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Awareness, Perceıved Effect and Mıtıgatıon Strategıes on The Effect of Clımate Change Among Poultry Farmers in Ogun State of Nigeria

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Abstract

Global warming poses a significant threat to poultry production, inducing heat stress that reduces feed intake, egg production, and reproductive capacity, while increasing mortality rates. However, limited research exists on poultry farmers' awareness, knowledge, and perceptions of climate change, which are essential for developing effective adaptation strategies. This study examines poultry farmers' perceptions of climate change in Ogun State, Nigeria. Primary data were collected from 154 registered members of the Poultry Association of Nigeria, Ogun State Chapter (PANOG) using a multistage sampling technique. Data analysis involved the use of descriptive and inferential statistics, including frequency, percentages, and chi-square tests. Results show that 64.5% of poultry farmers were male, 78.3% had tertiary education, and 93.4% were aware of climate change. Over 80% associated climate change with rising environmental temperatures, while more than 70% linked it to increased water intake in poultry birds. Additionally, 75% of respondents identified well-ventilated housing as a mitigation strategy. However, fewer than 50% strongly agreed on the effectiveness of improving feed quality, veterinary services, reducing stocking density, or integrating other livestock. Statistical analysis revealed significant ($P<0.05$) relationships between awareness and factors such as age, education level, experience, and access to information. Furthermore, awareness levels significantly ($P<0.05$) influenced the adoption of mitigation strategies. The study highlights the need for targeted education on climate change impacts and adaptive measures, particularly through feed management, to enhance poultry farmers' resilience and productivity in Ogun State.

Key Words: *Awareness, Perception, Climate change, Mitigation strategies,Poultry farmers, Nigeria.*

Introduction

Climate change has emerged as one of the most pressing global challenges, affecting various sectors, including agriculture. It is primarily caused by the accumulation of greenhouse gases in the atmosphere, leading to rising environmental temperatures, commonly referred to as global warming. This phenomenon has significant implications for food production systems worldwide, particularly in regions highly dependent on agriculture for economic sustenance. Among the most vulnerable agricultural sectors is poultry farming, which is crucial for food security, employment, and economic development in many countries, including Nigeria.

Poultry farming is a major component of the livestock industry and plays a pivotal role in meeting the protein requirements of growing populations. Poultry consists of birds which are of economic value to humans as the primary supplier of meat, egg, and raw materials to industries (feathers, waste products), they are also a source of income to man (Akanwa & Joe-Ikechebelu, 2019). The poultry industry in Nigeria is one of the most well-organized and most commercialized agricultural sub-sectors, contributing significantly to the nation's Gross Domestic Product (GDP). It is estimated to account for 25% of the agricultural GDP and provides a livelihood for millions of people across rural and urban areas (Mackenzie et al., 2020).

According to the Central Bank of Nigeria (CBN, 2019), the poultry industry has an estimated market value of ₦1.6 trillion. The demand for poultry products continues to rise, with an estimated annual production of 180 million birds, 3.8 million of eggs, and over a billion tonnes of poultry meat. However, despite the industry's potential, local production has struggled to meet this growing demand, leading to the smuggling of poultry products into the country (Oloso, 2020). This challenge is compounded by climate change, which negatively impacts poultry production and reduces its productivity (Liverpool-Tasie et al., 2019).

Poultry birds are homeothermic animals, meaning they thrive within specific temperature ranges known as the Thermo-Neutral Zone (TNZ). The TNZ ensures optimal feed conversion, growth, development, and productivity (Aroyehun, 2023). When temperatures exceed or fall below this range, poultry birds experience physiological stress, affecting their performance. In particular, high temperatures lead to heat stress, which reduces feed intake,

lowers egg production, increases mortality rates, and negatively affects reproduction. These adverse effects of climate change on poultry farming necessitate urgent interventions to mitigate its impact and ensure the sustainability of poultry production.

While climate change has been widely recognized as a significant threat to agriculture, there remains a gap in understanding its specific impact on poultry productivity. Several studies (Chah, 2013; Adebisi, 2017; Aroyehun, 2022) have documented the detrimental effects of climate change on livestock, including reduced fertility, poor egg quality, increased disease susceptibility, and higher production costs. However, there is limited information on poultry farmers' awareness, perceptions, and adaptive strategies regarding climate change. Many farmers may be aware of climate change but lack the knowledge and resources to implement effective mitigation measures. As a result, they continue to experience losses due to heat stress, feed inefficiencies, and disease outbreaks.

