



## Perceived Effects of Climate Change on Crop Production in Federal University of Agriculture Abeokuta, Ogun State, Nigeria

<sup>1</sup>Ogunjinmi, K.O., <sup>2</sup>Wole-Alo, F.I., <sup>3</sup>Ogunlusi, A.O., <sup>4</sup>Ogunjinmi, A.A. and <sup>1</sup>Fakoya, E.O.

<sup>1</sup>Department of Agricultural Extension and Rural Development  
Federal University of Agriculture Abeokuta, Ogun State.

<sup>2</sup>Federal University of Technology Akure, Ondo State.

<sup>3</sup>Department of Agricultural Extension and Communication Technology  
Federal Airport Authority Headquarter, Ikeja, Lagos State, Nigeria

<sup>4</sup>Department of Wildlife and Ecotourism Management,  
Federal University of Technology Akure, Ondo State.

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### Abstract

Climate change poses a significant menace to agriculture sector globally, especially crop production. This study focused on perceived effects of climate change on crop production. A sample size of 103 students was surveyed for this study using a questionnaire. Data obtained were summarized and presented using descriptive statistics (frequency counts, tables and means) while inferential statistical tools such as Chi-square and Pearson's Product Moment Correlation were used for analysis. Results indicated a high awareness (98.1%) of climate change among respondents. The dominant sources of awareness about climate change include social media (89.3%), television (82.5%) and radio (81.6%). Students observed changes mostly in temperature ( $\bar{x} = 2.71$ ), heat waves ( $\bar{x} = 2.62$ ) and rainfall ( $\bar{x} = 2.58$ ) and other climate indicators in the last 5 years (2019-2023). The respondents identified deforestation (82.5%), burning fossil fuels (68.9%), and urbanization (52.4%) as the major drivers of climate change. The respondents' perceived effects of climate change on crop production were decreased crop yields ( $\bar{x} = 2.83$ ), crop damage from the storms ( $\bar{x} = 2.66$ ), and crop failure ( $\bar{x} = 2.64$ ). There existed a significant relationship ( $p < 0.05$ ) between the respondents' sources of awareness ( $\chi^2 = 1.672$ ,  $p = 0.000$ ) and perceived effects of climate change. The cumulative effect of climate change on crop production could be felt more on food availability in the study area. There is a need to enlighten students on the human activities that aggravate the state of climate.

### Introduction

Climate change is one of the most pressing concerns of our day, having far-reaching repercussions for the planet's ecosystems and human progress in all sectors (Idris *et al.*, 2024). It is recognized to pose a significant effect on all sectors of human endeavors, most especially agriculture. The sector's reliance on climate is faced with several challenges that impede food production and frustrate the farmers' efforts and commitment to agricultural activities (Osuji *et al.*, 2025). It is indeed a global phenomenon and remains a

key determinant of all efforts to ensure the sustainable production of crops in rural areas. Africa is identified as a region highly vulnerable to climate change (Tajudeen *et al.*, 2022). Any change in climatic pattern would affect the production of different crops in Africa, hence, there is a need to integrate agriculture within resilience efforts and financing (Elisha *et al.*, 2024).

Climate change is a reality in Nigeria as elsewhere in the world, including the increased severity and frequency of extreme events such as floods, droughts, and heat waves (Federal Ministry of Environment, 2020). Climate change is witnessed due to the recurrent occurrence of drought and floods threatening the livelihood of many farmers who depend on rainfall

Corresponding author: Tel: +2348039724973

Email address: [ogunjinmiko@funaab.edu.ng](mailto:ogunjinmiko@funaab.edu.ng), (K.O.

Ogunjinmi)

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for farming practices due to the high concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere (Kamba *et al.*, 2022). Agricultural production depends on climatic factors so, minor negative changes in climate are capable of prompting damage to the outcomes of agricultural activities (Ofuoku and Obiazi, 2021). The incidence of climate change includes changes in soil moisture, soil quality, crop resilience, the timing of growing seasons, yield of crops, animal production, atmosphere temperatures, weed insurgence, flood, unprecedented droughts, sea level rises, reduced length of the growing season and many more (Anhoya *et al.* 2013 cited in Ogunjinmi *et al.*, 2020).

