

FARMERS' PERCEPTION OF CLIMATE CHANGE IN KWARA STATE, NIGERIA

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Abstract: This paper highlights some indigenous mitigation and adaptation strategies that have been practiced by farmers in Kwara State, Nigeria. Random sampling technique was used to select 176 respondents from 8 villages under the four agricultural zone of the Kwara State Agricultural Development Programme. Data were collected through scheduled interviews and results were analyzed using descriptive statistics and Chi-Square. Findings showed that majority (70.45%) of the respondents was male, 71.59% were married, the mean age of the farmers was 46years, and 87.5% were educated while 72.15% of them had not less than 14 years of farming experience. The study revealed that majority source their information through family/friends, while 93.18% were of the opinion that the environment and the climate in particular are changing due to diverse human activities. It was also found that majority (82.95%) of the respondents indicated that climate change has led to various forms of crop infestations thereby reducing the quality and quantity of crops produced and increased cost of food crops as opined by 77.84% of respondents. In adapting to climate change, findings showed that majority (72.16%) of the respondents cultivates different/varieties of crops. The result further revealed that there is significant relationship between the personal characteristics of the farmers and their level of awareness ($X^2_{cal} 440.599 > \text{the } X^2_{Tab} 41.34$), climatic change has significant effect on arable crop production in the study area ($X^2_{cal} 182.362 > X^2_{Tab} 67.50$) and there is significant relationship between the farmers perception and coping mechanism used during climate change ($X^2_{cal} 212.597 > X^2_{Tab} 14.07$). Government and development agencies concerned with the issue of climate change should sensitize farmers on the reality of climate change, their impacts, its consequences on food crop production and modern adaptation measures.

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Introduction

Agriculture places heavy burden on the environment in the process of providing humanity with food and fiber, while climate is the primary determinant of agricultural productivity. Given the fundamental role of agriculture in human welfare, concern has been expressed by federal agencies and others regarding the potential effects of climate change on agricultural productivity. Interest in this issue has motivated a substantial body of research on climate change and agriculture over the past decade (Nelson et al, 2009; Lobell *et al*, 2008; Darwin, 2004; Fischer *et al*, 2002). Climate change is expected to influence crop production, hydrologic balances, input supplies and other components of agricultural systems. However the nature of these biophysical effects and human responses to them are complex and uncertain. It is evidenced that climate change will have a strong impact on Nigeria-particularly in the areas of agriculture; land use, energy, biodiversity, health and water resources. Nigeria, like all the

countries of Sub-Saharan Africa, is highly vulnerable to the impacts of Climate Change (IPCC, 2007). Most research on people perception of climate changes were carried out in the developed countries of the world which dominate the uppermost northern region of the earth where the relationship between Scientists and Indigenous Peoples is high (Jan & Anja, 2007). Though the hope in this devastating scenario of climate change lies with the indigenous peoples themselves, who are very successful at preventing deforestation and managing natural environment, those in the developing countries are rarely considered (Jan & Anja, 2007). Despite the fact that efforts have been made towards fighting climate change from scientific views, research and policies directed towards indigenous knowledge and perception are highly needed. Understanding of local perception is useful in understanding the true implications of changing climate.

To approach the issue appropriately, one must take into account local communities'

understanding of climate change, since they perceive climate as having a strong spiritual, emotional, and physical dimension. It is therefore assumed that these communities have an inborn, adaptive knowledge from which to draw and survive in high-stress ecological and socio-economic conditions. Thus, the human response is critical to understanding and estimating the effects of climate change on production and food supply for ease of adaptation. Accounting for these adaptations and adjustments is necessary in order to estimate climate change mitigations and responses (Apata, Samuel & Adeola, 2009).

Africa is generally acknowledged to be the continent most vulnerable to climate change. West Africa is one of the most vulnerable to the vagaries of the climate, as the scope of the impacts of climate variability over the last three or four decades has shown (IPCC, 2007). Climate change leads to land degradation which reduces the quality and productivity and manifest throughout the country while in the southern part of Nigeria, the problem is coastal erosion and flooding, in the sahelian zone of north, the most pronounced climate changed-related reforms of land degradation are wind erosion and related sand dune formation, drought and desertification, sheet erosion which results to the complete removal of arable land is Nigeria's biggest threat to agriculture especially in the sandy soil regions of south-eastern Nigeria.

