

## **Perceived Effects of Climate Change on Crop Production among Women Farmers in Ilorin-East L.G.A, Kwara State, Nigeria**

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### **Abstract**

*Climate change has affected agricultural activities in most countries of the world, thus resulting in food shortage. This study investigated the perceived effects of climate change on agricultural crops among women farmers in Ilorin-East Local Government Area (LGA), Kwara State, Nigeria. Specifically, the study described their socioeconomic characteristics, assessed the types of crops cultivated, examined the perceived effects of climate change on agricultural crops, investigated the coping strategies to climate change effects, and identified challenges encountered. A two-stage sampling procedure was used to select 150 respondents. Structured questionnaire was used while both descriptive and inferential statistics were used for data analysis. Specifically, the study employed Logistic regression and Pearson Product Moment Correlation (PPMC) for hypotheses testing. Findings showed that the respondents' average age was 42.5 years. Most (87.3%) respondents grew African spinach and 78.0% were grouped as having high perceived effects on crop production. The main perceived effect of climate change was reduced crop yield ( $\bar{x} = 4.60$ ), while the use of addition of manures and fertilizers ( $\bar{x} = 4.57$ ) was the major coping strategy employed. The main challenge encountered was difficulty in obtaining suitable land for farming ( $\bar{x} = 3.66$ ). The logistic regression result of the factors determining the perceived effects of climate change on crop farming of women farmers showed that marital status ( $p < 0.05$ ) and age ( $p < 0.05$ ) were significant. The study concluded that the majority of the women farmers perceived effects of climate change on their crops were high. Thus, the study recommends that extension services should prioritize the dissemination and training on climate-smart techniques such as mulching, agroforestry, water harvesting, and drought-resistant crop varieties, tailored specifically for women farmers who are disproportionately affected by climate change.*

Keywords: Agricultural crops, Climate change, Coping strategies, Perceived effects

## 1.0 Introduction

Climate change is one of the major environmental threats to humanity especially in agriculture on a global scale. It affects agriculture in a number of ways, one of which is directly related to food production. With its many implications for the environment and human survival, climate change is one of the most significant challenges of the twenty-first century (Jasper *et al.*, 2020). Climate change is a complicated issue on a global scale. It is associated with variations in temperature and precipitation patterns, which lead to food and water shortages in many parts of the world (Porter, *et al.*, 2022; Duchenne-Moutien & Neetoo, 2021; Bouteska *et al.*, 2024). Research indicates that the African continent is more susceptible to the consequences of swift global warming in agriculture due to its geographic position, economic structure, and deficiency of infrastructure (Ayugi *et al.*, 2022; Bjornlund *et al.*, 2022). The productivity of agricultural crops is a major factor in determining rural livelihood, economic growth, and food security. The global food production trajectory has been shaped in recent times by a multitude of factors that have an impact on crop output worldwide. Climate change is putting agricultural systems under persistent and severe stress, which has a negative influence on crop yields and production patterns. Extreme weather events that have impacted agricultural activities and affected crop yield in numerous locations include heat waves, floods, and droughts (Liverpool-Tasie *et al.*, 2020).

Moreover, recent heatwaves in West Africa, including northern Nigeria, have been intensified by climate change, with heat peaks up to 4 °C hotter and becoming up to ten times more likely due to global warming (Duru *et al.*, 2022). Climate impacts such as erratic rainfall, rising temperatures, increased pests, reduced soil fertility; all undermine staples such as maize, cassava and vegetables (Deji, 2021; Efretuei *et al.*, 2020). Figure 1.1 gives an overview of selected cereal production in Nigeria between 2019 and 2024. In Lagos State, for example, maize yield was significantly impacted by climatic variability between 1998–2018, whereas cassava remained relatively stable (Tajudeen *et al.*, 2022). Without adaptation, Nigeria's cultivated yields are projected to fall by up to 10–25 % by 2080 and its GDP by approximately 4.5 % (Omoluabi & Ibitoye, 2024). Furthermore, the spread of diseases and pests is accelerated by climate change, severely taxing Nigeria's agricultural sector and raising the risk of food shortages and price rises. The four aspects of food—availability, stability, accessibility, and utilization—are affected by these circumstances. This makes it harder for a sizable portion of the populace to physically, socially, and financially have access to enough good and healthy meals. Nigeria is a significant importer of agricultural goods despite having a vast agricultural potential because the majority of its women cultivate food for subsistence (Pawlak & Kołodziejczak, 2020).