According to Adepoju (2017), climate change implications in Nigeria include increased temperatures, rising sea levels, and more severe and unpredictable weather. Increased water and food shortages, as well as increased heat stress and ultraviolet radiation, are all effects of climate change. The significance of the effect of climate change in rain-dependent countries like Nigeria calls for increased awareness of climate change its causes to ensure a reduction in anthropogenic causes of climate change and driving individual and collective action to mitigate its impacts and promote a more sustainable future.. The effects of climate change on crops could occur at any stage of production because the survival of agriculture is dependent on climate, and the two are interrelated because they both take place globally (Gupta *et al.*, 2020).

The consequences of this climate change cannot be over-emphasized, ranging from the exacerbation of poverty to the breakdown of infrastructure to the loss of environmental, political, economic, and social security, the impacts of climate change are extensive (Onuoha *et al.*, 2022)). The awareness level of the causes and effects of climate change among farmers in Nigeria has been studied (Ibrahim *et al.*, 2015). There is a need to extend the same subject matter to students who are the leaders and farmers of tomorrow. This study sought to:

- (a) describe the personal characteristics of the respondents;
- (d) determine the sources of awareness of climate change;

- (c) determine their observations of climate change elements;

- (e) examine the causes of climate change;

- (f) examine the perceived effects of climate change on crop production.

The study hypothesized that no significant relationship existed between age, sources of awareness, and perceived effects of climate change on crop production.

## Material and Methods

### Study area

The study was conducted at the Federal University of Agriculture, Abeokuta, Ogun State. It was established on January 1, 1988. The institution is located at approximately 7.2093° N latitude and 3.2365° E longitude (Wikipedia).

### Sampling procedure

A multistage sampling procedure was used to select the respondents for this study. Stage one involves a random selection of the Department of Agricultural Economics and Farm management from the three Agricultural Departments in the College of Agricultural Management and Rural Development of the Federal University of Agriculture, Ogun State. Secondly, a purposive selection of 500 level students was employed, these respondents were selected because they have undergone farm practical year programme at 400 level and thus familiar with climate and practical agriculture. Lastly, Krejcie and Morgan's (1970) sample size determination formula was used to select a sample size of 103 students from a population of 130 obtained from the University enrolment list for 500 level students in the Department for 2022/2023 academic session.

A three-point Likert-type scale was used to measure the students' observation of climate change indicators in the last five years as increasing (3), decreasing (2), and no change (1). The higher the mean score obtained, the more the proportion of the responses attached to a particular statement. Also, respondents' perceived effects of climate change on crop production were measured as major effect (3), minor effect (2), and no effect (1). The mid-point for each rating scale was also computed by adding the assigned weights of 3, 2, 1 ( i.e.  $3 + 2 + 1 = 6$ ) divided by 3 (number of assigned weights) equal to 2.00 to

capture high and low effects, any mid point value equal to or above 2 was regarded as a high effect. In addition, awareness, sources and causes of climate change were measured using dichotomous variables of yes (1) and no (0).

### Analytical techniques

Frequency distribution table, mean scores, and percentages were used to summarize, present data, and achieve the research objectives, Pearson Product Moment Correlation and Chi-Square were used to show the association and strength of the relationships between variables using Statistical Package for Social Sciences version 23.

## Results and Discussion

### Personal characteristics of the respondents

Descriptive analyses in Table 1 revealed that 55.3% of the respondents were males, while 44.7% were females. This shows that the male students were more represented in this study. The finding of this study is consistence with Ogunsola *et al.* (2018) who observed a similar trend of 57.3% males and 42.7% females in a related study. However, Mustapha *et al.* (2022) observed 38.4% of male and 61.6% of female students in a similar study. It can be deduced that variation is inevitable in random selection.

In addition, the result also showed that the majority (63.1%) of the respondents were between the age group of 21-24 years and had a mean age of 23 years. This finding is in tandem with Dimelu *et al.* (2018) who reported a mean of 24 years for their students while Gindi and Kaka (2021) reported that most of their respondents fall between 21-25 years. This implies that the respondents are in their youthful age, more likely to be enthusiastic, and inquisitive about the causes of climate change. In addition, the majority (94.2%) of the respondents were single. This is an indication of lesser responsibility, the respondents could have had a better chance to obtain climate change information and thus enhance their understanding of the effects of climate change and the implications of human activities on the environment at large.

Results also show that the majority of the respondents (98.1%) were aware of the occurrence of climate change. This is an indication that climate change has become a relevant issue. The finding is in

agreement with Eneji *et al.* (2021) and Nguyen (2023) who reported that all their respondents were aware of climate change, while Ogunsola *et al.* (2018) observed 92.7%, while Mustapha *et al.* (2022) reported 90.0% for awareness.

