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PERCEIVED EFFECTS OF CLIMATE CHANGE ON POULTRY EGG PRODUCTION IN RIVERS STATE NIGERIA

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Abstract: The study assessed the effects of climate change on poultry egg production in Rivers State, Nigeria. A total of 120 poultry egg farmers were randomly selected through questionnaire and interview schedule. Descriptive statistics and inferential statistical tools were used for data analysis. Result of the socio-economic characteristics revealed that majorities (60.8%) of the poultry farmers were males, 80.8% were married, and 61.6% had tertiary education. Also from findings, the majority (67.5%) of the poultry farmers were aware that high temperature, increase in rainfall (86.7%), erratic rainfall pattern (71.7%), decrease in relative humidity (55.8%) and flooding of poultry farms (71.7%) has harmful effects on poultry egg production. More so, the perceived effects of climate on egg production include high rate of diseases and parasites incidence, soft egg shell formation, low quantity and quality of egg production, high costs of poultry production activities, reduction in feed and water intake, and increase in poultry bird mortality. Results also revealed that television, radio, social media and fellow poultry farmers were their main sources of information on climate change. The result of Chi-square also revealed that education attainment and marital status of poultry farmers were significant at 5% used in controlling the effects of climate change, because married farmers have family labour capacity to build adaptive strategies. It is therefore commended that poultry farmers should be adequately informed on the best operating systems to minimize the harmful effect of climate change on poultry egg production as well as ensure optimum level of poultry egg production.

Keywords: Climate change, Information, Poultry production, Perceived effects, Rivers State

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1. Introduction

Climatic change is a continual alteration in the average mean of climatic parameters such as temperature, wind speeds, rainfall, relative humidity and soil moisture content owing to the changes in the constituent and structure of atmospheric gases (Otitoju, 2013). In accordance with Intergovernmental panel on climate Change [IPCC] (2001) report, the United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a variation of meteorological conditions which is associated directly and indirectly to human being enterprise that affects the distribution and formation of the global and regional environment in addition to natural climate fluctuation observed over a proportionate duration of seasons. It is apparent and understandable from this definition that change is inbred and indispensable characteristic of climate, which is induced by both man's action and natural means. According to Krishna (2011) the change in the atmospheric constituent and structure is ascribed to the emissions of greenhouse gases (GHG) such as Carbon dioxide (CO₂), Methane (NH₄), Nitrogen oxide (N₂O) and other gases. Climate change is an alteration in the mean weather that an area experienced over a given period of time. Farmers are confronting with a lot of difficulties

because of change in climate and it may not be obvious in empirical stipulations what loss farmers encounter but it is acknowledged to cause more damage to the farmers' production than good (FAO, 2015). There are many human activities that are accountable for climate alteration worldwide such as poor environmental sanitation, deforestation, bush burning, drilling of boreholes, fuel combustion, and cement manufacture (European Commission Climate Action, 2022; Intergovernmental Panel on Climate Change IPCC, 2022). The greatest impact of climate change has however been foreseen to be in the livestock production in Sub-Saharan Africa (Adesoji and Famuyiwa, 2010). Therefore, adaptation to, and mitigation of the damaging effects of acute climates has played a huge task in fighting the climatic impact on livestock (Sejien et al., 2015). There is no doubt that climate change will have effect on poultry egg productivity in many regions of the world. The adversity facing livestock is weather extremes which include severe heat waves, droughts and floods. In conjunction to production deficit, acute occurrences like disease or infection attack also lead to death of livestock (Gaughan and Cawsell-Smith, 2015).

Poultry production is a core source of protein which has encouraged poultry farmers to obtain a way of survival and livelihood. Climate change alters poultry productivity



by decreasing poultry produce and nutritional quality of feeds, fostering disease and disease-scattering pests, decreasing water accessibility and making it tough and strenuous for poultry birds to survive (Spore, 2008). Climate change shows as increase in temperature leading a fall in relative humidity and provides a favourable means for fungal and bacterial development. Epidemic of disease becomes inescapable; diseases such as coccidiosis, fowl typhoid, haemorrhagic syndrome, chronic respiratory disease, fowl pox, and bronchitis will thus be multiply (Sejian et al., 2016). Rowlinson (2008) stated that slit change in temperature will lead to reduction in the rate of poultry bird feed consumption triggering poor performance. Animal have optimum temperature confines for growth, development and coziness known as the Thermos-Neutral Zone (TNZ) that based on the species, livestock age and physiological stature, relative humidity and other determinants. Within the TNZ, livestock has maximum production level and best feed conversion efficiency. Low temperatures will lead to more feed consumption to match increased maintenance vigor and energy needs of poultry birds. Beyond the TNZ, high temperatures that bring heat stress on livestock may result in low feed consumption, decreased in production of eggs, high mortality and low reproduction. According to Indian Council for Agricultural Research [ICAR] (2010), as the environmental or atmosphere temperature rise to $\geq 34^{\circ}\text{C}$ the rate of mortality owing to heat was considerably high in meat (broiler) poultry bird by 8.4%, the feed intake of the poultry bird reduces from 108.3g/bird/day at 31.6°C to 68.9g/bird/day at 37.9°C , the poultry bird egg production equally reduced by 6.4% as related to their normal egg production.