Interestingly, Nigeria remains a global leader in cassava, yam, sorghum, maize and significant in vegetable and fruit production. To buttress this, Omoluabi & Ibitoye (2024) predicted that, in the next decade, the area cultivated for cassava will be 11295.04 ('000 hectares), the output of cassava will be 73300.33 ('000 tonnes), the yield of cassava will be 10.98 tonnes/ha. Whereas, climate change is already altering yields unevenly across crops, affecting smallholder and women farmers the most. Women form the backbone of food production yet face structural barriers to adaptation. Women are important contributors to the agricultural industry, but in comparison to men, they own fewer assets, have less access to land, inputs, financial and extension services, and are more vulnerable to the negative consequences of a worsening

environment (Bello *et al.*, 2021). Understanding intervention approaches to address issues of low yield, pest and disease incidence, and heat and cold stress related to vegetable production requires assessing whether women farmers perceive climate change as a threat to their vegetable production, i.e., their perception about the effect of climate change on their vegetable production. Comprehending the coping mechanisms people utilize to endure this severe state is equally essential (Borda, 2023).

**Figure 1.1: Cereal Production in Nigeria between 2019 and 2024**

Cereals	2019-2023 Average	2023	2024 Estimate	Change 2024/2023
000 tonnes				
Maize	12350	11053	11164	1.0
Rice (paddy)	8487	8902	9169	3.0
Sorghum	6638	6402	6402	0.0
Others	2023	1754	1759	0.3
Total	29498	28111	28494	1.4

Note: percentage change calculated from unrounded data

source: FAO (2025)

Although women farmers are actively adopting coping strategies such as organic manure application, irrigation, and crop diversification, there is limited documentation and analysis of these practices. As a result, their adaptive efforts are often excluded from climate-resilient agricultural policy frameworks (Haque *et al.*, 2023). Also, there is a paucity of localized, gender-specific research that captures how women farmers in Ilorin-East Local Government Area (L.G.A) perceive the effects of climate change on crop production. Existing studies often generalize farmer experiences, overlooking the unique vulnerabilities and adaptation strategies of women. This study, anchored in Ilorin East L.G.A and focused on key crops, provides a critical lens into the gender climate nexus at a granular level. Its findings inform gender equitable, crop specific policies to boost resilience, food security and women's empowerment.

The overall aim of the study was to examine the perceived effects of climate change on agricultural crops among women farmers in Ilorin East L.G.A, Kwara State, Nigeria. Specifically, the study describes the socioeconomic characteristics of the women vegetable farmers in the study area; identifies the types of agricultural crops mostly planted in the study area; examines the perceived effects of the climate change on agricultural crops in the study area; identifies the coping strategies employed by women agricultural crop farmers on climate change effects in the study area; and examines the challenges faced by women farmers in the study area. Based on the study objectives, two hypotheses were postulated. These are:

Hypothesis one ( $H_0_1$ ): There is no significant relationship between some selected socio-economic characteristics and perceived effects of climate change on agricultural crops among women farmers in Kwara State; and

Hypothesis two ( $H_0_2$ ): There is no significant relationship between coping strategies employed and perceived effects of climate change on crop farming.

## 2.0 Methodology

### 2.1 The Study Area

The study was carried out in Ilorin East L.G.A of Kwara State. Ilorin East is located between latitude  $8^{\circ} 5'N$  and longitude  $4^{\circ} 5'E$ . The L.G.A shares a boundary with Ilorin South, Ilorin West, Moro, and Ifelodun L.G.A. It has a land area of about  $486 \text{ km}^2$  and a population of 207,462.15. Kwara State is bounded in the north by Niger State and by the River Niger; to the east is Kogi State, while it shares boundaries with Oyo, Ondo, and Osun States in the south. There are many flowing streams in Kwara State, and the state has about 36,820 hectares of farmland (Alalade, 2016). The majority of the people in Ilorin-East L.G.A are farmers who engage in the production of agricultural crops like millet, corn, sweet potatoes, yam, tomato, okra, pepper, fruits, etc.

### 2.2 Sampling Procedure and Sample Size

A two-stage sampling procedure was used in selecting respondents for this study. Stage 1 was a purposive selection of five villages from Ilorin East L.G.A because of the predominance of women in agricultural activities, and Stage 2 was a random selection of 30 women crop farmers in each of the selected five villages. In all, a total of one hundred and fifty respondents were sampled to provide data for this study.

**Table 2.1: Summary of sampling procedure for women farmers in Ilorin East L.G.A**

L.G.A of study	Stage 1: Purposive selection of 5 villages	Stage 2: Random selection of 30 female agricultural crop farmers from each selected village	Total no of respondents
Ilorin East	5	30	150

### 2.3 Data Collection and Analysis

The primary data for this study were collected using the interview schedule method. A well-structured questionnaire was used to collect information on a variety of variables. The questionnaire was piloted in Ilorin West L.G.A of Kwara state and was found to be reliable after the validity and reliability tests. Data from the field survey were subjected to both descriptive and inferential statistical tools. Descriptive statistics such as frequency distribution, percentages, mean scores, and ranking order were used to present the findings from the objectives of the study. Logistic regression was used to test hypothesis one, while Pearson Product Moment Correlation (PPMC) was used to test hypothesis two.

