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Rice Farmers' Awareness and Perception of Climate Change in Ondo State, Nigeria

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ABSTRACT

The study investigated rice farmers' awareness and perception of climate change on rice production in Ondo State, Nigeria. The objectives of the study are to: describe the socio-economic characteristics of the rice farmers, determine the level of awareness among rice farmers, examine the perceptions of the respondents on climate change, examine the coping strategies to climate change and identify the constraints militating against the production of rice. A validated interview scheduled was used to source information from one hundred and forty-four rice farmers. Primary data were collected on some socio-economic characteristics of rice farmers, awareness level of climate change, perceived effect of climate change on rice production, adaptation strategies and constraints to rice production in the study area. Descriptive statistics such as frequency count, percentage, mean, and ranking were used to summarize the data. Multiple regression analysis was employed to determine the relationships between selected socio-economic characteristic of rice farmers and their level of awareness of climate change. The mean age of rice farmers was 43.1 years with male (59.7%) dominated rice farming, 78.5% were married, and 70.2% percent could read and write. The mean annual income was N298.611 and mean farm size was 3.3hectares. Rice farmers were aware of climate change through some changes in climate elements such as excessive rainfall, prolonged dry season, high temperature, pests, and diseases infestations etc. As perceived by rice farmers, some effects of climate change were poor growth, poor yield, poor marketing, and the adaptation strategies employed were increased farm size, planting of improved rice varieties, irrigation practices change in planting periods etc. The regression results shows that household size had co-efficient (0.30), sex (0.509), years of farming experience (0.211) and level of education (0.383) which are positively significant to rice farmers' awareness of climate change. It was found that rice farmers were aware of climate change. The study therefore recommends that rice farmers should be encouraged by Government and Non-Government agencies through the provision of improved rice varieties, fertilizers etc. Rice farmers should also be encouraged to form themselves into cooperative societies in order for them to have easy access to credit and other facilities.

Keywords: Awareness, Climate change, Effect, Perception.

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I. Introduction

A. Background to the Study

Climate change is one of the most severe problems facing farmers in this present day and seems to be too severe than the threat of terrorism, affecting not only the sustainable development of socio-economic and agricultural activities of any nation but also threatening the complete human existence.

It is clearly evident that farm families are among the most threatened by climate change and surging populations in Nigeria because they rely solely on rain-fed agriculture; they often operate with scanty financial resources and have little or no access to credit facilities [1]. In the context of environmental policy especially in recent times, climate change has always been causing noticeable variation in environmental and atmospheric compositions, (The Inter-governmental panel on climate change, [2]. Any appreciable alteration in the earth's climate that lasts for a long period of time is referred to as climate change. It is an increase in average global temperatures. Natural events and human activities are conceived to be associated with climate change.

The [3] already predicts that Africa is the most vulnerable to climate change impacts because of additional temperature that will affect water balance and harm the agricultural sector. Climate is the state of the atmosphere that is created by weather events over a period of time. The effect of climate on agriculture is related to variability in local climates rather than in global climate patterns [4]. The most critical aspect of climate change to rice production is an increase in temperature. Alteration in temperature as a result of climate change does not only affect rice production but agriculture

generally. Climate change phenomena or variation in temperature affects agriculture in a number of ways [5]. Extreme weather events such as thunderstorms, heavy wind and floods, uncertainties in the onset of the farming season due to changes in rainfall characteristics, desertification result into crop failure and influence on animal performances such as growth, milk production, wool production and reproduction are ways among others by which climate change affects agriculture.

B. Statement of Problem

Rice is one of the food security crops grown in the continent of Africa especially in Nigeria, but it is not being grown fast enough in relation to the major problems farmers are experiencing in its production. These include drought, flood, salt stress, extreme temperatures, drastic changes in rainfall patterns and rise in temperatures. All these introduced unfavorable growing conditions into the cropping seasons. These changes modify growing seasons and subsequently reduce productivity [6]. Rice (Oryza *Sativa L*) production is greatly dependent on environmental factors provided by nature and the optimum combination of these factors plus production inputs determine yield. Rice productivity and sustainability are threatened by both biotic and abiotic stresses and the effects of these stresses can further be aggravated by dramatic changes in the global climate. Drought and flood already caused widespread rice yield losses across the globe and the expected increase in drought and flood occurrence due to climate change would further add to rice production losses in the future. Drought can also affect irrigated rice fields with poor water control. Water stress has been identified as one of the most important production constraints in Africa. Therefore, the major challenge is the potential adverse effect of climate change on rice production and being the factor reducing the increase in yearly production.

