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CLIMATE CHANGE AWARENESS, INFORMATION SOURCES AND ADAPTATION STRATEGY BY MAIZE FARMERS IN IWO LGA OF OSUN STATE, NIGERIA

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ABSTRACT

Due to the continuous negative impact of climate change on the environment and on agriculture in general, which have endlessly taken a toll on livelihood outcome of key agricultural stakeholders, farmers have continued to search for strategic measures to cope with the ordeal amidst their numerous limitations. This study was therefore carried to identify maize farmers coping strategies to the effects of climate change in Iwo local government area of Osun State. The sample size for this study was 120 respondents and structured questionnaire was used for data collection. The data were subjected to both descriptive (frequency and mean) and inferential statistics such as Chi-square and Pearson Product Moment Correlation (PPMC). The study revealed that the respondents were mostly male (57.5%), quite in their active age with a mean of 46.5 years and married (65.8%). A sizeable number (68.4%) were literate, majorly having a mean household size of 7.00 members, a mean farm experience of 2.84 years and a mean farm size of 5.44 hectares. Also the respondents mainly sourced their credit from personal savings/friends (59.1%) and had annual income of ₦1-100,000.00 with only few being in cooperative society (33.3%). In the same vein, the respondents were mostly aware of pests and disease ($\bar{x}=1.91$), irregular rainfall distribution ($\bar{x}=1.88$) and loss of land due to flood ($\bar{x}=1.87$) as the most common effect of climate change. Furthermore, personal observation ($\bar{x}=1.83$), radio ($\bar{x}=1.81$) and friends ($\bar{x}=1.43$) were their most common source of information. Early planting ($\bar{x}=2.82$), use of organic fertilizer ($\bar{x}=2.78$) and use of tolerant variety ($\bar{x}=2.70$) were the most used adaptation strategies to climate change in the study area. The inferential statistics results showed that marital status ($p=0.000$), educational status ($p=0.000$), members of cooperative ($p=0.016$), household size ($p=0.002$) and farming experience ($p=0.000$) had a positive and significant influence on adaptation strategy to climate change. The study recommends more farmers' awareness on the effect of climate change, and this would mean more farmers' exposure to extension services so as gain the required knowledge in this regards and also farmers should be exposed to more sustainable adaptation measures by the government and other private agencies through trainings.

Key words: maize farmers, climate change, adaptation strategies, awareness, Osun State

Introduction

Agriculture is an important sector of the Nigerian economy, offering employment to large number of the populace especially in the agrarian communities but then large number of these populace practice agriculture on a subsistence basis and hence are weather dependent. Emehute et al, (2021) stated that rain-fed agriculture is a type of cultivation that does not use any form of irrigation but depends on rainfall for crop cultivation and it accounts for more than 95% of farmed land in the agrarian communities of Nigeria. According to Ozioko, R.I., Eze, K.C., Emordi, A.N., Okoronkwo, D. J. and Nwobodo, C.E. (2022), the Nigerian agricultural production is threatened through extreme weather events such as drought and flood with adverse effects on fertility of the soil and crop productivity. This is inclusive of maize (*Zea mays*) farming with their farmers

operating mainly on a small scale in the country. Maize remains a staple crop in Nigeria and hence it's highly consumed and largely being produced in the country. Maize is one of the important Nigeria's household grains that contribute to food security and there are high numbers of subsistence maize farmers in the country (Mohammad et al, 2021). Also Nigeria was ranked tenth largest producer of maize in the world, sliding to twelfth in 2019 and it was the second largest producer in Africa after South Africa in 2019 (Knoema.com, 2020; IPCC, 2007).