Climate change has serious consequences on food security, the success of which is dependent on the age long ability of farmers to predict when to plant their crops. Unpredicted changes in the onset of rains in the last 20 to 30 years have led to situation where crops planted with the arrival of early rains get smothered in the soil by an unexpected dry spell that can follow early planting. There is the need to gain as much information as possible, and learn the positions of rural farmers and their needs, about what they know about climate change, in order to offer adaptation practices that meet these needs.

The study aims at addressing the following research questions:

- What is the level of awareness of arable crop farmers on climate change?
- Does climate change have any effect on the rate of production?
- What are the coping mechanisms used during climate change?

- What are the problems facing farmers when using proper adaptation measures to climate change barriers?

Objectives of the study

The general objective of the study is to assess and determine perception rate and knowledge of arable crop farmers on climate change in Kwara State, Nigeria.

The specific objectives are to:

- Identify the personal characteristics of the arable crop farmers
- determine the level of awareness of farmers on climate change
- identify effect or impact of climate change on the rate of arable crop production
- identify the coping mechanism used during climate change
- identify the barriers farmers encounter when using coping mechanism during climate change

Hypotheses of the study

- **Ho₁:** There is no significant relationship between the personal characteristics of the arable crop farmers and the level of awareness of the arable crop farmers on climate change.
- **Ho₂:** Climatic change has no significant relationship on arable crop production in the study area.
- **Ho₃:** There is no significant relationship between the farmers' perception on climate change and the coping strategies of climate change.

METHODOLOGY

This study was carried out in Kwara State, Nigeria. It is located in the agro-ecological zone of the country. With a population of about 2.37 million (Census, 2006), and is made up of four ethnic groups namely; Yoruba, Nupe, Fulani and Baruba. The state is made up of four zones. It has about 260,528 farm families (KWADP, 2010) and about 36,820 hectares of farmland (FOS, 2005). The state lies between latitudes 7^o45'N and 9^o30'N and longitudes 2^o30'E and 6^o35'E. The annual rainfall pattern across the state extends between the months of April and October with minimum temperature ranging from 21.1^oC to 25^oC while maximum average temperature ranges from 30^oC to 35^oC. The population of the state

is predominantly farmers that specialized in arable crops such as groundnut, shorgum, cassava, yam, cowpea, maize, yam and rice (KWADP, 2010).

The data for this study were obtained from primary sources with the use of well-structured questionnaires augmented with personal oral interview. The target population for the study was made up of the arable farmers in the selected Local Government Area in the State. Four local government areas were selected from the four agricultural zones of the Kwara State Agricultural Development Programme (KWADP) in such a way that all the four zones were included and respondents were arable crop farmers.

Two (2) villages were then selected randomly from each local government area, making a total of eight (8) villages. Twenty two (22) farmers were selected from each village amounting to 176 farmers. The use of interpreters was also employed, where necessary, to enhance better communication with the respondents.

Data Analysis

Simple descriptive statistics involving frequency counts, mean and percentages was used in the analysis of the data. Also, chi-square was also used to test the formulated hypotheses.

Results and Discussion

Table 1 shows that 70.45% of the respondents were male while 29.55% were female. The reason for this likely stems from the fact that the male are more capable of doing tedious work, associated with farming, than the female. The modal age range is 41 – 50, with an average of 36years. This implies that most of the farmers are still within their active and productive age, hence they have the ability to perceive and know more on climate change. 71.59% of the respondents were married, 87.5% of the respondents had formal education. This implies that they are likely to have the idea about climate change. Majority (52.84%) of the respondents from villages studied were mainly farmers. The modal farming experience is 11-15 years while the mean is 14 years. This likely indicates that the farmers have acquired relevant skills in coping with the effects of climate change over the years.

Table 2 reveals that the major media of information on climate change available to the farmers are radio, a combination of the radio and extension services, and the television. On the other hand, very few respondents obtain theirs through agricultural show, print media and conference/seminar/workshop. Also, none of the respondents is aware of climate change through entrepreneurship. This probably indicates the dearth of training sessions on climate change in the study area.

