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# Climate Change Adaptation Needs of Arable Crop Farmers in Ido Local Government Area, Oyo State, Nigeria

**Ogunjinmi, K.O., Adetarami,O., Oyebamiji, B.A., Adeosun, K. G., Adebayo, T.D. and Obasa, P.**

Department of Agricultural Extension and Rural Development,
Federal University of Agriculture, Abeokuta, State
Corresponding author's email: ogunjinmiko@funaab.edu.ng

**Abstract**
Adaptation is second to none in adjusting to a changing climate. The study was conducted to assess the climate change adaptation needs of arable crop farmers in Ido Local Government Area of Oyo State. A Multistage sampling procedure was employed to select one hundred and seventy respondents. An interview guide was used to collect data and analyse using both descriptive and inferential statistics. The findings of the study indicated that the mean age of the respondents was 55.3 years and the majority (80.0%) of the respondents were males, married (81.8%) with an average of 5 persons per household, and had a mean of 27.6 years of farming experience. The respondents cultivated an average of 1.4ha for arable crops and generated a mean income of #158, 288.24k per annum while most (98.8%) of the farmers had no access to farm credit loans. Furthermore, radio ($\bar{x}$ = 2.94) and family and friends ($\bar{x}$ = 2.39) were the major sources of information on climate change adaptation. The respondents observed an increase in rainfall ($\bar{x}$= 2.79), occurrence of flood ($\bar{x}$= 2.48) and, drought ($\bar{x}$=2.38) while temperature ($\bar{x}$=2.38) was observed to reduce. The pressing adaptation needs of the respondents were loans for livelihood diversification ($\bar{x}$=4.78), early maturing varieties ($\bar{x}$= 4.60), irrigation facility ($\bar{x}$=4.44) and drought-resistant varieties ($\bar{x}$=4.43). Results of the Chi-square analysis showed that age ($\chi^2$ = 0.017, p = 0.826) and religion ($\chi^2$ = 0.654, p = 0.721) had no significant relationship (P>0.05) with climate change adaptation needs of respondents, whereas, climate change adaptation barriers (r = 0.399**, p = 0.000) has a significantly weak relationship with climate change adaptation needs. It is therefore recommended that arable crop farmers should be granted access to loans for diversification. Also, there should be favourable policies on the availability of subsidized improved seeds for prompt adaptation to ensure sustainable production.
***Keywords: Adaptation, Arable, Climate change, Crop, and Needs***

## Introduction

Agriculture remains the pillar of the Nigerian economy, even in the face of climate variation. Nigeria, like all the countries of Sub-Saharan Africa, is highly vulnerable to the impacts of Climate Change (Ikpe *et al.,* 2017). According to World Bank (2019), Nigeria is one of the top ten of the most exposed countries to the effects of climate change, with approximately 6 percent of its land area projected to be exposed to dangerous weather events. Climate change impact is significant in agricultural production in Nigeria as arable crop production suffers approximately a 20 percent decline in the cycle of growing days (Ebele and Emodi, 2016). The variations in climatic variables, for example, the amount of rainfall, temperature, wind speed, relative humidity, and sunshine duration, play a very crucial role in determining the yields of crops (Ayal and Filho, 2017). All efforts to improve agricultural production to achieve sustainable food production always prove fruitless because the adaptation essentials of the farmers are not available, this has increased the level of vulnerability of the farmers in this part of the world. Adaptation is widely known as the sustaining answer to climate change, therefore the adaptation needs of the farmers are important to cope with the changing climate. Climate adaptation is those interventions that enable farmers to cope with the effects of climate change. This is essential for arable crop farmers because these crops are susceptible to climate variation at every stage of growth. However, rural farmers have been adjusting to climate change and/or variability when observable changes occur. It is now recognized that adaptation strategies are unique and hence irreplaceable in climate change mitigation and effect reduction (Sarkodie and Strezov, 2019). According to Okon *et al.* (2021), some adaptation strategies observed by farmers were insurance, soil fertility improvement measures, mulching, use of improved varieties of crops, and changes in planting/harvesting dates. Planting of cover crops, tree planting, drainage/flood barrier construction,