Never the less, as opined by Olaitan, A. O., Akomolede, L. A. Adesokan, F. B., Babalola, Y. O., Rufai, S. O., and Agbeje, M. A. (2021); Nmadu, J. N., Coker, A. A., and Adams, E. (2017), about 90% of the total population in Nigeria depends on rain-fed agriculture for food production. It therefore means

that any changes in climate would most likely have negative impact on productivity and the livelihood outcomes of farmers and other key stakeholders of agricultural value chain in the country. These effects could be measured in term of drought and its effects on crop growth, soil erosion, incidence of pests and diseases and availability of soil water (Olaitan *et al* 2021). Climate change is defined as a thirty or more years of persistence pattern of revolving changes in weather characteristics, these are in relation to temperature, pressure, wind system and direction, humidity, cloud cover and precipitation (Alalade, O. A., Longe, M. P., Ladipo, T. O., James-Ojibo, I. O. and Akinboye, O. A. (2021): Intergovernment Panel on Climate Change, 2017). Climatic factors such as temperature, precipitation, moisture and pressure affect the development of plant, either alone or by interacting with other factors and thereby affecting farmer's productivity. IPCC, (2017) further stated that Africa seems to be the most inherently vulnerable continent to future climate change impacts given that agriculture is the main stay of its food production and also rain fed reliant amidst its economic challenges. According to Mohammad et al (2021), Nigeria was ranked the 6th most vulnerable country in Africa by as shown by Climate Change Vulnerability Index of 2014.

Over the years, farmers have tried out several measures to manage the impact of the ugly incidence on their farming endeavors. According to Agbeja (2021) climate change adaptation is the adjustment of a system in response to changing environmental conditions so as to reduce vulnerability. Considerable research works have been carried out on the effects of weather/climate on agricultural production, but few works have been specific on the effect of climate change on maize production and farmers adaptation strategies to curb the menace in Iwo Local Government area Osun state. The likely importance of this work is to ascertain maize farmers awareness level and knowledge of climate change and its needed adaptive measures for mitigating climate change effects. Therefore, this study seeks to ascertain climate change awareness, information sources and adaptation strategies by maize farmers in Iwo LGA of Osun State, Nigeria.

Objectives of the study

The broad objective of the study is to examine the climate change adaptation strategies used by maize farmer in Iwo local government area Osun State.

The specific objectives of the study are to;

- i. describe the socio-economic characteristic of maize farmers;
- ii. examine the farmer's level of awareness on the effect of climate change;
- iii. identify the farmer's source of information on climate change and adaptation

- iv. examine the adaptation measures adopted by respondents

Test of Hypothesis of the study: H01: There is no significant relationship between the socio-economic characteristic of the respondents and their climate change adaptation strategies

Methodology

Study area: Iwo Local Government is one of the thirty three (33) Local Governments in Osun State. It lies on Lat. 7°38'N 4°11'E and Long. 7.633°N 4.183°E. The Council Area has an extensive landmass, with an area of 245km², and a population of 191,348 (NPC, 2006). The people are predominantly farmers, cultivating maize and other crops.

Method of data collection: the data were collected with the aid of a structured questionnaire using interview schedule.

Sampling procedure: A multistage technique was used and firstly Iwo LGA was purposively selected due to the concentration of maize farmers in the area. Secondly, a simple random sampling technique was used to select 5 communities in Iwo Local Government Area; they are Molare, Oosa, Patara, Agoro, Molefon. Then, lastly twenty four 24 respondents were randomly chosen from each of the community making a total number of 120 respondents.

Data analysis: Objective (i) was analysed using Chi-square and Pearson Product Moment Correlation (PPMC), objective (ii-iv) were analyzed using Pearson Product Moment Correlation (PPMC).