## 2.4 Logistic Regression Analysis

Logit regression method was used to test hypothesis one that state that, there is no significant relationship between some selected socio-economic characteristics and perceived effects of climate change on agricultural crops among women farmers in Kwara State. Logit regression is appropriate for this study because the dependent variable (perceived effect of climate change on agricultural crops) is binary (coded as 0 = low and 1 = high). This method allows for estimating the probability of a high perceived effect based on selected socio-economic characteristics of women farmers. Unlike linear regression, the Logit model accounts for the non-linear relationship between the predictors and a binary outcome, ensuring more accurate and interpretable results (Harris, 2021). This makes it a robust tool for hypothesis testing in this context. The econometric model that was used to examine the relationship between selected socio-economic characteristics and perceived effects of climate change on agricultural crops among women farmers is implicitly stated as follow:

$$CCE = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U)$$

.....Equation 2.1

Where:

CCE= Perceived effects of climate change on agricultural crops (low=0; high=1),

X1 = Age (years)

X2 = Marital status (single=1; married=2; divorced=3; widowed=4)

X3 = Education (no formal education=1; primary=2; secondary=3; tertiary=4)

X4 = Annual income (naira)

X5 = Sources of capital (personal saving=1; microfinance bank=2; cooperative=3; family=4)

X6 = Sources of information (family=1; friends=2; extension agents=3; radio=4)

X7 = Years of experience (years); X8 = Number of dependents (number); and

U= Random error term.

The model was analyzed using the logistic regression technique.

## 2.5 Pearson Product Moment Correlation (PPMC) Analysis

Pearson Product Moment Correlation (PPMC) was used to test hypothesis two that stated: there is no significant relationship between coping strategies employed and perceived effects of climate change on crop farming among women farmers in Kwara State. The dependent variable

for the PPMC analysis is the coping strategies employed (addition of manures and fertilizers; use of cultural practices; managing crop yields; planting at any convenient time; fetching of water from the rivers or streams; reliance on wind pollination; planting of drought tolerant crops; wetting the crops early in the morning and in the evening; planting on highland; and mulching) rated on a 5-point likert scale. The independent variable is perceived effects of climate change (reduced crop yields; infestation of pest and diseases; shift in crop growing season; disruption to pollination; water scarcity and irrigation challenges; soil quality degradation; increased temperature; increased heat stress; more frequent drought; and increased flooding) rated on a 5-point likert scale.

### 3.0 Results and Discussion

#### 3.1 Socio-economic Characteristics of Respondents in Ilorin East L.G.A

Results presented in Table 3.1 showed that 12.0% of the respondents were aged less than 30 years, and 38.0% were aged between 31 and 40 years, while the average age of all respondents was 42.5 years, implying that the women farmers were relatively advanced in age. A farmer's age plays a vital role in agricultural productivity, as most Nigerian farmers are small-scale farmers who use crude implements, requiring strength and energy (Egwue *et al.*, 2020; Antia-Obong *et al.*, 2021). Also, the majority (77.3%) of the respondents were married. Being married implies that rural women have spouses expected to help in carrying out climate change adaptation activities that are strenuous at no cost. This finding conforms to the report by Mustapha *et al.*, (2024) that the majority of the women farmers in their study were married.

Findings in Table 3.1 showed that some (35.3%) of the respondents had no formal education while 32.0% had secondary education. This indicates that women farmers in the study area were literate and able to read and write. It is anticipated that this characteristic will accelerate the adoption of climate change adaptation strategies among rural women farmers, which necessitate reading instructions and maintaining records. This finding corroborates a report by Duru *et al.* (2022), who found in their study that rural women farmers in Kwara State were literate.

Additional information about the women farmers' capitals and information sources was provided in Table 3.1. Most (65.3%) of the respondents used their personal money, whereas only a small percentage (7.3%) obtained information from radio. This suggests that networks of friends and family members of farmers have been driving climate change issues. According to studies, farmer-farmer information sharing is crucial for the spread of updated knowledge about climate change and adaptation techniques (Duru *et al.*, 2022).

The results on years of farming experience in crop farming revealed that the majority (60.7%) of respondents had 10 years or less, while 11.3% had 21 years or more. The average years of experience were 9.6 years. This data shows that rural women farmers in the research area had adequate farming expertise. The abilities developed in an enterprise are proportionate to the time spent on it; hence, the more time a person devotes to a business, the better his or her comprehension of the business (Mukaila *et al.*, 2021).

The result on the number of dependents of respondents displayed in Table 3.1 revealed that more than half (52.0%) of the respondents had between less than or equal to 5 persons, and few (3.3%) had more than 10 dependents. The average number of dependents was approximately 6 persons. This implies that rural women farmers' dependents will assist in performing climate change adaptation practices that requires helping hand of more labour (Sheikh *et al.*, 2024). The results in Table 3.1 also indicated that the women's farmlands were obtained through inheritance (31.3%) and leasing (22.0%).