application of agricultural chemicals, irrigation facilities, and irrigation of crops (Ifeanyi-Obi, 2016). Despite the contributions of the farmers and the efforts of the stakeholders to avert the challenges of climate change and its associated effects, it is requisite to prioritize the adaptation needs of the poor farmers to achieve the expected outcomes of sustainable development goal number one. It is based on these premises that this study sought to (i) examine the understanding of arable crop farmers about climate change adaptation (ii) identify the sources of information on climate change adaptation of the farmers (iii) examine their climate change adaptation needs (iv) determine farmers' barriers to adaptation to climate change The study, therefore, hypothesized that (i) there is no significant relationship between socio-economic characteristics of the farmers and their climate change adaptation needs (ii) there is no significant relationship between climate change barriers and climate change adaptation needs of the respondents.

## Materials and Methods

The study area: This study was conducted in Ido Local Government Area, Oyo State Ibadan. It is located between longitude $3^0 47^1$ $34^0$ $99^1$S and latitudes $9^0 30^1$ and $44^0.49^1$N. Occupying a land area of 986 $km^2$ with a projected population of 174,826 (National Population Commission, 2020). In Ido Local Government Area, the wet season is oppressive while the dry season is muggy, and it is hot year-round over the year. The temperature typically varies from $69^0$F to $92^0$F and is rarely below $63^0$F or above $96^0$F. The average humidity level of Ido Local Government Area is $59^0$C while the total precipitation in the area is at 1950mm of rainfall per annum. On account of the extensive fertile soil, which is suitable for agriculture, the basic occupation of the people is farming. People in that area grow varieties of cash crops such as cocoa, kolanut, palm oil, and timber and food crops such as maize and rice.

### *Sampling, data collection and analysis*

The multi-stage process was employed for sampling. At stage one; Ido Local Government area of Oyo State was purposively selected because arable crop farming is the predominant occupation. At stage: 20% of the 10 wards in the LGA were randomly selected, making two wards. A simple random technique was used to sample 170 respondents from the study area. For data gathering, the study used a questionnaire survey. Respondents' frequency of use of sources of information of adaptation to climate change was measured on 3 point-rating scales of 'always used (3), occasionally used (2) and never used (1), Farmers' understanding of climate change was determined on a 3-point rating scale of 'increased (3), decreased (2) and no change (1) (Tanko and Mushinat, 2014; Uddin *et al*., 2017; Tarfa *et al*., 2019). Adaptation needs of the farmers were measured on a four-point rating scale on ten (10) items as 'essential priority (5) high priority (4), moderate (3), low priority (2) and not a priority (1). In addition, adaptation barriers to climate change were measured on a 4-point rating scale on eight (8) items as 'extreme barrier = 5, moderate barrier = 4, moderate barrier = 3, somewhat of a barrier = 2 and not a barrier. The descriptive statistics used for data analysis were frequency counts, means, percentages and inferential statistics (Chi-square and Pearson Product Moment Correlation- PPMC). Chi-square and PPMC were used to measure the strength of the relationships between dependent and independent variables.