**Table 1: Personal Characteristics of Respondents**

| Variables                   | Frequency (f) | Percentage (%) |
|-----------------------------|---------------|----------------|
| Sex                         |               |                |
| Male                        | 57            | 55.3           |
| Female                      | 46            | 44.7           |
| Age (years)                 |               |                |
| < 21                        | 8             | 7.8            |
| 21-24                       | 65            | 63.1           |
| 25-28                       | 28            | 27.2           |
| Above 29                    | 2             | 1.9            |
| Mean age ( $\bar{x}$ ) =    | 23 years      |                |
| Marital status              |               |                |
| Single                      | 97            | 94.2           |
| Married                     | 6             | 5.8            |
| Awareness of climate change | 101           | 98.1           |

Source: Field Survey, 2023.

### Sources of Awareness of Climate Change

Results in Table 2 revealed that the majority of the respondents were aware of climate change via social media (89.3%), television (82.5%), radio (81.6%), courses offered (72.8%), newspaper (69.9%) and friends (65.0%). These results could suggest that the respondents obtained information on climate change through various means. This finding is in agreement with Belay *et al.* (2017). In addition, this result shows that climate change issues are widely disseminated on popular social media such as facebook and whatsapp. The findings of this study are similar to Nguyen (2023) who noted that 76.9% of his respondents were aware of climate change via social networks, newspapers (75.4%), and educational activities (68.5%). However based on this study, climate change issue was not widely discussed among the students when compared to other means. The probable reason could be that the students are indirectly affected by the climate change.

**Table 2: Sources of Awareness of Climate Change**

| Sources of Awareness                 | Frequency | Percentage (%) |
|--------------------------------------|-----------|----------------|
| Social media (whatsApp and facebook) | 92        | 89.3           |
| Television                           | 85        | 82.5           |
| Radio                                | 84        | 81.6           |
| School                               | 75        | 72.8           |
| Newspaper                            | 72        | 69.9           |
| Friends                              | 67        | 65.0           |

Source: Field Survey, 2023. Above values in parenthesis are percentages

### Respondents' Observation of the Elements of Climate Change

Results in Table 3 revealed the respondents' observation of climate change indicators in the last five years (2019-2023) were increasing temperature (1st); heat waves (2nd); and decreasing rainfall (3rd). The results could hint that there existed variability in the climate indicators as shown in this study. In addition, the respondents experienced and had better observation of temperature ( $\bar{x} = 2.71$ ), heat waves ( $\bar{x} = 2.61$ ), rainfall ( $\bar{x} = 2.58$ ), extreme flood ( $\bar{x} = 2.45$ ), drought ( $\bar{x} = 2.25$ ), wind ( $\bar{x} = 2.09$ ), storm ( $\bar{x} = 1.89$ ) and hail ( $\bar{x} = 1.82$ ). The higher the mean scores, the higher the proportion of the responses, this is an indication that storms and hails were less experienced by the respondents. These findings are in tandem with Belay *et al.* (2017) who observed an increasing temperature (68.3%) and declining rainfall (85.0%). Since the mean scores are greater than or equal to the cut-off point ( $\bar{x} = 2.00$ ). It can be deduced that the respondents had better

observation of the climate elements except for storm ( $\bar{x} = 1.89$ ) and hail ( $\bar{x} = 1.82$ ) which were probably less experienced.

### Causes of Climate Change

Results in Table 4 show that most of the respondents attributed the causes of climate change to deforestation ( $\bar{x} = 2.77$ ), burning of fossil fuel ( $\bar{x} = 2.67$ ), and bush burning ( $\bar{x} = 2.60$ ). These results show that the respondents attributed the causes of climate change to human activities. These findings are in consonance with Dimelu *et al.* (2018), and Ogunisola *et al.* (2019), and Mustapha *et al.* (2022) where their respondents had favourable perceptions that human activities cause climate change. In addition, Nguyen (2023) observed that over-exploitation (66.7%) and excessive use of fossil fuel (55.4%) were the major causes of climate change, while Ibrahim and Yahaya (2022) reported cutting down of trees (100%), bush burning (97%), use of agrochemical (83%), overgrazing (81%), burning of firewood (76%) and ozone layer depletion (74%).