### **3.2 Types of Agricultural Crops Cultivated by Women Farmers in Ilorin East L.G.A**

Table 3.2 displays the result of the crop types the respondents grew. The majority of respondents planted African spinach (Efo tete) (87.3%) and maize (80.7%), with some (53.3%) planting sorghum. These findings revealed that women farmers cultivated a variety of food crops, implying that women in the study area are a large labor force in agriculture, playing critical roles in food crop production and household food security (Antriyandarti *et al.*, 2024). This study supports the assumption that women in Africa account for the majority of crop production and agricultural processing (Perelli *et al.*, 2024).

### **3.3. Perceived Effects of Climate Change on Crops Cultivated by Women Farmers in Ilorin East L.G.A**

Table 3.3 showed that crop yields were the most affected by climate change (mean = 4.60), while increasing floods were least (mean = 4.34). This means that climate change has reduced crop productivity significantly due to pests and disease infestations, as well as shifted crop growing seasons for farmers. Climate change has also been shown in studies to reduce smallholder farmers' crop production (Belay *et al.*, 2022; Tajudeen *et al.*, 2022; Wing *et al.*, 2021).

The aggregate level of individual respondents' perceived effects of climate change on crop farming is presented in Table 3.4. Findings showed that most (78.0%) of the respondents were grouped as having high perceived effects on crop production, while few (22.0%) respondents were grouped as having low perceived effects. This implies that the majority of women farmers in the study area have a high perception that climate change phenomena adversely affect their crop production activities. This finding is in agreement with many studies that earlier found that climate change manifestation poses negative effects on rural livelihood activities of women (Duru *et al.*, 2022; Dibakoane *et al.*, 2022).

### **3.4 Coping Strategies to Climate Change Used by Women Farmers in Ilorin East L.G.A**

Table 3.5 showed the result of climate change coping strategies adopted by women farmers. The table showed that the addition of manures and fertilizers (mean=4.57) ranked first, weeding (mean=4.51) ranked second, and mulching (mean=4.32) was listed as the least common coping strategy. This means that adding manures and fertilizers, as well as using cultural practices, were the primary coping methods utilized by women farmers to adjust to the consequences of climate change in the study area which also corroborates with the findings of Balasha *et al.* (2023).

**Table 3.1: Socio-economic characteristics of respondents (N=150) in Ilorin East L.G.A**

Variables	Frequency (n=150)	Percentage	Mean	Std. Dev.
<b>Age (years)</b>				
≤ 30	18	12.0		
31 – 40	57	38.0	42.5	10.17
41 – 50	48	32.0		
> 50	27	18.0		
<b>Marital Status</b>				
Single	11	7.3		
Married	116	77.3		
Divorced	7	4.7		
Widowed	16	10.7		
<b>Level of education</b>				
No formal	53	35.3		
Primary	26	17.3		
Secondary	48	32.0		
Tertiary	23	15.3		
<b>Annual income (Naira)</b>				
≤ 200,000	80	53.3		
200,000 – 400,000	57	38.0	289121.33	526481.1
>400,000	13	8.7		
<b>Sources of capital</b>				
Personal saving	98	65.3		
Micro-finance bank	1	0.7		
Cooperative society	30	20.0		
Family	21	14.0		
<b>Sources of information</b>				
Family	79	52.7		
Farmers friends	48	32.0		
Extension agents	12	8.0		
Radio	11	7.3		
<b>Years of experience</b>				
≤ 10	91	60.7		
11 – 20	42	28.0	12.9	9.6
> 21	17	11.3		
<b>Number of dependence</b>				
≤ 5	78	52.0		
6 – 10	67	44.7	6.1	2.6
> 11	5	3.3		
<b>Land ownership status</b>				
Owned	30	20.0		
Inherited	47	31.3		
Lease	33	22.0		
Sharecropper	29	19.3		
Others	11	7.3		

Source: Field Survey, 2024

**Table 3.2: Types of crops cultivated by women farmers in Ilorin East L.G.A**

Agricultural Crops	Frequency	Percentage
African Spinach (Efo tete)	131	87.3
Fruits	97	64.7
Maize	121	80.7
Sweet potatoes	102	68.0
Millet	85	56.7
Beans (Ewa)	83	55.3
Sorghum	80	53.3
Cassava	84	56.0
Tomatoes	104	69.3
Pepper	110	73.3
Yam	85	56.7
Melon	106	70.7
Okra	103	68.7
Groundnut	103	68.7
Bitter leaf (Efo ewuro)	101	67.3
*Others	110	73.3

NB: \*others include: soybean, rice, ewedu (jute mallow) etc.