## Results and Discussion

### *Socioeconomic and production characteristics of the respondents*

Results of the descriptive analysis (Table 1) show that 40% of the respondents were within the age range of 46 to 60 years with a mean age of 55.3%. This suggests that the farmers were active and could withstand the stress of arable crop farming. This finding is in agreement with Adigun and Adelesoye (2022), who observed a mean age of 46.1 years for their respondents in a study conducted on climate change farmers in southwest, Nigeria. In addition, 80% of the respondents were males, this could inform that arable crop farming in the study area is dominated by male farmers. The result is a little higher than what was obtained by Adigun and Adelesoye (2022) and Apata and Adekunmi (2013) who reported 87.7% and 90% respectively. Also, the majority (81.8%) of the respondents were married and approximately half (53.5%) had 5 persons per household. This could imply the availability of family labour. This study is lower than the observation of Ogunwale *et al*., (2020) who reported 85.8% in a similar study conducted in Oyo State, Nigeria. However, the study is inconsistent with Azeeze and Oyekanmi, (2021) who observed an average of 10 people per household. The probable reason could have arisen from the high marital status (95.6%) of their respondents. In addition, most (78.6%) of the farmers obtained formal education in one form or the other while 28.8% of them had no formal education. This implies that most of the respondents were educated, and this could help prioritize their adaptation needs. The study is similar (79%) to Azeze and Oyekanmi (2021). Furthermore, the majority (62.9%) of the population practised mixed cropping while 37.1% were involved in mono-cropping. This could imply an adaptation strategy to climate change, as not all crops in mixed cropping are susceptible to climate variability. The study further revealed that almost one-third (38.8%) of the respondents had an average annual income of less than N100,000 with a mean of N158,88.24k. This implies that the farmers are low-income earners who could have been affected by climate change. However, Apata and Adekunmi (2013) reported that their respondents earned 35.8% of theirs between #401,000 and #600,000 per annum. The probable reason could have been that their respondents were large-scale producers and could adapt to climate change. Moreover, 52.4% of the respondents cultivated less than 2 hectares of land for arable crops and a mean of 1.4ha while also most (73.5%) of the respondents cultivated on rented farmland. This could be counted on the cost of production. The finding of this study is similar to Adigun and Adelesoye (2022) who reported that the majority of their respondents cultivated

less than 2ha. The study also revealed that the respondents generally (98.8%) had no access to credit loans. This could pose an impediment to securing adaptation resources. On the contrary, 33.3% of the respondents had access to credit in a study conducted on climate-smart agriculture as reported by Gbadebo *et al*. (2022). Furthermore, the study also revealed that 40.0% of the respondents had over 30 years of farming experience. This could suggest that the respondents would have experienced different patterns of climate change/variability and therefore had been adapting to climate change for a long. The findings of this study are lower than the report (above 40 years) of Fadina and Barjolle (2018). In addition, almost half (51.2%) of the respondents belong to farmers' associations. This could be useful for sharing knowledge on adaptation needs. This result is lower than (76.7%) of Gbadebo *et al*. (2022) conducted on cassava farmers in the same LGA.

***Farmer Understanding of Climate Change***

Table 2 shows that the majority (79.4%) of the respondents perceived an increase in rainfall, flood (59.4%) and drought (53.5%). However, a decrease was noticed in temperature (53.5%), storm (42.4%) and heat wave (37.6%). This enlightens that the major indices of climate change (rainfall and temperature) were varied and there is a need for adaptation. The result also confirmed that most (80.6%) of the respondents indicated that there has been a rapidly changing season, whereas no change was observed in hail (69.4%) in the study area. This is an indication of the occurrence of climate variability which will call for the prompt application of adaptation measures. The result is similar to the findings of Chikaire *et al*. (2018) who reported an unpredictable change in weather ($\bar{x}$= 2.50 and heavy rainfall ($\bar{x}$= 2.37).