Table 3 above reveals majority(93.18%) of the respondents were of the opinion that the environment and the climate in particular has been changing over the years due to human activities such as farming, deforestation either by cutting down of trees for fuel, roofing, farmlands extension, overgrazing, bush burning, and industrialization. 51.70% of the respondents strongly agree and believe that temperature has been rising over the past few decades, 46.60% agree that the yearly rains are not supporting crop production as before and due to these 47.73% of the respondents strongly agrees that the environment is becoming dry every year affecting human comfort within the study area. 26.70% respondents were undecided about serious awareness on climate change.

Table 4 gives the details of the effects of climate change on arable crop production. 46.59% of the respondents agree that climate change has led to various forms of crops infestations there by reducing the quality and quantity of crops produced, which are very significant factors that increase cost of food crops generally as agreed by 53.41% of the respondents. 50.57% and 50% of the respondents also agrees that there had been problems of flood and drought which are serious contributing problems associated with climate change that threatened the livelihood of the farmers in the study area. Apart from the impact of climate change on crop production in the study area, most of the respondents (51.70%) studied agree that the environment is suffering from excessive de-vegetation which presently causes a decline in forest resources. Overall, 88.64% of the respondents are of the opinion that climate change has led to shortage of farm produce during the dry season.

Table 1: Distribution of Respondents according to their Personal Characteristics

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Age(Years):		
≤ 30	17	9.66
31 – 40	36	20.45

41 – 50	58	32.95
51 – 60	53	30.11
> 60	12	6.82
Total	176	100
Gender:		
Male	124	70.45
Female	52	29.55
Total	176	100
Marital Status:		
Single	16	9.09
Married	126	71.59
Divorced	9	5.11
Separated	11	6.25
Widowed	14	7.95
Total	176	100
Level of Education:		
No formal education	22	12.5
Adult education	23	13.07
Primary education	58	32.95
Secondary education	67	38.07
Tertiary education	5	2.84
Others	1	0.57
Total	176	100
Primary Occupation:		
Farming	93	52.84
Trading	19	10.80
Weaving	1	0.57
Civil Servant	4	2.27
Others	2	1.14
Farming & Trading	30	17.02
Farming & Civil Servant	15	8.52
Farming & Others	11	6.25
Farming & Weaving	1	0.57
Total	176	100
Farming experience(years)		
1-5	19	10.8
6-10	36	20.45
11-15	72	40.90
16-20	43	24.40
Above 20	6	3.41
Total	176	100

Source: Field Survey, 2011

Table 2: Distribution of the respondents in order of medium through which they are aware of climate change

MEDIUM	FREQUENCY	PERCENTAGE
Extension Service	24	13.63
Conference/Seminar/Workshop	1	0.57
Entrepreneurship Centre	-	-
Radio	68	38.63
Television	21	11.93
Agric Show	1	0.57

Print Media	1	0.57
Radio/Agric Show	3	1.70
Radio/Television	4	2.27
Extension Service/Radio	26	14.77
Extension Service/Television	9	5.11
Extension Service/Print Media	3	1.70
Extension Service/Radio/Television/Print Media	5	2.84
All of the above	10	5.68
Total	176	100

Source: Field Survey, 2011

Table 3: Distribution of the respondents according to their statements based on their level of awareness on climate change

Statements		Strongly Agree	Agree	Undecided	Strongly Disagree	Disagree	Total
The climate is changing due to human activities	F	86	78	6	4	2	176
	%	48.86	44.32	3.41	2.27	1.14	100
The temperature is rising	F	91	78	4	3	0	176
	%	51.70	44.32	2.27	1.70	0	100
The yearly rains are not supporting crop production as before	F	77	82	12	5	0	176
	%	43.75	46.59	6.82	2.84	0	100
The weather is becoming dry every year	F	84	71	15	6	0	176
	%	47.73	40.34	8.52	3.41	0	100
There is serious awareness on climate change	F	26	43	47	42	18	176
	%	14.77	24.43	26.70	23.86	10.23	100

Source: Field Survey, 2011

Table 4: Distribution of the respondents according to effect of climate change on arable crop production