**Table 3.3: Perceived effects of climate change on crop production in Ilorin East L.G.A**

Perceived effects	SA	A	U	D	SD	Mean	St.D	Rank
Reduced crop yields	94(62.7)	52(34.7)	4(2.7)	0	0	4.60	0.54	1 <sup>st</sup>
Infestation of pest and diseases	77(51.3)	70(46.7)	3(2.0)	0	0	4.49	0.54	2 <sup>nd</sup>
Shift in crop growing season	73(48.7)	75(50.0)	1(0.7)	1(0.7)	0	4.47	0.55	3 <sup>rd</sup>
Disruption to pollination	72(48.0)	73(48.7)	3(2.0)	1(0.7)	1(0.7)	4.43	0.64	4 <sup>th</sup>
Water scarcity and irrigation challenges	69(46.0)	77(51.3)	4(2.7)	0	0	4.43	0.55	5 <sup>th</sup>
Soil quality degradation	70(46.7)	73(48.7)	7(4.7)	0	0	4.42	0.58	6 <sup>th</sup>
Increased temperature	71(47.3)	73(48.7)	4(2.7)	1(0.7)	1(0.7)	4.41	0.65	7 <sup>th</sup>
Increased heat stress	67(44.7)	77(51.3)	5(3.3)	1(0.7)	0	4.40	0.59	8 <sup>th</sup>
More frequent drought	63(42.0)	81(54.0)	3(2.0)	2(1.3)	1(0.7)	4.35	0.66	9 <sup>th</sup>
Increased flooding	61(40.7)	81(54.0)	6(4.0)	2(1.3)	0	4.34	0.62	10 <sup>th</sup>

Keys: SA-Strongly Agree, A-Agree, U- Undecided, D- Disagree, SD-Strongly Disagree, St.D-Standard deviation

Source: Field Survey, 2024

**Table 3.4: Level of effect of climate change on crop farming of women farmers in Ilorin East L.G.A**

Obtained score	Level of effects	Frequency	Percentage
10 – 30	Low	33	22.0
31 – 50	High	117	78.0
Total		150	100.0

Possible score range = 10 – 50

Source: Field Survey, 2024

**Table 3.5: Coping Strategies to Climate Change Used by Women Farmers in Ilorin East L.G.A**

Coping strategies	SA	A	U	D	SD	Mean	St. D	Rank
Addition of manures and fertilizers	86(57.3)	63(42.0)	1(0.7)		0	4.57	0.51	1 <sup>st</sup>
Weeding	76(50.7)	74(49.3)		0	0	4.51	0.50	2 <sup>nd</sup>
Managing crop yields	80(53.3)	66(44.0)	3(2.0)	0	1(0.7)	4.49	0.61	3 <sup>rd</sup>
Planting at any convenient time	79(52.7)	68(45.3)	2(1.3)	0	1(0.7)	4.49	0.60	4 <sup>th</sup>
Fetching of water from the rivers or streams	70(46.7)	76(50.7)	4(2.7)		0	4.44	0.55	5 <sup>th</sup>
Reliance on wind pollination	73(48.3)	71(47.3)	4(2.7)	1(0.7)	1(0.7)	4.43	0.65	6 <sup>th</sup>
Planting of drought tolerant crops	71(47.3)	72(48.0)	3(2.0)	3(2.0)	1(0.7)	4.39	0.69	7 <sup>th</sup>
Wetting the crops early in the morning and in the evening	69(46.0)	74(49.3)	5(3.3)	1(0.7)	1(0.7)	4.39	0.65	8 <sup>th</sup>
Planting on highland	67(44.7)	72(48.0)	7(4.7)	3(2.0)	1(0.7)	4.34	0.72	9 <sup>th</sup>
Mulching	58(38.7)	86(57.3)	4(2.7)	2(1.3)	0	4.32	0.66	10 <sup>th</sup>

Keys: SA-Strongly Agree, A-Agree, U-Uncertain, D- Disagree, SD-Strongly Disagree, St.D- Standard deviation

Source: Field Survey, 2024

### 3.5 Challenges Faced by Women Crop Farmers in Ilorin East L.G.A

Challenges to crop farming by women farmers are presented in Table 3.6. Findings showed that difficulty in obtaining suitable land for farming (mean=3.66) ranked first, limited access to resources (mean=3.55) ranked second, difficulty in obtaining loan (mean=3.54) ranked third, while balancing farm responsibilities with household duties (mean=3.37) ranked the least constraint. This implies that difficulty in obtaining suitable land for farming, limited access to resources, and difficulty in obtaining loan were the major constraints facing rural women farmers in applying coping strategies to climate change effects on crop production in the study area. This finding agrees with the studies of Kehinde *et al.* (2021) and Nnaji *et al.* (2021) who found that

difficulty in assessing suitable lands for farming was a major problem facing women farmers in Nigeria.