***Use of sources of Information on Adaptation to Climate Change***

The result in Table 3 reveals that radio (96.5%) was always used by the farmers while approximately half (50.6%) occasionally obtain information on adaptation to climate change through family and friends. The finding of this study is in tandem with Oyelene *et al.*, (2020) that radio (72%) and friend and neighbour (54%) were the commonly used sources of information for adaptation to climate change. In addition, 30.6% of the respondents always got adaptation information from farmers' associations. This result is lower but corroborates Ogunwale *et al*., (2020) who observed that 89.2% of their farmers received information via farmers' associations and Umunakwe *et al. (*2014) that radio was mostly used as to source for cc information. Furthermore, the farmers occasionally obtained adaptation information from extension agents, which means that the majority (68.8%) of the respondents never sourced information on climate change adaptation from the extension agents. This result showed that there exists a weak link between the respondents and extension agents in sourcing climate change adaptation information. However, the findings of this study are inconsistent with Oyelere *et al.* (2022) that 84.3% of their respondents obtained climate change adaptation information through the extension agents, this probable reason could be that their study had a wider coverage. Also, the farmers hardly obtained adaptation information from television (3.5%), the internet (2.4%) newspapers (1.8%) and research institutes (1.2%). This implies that this category of farmers still relies on traditional sources of information on adaptation to climate change. The result of this study is in a similar pattern to Tanko and Muhsinat (2014) in that their respondents sourced information on climate change from the internet (4.9%), magazines (11.9%) and Television (7.9).

***Climate change adaptation needs of arable crop farmers***

The result in Table 4 shows the adaptation needs of the farmers, ranging from 'essential to not a priority'. The results showed that loans for diversification of livelihood ($\bar{x}$= 4.78), early maturing species ($\bar{\mathbf{x}}$= 4.60), Irrigation facility (4.44), drought resistant varieties ($\bar{\mathbf{x}}$= 4.43), improved storage methods ($\bar{\mathbf{x}}$=4.41), subsidy on farm inputs ($\bar{\mathbf{x}}$= 4.38), availability of mechanization ($\bar{\mathbf{x}}$= 4.36), weather forecast information ($\bar{\mathbf{x}}$= 4.27), extension services ($\bar{\mathbf{x}}$= 4.15) diversification options ($\bar{\mathbf{x}}$= 4.02)), were essential and of high priority to the respondents. The findings of this study indicate that all the adaptation measures reviewed in this study were regarded as adaptation needs by the respondents because all the mean values were above the discriminating mean ($\bar{\mathbf{x}}$=3.00). This study corroborates Chikaire e*t al*. (2018) who reported the first and second priority need for improved access to credit ($\bar{\mathbf{x}}$= 3.34) short-term crops ($\bar{\mathbf{x}}$= 3.30) in a study conducted on adaptation needs.

***Climate Change Adaptation Barriers***

The result in Table 5 shows that inadequate extension agents' training on adaptation ($\bar{\mathbf{x}}$= 3.67), poor government policy ($\bar{\mathbf{x}}$= 3.65), lack of access to farm credit ($\bar{\mathbf{x}}$= 3.56), the inadequacy of improved seed varieties ($\bar{\mathbf{x}}$= 3.45), inadequate storage facilities ($\bar{\mathbf{x}}$= 3.36), inadequate information and knowledge of adaptation ($\bar{\mathbf{x}}$=**3.27** ) and poor access to land ($\bar{\mathbf{x}}$=3.08) were the major constraints inhibiting farmers' ability to adapt to climate change since their mean scores were above the discriminating mean of 2.50. The study shows that the service of extension agents' training posed a major impediment to the respondents' adaptation information. This study is similar to Anugwa *et al*. (2021) that poor storage facilities ($\bar{\mathbf{x}}$=2.58), inadequate access to credit facilities ($\bar{\mathbf{x}}$= 2.32) lack of access to improve crop varieties as barriers to adaptation ($\bar{\mathbf{x}}$= 2.40).

***Test of the relationships between socioeconomic characteristics and climate change adaptation needs***

The results (Table 6) showed that there were no significant relationships ($p > 0.05$) between the respondents' sex ($\chi^2 = 0.251$, p= 0.616), marital status ($\chi^2 = 0.224$, p=0.974), religion ($\chi^2 = 0.654$, p= 0.721), educational level ($\chi^2 = 0.937$, p=0.816), a system of farming ($\chi^2 = 1.708$, p=0.191), mode of farming ($\chi^2$ =

0.638, 0.424), access to credit ($\chi^2$ = 0.012, 0.913), land ownership ($\chi^2$ = 0.362, p=0.948), membership of farmers' association ($\chi^2$ = 1.054, 0.0304) and climate change adaptation needs. This result showed that the association between these socioeconomic characteristics and climate change adaptation is not substantial.