Results and discussion

Socio-economic characteristics: Table 1 revealed that more than half (57.5%) of the respondents were males and had a mean age of 46.5 years. This implies that majority of the respondents were relatively young and so they could easily adopt and adapt to new and better strategies of climate change effects. This aligns with the findings of Mohammad *et al* (2021) who stated that the farmers involved in maize production were young and in their productive ages in their study area. Most (65.8%) of the respondents were married. This implies that there were more married folks in the study area, and they are likely to have more hands to assist on the farm. This finding further showed that 31.7% of the respondents have no formal education, 30.0% had secondary education, 19.2% had primary education and also 19.2% had tertiary education. This implies that a sizeable number of the respondents were illiterates, though they had more literate members, this could imply that the illiterates among them may find it difficult to cope with the effect of climate change than the literate counterpart. This aligns with the findings of Bamigbade et al (2021), where one-quarter of the respondents were illiterate while others were literate, they further added that this has a negative implication

because the respondents' low level of education may impede their access to useful climatic information and adaptive technologies.

Also the respondents had a mean household size of 7.00 persons and this implies that most of the respondents had sizeable members of family that could also assist with the farm work and increased labour due to some adaptive measures of climate change effect like that of increasing ridge size. In the same vein, the respondents had a mean farm experience of 2.44 years and a mean farm size of 5.44 hectares. This implies that they were quite experienced in maize farming and also that they were mainly small scale farmers. Their enhanced farm experience could be an advantage to their coping strategies and this corroborates with the findings of Muhammad *et al*, (2020) who stated that farming experience matters a lot as it significantly affects farm management and decision making. Also small

farm size could hamper their rate of adaptation to the effect of climate change given their economic constraints among numerous others. Furthermore, majority (59.2%) of them sourced credit from personal savings/friends and about half of the respondents earned income of within the range of # 1-100,000 annually, 20.8% earned #101,000-200,000, 10.8% earned #201,000-300,000, 16.7% earned #301,000-400,000 annually. This also implies that farmers in the study area were small scale farmers who could have been financially incapacitated to successfully cope with the scourging effects of climate change. And lastly only few (33.3%) of the respondents were members of cooperative society. This could imply that it would have negative effect on the respondents' ability to cope with the effects of climate change since there would be lack of the collaborative advantages that farmers could amass from being in cooperative society.

Table 1: Socio-economic characteristic of the respondents

Variable	Frequency	Percentage	Mean
Gender			
Male	69	57.5	
Female	51	42.5	
Age			
21-30	13	10.8	46.50
31-40	55	45.9	
41-50	32	26.7	
51-60	20	16.7	
Marital status			
Single	14	11.7	
Married	79	65.8	
Divorced	3	2.5	
Widowed	24	20.0	
Educational status			
No formal education	38	31.7	
Primary education	23	19.2	
Secondary education	36	30.0	
Tertiary education	23	19.2	
Household size			
1-5	41	34.2	7.0
6-10	59	49.1	
11-15	20	16.7	
Farming experience (Years)			
1-10	61	50.8	2.84
11-20	30	25.0	
≥21	29	24.2	
Farm size (Ha)			
1-5	70	58.3	5.44
6-10	33	27.5	
>10	17	14.2	
Source of credit			
Bank	26	21.7	
Cooperative society	11	9.2	
Family	12	10.0	
Personal savings/Friends	71	59.1	
Annual income (Naira)			

1-100,000.00	62	51.7	203400.00
101-200,000.00	25	20.8	
201-300,000.00	13	10.8	
301-400,000.00	20	16.7	
Membership of cooperative			
Yes	40	33.3	
No	80	66.7	

Source: Field survey, 2021

Farmer's level of awareness of the effect of climate change

Table 2 shows that pests and diseases ($\bar{x}=1.91$), irregular rainfall distribution ($\bar{x}=1.88$) and loss of land due to flood ($\bar{x}=1.87$) were most effects of climate change that were aware by the respondents in the study area. This could imply that these were the most common effect of climate change. Recent studies have showed that important climatic variables for crop growth and yield are temperature, solar radiation and rainfall (Elijah, S.T., Osuafor, O.O. and Anarah, S.E. (2018). In the same vein, Adejuwon,

(2019) stated that the climate of an area is determined by considering the climatic elements such as precipitation, rainfall, temperature, wind, relative humidity, sunshine solar radiation etc, and their variability plays a significant role in the performance of agricultural production. While stunted growth ($\bar{x}=1.38$) had the least mean and ranking and so this was the least climate change effect that the respondents in the study area were aware of, implying that it has minimal impact on the farmers enterprise.