Research has shown that farmers' socio-economic characteristics, such as age, gender, education level, and access to information sources, play crucial roles in farmers' perception and adaptation strategies (Sesay & Kallon, 2022; Adepoju & Osunbor, 2018). Farmers with higher education levels and access to extension services are more likely to be aware of climate change impacts and adopt appropriate adaptation measures to counteract climate-induced challenges (Adepoju & Osunbor, 2018; Aroyehun, 2022). Those with limited knowledge may struggle to implement appropriate interventions. Additionally, training programs and climate-related information play a critical role in shaping farmers' perceptions and responses. Without adequate knowledge, poultry farmers may fail to adopt adaptive measures such as improving housing conditions, optimizing feeding practices, enhancing veterinary care, and reducing stocking densities to mitigate climate change effects.
Despite government efforts to boost local poultry production, policy frameworks have not fully considered the implications of climate change. In 2015, the Nigerian government implemented measures to promote local production by restricting the importation of poultry products and cracking down on smuggling activities (Amata, 2022). While these policies aimed to enhance domestic poultry farming, they did not address the environmental challenges that threaten the sector's growth. Consequently, many poultry farmers continue to face climate-related obstacles without adequate support or guidance.

Furthermore, Nigeria is expected to be a key driver of global meat consumption in the coming decades (The Economist, 2019). This projection underscores the importance of developing climate-resilient poultry farming systems to meet future food demands. As climate change intensifies, it is imperative to equip poultry farmers with the necessary knowledge and resources to adapt and build resilience against environmental stressors. Sustainable practices, such as climate-smart housing, strategic feeding, genetic selection for heat-resistant breeds, and efficient waste management, must be prioritized to safeguard the industry's future.

Given the critical role of poultry farming in Nigeria's economy and food security, it is essential to assess poultry farmers' awareness, knowledge, and adaptive capacity concerning climate change. Understanding their perceptions and identifying the challenges they face will provide valuable insights into effective mitigation strategies. This study aims to fill the existing knowledge gap by assessing farmers' level of awareness, perceived effects, and mitigation strategies that could reduce the effects of climate change on poultry production.

Hypothesis
Ho_1: No significant relationship between selected socio-economic characteristics of poultry farmers and their awareness of climate change.
Ho_2: No significant relationship was found between their level of awareness and adoption of practices for mitigating the effects of climate change.

Materials and Methods

This study employed a cross-sectional survey design to gather data from members of the Poultry Association of Nigeria, Ogun State Chapter (PANOG). PANOG is divided into six zones, namely, Ijebu, Remo, Egba, Ota, Yewa, and Mowe. A total of 154 poultry farmers were selected using a multi-stage random sampling technique.
In the first stage, purposive sampling was used to select three zones—Ijebu, Remo, and Egba—due to their proximity. The second stage involved proportional random sampling to determine the number of farmers from each selected zone. In the final stage, convenience sampling was employed during monthly meetings, with the assistance of the PAN Ogun State secretary, to recruit farmers who were available and willing to participate.
Data were collected on farmers' socioeconomic characteristics, awareness, perceived effects, and mitigation strategies related to climate change. Descriptive statistics, including frequency and percentages, were used to analyze socioeconomic characteristics and awareness levels. Inferential analysis using chi-square was conducted to test the study's hypotheses and draw relevant conclusions.

Results and Discussion

The socioeconomic characteristics of the poultry farmers were analysed using descriptive statistics. These include gender, age, level of education, farming experience, types of birds raised, number of birds in stock, management system, awareness of climate change and source of awareness.
The results indicate that 64.5% of the respondents were male, with a significant proportion falling within the age groups of 45-54 years (26.3%) and 55-65 years (23.7%). The majority (78.3%) of poultry farmers had tertiary education.
Regarding experience, 38.2% of farmers had 6-10 years of experience, while 25.7% had 11-16 years, suggesting that most respondents were experienced poultry farmers. Half (50.0%) of the farmers raised layer breeds, while only 33.6% reared broilers.