### Perceived Effects of Climate Change on Crop Production

The mean values of the respondents' perceived effects of climate change range from 2.83 to 2.55 as shown in Table 5. The majority of the respondents perceived that the effects of climate change evident on crops as decreased yield ( $\bar{x} = 2.83$ ), crop failure ( $\bar{x} = 2.66$ ), damage to crops from the storms ( $\bar{x} = 2.64$ ), food shortage ( $\bar{x} = 2.63$ ) wilting of crops ( $\bar{x} = 2.61$ ), decrease income generating activities ( $\bar{x} = 2.60$ ), change in agriculture calendar ( $\bar{x} = 2.59$ ), decrease in soil fertility ( $\bar{x} = 2.55$ ) and premature ripening of crops ( $\bar{x} = 2.54$ ).

**Table 3: Respondents' Observations of Climate Change**

| Elements of Climate Change | Increasing Freq. (%) | Decreasing Freq. (%) | No change Freq. (%) | Mean ( $\bar{x}$ ) | Rank            |
|----------------------------|----------------------|----------------------|---------------------|--------------------|-----------------|
| Temperature                | 77(74.7)             | 22(21.4)             | 4(3.9)              | 2.71               | 1 <sup>st</sup> |
| Heat Waves                 | 74(71.8)             | 19(18.5)             | 10(9.7)             | 2.62               | 2 <sup>nd</sup> |
| Rainfall                   | 41(39.8)             | 61(59.2)             | 1(1)                | 2.58               | 3 <sup>rd</sup> |
| Extreme flood              | 59(57.3)             | 31(30.1)             | 13(12.6)            | 2.45               | 4 <sup>th</sup> |
| Drought                    | 43(41.8)             | 43(41.8)             | 17(16.4)            | 2.25               | 5 <sup>th</sup> |
| Wind                       | 36(35.0)             | 40(38.8)             | 27(26.2)            | 2.09               | 6 <sup>th</sup> |
| Storm                      | 25(24.3)             | 42(40.8)             | 36(34.9)            | 1.89               | 7 <sup>th</sup> |
| Hails                      | 25(24.3)             | 34(33.0)             | 44(42.7)            | 1.82               | 8 <sup>th</sup> |

Source: Field Survey, 2023, \*freq. = Frequency, above values in parenthesis are percentages. Cut-off point ( $\bar{x}$ ) = 2.00

**Table 4: Respondents' Perceived Causes of Climate Change**

| <b>Causes</b>           | <b>Major Cause<br/>Freq. (%)</b> | <b>Minor Cause<br/>Freq. (%)</b> | <b>Not a cause<br/>Freq. (%)</b> | <b>Mean<br/>(<math>\bar{x}</math>)</b> | <b>Rank</b>     |
|-------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------------|-----------------|
| Deforestation           | 85(82.5)                         | 12(11.7)                         | 6(5.8)                           | 2.77                                   | 1 <sup>st</sup> |
| Burning of fossil fuel  | 71(68.9)                         | 27(26.2)                         | 5(4.9)                           | 2.67                                   | 2 <sup>nd</sup> |
| Bush Burning            | 65(63.2)                         | 31(30.1)                         | 7(6.7)                           | 2.60                                   | 3 <sup>rd</sup> |
| Old nature of the earth | 63(61.2)                         | 28(27.2)                         | 12(11.6)                         | 2.53                                   | 4 <sup>th</sup> |
| Urbanization            | 54(52.4)                         | 40(38.8)                         | 9(8.7)                           | 2.48                                   | 5 <sup>th</sup> |
| Emissions               | 53(51.5)                         | 43(41.7)                         | 7(6.8)                           | 2.45                                   | 6 <sup>th</sup> |
| Overgrazing             | 44(42.7)                         | 52(50.5)                         | 7(6.8)                           | 2.40                                   | 7 <sup>th</sup> |
| Act of God              | 46(44.6)                         | 29(28.2)                         | 28(27.2)                         | 2.17                                   | 8 <sup>th</sup> |

Source: Field Survey, 2023. \*freq = Frequency, above values in parenthesis are percentages.