Table 2: Respondents' level of awareness of the effect of climate change

Level of awareness	Aware	Not aware	Mean	Rank
Soil erosion	53.3	46.7	$\bar{x}=1.53$	9 th
Reduced yield of maize	84.2	15.8	$\bar{x}=1.84$	4 th
Irregular rainfall distribution	87.5	12.5	$\bar{x}=1.88$	2 nd
Pests and diseases	90.8	9.2	$\bar{x}=1.91$	1 st
Stunted growth	38.3	61.7	$\bar{x}=1.38$	12 th
Thin stem	30.8	49.2	$\bar{x}=1.51$	10 th
Low income	74.2	25.8	$\bar{x}=1.74$	7 th
Recurrent drought	40.8	59.2	$\bar{x}=1.41$	11 th
Late maturity	82.5	17.5	$\bar{x}=1.83$	6 th
Weed infestation	56.7	43.3	$\bar{x}=1.57$	8 th
Loss of land due to flood	86.7	13.3	$\bar{x}=1.87$	3 rd
Increased cost of maize	84.2	15.8	$\bar{x}=1.84$	4 th

Source: Field survey, 2021.

Source of information on climate change

Findings in table 3 revealed the distribution of respondents according to sources of information on climate change and adaptation. Their highest source of information were personal observation ($\bar{x}=1.83$), radio ($\bar{x}=1.81$) and friends ($\bar{x}=1.43$). This could be

that they were the most readily available and with little or cost attached. This contradicts the findings of Muhammad (2016) who found fellow farmers to be the main source through which farmers elicit farm information.

Table 3: Source of information on climate change

Source of information	Yes	No	Mean	Rank
Newspaper	25.8	74.2	$\bar{x}=1.26$	6 th
Radio	80.0	19.2	$\bar{x}=1.81$	2 nd
Friends	42.5	57.5	$\bar{x}=1.43$	3 rd
Extension agent	33.3	66.7	$\bar{x}=1.33$	5 th
Personal observation	82.5	17.5	$\bar{x}=1.83$	1 st
Television	30.8	69.2	$\bar{x}=1.31$	4 th

Source: Field survey, 2021

Adaptation strategies by maize farmers in coping to climate change

The study revealed that early planting ($\bar{x}=2.82$), use of organic fertilizer ($\bar{x}=2.78$) and use of tolerant

variety ($\bar{x}=2.70$), respectively were the most used adaptation strategies to cushion the effect of climate change by farmers in the study area. This could be because planting maize earlier can help the crop

establish itself before temperatures get too hot and can reduce the risk of crop loss due to heat stress or drought and also before rain patterns change, thereby taking advantage of the optimal growing conditions especially as most farmers are weather dependent in Nigeria. This aligns with the opinion of Ajiere and Weli (2018) who stated that the decrease in rainfall and increase in temperature can affect crop yields because rainfall and temperature are the key determinants for crop growth in Nigeria. Also maize farmers use tolerant varieties because they are more resistant to drought conditions and other effects of

climate change. This was similar to the findings of Mohammad et al (2020), who found farmers most adaptation strategies to the effect of climate change in their study area to be the use of improved seeds, use of organic manure and early planting. Never the less, this findings also partially agrees with the findings of Ogbodo, J.A., Shuaibu, S.M., Wasige, E.J. and Sani M. A. (2016) which found early planting, multiple cropping and use of organic manure as main key adaptation strategies used by farmers in sub Saharan Africa.