Table 1.0 Socio-Economic Characteristics of Poultry Farmers in the Study Area

Characteristics	Frequency	Percentage
Gender		
Male	95	64.5
Female	54	35.5
Age		
25-34	38	25.0
35-44	31	20.4
45-54	40	26.3
55-65	36	23.7
Above 66	6	3.9
Respondent's level of Education		
Primary	7	4.6
Secondary	22	14.5
Tertiary	119	78.3
Formal education.	4	2.6
Years of Farming Experience		
≤ 5	27	17.8
6-10	58	38.2
11-16	39	25.7
Above 16	27	17,8
Type of birds raised		
Layers	76	50.0
Breeders	19	12.5
Broilers	51	33.6
Number of birds in stock		
< 500	34	22.4
500-1,000	53	34.9
1001-5000	35	23.0
5001-10,000	24	15.8
Above 10,000	5	3.3
Management system in practice		
Deep litter	60	39.5
Battery cage	79	52.0
Semi- intensive	8	5.3
others ----------	4	2.6
Awareness of climate change		
Yes	142	93.4
No	9	5.9
Source of information on climate change		
Newspapers	29	19.1
Radio / TV	46	30.3
Professional colleagues / Association	51	33.3
Extension workers	9.2	9.2
Others ----------	8	5.3

Source: Field Survey, 2024

More than half (52.0%) of the respondents practiced the battery cage system of poultry production, likely due to the high proportion of layer farmers, as battery cages facilitate egg collection.
The majority (93.4%) of respondents reported being aware of climate change, which may be attributed to the high level of education among poultry farmers in the study area. Television and radio were identified as the primary sources of climate change information for these farmers.

Awareness of Climate Change by Poultry Farmers

Table 2.0 indicates a relatively high level of awareness of climate change among poultry farmers in Ogun State. The majority of the farmers were very moderately aware of what climate entails. A significant 79.9% of respondents acknowledged their awareness that climate change involves an increase in environmental temperature (global warming). This is consistent with the findings of Ezihe et al. (2020), who reported that 90.9% of poultry farmers agreed that they are aware of climate change**.** 54.6% are aware that climatic changes can lead to unfamiliar disease symptoms in birds. This awareness highlights the interconnectedness of climate change, environmental factors, and livestock health, which has been documented in previous studies (Thornton et al., 2022).
The majority (75.7%) of the poultry farmers agreed that there have been changes in rainfall patterns in recent years. This result supports the findings of Aroyehun (2022), who reported that 86.7% of the poultry farmers agreed that climate change increases in rainfall.

Table 2.0 Awareness of climate change by Poultry Farmers

Awareness	**Very Aware (VA)** Frq (%)	**Moderately Aware (MA)** Frq (%)	**Somehow Aware (SA)** Frq (%)	**Not Aware (ND)** Frq (%)
Climate change involves increase in environmental temperature (global warming)	120 (79.9%)	19 (12.5%)	6 (3.9%)	4 (2.6%)
Climate change is a global issue	117 (77.0%)	19 (12.5%)	9 (5.9%)	6 (3.9%)
There have been changes in rainfall pattern in recent years	115 (75.7%)	118 (11.8%)	10 (6.6%)	5 (3.3%)
Human activities are responsible for climate change	96 (63.2%)	32 (21.1%)	12 (7.9%)	8 (5.3%)
Weather has become unpredictable	113 (74.3%)	19 (12.5%)	13 (8.6%)	6 (3.9%)
Climatic changes increases unfamiliar diseases symptoms in birds	83 (54.6%)	44 (28.9%)	12 (7.9%)	7 (4.6%)
Flooding is a result of climate change	84 (55.3%)	32 (21.1%)	17 (11.2%)	17 (11.2%)
Poultry contributes to green house gas emission	67 (44.1%)	44 (28.9%)	19 (12.5%)	19 (12.5%)
Dry season is now more prolonged than before.	84 (55.3%)	35 (23.0%)	23 (15.1%)	7 (4.6%)

Source: Field Survey, 2024

Perceived Effects of Climate Change on Poultry Production

Table 3.0, shows perceived effects of climate change on poultry production by the farmers. Over 50% strongly agreed that climate change increases the water intake of poultry birds and increases maintenance costs. However, less that 50% strongly agreed on other listed perceived effects with the least percentage (30.9%) strongly agreeing to climate change effect on quality of feed ingredient. Other listed percieved effect of climate change include rate of feed intake,egg and meat production, growth rate, availability and cost of feed, maintanance cost, diseases susceptibility,mortality rate and income.
About 47.4% of the poultry farmers strongly agree that climatic change reduces the rate of feed intake of birds. Result agrees with Olorede (2021) findings that climate change increases feed intake in birds.While 32.9% of the poultry farmers strongly agree that climate change reduces the availability of feed, 22.4% are neutral. Effect of feed grain availability may be due to hash climatic conditions resulting in low harvest and hence scarcity of feed grain. Poultry farmers who are neutral on climate change effect are between 11.2% and 22.4%. This implies that they are not knowledgeable on climate change effect. Results indicate the need to educate the poultry farmers on the effect of climate change on poultry production.