Based on the foregoing, it is obvious that many studies have been conducted on climate, its effect on rice development stages. However, studies have not been done on climate change awareness and perception of rural farmers particularly rice farmers on climate change in the study area. Hence, answers will be provided to the following research questions; viz:

- What are the socio-economic characteristics of rice farmers in the study area?
- What is the level of awareness of climate change?
- How do rice farmers perceived climate change?
- What are the coping strategies employed by the rice farmers to combat the effect of climate change? and
- What are the constraints encountered by farmers in rice production?

C. Objectives of the Study

The main objective of the study is to assess rice farmers' awareness and perception of climate change in Ondo State. The specific objectives are to:

- describe the socio-economic characteristics of rice farmers in the study area;
- assess the level of climate change awareness among rice farmers;
- examine rice farmers' perception of climate change in the study area,
- examine the coping strategies used by rice farmers to prevent the effect of climate change;
- identify the constraints encountered by rice farmers in the course of production in the study area.

D. Hypothesis of the Study

H_o: There is no significant relationship between the socio-economic characteristics of rice farmers and their level of awareness of climate change in the study area.

II. Methodology

The study was carried out in Ondo state, Nigeria. Ondo state has 18 Local Government Areas. It has an area of 14,793 km^2 and a population of 3,441,024 [7]. It lies in the South of Ekiti state as well as Edo state in the East, Kogi State in the South, ant Delta state to the Southeast, and Ogun state to the Southwest, and Osun to the Northwest. The state is located in latitude 6.89 59^o or 7^o 10′ and longitude 4.89 36^E o and the temperature in the state ranges between 21^{o}c and 29^{o}c with high relative humidity. Farming is the major occupation of people in the study area. A multistage sampling technique was employed for the study. The first stage involves a purposive selection of one Local Government Area (LGA) from each of the four Agricultural Development Project (ADP) Zones based on the LGAs, which grow rice. The second stage involved a random selection of three communities from each LGA sampled. The final stage involved a random selection of twelve (12) rice farmers from each community selected. A total of One hundred and forty-four rice farmers were selected for the study. Data collected for the study was through the use of a structured interview schedule and analyzed using frequency count, percentages, mean ranking, and multiple regression model to determine the relationship between rice farmers' socio-economic characteristics and their awareness of climate change.

The multiple regression model was explicitly stated as:

$$Y= b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 \ldots\ldots\ldots\ldots u$$

where
Y = Awareness level of climate change;
x_1 = Age (years);
x_2 = Sex;
x_3 = Marital status;
x_4 = Years of farming experience;
x_5 = Household size;
b_0 = Constant;
b_1- b_6 = Regression of coefficient of $x_1 \ldots x_6$ to be estimated;
u = Error term.

III. Results and Discussion

A. Socio-economic Characteristic of Respondents

This category of rice farmers according to age (Table I) shows that 50.0% of respondents were within the age bracket of 41–50 with the mean age of 43.1. This corroborates the submission of [8] that majority of rice farmers were within the age category of 31-50 years. Male dominated rice cultivation with 59.7% of the respondents. The majority

(78.5%) of the respondents were married, and 54.2% had a family size of between 6 and 10 with a mean household size of 6.5. Findings also revealed that 70.2% could read and write. Table I also reveal that ₦298.611 was the mean annual income with the major source of capital as personal savings as submitted by 58.3%. This implication of this is that respondents funded their enterprises themselves which confirms the report by [9] that farmers hardly obtain loans due to high-interest rates. The mean farm size was 3.3 hectares, and this indicates that the majority (74.3%) of the rice farmers cultivated below the mean farm size which was still small. Hence rice farmers in the study area were still operating at a small-scale level. This finding was supported by the International Fund for Agricultural Development [10] who reported that about 90% of Nigeria's food produced by smallholder farmers who cultivated small plots of land was usually less than 5ha of land per household. The mean farming experience of the respondents was 19.7 years which might indicate ability to have knowledge of climate change due to long farming experience.