Given that the effects of climate change can only be mitigated and adapted to, it is appropriate and relevant to determine a forehand the effect of the trend by the farmers most involved in poultry farming. Therefore, this study aims to determine the effects of climate change on poultry egg production. The study was conducted in Rivers State Nigeria. The specific objectives of the study are to:

1. Determine the socioeconomic characteristics of the poultry farmers in the study area;
2. Ascertain the climatic factors affecting poultry egg production in the study area;
3. Identify the source of information on change in climate by the poultry farmers in the study area; and
4. Describe the perceived effects of climate change on poultry egg production in the study area.

The findings of this study will provide useful information on the effect of climate change on poultry egg production and proffer appropriate ways to mitigate its effect. It will also provide vital information for policy makers in taking appropriate actions toward improving livestock and nutrition needs of Rivers State and Nigeria at large.

2. Materials and Methods

The study was carried out in Rivers State, Nigeria. The state lies between longitude $6^{\circ} 50'\text{E}$ and Latitude $4^{\circ} 45'\text{N}$, bounded on the South by the Atlantic Ocean, to the North by Imo and Abia States, to the East by Akwa-Ibom State and to the West by Bayelsa and Delta States (Niger Delta Regional Development Master Plan [NDRDMP], 2006). The state is made up of 23 Local Government Areas (LGAs). Total annual rainfall decreases from about 4,700mm on the coast to about 1,700mm in extreme north of the State and the mean monthly temperature is in the range of 25°C to 28°C (Niger Delta Regional Development Master Plan [NDRDMP], 2006). The State is proficient with vastness of land right and proper for cultivation of yam, cassava, maize, vegetables and rearing of livestock such as poultry, cattle, pig, sheep, fish and goat.

Multistage sampling was used to select respondents for the study. In the first stage, simple random sampling was used to select six Local Government Areas (LGAs); namely Oyiabo, Obio/Akpor, Emohua, Ikwere, Etche and Eleme LGAs. Secondly, four communities in each of the six LGAs were randomly selected to give twenty-four. Thirdly, five poultry egg production farmers were selected from each of the communities to give a total of one hundred and twenty (120) poultry egg production farmers that form the sample size for the study. Data were collected using questionnaire and interview schedule; frequencies, percentages and chi-square were used to describe and analyze the data. In order to achieve the objectives of the study, Chi-square was used to examine the relationship between socioeconomic characteristics of respondents and their awareness on climate change, as used Adesiji et al. (2013) and expressed as given Equation 1;

$$\chi^2 = \frac{(f_o - f_e)^2}{f_e} \quad (1)$$

Where;

χ^2 = Chi-square

f_o = Observed frequency

f_e = Expected frequency if NO relationship existed between the variables.

Statistical Package for the Social Sciences (SPSS) version 23 statistics software was used to analyze the data.

3. Results and Discussion

The socioeconomic characteristics of the poultry farmers are presented in Table 1 which shows that majority (60.8%) of the respondents were males. This agrees with Amos (2006) that reported that there is uneven gender distribution in poultry production in Ondo State Nigeria. It also shows that about 80.8% of the respondents were married this implies the significance of the poultry egg production in meeting the family needs and welfare.