Table 4: Adaptation strategy by maize farmers in coping with climate change

Adaptation variables	Always	Rarely	Never	Mean (\bar{x})
Crop diversion	45.0	15.0	40.0	2.1
Early planting	83.3	15.0	1.6	2.8
Mixed farming	51.7	35.0	13.3	2.4
Mulching	53.3	22.5	24.2	2.3
Irrigation	61.7	30.0	8.3	2.3
Use of organic fertilizer	83.3	10.8	5.7	2.8
Switching to other source of income	24.2	19.2	56.7	1.7
Zero tillage	24.2	13.3	62.5	1.6
Shifting cultivation	32.5	54.2	13.3	2.2
Late planting	68.3	15.0	16.7	2.5
Use of tolerant varieties	77.5	15.0	7.5	2.7
Increased ridge size/height	74.2	15.0	10.8	2.6

Source: Field survey, 2021.

Chi-square and PPMC analysis showing the relationship between socio-economic characteristics of the respondents and the adaptation strategy

The chi-square analysis revealed that the marital status ($p=0.000$), religion ($p=0.000$), educational status ($p=0.000$), secondary occupation ($p=0.000$), source of farm land ($p=0.000$) and members of cooperative ($p=0.016$) showed significant relationship with the adaptation strategies to climate change in the study area. This implies that marital status, religion, educational status, secondary occupation, source of farm land and members of cooperative had significant influence on adaptation strategy used by the respondents for climate change. This could imply that the married folks have more labour force to apply the adaptive strategies to climate change as earlier seen in table 4.

Also, the literates has more tendencies to understand the effects of climate change and more likelihood to adopt and adapt to its preventive and mitigation effects, they also have easier access to information given their expanse social capitals. This aligns with

Aderinoye-Abdulwahab and Abdulbaki (2021) who stated that having relevant weather related information and skills would enable farmers to easily mitigate and apply adaptation measures to climate change.

Furthermore, the more source of farmland connotes better social and financial capital which will likely correlate with more adoption of adaptive strategies to climate change. Lastly, belonging to a cooperative society implies more social capital and access to firsthand information with regards to the success of their livelihood as a maize farmer.

The PPMC analysis showed that household size ($p=0.002$) and farming experience ($p=0.000$) were significant which implies that household size and farming experience have significant relationship with adaptation strategies to climate change. This could imply that the more the farming experience, the more knowledgeable the farmer will be about the negative impact of climate change and the urgent need to apply adaptive and mitigation measures.

Table 5: Chi-square and PPMC analysis show the relationship between the socio-economic characteristics and the adaptation strategies.

Variables	df	X ²	r-value	Significant	Decision
Marital status	36	77.57		0.00	significant
Educational status	36	68.83		0.001	significant
Source of credit	36	45.02		0.14	Not significant
Members of cooperative	12	24.67		0.016	significant

Age	1		
Household size	0.28	0.02	Significant
Farming experience	0.72	0.00	significant
Farm size	0.035	0.701	Not significant
Annual income	-0.032	0.725	Not significant

Source: Field experiment, 2021

Df: Degree of freedom; X^2 : Chi-square value; **r-value**: Pearson Product Moment Correlation value

Conclusion: The study concludes that the respondents were mostly male, relatively in their active age and married. Some were illiterate and a sizeable number were literate, majorly having a household size of 6-10 members, a farm experience of 1-10 years and a farm size of 1-5 hectares. The respondents mainly sourced their credit from personal savings/friends and had annual income of ₦1-100,000.00 with only few being in cooperative society. The respondents were mostly aware of pests and disease, irregular rainfall distribution and loss of land due to flood as the most common effect of climate change. They had personal observation, radio and friends as their most common source of information. The study revealed that early planting, use of organic fertilizer and use of tolerant variety respectively were the most used adaptation strategies to climate change in the study area. It is also concluded that correlation results shows that marital status, educational status, source of credit, members of cooperative, household size and farming experience had significant influence on adaptation strategy to climate change. The study recommends the creation of more awareness of the effect of climate change and a more sustainable adaptation measures to climate change effects by the government and other private agencies through knowledge impartation via extension services and also, the farmers should be better exposed to other livelihood activities for easy diversification.

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