TABLE I: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

Variables	Frequency	Percentage	Mean
Age			
≥30	13	9.0	
31-40	30	20.8	43.1
41-50	72	50.0	
>50	29	20.2	
Sex			
Male	85	59.7	
Female	58	40.3	
Marital Status			
Single	22	15.3	
Married	113	78.5	
Widowed	7	4.9	
Divorced	02	1.4	
Household Size (members)			
≤5	52	36.1	
6-10	78	54.2	6.5
>10	14	9.7	
Educational Status			
No formal education	40	27.8	
Primary	68	47.2	
Secondary	28	19.4	
Tertiary	03	2.1	
Others like (Adult education)	05	3.5	
Estimated annual income (₦) l acre			
≤ = 300000	86	59.7	
3001,000 = 600000	43	29.9	298.611
600001 = 900000	7	4.9	
>900000	8	56	
Source of capital			
Own savings	84	58.3	
Bank loan	06	4.2	
Cooperative Societies	34	23.6	
Family and Friends	20	13.9	
Farm size(ha)			
1-3	107	74.3	
4-6	19	13.2	
7-9	13	9.0	
>9	05	3.5	
Year of Farming Experience			
≤10	11	7.6	
11-20	73	50.7	19.7
21-30	42	29.2	
>30	18	12.5	

Source: Field Survey, 2020.

The result in Table II shows that rice farmers were aware of one parameter or the other caused by climate change. The parameters such as excessive rainfall (95.1%), prolonged dry season (91.7%), fluctuation in rainfall pattern (89.6%), high temperature as a result of intense heat (51.4%), others are high humidity (43.2%), fluctuation in temperature pattern (44.4%), flooding (26.4%) and heavy and windy storm (26.4%). The affirmation of the respondents on the occurrence of climate parameters was in tandem with the findings of [11] who reported that respondents are aware of changes in climate parameters and their constant manifestations.

TABLE II: AWARENESS OF CLIMATE CHANGE

Awareness of change in climate	Percentages	Ranks
Excessive rainfall	95.1	1st
High temperature	51.4	4th
High humidity	43.2	5th
Fluctuation in temperature pattern	44.4	6th
Flooding	26.4	7th
Heavy and windy storm	26.4	7th
Prolonged dry season	91.7	2nd
Fluctuation of rainfall pattern	89.6	3rd

Mean level = 4.03, SD: 2.21, High: 6.24, Low: 1.82.
Source: Field survey, 2020.

The results in Table III show farmers' perception of climate change's effects on rice production. Climate change leads to poor growth with a mean score of 2.82 and ranked first; poor marketing due to poor yield (2.67), flooding as a result of excessive rainfall (2.58) and poor yield with a mean score of 2.53. This statement shows that rice farmers had an unfavorable perception of climate change. The perceived submission of rice farmers on poor growth corroborates the submission of [10] that the climate change effect is already manifesting in crop failures and livestock death causing higher economic losses. This contributes to higher food prices and undermines food security.

TABLE III: RESPONDENTS' PERCEIVED EFFECTS OF CLIMATE CHANGE ON RICE PRODUCTION

Perceived Effects	SA	A	SD	D	Mean	Rank
Climate change leads to poor growth	85.2	11.1	2.1	1.6	2.82	1st
Climate change leads to poor yield	62.6	22.4	13.2	11.8	2.53	4th
Climate change leads to high cost of labour	2.8	2.1	13.2	81.9	10.3	6th
Climate change leads to poor marketing as a result of poor yield	7.6	14.0	9.7	68.8	1.61	5th
Climate change leads to loss as a result of drought due to insufficient rainfall	0.7	2.8	25.7	70.8	0.91	7th
Climate change leads to loss through flooding due to excessive rainfall	63.8	21.0	7.0	8.3	2.58	3rd
Climate change leads to low income due to poor marketing emanated from poor yield.	72.9	8.3	18.1	0.7	26.7	2nd

Source: Field Survey, 2020.
key: SA = Strongly Agree, A=Agree, SD=strongly disagree, D=Disagree, Overall Mean=2.01.
Sources: Field Survey, 2020.

The results in Table IV show some adaptation strategies carried out by rice farmers. An increase in rice farm size with a mean score of 3.87 was ranked first, followed by irrigation practice when and where there is drought ($\bar{X}$= 3.70) and this came second, planting of different rice varieties came third with $\bar{X}$= 3.27. Others were channelization of water due to excessive rainfall to avoid flooding with mean score of 2.62, diversification of livelihood sources to lessen the effect of climate change ($\bar{X}$= 2.52), Early planting and delayed planting with mean scores of 2.01 and 1.87 respectively.