**Table 3.6: Challenges faced by women crop farmers in Ilorin East L.G.A**

Challenges Faced	VS	S	NS	NC	Mean	SD	Rank
Difficulty in obtaining suitable land for farming	104(69.3)	43(28.7)	1(0.7)	2(1.3)	3.66	0.57	1 <sup>st</sup>
Limited access to resources	82(54.7)	68(45.3)	0	0	3.55	0.50	2 <sup>nd</sup>
Difficulty in obtaining loan	83(55.3)	65(43.3)	2(1.3)	0	3.54	0.53	3 <sup>rd</sup>
Unpredictable weather patterns	77(51.3)	70(46.7)	1(0.7)	2(1.3)	3.48	0.59	4 <sup>th</sup>
Inadequate infrastructure	73(48.7)	76(50.7)	0	1(0.7)	3.47	0.54	5 <sup>th</sup>
Pests and diseases	66(44.0)	84(56.0)	0	0	3.44	0.50	6 <sup>th</sup>
Difficulty in accessing markets	67(44.7)	80(53.3)	2(1.3)	1(0.7)	3.42	0.56	7 <sup>th</sup>
Limited access to education and training opportunities	65(43.3)	82(54.7)	2(1.3)	1(0.7)	3.41	0.56	8 <sup>th</sup>
Gender based discrimination	68(45.3)	77(51.3)	2(1.3)	3(2.0)	3.40	0.62	9 <sup>th</sup>
Balancing farm responsibilities with household duties	62(41.3)	83(55.3)	3(2.0)	2(1.3)	3.37	0.60	10 <sup>th</sup>

Key: VS-Very Severe, S-Severe, NS-Not Severe, NC-Not a Challenge

Source: Field Survey, 2024

### 3.6 Test of Hypotheses Results

Hypothesis one ( $H_0_1$ ): There is no significant relationship between some selected socio-economic characteristics and perceived effects of climate change on crops among women farmers in Kwara State.

Table 3.7 showed that marital status ( $B = 2.09$ ,  $p < 0.05$ ) and age ( $B = 0.07$ ,  $p < 0.05$ ) had significant and positive relationships with the perceived effects of climate change on women's crop farming. This means that an increase in age could worsen the negative effects of climate change on crop farming in the study area. This may be attributed to the fact that increment in age usually comes with more experience, which may bring about increased perceived effects of climate change on crop farming among the women farmers. Farmers in their advanced years are predicted to be hesitant to accept innovations that can help avert the disastrous consequences of climate change on agricultural production (Grigorieva, 2023).

Hypothesis two ( $H_0_2$ ): There is no significant relationship between coping strategies employed and perceived effects of climate change on crop farming.

The results of PPMC presented in Table 3.8 showed that coping strategies employed by women farmers had a significant negative relationship with the effects of climate change at the  $p < 0.01$  level. This implies that an increased application of the coping strategies would lessen the effects of climate change experienced by the women farmers. This further implies that coping strategies

employed by the women farmers are significantly effective in mitigating the adverse effects of climate change on farms (Malhi *et al.*, 2021).

**Table 3.7: Result of logistic regression showing the determinants of women farmers perceived effects of climate change on their cultivated crops**

Variables in the Equation	B	S.E.	Wald	Sig.	Exp(B)
Age	0.07*	0.03	4.60	0.03	1.07
Marital status	2.09*	0.66	2.73	0.01	2.97
Education	-0.69	0.47	2.12	0.15	0.50
Annual income	0.00	0.00	0.05	0.82	1.00
Sources of capital	0.09	0.44	0.04	0.84	1.09
Sources of information	-0.53	0.83	0.41	0.52	0.59
Years of experience	-0.01	0.03	0.09	0.77	0.99
Number of dependents	-0.10	0.09	1.34	0.25	0.90

### Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	144.398a	0.087	0.134

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001

**Table 3.8: PPMC correlation between coping strategies employed and perceived effects of climate change on crop farming**

		Coping strategies	Effects of climate change
Coping strategies	Pearson correlation	1	-0.645**
	Sig. (2-tailed)		0.000
	N	150	150
Effects of climate change	Pearson correlation	-0.645**	1
	Sig. (2-tailed)	0.000	
	N	150	150

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey, 2024

#### 4.0 Conclusion and Recommendations

The study concluded that the majority of the women farmers perceived that the effects of climate change on their crops were high. Also, age and marital status were the significant factors determining the perceived effects of climate change on crop farming of women farmers in the study area. The application of manures, fertilizers, cultural methods, and fetching of water from rivers or streams were the most common coping strategies adopted by women farmers to adjust to the effects of climate change. In line with the findings, the study recommends that extension services should prioritize the dissemination and training on climate-smart techniques such as mulching, agroforestry, water harvesting, and drought-resistant crop varieties, tailored specifically for women farmers who are disproportionately affected by climate change. Also, since age and marital status significantly influence women's perception of climate change effects, programs should be age-sensitive and consider household responsibilities. For example, older or married women may benefit more from local, time-saving interventions such as mobile advisory services or closer access to water sources.