***Test of the relationship between the socioeconomic characteristics of the respondents and climate change adaptation needs***

Pearson Product Moment Correlation (PPMC) analysis (Table 7) showed that there was no significant relationship (p > 0.005) between respondents' age (r = 0.017, p = 0.826), household size (r = -0.080, p = 0.298), average annual income (r = -0.029, p = 0.712), years of farming experience (r = -0.014, p = 0.852), farm size (r = 0.021, p = 0.781) and climate change adaptation needs of arable crop farmers. This is an indication of a strong and inverse relationship between these variables and the adaptation needs of the farmers except age who had a weak relationship. This is an indication that the adaptation needs of the respondents decline with an increase in these socioeconomic characteristics variables. This result is supported by Umunakwe (2014) that education and age were negatively related. This finding is inconsistent with Osman-Elasha *et al*. (2006) that age, educational level, household size, membership in social organization, and farm size farming experience were significant.

***Test of the relationship between the climate change adaptation barriers and climate change adaptation needs***

The results of the Pearson Product Moment Correlation showed that there was a significant relationship (p<0.05) between the climate change adaptation barriers of the respondents and climate change adaptation needs (Table 8). This is an indication that adaptation barriers had a statistically significant, weak, and positive relationship with the farmers' adaptation needs. This implies a direct relationship, the higher the barriers to adaptation the more the needs of the farmers to adapt to climate change.

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**Conclusion**

The study focused on the climate change adaptation needs of arable crop farmers in Ido Local Government Area. Approximately half (51.8%) of the respondents had primary education, this could easily understand the concept of climate change. In addition, 40.0% of the respondents had over 30 years of farming experience. The implication is that the respondents should have been adapting to climate change. Also, the majority (98.2%) of the respondents had no access to credit loans. This could constitute a major obstacle to the procurement of adaptation needs. Also, the majority (73.5%) of the respondents rented the land for cultivation of arable crops, this could indicate low access to land. The study further showed that rainfall ($\bar{x}$= 2.79), floods ($\bar{x}$= 2.48 and drought ($\bar{x}$= 2.38) were on the increase while, the temperature decreased. This study also revealed rapidly changing seasons ($\bar{x}$=2.72) as observed by the respondents. In addition, Radio (96.5%) and, family and friends (50.6%) were the main sources through which the farmers acquired information on adaptation to climate change. Furthermore, loans for diversification of livelihood and early maturing crop varieties were the most essential priority needs of the farmers. In addition, inadequate extension agents' training on adaptation, poor government policy and lack of access to farm credit were the leading barriers to climate change adaptation. This study therefore advocates for a favourable policy of government on climate change adaptation while the farmers could form a self-help group in the form of a cooperative to raise capital to meet climate change adaptation needs.

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**Table 1: Socio-economic and production characteristics of the respondents**

| Socio-economic and production characteristics | Frequency | Percentage (%) | Mean ($\bar{x}$) |
|---|---|---|---|
| **Age (years)** | | | |
| ,35 | 10 | 5.9 | |
| 36-45 | 32 | 18.8 | |
| 46-60 | 68 | 40.0 | 55.3 years |
| 61-75 | 54 | 31.8 | |
| >75 | 6 | 3.5 | |
| **Sex** | | | |
| Male | 136 | 80.0 | |
| Female | 34 | 20.0 | |
| **Marital Status** | | | |
| Single | 6 | 3.5 | |
| Married | 139 | 81.8 | |
| Divorce | 7 | 4.1 | |
| Widow | 18 | 10.6 | |
| **Religion** | | | |
| Christian | 103 | 60.6 | |
| Islam | 62 | 36.5 | |
| Traditional | 5 | 2.9 | |
| **Household Size** | | | |
| ≤ 5 | 91 | 53.55 | 5 people |
| 6-10 | 77 | 45.3 | |
| >10 | 2 | 1.2 | |
| **Level of Education** | | | |
| No formal education | 49 | 28.8 | |
| Primary education | 88 | 51.8 | |
| Secondary | 27 | 15.9 | |
| Tertiary | 6 | 3.5 | |
| **System of farming** | | | |
| Mono cropping | 63 | 37.1 | |
| Mixed cropping | 107 | 62.9 | |