Table 3.0. Distribution of Respondents on Perceived Effects of Climate Change on Poultry Production

Perceived effects of climate change on poultry production	Strongly Agree (SA) Frq (%)	Agree (A) Frq (%)	Neutral (N) Frq (%)	Strongly Disagree (SD) Frq (%)	Disagree (D) Frq (%)
Climatic changes increase water in take of poultry birds	97 (59.9%)	37 (24.3%)	17 (11.2%)	4 (2.6%)	2 (1.3%)
Climatic changes reduces the rate of feed intake of birds	72 (47.4%)	46 (30.3%)	23 (15.1%)	5 (3.3%)	4 (2.6%)
Climate change limit egg and meat production	72 (47.4%)	48 (31.6%)	22 (14.5%)	3 (2.0%)	5 (3.3%)
Climatic changes slow down the growth of the poultry birds	62 (40.8%)	50 (32.9%)	26 (17.1%)	8 (5.3%)	3 (2.0%)
Climatic changes increases disease susceptibility	52 (34.2%)	41.4 (27.2%)	17.1 (11.3%)	2.0 (3%)	2.0 (3%)
Climate change increase maintenance cost	85 (55.9%)	36 (22.7%)	18 (11.8%)	5 (3.3%)	3.0 (2%)
Climate change increases the cost of feed	62 (40.8%)	42 (27.6%)	30 (19.7%)	5 (3.3%)	6 (3.9%)
Climate change reduces the availability of feed	50 (32.9%)	50 (32.9%)	34 (22.4%)	9 (5.9%)	8 (5.3%)
Climate change reduces the quality of feed ingredient	47 (30.9%)	51 (33.6%)	29 (19.1%)	11 (7.2%)	8 (5.3%)
Climate change increased mortality of birds.	65 (42.8%)	48 (31.6%)	24 (15.8%)	5 (3.3%)	7 (4.6%)
Reduces farmers income	62 (40.8%)	50 (32.9%)	23 (15.1%)	6 (3.9%)	5 (3.3%)

Source:Field survey,2024

Strategies to Mitigate Climate Change in Poultry Production

Table 4.0 shows the mitigation strategies proposed by poultry farmers to counteract the negative effects of climate change on poultry production. 75.0%, 66%, and 63% of the poultry farmers strongly agree that construction of buildings with a good ventilation system, planting to provide shade, and using an efficient cooling system could mitigate the effect of climate change on poultry production, respectively. This result is in agreement with Liverpool-Tasie et al. (2019), who reported that air ventilation and cooling systems are adaptation strategies recommended to be used in response to heat stress. 69% and 73% strongly agreed to maintaining good hygiene and supplying adequate water respectively. While 27% strongly agreed to increased use of veterinary services and use of herbs and spices, 19% strongly agreed to keeping other livestock, and 37.5% were neutral. 12.5% and 13.8% strongly disagree with the use of herbs and spices and keeping other livestock, respectively. This indicates the need for further enlightenment on strategies for building the resilience of poultry against climate change for improved productivity.

Relationship between Selected Socioeconomic Characteristics of Poultry Farmers and their Awareness of Climate Change

The results of the test of hypothesis (Table 5.0), show the relationship between selected socioeconomic characteristics of the poultry farmers and their awareness of climate change. Age, level of education, experience, and information were significantly ($P<0.05$) related to awareness, perception, and measures in mitigating and controlling the effects of climate change. This finding agrees with Okocha et al. (2024), who reported that education and access to information influence farmers' perceptions and adoption of mitigation strategies. The more educated, experienced, and the easier the accessibility to information, the more aware the farmer is about climate change. The result also agrees with Debela et al. (2015), who reported that personal attributes such as age, education, and access to information affect how individuals perceive climate change.

Relationship between the Level of Awareness and Practices for Mitigating the Effects of Climate Change.