**Table 5: Perceived effects of Climate Change on arable Crop Production**

| <b>Perceived effects of climate change</b> | <b>Major<br/>Effect<br/>Freq. (%)</b> | <b>Minor<br/>Effect<br/>Freq. (%)</b> | <b>No Effect<br/>Freq. (%)</b> | <b>Mean<br/>(<math>\bar{x}</math>)</b> | <b>Rank</b>     |
|--------------------------------------------|---------------------------------------|---------------------------------------|--------------------------------|----------------------------------------|-----------------|
| Decreased yield                            | 64(62.2)                              | 37(35.9)                              | 2(1.9)                         | 2.83                                   | 1 <sup>st</sup> |
| Crop failure                               | 62(60.2)                              | 36(34.9)                              | 5(4.9)                         | 2.66                                   | 2 <sup>nd</sup> |
| Crop Damage from the storms                | 71(68.9)                              | 29(28.2)                              | 3(2.9)                         | 2.64                                   | 3 <sup>rd</sup> |
| Food shortage                              | 72(69.9)                              | 24(23.3)                              | 7(6.8)                         | 2.63                                   | 4 <sup>th</sup> |
| Heat stress                                | 63(61.2)                              | 33(32)                                | 7(6.8)                         | 2.61                                   | 5 <sup>th</sup> |
| Decreased income-generating activities     | 67(65)                                | 35(34)                                | 1(1)                           | 2.60                                   | 6 <sup>th</sup> |
| Changing of agriculture calendar           | 64(62.1)                              | 36(35)                                | 3(2.9)                         | 2.59                                   | 7 <sup>th</sup> |
| Decreased soil fertility                   | 68(66)                                | 30(29.1)                              | 5(4.9)                         | 2.55                                   | 8 <sup>th</sup> |
| Premature ripening of crops                | 52(50.5)                              | 43(41.7)                              | 8(7.8)                         | 2.54                                   | 9 <sup>th</sup> |

Source: Field Survey, 2023. \*f=Frequency, above values in parenthesis are percentages.

Mid-point value= 2.00

This is an indication that the effect of climate change is mainly felt as a decreased yield (1st), crop failure (2nd) and crop damage (3rd). These show that climate change is a serious threat to the achievement of Sustainable Development Goals (SDGs) 1 and 2 (reduction of hunger and poverty). In addition, it can be inferred that the effects of climate change will be more significant on crop production because the mean values obtained are above the cut-off point ( $\bar{x}$  = 2.00). This study is in tandem with Ibrahim and Yahaya (2022) who reported reduced yield and soil fertility as major effects of climate change.

#### **Relationship between the respondents' age and their perceived effects of climate change**

Results in Table 6 show that there was no significant relationship between the age of the respondents ( $r$  = 22.98,  $p$  = 0.772) and the perceived

effects of climate change on crop production. This is an indication of a strongly negative relationship, as the age of respondents increase, respondents' perception of the effects of climate change is likely to decrease, this means that younger students could express higher levels of concern about climate change issues. This result is consistent with Shin and Kim (2023), that younger group was more likely to be aware of climate change issues than older group.

**Table 6: Test of Relationship between the Respondents' Age and their Perceived Effects of Climate Change**

| <b>Variables</b> | <b>r value</b> | <b>p-value</b> | <b>Decision</b> |
|------------------|----------------|----------------|-----------------|
| Age              | 22.98          | 0.772          | Not significant |

Source: Field Survey, 2023. Significant level at  $p < 0.05$

### Relationship between the Respondents' Sources of Awareness and their Perceived Effects of Climate Change

Results in Table 7 revealed that there existed a significant relationship between the respondents' source of awareness of climate change ( $\chi^2 = 1.672$ ,  $p = 0.000$ ) and perceived effects of climate change. This indicates that sources of awareness of climate change could increase the likelihood of perception of the effects of climate change. This result corroborates the findings of Verma and Pandey (2024).

**Table 7: Test of Relationship between the Respondents' Sources of Awareness and their Perceived Effects of Climate Change**

| Variables                              | Chi square value ( $\chi^2$ ) | p-value | Decision    |
|----------------------------------------|-------------------------------|---------|-------------|
| Sources of awareness of climate change | 1.672                         | 0.000   | Significant |

Source: Field Survey, 2023. Significant level at  $p < 0.05$

### Conclusion and Recommendations

Awareness and observation are two concepts essentially needed for climate change adaptation action. This study investigated students' awareness, observations and perceived effects of climate change on crop production. The findings indicated that the reliance of the respondents on mass media could have resulted in better awareness of climate. In addition, climate change was primarily caused by human activity, indicating the need for greater awareness of non-natural causes of climate change.

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