#### References

Alalade, O.A., Matanmi, B.M., Olaoye, I.J., and Tifase, O.A. (2016). Perception of poultry farmers on the effect of mobile telephony on poultry production in Kwara State, Nigeria. *Journal of Science, Technology, Mathematics and Education (JOSTMED)*, 12(2), 80-88

Antia-Obong, E.A., Hubbard C., and Garrod G. (2021). Influence of transaction costs on smallholder poultry market participation in Nigeria: A mixed-methods analysis. *World Food Policy* 7(2): 96-110.

Antriyandarti, E., Suprihatin, D.N., Pangesti, A.W., and Samputra, P.L. (2023). The dual role of women in food security and agriculture in responding to climate change: Empirical evidence from Rural Java. *Environmental Challenges*, 14, 100852. <https://doi.org/10.1016/j.envc.2024.100852>

Ayugi, B., Eresanya, E.O., Onyango, A.O., Ogou, F.K., Okoro, E.C., Okoye, C.O., Anoruo, C.M., Dike, V.N., Ashiru, O.R., Daramola, M.T., Mumo, R., and Ongoma, V. (2022). Review of meteorological drought in Africa: historical trends, impacts, mitigation measures, and prospects. *Pure and Applied Geophysics*, 179(4), 1365-1386. <https://doi.org/10.1007/s00024-022-02988-z>

Balasha, A.M., Munyahali, W., Kulumbu, J.T., Okwe, A.N., Fyama, J.N.M., Lenge, E.K., and Tambwe, A.N. (2023). Understanding farmers' perception of climate change and adaptation practices in the marshlands of South Kivu, Democratic Republic of Congo. *Climate Risk Management*, 39, 100469. <https://doi.org/10.1016/j.crm.2022.100469>

Belay, A., Oludhe, C., Mirzabaev, A., Recha, J.W., Berhane, Z., Osano, P.M., Demissie, T., Olaka, L.A., and Solomon, D. (2022). Knowledge of climate change and adaptation

by smallholder farmers: Evidence from southern Ethiopia. *Heliyon*, 8(12). <https://doi.org/10.1016/j.heliyon.2022.e12089>

Bello, L.O., Baiyegunhi, L.J., Danso-Abbeam, G., and Ogundehi, A.A. (2021). Gender decomposition in smallholder agricultural performance in rural Nigeria. *Scientific African*, 13, e00875. <https://doi.org/10.1016/j.sciaf.2021.e00875>

Bjornlund, V., Bjornlund, H. and van Rooyen, A. (2022). Why food insecurity persists in sub-Saharan Africa: A review of existing evidence. *Food Sec.* 14, 845–864. <https://doi.org/10.1007/s12571-022-01256-1>

Borda, Á.J., Sárvári, B., and Balogh, J.M. (2023). Generation Change in Agriculture: A Systematic Review of the Literature. *Economies*, 11(5), 129. <https://doi.org/10.3390/economies11050129>

Bouteska, A., Sharif, T., Bhuiyan, F., and Abedin, M.Z. (2024). Impacts of the changing climate on agricultural productivity and food security: Evidence from Ethiopia. *Journal of Cleaner Production*, 449, 141793. <https://doi.org/10.1016/j.jclepro.2024.141793>

Dibakoane, S., Siyongwana, P., and Shabalala, A.N. (2022). Vulnerability, impact and adaptation strategies of female farmers to climate variability. *Jamba*, 14(1), 1302. <https://doi.org/10.4102/jamba.v14i1.1302>

Duchenne-Moutien, R.A., and Neetoo, H. (2021). Climate change and emerging food safety issues: a review. *Journal of Food Protection*, 84(11), 1884-1897. <https://doi.org/10.4315/JFP-21-141>

Duru, J., Aro, J., and Oladipo, R.E. (2022). The effects of climate change on the livelihood of rural women: a case study of Ilorin South, Nigeria. *Bulletin of the National Research Centre*, 46, 165 (2022). <https://doi.org/10.1186/s42269-022-00834-9>

Egwue, O.L., Agbugba, I.K., and Mukaila, R. (2020). Assessment of rural households' food insecurity during covid-19 pandemic in South-East Nigeria. *International. Journal of Research, GRAN-THAALAYAH*, 8(12), 182–194. <https://doi.org/https://doi.org/10.29121/granthaalayah.v8.i12.2020.2713>

Efretuei, A.O., and Udounang, P.I. (2020). Maize yield response to inorganic fertilizer rates in the tropical rainforest of South-Eastern Nigeria. *International Journal of Agriculture and Rural Development*, 23(1), 4858-4865.

FAO (2025). GIEWS - Global Information and Early Warning System. Country Briefs. Food and Agriculture Organization of the United Nations.

Grigorieva, E., Livenets, A., and Stelmakh, E. (2023). Adaptation of agriculture to climate change: a scoping review. *Climate*, 11(10), 202. <https://doi.org/10.3390/cli11100202>

Haque, A.T., Kumar, L. and Bhullar, N. (2023). Gendered perceptions of climate change and agricultural adaptation practices: a systematic review. *Climate and Development*, DOI: 10.1080/17565529.2023.2176185.