Table 1. Socioeconomic distribution of the poultry farmers

Variables	n	%
Gender		
Male	73	60.8
Female	47	39.2
Age		
<30	13	10.8
31 – 40	33	27.5
41 – 50	31	25.9
51 – 60	38	31.6
61 and Above	5	4.2
Mean	44.69	
Marital Status		
Single	17	14.2
Married	97	80.8
Widow/Widowers	6	5.0
Level of Education		
No Formal Education	14	11.7
Primary	5	4.2
Secondary	27	22.5
Tertiary	74	61.6
Primary Occupation		
Poultry Farming	46	38.3
Civil Servant	21	17.5
Public Servant	10	8.3
Student	5	4.2
Others (Traders, Artisan and Clergy)	38	31.6
Annual Income (in ₦'000,000)		
<1	31	25.8
1.1 – 5	81	67.5
5.1 – 10	4	3.3
10.1 – 15	2	1.7
>15.1	2	1.7
Mean	2,681,930	

The mean age was 44.69 years. This agrees with Adesiji, Baba and Tyabo (2013) who reported the active age of 31 – 40 years among poultry farmers in Ondo State Nigeria. This implies that poultry farming in the study area is dominated by young people within the productive age and work force that are strong and energetic to engage in poultry farming enterprise. The majority (74.0%) of the poultry farmers had tertiary education, this agrees with Adesiji et al. (2013) that reported 42.2% among poultry farmers in Ondo State, this shows that most of the respondents were educated enough and could have access to information on climate change and its adaptive strategies. However, about 38.3% of the farmers had poultry egg production as their primary occupation and as a source of livelihood this means that the business is viable in the study area. Result of analysis also showed that majority (67.5%) make between 1.1 million and 5 million naira per annum with mean of ₦2,681,930.00 annually from poultry egg production.

Table 2 shows that change in climate is obvious. Poultry farmers were well aware of higher temperature (67.5%), increase in rainfall (86.7%), flooding of poultry farms (71.7%), and decrease in relative humidity (55.8%). This finding agrees with Elijah and Adedapo (2006) that reported that change in climatic factors are simple and evident; and the changes revolve around temperature and volumes of rainfall and their deviations.

Table 3 shows that the majority (55.8%) of the poultry farmers got most of their information from television, about 29.2% from radio, and about 30.8% from fellow poultry farmers. This supports the findings of Yahaya (2002) that television and radio are the potent source of information to farmers and their families. And with the findings of Henri-Ukoha et al. (2012) who reported that among Livestock farmers in Ukwu West L.G.A of Abia State recorded high level of usage for conventional information communication technology (ICTs) such as radio and television to obtained information on livestock production. However, radio air agricultural programmes on crops farming related than livestock production distinctively. In addition, fellow poultry farmers are not to be relied on with such professional information because it could be more of trial and error sourced.

Table 4 shows that the majority (94.0%) of the poultry farmer agreed that climate change has effect the rate of distribution of poultry diseases and parasites incidence. About 91.4% confirmed that change in climate leads to increase in poultry bird mortality while about 52.6% had been displaced due to floods incidence. Majority (87.1%) and (85.3%) attested that climate change actually leads to low feeding intake and water consumption respectively. This finding is in support of Spore (2008) which reported that change in climate could lead to an increase in diseases and parasites incidence in the pens. Research interview schedule reports the production of thin egg shells, shell-less eggs, small egg sizes, increase in broken eggs and bird life weight, agreeing with (Demeke, 2004). This endangers protein production, accessibility and utilization and also the achievement of food security and nutritional requirement in the area.

Table 5 shows that poultry farmers change poultry breeds (72.5%), plant crops (60.8%), trees and plantain around the pens (95.0%). This finding agrees with Chahet al. (2013) who reported that poultry farmers in Enugu North agricultural zone of Enugu State Nigeria adapted to climate change by planting of crops. About 5.0% construction of polyvinyl chloride (PVC) with holes over the roof of the pens. This finding agrees with Chah et al. (2013) who reported about 10.3% among poultry farmers in Enugu North agricultural zone of Enugu State that installed cooling system. This will reduce heat during high temperature and provide a well-ventilated housing stabilized the birds.

Table 2. Distribution on awareness of climate change by the poultry egg farmers (Field Survey 2018)

Variables	Yes		No	
	n	%	n	%
Higher temperature	81	67.5	39	32.5
Lower temperature	88	73.3	32	26.7
Increased in rainfall	104	86.7	16	13.3
Decreased in rainfall	47	39.2	73	60.8
Delay/Erratic rainfall pattern	86	71.7	34	28.3
Heavy winds	50	41.7	70	58.3
Change in wind direction	58	48.3	62	51.7
Flooding of poultry farms	86	71.7	34	28.3
Drought	64	53.3	56	46.7
Decrease in relative humidity	67	55.8	53	44.2

Table 3. Distribution of poultry farmers according to source of information on climate change (Field Survey 2018)