TABLE IV: CLIMATE CHANGE ADAPTATION STRATEGIES BY RICE FARMERS

Adaptation Strategies	Mean	Rank
Planting or different rice varieties	3.27	3rd
Increase in farm size	3.87	1st
Practice irrigation during insufficient rainfall.	3.70	2nd
Channelization of water due to excess rainfall to avoid flooding	2.62	4th
Early planting of rice varieties	2.01	6th
Delay the planting of rice varieties at times	1.87	7th
Diversification of livelihood sources	2.52	5th

Grand mean: 2.25.
Source: Field Survey, 2020.

On the constraints to climate change adaptation by rice farmers, as shown in Table V, the majority of the rice farmers had financial constraints due to poor savings ($\bar{X}$= 2.57), followed by no access to water for irrigation and irrigation facilities ($\bar{X}$= 2.41) and high cost of production ($\bar{X}$= 2.25), and no access to market and market facilities ($\bar{X}$= 2.25). Others were poor storage facilities ($\bar{X}$= 2.20), lack of drought resistant rice varieties ($\bar{X}$= 1.15), ignorance of rice farmers on climate change ($\bar{X}$= 1.43) and poor knowledge of climate change ($\bar{X}$= 1.40).

TABLE V: CONSTRAINTS TO CLIMATE CHANGE ADAPTATION BY RICE FARMERS

Constraints	Highly severe	Moderately severe	Not severe	Mean	Rank
No sufficient credit/savings	97.2	2.1	0.7	2.57	1st
No access to water for irrigation during drought	96.5	0.7	2.8	2.41	2nd
No access to market facilities	95.8	2.1	2.1	2.25	3rd
High cost of production	95.8	2.8	1.4	2.25	3rd
Poor storage facilities	91.9	1.4	0.7	2.20	5th
Lack of drought resistant of rice varieties	38.9	11.8	49.3	1.51	6th
Ignorance of rice farmers on adaption strategies	35.4	42.4	15.3	1.43	7th
Poor knowledge of climate change and weather	29.2	98.6	72.2	1.40	8th
Poor access to early maturing varieties	9.7	63.9	26.4	1.01	9th

Source: Field Survey, 2020.

The co-efficient of multiple determination F-value shows proportion of the variation explained by the model which gave a value of 26.39 and the R square adjusted value = 0.73. This implies that there is existing relationship between Y variable and other X variables, whereby 61 percent of the variation observed was explained by the model, while the remaining 26 percent was accounted for by the error term. Therefore, the model fits the study.

IV. CONCLUSION AND RECOMMENDATIONS

It was found that rice farmers were aware of the changes in the climate elements. As perceived by rice farmers, effects of climate change on rice hinged on irregularities in rainfall patterns, poor growth and yield, high labour cost, a high temperature which hikes spikelet fertility, excessive rainfall which causes flooding and low income as a result of poor marketing. However, rice farmers endeavored to put in place some adaptation strategies such as planting of different varieties of rice, irrigation practice, change in planting dates, diversification of livelihood sources that can withstand changes in climate. Based on the conclusion drawn from the study, it is therefore recommended that Government should encourage rice farmers to form themselves into cooperative groups for adequate coordination of efforts and assistance such as credit facilities, supply of right inputs such as improved rice varieties, chemicals, expansion of rice fields will be made feasible by each of the rice farmers within the groups.

TABLE VI: MULTIPLE REGRESSION RESULT OF THE RELATIONSHIP BETWEEN SOCIO-ECONOMIC CHARACTERISTICS OF RICE FARMERS AND THEIR LEVEL OF AWARENESS OR CLIMATE CHANGE

Variables	Coefficient	Standard error	T-Value	P-Value
Constant	1.372	0.054	1.62	0.109
Age	0.307	0.282	1.53	0.128
Sex	0.509	0.409	2.14	0.003
Marital Status	-1.301	0.369	0.238	0.282
Years or farming experience	0.211	0.243	2.13	0.035
Household Size	0.301	0.274	1.32	0.000
Level of education	0.383	0.286	2.19	0.014

R-Square = 0.73, R-Square adjusted = 0.61, F-Value = 26.39.
Level of significance: 0.05.
Source: Field Survey, 2020.

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