perception of the effects of climate change in the area. The result is in consonance with the study of Sahya et al. (2021,) who asserted that effective agricultural extension is perceived to be one of the most important keys in advancing innovation and development among farmers.

Access to credit facilities (X_{11}): The coefficient of access to credit facilities was positive and significant at 1% level of probability. This implies that poultry farmers who have access to credit facilities will perceive more effects of climate change on production and will be able to make their choice in adequate adaptation strategies. Furthermore, the F-ratio (21.409), which determines the overall significance of the regressor, was highly significant at 1% level of probability. This implies that the explanatory variables jointly exerted great influence on the perceived effects of climate change in the area.

Table 5. Multiple Regression on socio-economic characteristics of poultry farmers on perceived effects of climate change on poultry production

Variables	Coefficient	Std. Error	t-ratios	Sig.
(Constant)	84.123	6.217	13.531	.000*
Sex (X_1)	.436	.835	.522	.603
Age (X_2)	.099	.074	1.334	.187
Marital Status (X_3)	.532	.952	.559	.578
Educational Level (X_4)	.381	.106	3.586	.001*
Poultry Farming Experience (X_5)	.131	.268	.490	.626
Household Size (X_6)	.257	.251	1.026	.308
Management system (X_7)	.212	.332	.638	.526
Member of Association (X_8)	3.013	.891	3.383	.001*
Extension contact (X_9)	2.680	.943	2.843	.006*
Income (X_{10})	8.044E-007	.000	.246	.806

$R^2 = 0.776$, F-Ratio value =21.409, *1% probability level significance; Source: *Field Survey, 2024*.



CONCLUSION AND RECOMMENDATIONS

The study revealed that presently, poultry farmers are adequately aware of climate change in Imo State. The poultry farmers were able to perceive climate change on poultry production. Climate change poses a threat to poultry production in the study area. The poultry farmers therefore perceived the effect of climate change as high costs on poultry production activities, low quantity and quality of egg production, high temperature and low rainfall conditions reduce the quality of grains, high temperature makes birds feed less and drink more, decrease in weight gain, pest infestation and spread of diseases. The study revealed that poultry farmers who were educated, members of social organizations, had extension contact and also had access to credit facilities were able to perceive effect of climate change. However, poultry farmers particularly should be adequately informed on the best operating systems to minimize the harmful effects of climate change on poultry egg production, such as the construction of a cooling system during high temperatures. Radio programs that will create more awareness and adaptation strategies on climate change as it affects poultry production should be encouraged and sponsored by the governments and nongovernmental organizations. Efforts should be made to minimize human actions that contribute immensely to the occurrence of climate change. Activities such as deforestation, bush burning, and piling of poultry waste without disposing of them on time and properly should be discouraged.

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