Variables	Yes		No	
	n	%	n	%
Radio	35	29.2	85	70.8
Television	67	55.8	53	44.2
Social group/association	3	2.5	117	97.5
Fellow poultry farmers	37	30.8	83	69.2
Social media	33	27.5	87	72.5
Phone	17	14.2	103	85.8
Printing materials	6	5.0	114	95.0

Table 4. Effects of climate change on poultry egg production (Field Survey 2018)

Variables	Yes		No	
	n	%	n	%
High rate of diseases and parasites incidence	109	94.0	7	6.0
Decrease weight gain	68	58.6	48	41.4
Soft egg shell formation	73	62.9	43	37.1
Low quantity and quality of eggs production	83	71.6	33	28.4
High costs on poultry production activities	84	72.4	32	27.6
Reduction in poultry bird rate of feed consumption	101	87.1	15	12.9
Reduction in poultry bird rate of water intake	99	85.3	17	14.7
Increases poultry bird mortality	106	91.4	10	8.6
Instability and inconsistency in poultry farming	71	61.2	45	38.8
Displacement of poultry farmers	61	52.6	55	47.4

Table 5. Distribution of respondents according to measures for controlling effects of climate change on poultry egg production (Field Survey 2018)

Variables	Yes		No	
	n	%	n	%
Change poultry bird breeds	87	72.5	33	27.5
Construction of polyvinyl chloride (PVC) over the roof of the pens	6	5.0	114	95.0
Poultry and crop farming	73	60.8	47	39.2
Planting of trees and plantain around the pens	114	95.0	6	5.0
Change poultry bird feeds	101	84.2	19	15.8
Reduce stock size of birds	38	31.7	82	68.3
Use of vaccines and other medications	116	96.7	4	3.3

Table 6. Relationship between socioeconomic characteristics of respondents and their awareness on climate change (Field Survey 2018)

Variables	Chi-square value	df	Significance	Decision
Age	42.000	35	0.193	NS
Gender	5.633	1	0.18	NS
Level of education	189.600	5	0.001**	S
Income level	62.400	63	0.498	NS
Marital status	123.350	2	0.001**	S

df= degree of freedom; S= Significant; NS= Not Significant; **= Significant at 5%.

Table 6 shows the relationship between measures used in controlling effects of climate variation and some socioeconomic characteristics of the poultry farmers. Level of education and marital status were significantly related to procedures and measures in adjusting and controlling the effects of climate change. This finding agrees with Adesiji, et al. (2013) who reported that the more educated an individual farmer is, the more he or she will be exposed to several techniques and means of controlling the effects of climate change and in addition, he or she will be able to search for information from the social media, printed materials and extension officers. Also, marital status of the poultry farmer will determine how much family labour he or she will be able to utilize, marital status is an essential component in determining access to adaptation strategies. This finding agrees with Aelst and Holvoet (2016) who reported that marital status of married is very central and important in accessing and building adaptive strategies in comparison to single, widows/ widowers and/ or divorcees in agricultural water management in rural area in Tanzania. Poultry farmers with high household size could be more disposed to production information because they needed to sustain their household. However, climate change awareness did not differ across age groups, gender and level of income.

4. Conclusion

The study concluded that majority of poultry egg farmers in the study area were male, married and educated. Most of them were aware of high temperature, increase in rainfall, erratic rainfall pattern and flooding. Some of the effects of climate change on poultry egg production are high rate of diseases and parasites incidence, low quantity and quality of eggs, increase in bird mortality, reduction in the rate of feed and water consumption. These adverse effects of climate change were being adapted to/or mitigated in poultry production through planting of trees and plantain around the pens, change poultry bird feeds and use of vaccines and other medications.

From the findings, it is therefore recommended that:

1. Poultry egg farmers particularly should be adequately informed on the best operating systems to minimize the harmful effect of climate change on poultry egg production such construction of cooling system during high temperature.

2. Efforts should be made to minimize human actions that contribute immensely to the occurrence of change in climate, such activities like deforestation, bush burning, and piling of poultry waste without disposing them on time.
3. Private organizations, NGOs and Government agencies should also be encouraged to sponsor radio and television programs that will create awareness and mitigation and/or adaptation strategies on climate change as it affects livestock especially poultry production.

Author Contributions

The percentage of the author contributions is present below. The author reviewed and approved final version of the manuscript.

	A.R.A.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100
PM	100
FA	100

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The author declared that there is no conflict of interest.

Ethical Consideration

This study was conducted before the year of 2019. In that case ethical approval doesn't required.

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