Table 6.0 shows that there is a significant ($P<0.05$) relationship between the level of awareness of poultry farmers and farm practices for mitigating the effects of climate change. This shows that the more aware the farmers are about what climate change is, the more their knowledge on the mitigation practices.

Table 4.0. Strategies to Mitigate Climate Change Effect on Poultry Production

Strategies to mitigate climate change effect on poultry production	**Strongly Agree (SA)** Frq (%)	**Agree (A)** Frq (%)	**Neutral (N)** Frq (%)	**Strongly Disagree (SD)** Frq (%)	**Disagree (D)** Frq (%)
Construction of buildings with a good ventilation system	114 (75.0%)	26 (17.1%)	6 (3.9%)	1 (0.7%)	3 (0.2%)
Planting trees to provide shade for the birds	101 (66.4%)	30 (19.7%)	10 (6.6%)	4 (2.6%)	3 (2.0%)
Use of efficient cooling system like fans.	96 (63.2%)	30 (19.7%)	19 (12.5%)	3 (2.0%)	2 (1.3%)
Seeking more information on climate change.	98 (64.5%)	35 (23.0%)	13 (8.6%)	1 (0.7%)	1 (0.7%)
Improving quality of feeds	42.1 (28%)	23.7 (15.6%)	17.1 (11.3%)	9.2 (6.1%)	5.9 (4%)
Increased use of veterinary services	41.4 (27.2%)	31.6 (20.8%)	15.1 (10%)	2.6 (2%)	5.9 (4%)
Maintaining good hygiene.	105 (69.1%)	27 (17.8%)	12 (7.9%)	1 (0.7%)	2 (1.3%)
Vaccination of birds	79 (52.0%)	38 (22.4%)	24 (15.8%)	6 (3.9%)	5 (3.3%)
Supplying adequate water	112 (73.7%)	28 (18.4%)	6 (3.9%)	1 (0.7%)	2 (1.3%)
Decreasing stocking density.	65 (42.8%)	44 (28.9%)	28 (18.4%)	7 (4.6%)	2 (1.3%)
Use of herbs and spices	41 (27.0%)	39 (25.7%)	43 (28.3%)	19 (12.5%)	7 (4.6%)
Keeping other livestock	29 (19.1%)	32 (21.1%)	57 (37.5%)	21 (13.8%)	9 (5.9%)

Source:Field survey,2024

Table 5.0. Relationship between Selected Socioeconomic Characteristics of Poultry Farmers and their Awareness of Climate Change

Socio-economic characteristics	Pearson Chi-Square	Likelihood Ratio	Linear-by-Linear Association	N of Valid Cases
Gender	0.362 (0.548)	0.353 (0.552)	0.359 (0.549)	152
df	1	1	1	
Age	6.729 (0.151)	5.341 (0.254)	3.747 (0.053)	151
df	4	4	1	
Level of Education	40.734 (0.000)	27.675 (0.000)	2.342 (0.126)	152
Experience	11.8189 (0.019)	6.864 (0.143)	0.548 (0.459)	152
df	4	4	1	
Information	44.172 (0.000)	25.881 (0.000)	5.900 (0.015)	148
df	4	4	1	

Source:Field survey, 2024; df= degree of freedom; Significant at $p<0.05$.

Table 6.0. Relationship between the Level of Awareness and Practices for Mitigating the Effects of Climate Change.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.032	1	0.045
Continuity Correction	0.604	1	0.437
Likelihood Ratio	2.244	1	0.134
Linear-by-Linear Association	4.006	1	0.045
N of Valid Cases	152		

Source: Field survey, 2024

Conclusion

The study indicates a high level of awareness among poultry farmers in Ogun State regarding the impacts of climate change on poultry production. Despite this awareness, there is a pressing need to implement effective mitigation strategies to address the adverse effects of climate change on poultry farming.

As the evidences of climate change are becoming more pronounced all over the world and in Nigeria, adopting climate-smart agricultural practices, improving infrastructure, enhancing veterinary services, good housing systems, manipulation of feed and feeding systems, supplying adequate water of good quality, ensuring adequate stocking density, and capacity building are essential steps towards building climate-resilient poultry farming systems in the area. Since the majority of poultry farmers got climate change information from radio and TV programs, enlightenment programs should be sponsored on the media (particularly radio and television) to create more awareness on mitigation and adaptive strategies that can reduce the effects of climate change on poultry production.

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