Harris J.K. (2021). Primer on binary logistic regression. *Fam Med Community Health*. 2021 Dec;9 (Suppl 1): e001290. [doi: 10.1136/fmch-2021-001290](https://doi.org/10.1136/fmch-2021-001290). PMID: 34952854; PMCID: PMC8710907.

Jasper, J., Wagstaff, C., and Bell, L. (2020). Growth temperature influences postharvest glucosinolate concentrations and hydrolysis product formation in first and second cuts of rocket salad. *Postharvest Biology and Technology*, 163, 111157. <https://doi.org/10.1016/j.postharvbio.2020.111157>

Kehinde, M.O., Shittu, A.M., Adeyolu, A.G., and Ogunnaike, M.G. (2021). Women empowerment, Land Tenure and Property Rights, and household food security among smallholders in Nigeria. *Agriculture & Food Security*, 10(1). <https://doi.org/10.1186/s40066-021-00297-7>

Liverpool-Tasie, L.S., Pummel, H., Tambo, J.A., Olabisi, L.S., and Osuntade, O. (2020). Perceptions and exposure to climate events along agricultural value chains: Evidence from Nigeria. *Journal of Environmental Management*, 264, 110430. <https://doi.org/10.1016/j.jenvman.2020.110430>

Malhi, G.S., Kaur, M., and Kaushik, P. (2021). Impact of climate change on agriculture and its mitigation strategies: A review. *Sustainability*, 13(3): 1318. <https://doi.org/10.3390/su13031318>

Mukaila, R., Falola, A., and Akanbi, S.U.O. (2021). Socioeconomic determinants of income among rural women in Enugu state, Nigeria: implication for achieving first sustainable development goal. *J. Agribus. Rural Dev.*, 4(62): 363–370. <http://dx.doi.org/10.17306/JJARD.2021.01450>

Mustapha, M.A., Idi, S., and Bose, A.A. (2024). Rural women farmers' participation in agricultural cooperative societies in Bauchi and Tafawa Balewa local government areas of Bauchi State. *Nigerian Journal of Agriculture and Agricultural Technology*, 4(1), 159–168.

Nnaji, A., Ratna, N.N., and Renwick, A. (2021). Gendered access to land and household food insecurity: Evidence from Nigeria. *Agricultural and Resource Economics Review*, 1–23. <https://doi.org/10.1017/age.2021.13>

Omoluabi, J.E, and Ibitoye, S.J. (2024). Cassava Production and Agricultural Growth in Nigeria. Analysis of Effects and Forecast. *GSC Advanced Research and Reviews*, 21 (1): 37-46.

Pawlak, K., and Kołodziejczak, M. (2020). The Role of Agriculture in Ensuring Food Security in Developing Countries: Considerations in the Context of the Problem of Sustainable Food Production. *Sustainability*, 12(13), 5488. <https://doi.org/10.3390/su12135488>

Perelli, C., Cacchiarelli, L., Peveri, V., and Branca, G. (2024). Gender equality and sustainable development: A cross-country study on women's contribution to the adoption of the

climate-smart agriculture in Sub-Saharan Africa. *Ecological Economics*, 219, 108145. <https://doi.org/10.1016/j.ecolecon.2024.108145>

Porter, J.R., Challinor, A.J., Henriksen, C.B., Howden, S.M., Martre, P., and Smith, P. (2019). Invited review: Intergovernmental panel on climate change, agriculture, and food—A case of shifting cultivation and history. *Global Change Biology*, 25(8), 2518–2529. <https://doi.org/10.1111/gcb.14700>

Sheikh, Z.A., Ashraf, S., Weesakul, S., Ali, M., and Hanh, N.C. (2024). Impact of climate change on farmers and adaptation strategies in Rangsit, Thailand. *Environmental Challenges*, 15, 100902. <https://doi.org/10.1016/j.envc.2024.100902>

Tajudeen, T.T., Omotayo, A., Ogundele, F.O., and Rathbun, L.C. (2022). The effect of climate change on food crop production in Lagos State. *Foods*, 11(24): 3987. <https://doi.org/10.3390/foods11243987>

Tajudeen, T., Omotayo, A., Ogundele, F., and Rathbun, L. (2022). The effect of climate change on food crop production in Lagos State. *Foods*, 11(24), 1-15. <https://doi.org/10.3390/foods11243987>

Wing, I.S., De Cian, E., and Mistry, M.N. (2021). Global vulnerability of crop yields to climate change. *Journal of Environmental Economics and Management*, 109, 102462. <https://doi.org/10.1016/j.jeem.2021.102462>

World Bank. (2021). Nigeria biannual economic update: Resilience through reforms. World Bank Group. Accessed from <https://www.worldbank.org/en/country/nigeria/publication/nigeria-biannual-economic-update> on 31/04/25