**Table 1 continued: Socio-economic characteristics of arable crop farmers**

| Annual Income (₦) | Frequency (%) | Percentage (%) | Mean (x̄) |
|---|---|---|---|
| ≤ ₦100000 | 66 | 38.8 | |
| ₦100001- ₦200000 | 63 | 37.1 | ₦158288.24 |
| ₦200001- ₦300000 | 26 | 15.3 | |
| ₦300001- ₦400000 | 9 | 5.3 | |
| > ₦400000 | 6 | 3.5 | |
| **Farming Experience (years)** | | | |
| ≤10 | 16 | 9.4 | |
| 11-20 | 45 | 26.5 | 27.6 years |
| 21-30 | 41 | 24.1 | |
| >30 | 68 | 40.0 | |
| **Access to credit** | | | |
| No | 168 | 98.8 | |
| Yes | 2 | 1.2 | |
| **Farm Size Cultivated (ha)** | | | |
| ≤2 | 89 | 52.4 | 1.4 ha |
| 2.01-4 | 59 | 34.7 | |
| 4.01-6 | 21 | 12.4 | |
| >6 | 1 | 0.6 | |
| **Land Ownership** | | | |
| Owned | 21 | 12.4 | |
| Rented | 125 | 73.5 | |
| Joint ownership | 11 | 6.5 | |
| Communal | 13 | 7.6 | |
| **Membership of farmers group** | 87 | 51.2 | |

***Source: Field Survey, 2022***

**Table 2: Farmers' Understanding of Climate Change**

| Climate change indices | Increased | Decreased | No Change | Mean (x̄) |
|---|---|---|---|---|
| Rainfall | 135(79.4) | 34(20.0) | 1(0.6) | 2.79 |
| Rapidly changing season | 137(80.6) | 19(11.2) | 14(8.2) | 2.72 |
| Floods | 101(59.4) | 49(28.8) | 20(11.8) | 2.48 |
| Drought | 105(61.8) | 25(14.7) | 40(23.5) | 2.38 |
| Temperature | 68(40.0) | 91(53.5) | 11(6.5) | 2.34 |
| Storm | 33(19.4) | 72(42.4) | 65(38.2) | 1.81 |
| Heat waves | 46(27.1) | 64(37.6) | 60(35.3) | 1.92 |
| Hail | 5(2.9) | 47(27.6) | 118(69.4) | 1.34 |

***Source: Field Survey, 2022***

**Table 3: Respondents' Use of sources of information on climate change adaptation**

| Sources of information | AU | OU | NU | Mean (x̄) | Rank |
|---|---|---|---|---|---|
| Radio | 164(96.5) | 2(1.2) | 4(2.4) | 2.94 | 1st |
| Family and friends | 75(44.1) | 86(50.6) | 9(5.3) | 2.39 | 2nd |
| Farmers association | 52(30.6) | 36(21.2) | 82(48.2) | 1.82 | 3rd |
| Extension agents | 4(2.4) | 49(28.8) | 117(68.8) | 1.34 | 4th |
| Newspaper | 3(1.8) | 28(16.5) | 136(80.0) | 1.27 | 5th |
| Television | 6(3.5) | 31(18.2) | 133(78.2) | 1.25 | 6th |
| Internet | 4(2.4) | 10(5.9) | 156(91.8) | 1.11 | 7th |
| Research Institute | 2(1.2) | 3(1.8) | 165(97.1) | 1.04 | 8th |

***Source: Field Survey, 2022. AU- Always Used, OU-Occasional Used, Not Used- NU***