Effects		Strongly Agree	Agree	Undecided	Strongly Disagree	Disagree	Total
There is increase in cost of food crops due to climate change	F	43	94	35	3	1	176
	%	24.43	53.41	19.89	1.70	0.57	100
Climate change has lead to crop infestation and diseases	F	64	82	25	4	1	176
	%	36.36	46.59	14.20	2.27	0.57	100
Climate change has led to decline of forest resources	F	74	91	8	3	0	176
	%	42.05	51.70	4.55	1.70	0	100
Climate change has led to shortage of farm produce during the dry season	F	63	93	17	3	0	176
	%	35.80	52.84	9.66	1.70	0	100
There have been increased incidences of flood during raining season	F	80	89	5	2	0	176
	%	45.45	50.57	2.84	1.14	0	100

There have been increased incidences of drought during dry season	F	80	89	5	2	0	176
	%	44.89	50.00	2.84	1.14	1.14	100

Source: Field Survey, 2011

Table 5: Distribution of the respondents according to coping mechanism used during climate change

Coping Strategies	YES		NO	
	Freq	%	Freq	%
Planting of different varieties of crops	127	72.16	49	27.84
Changing cropping pattern	121	68.75	55	31.25
Mulching	101	57.38	75	42.61
Shortening growing season	57	32.39	119	67.61
Shading and shelter	78	44.32	79	44.89
The use of chemical fertilizer	128	72.73	48	27.27
Adoption of new technologies	142	80.68	34	19.32

Source: Field Survey, 2011

Table 5 presents the strategies used by the farmers in coping with climate change. 72.16% of the respondents cope with climate change by cultivating different varieties of crops. This is probably because different varieties of crops have different levels of tolerance for adverse effects of climate change and so would not result in a complete loss on the part of the farmers. 68.75% of the respondents limit themselves to changing cropping pattern. This could be because changing crop pattern guards against crop infestation and disease attack, which are some of the effects of climate change as it was the opinion of majority (82.95%) of the respondents (Table 4). 80.68% of the respondents adopt new technology such as irrigation and others while just 32.39% adopts shortening of growing season strategies in combating climate change. The reason for this could be the low level of knowledge of the farmers about shortening the growth season of the crops. 72.73% respondents adapt fertilizer as one of coping mechanism being used. This could be an attempt to improve soil fertility by the farmers. 57.39% mulch the land to reduce the loss of soil moisture for crops while 44.32% make use of land shading and sheltering techniques. These could be the need to mitigate soil moisture loss resulting from increase in temperature and decrease in rainfall.

Table 6: Distribution of the respondents according to barriers encountered by farmers when using the coping mechanism during climate change

Barriers		Strongly Agree	Agree	Undecided	Strongly Disagree	Disagree	Total
Inadequate finance	F	58	112	4	2	0	176
	%	32.95	63.64	2.27	1.14	0	100
Inadequate access to new technologies	F	86	78	11	1		176
	%	48.86	44.32	6.25	0.57	0	100
Insufficient information on weather incidences	F	84	81	9	2	0	176
	%	47.73	46.02	5.11	1.14	0	100
Insufficient current knowledge to adapting methods	F	96	68	9	3	0	176
	%	54.55	38.64	5.11	1.70	0	100
Inadequate extension workers & education	F	99	70	4	3	0	176
	%	56.25	39.77	2.27	1.70	0	100
No barrier encounter	F	7	20	69	51	29	176
	%	3.98	11.36	39.20	28.97	16.47	100

Source: Field Survey, 2011

Table 6 reveals that 63.64% of the respondents agree that there is inadequate finance. This implies that they would not have adequate fund to acquire adaptive facilities. 48.86% of the respondents strongly agree that they have inadequate access to new technologies. 47.73% strongly agree that there is insufficient information on weather incidences, 54.55% of the respondents strongly agree that there is insufficient current knowledge to adapting methods. Majority of the respondents (56.55%) strongly agree that there are inadequate extension workers & education while 39.20% of the respondents were indifferent as regards the existence of barriers to coping strategies.

Testing of Hypotheses

Ho₁: There is no significant relationship between the personal characteristics of arable crop farmers and their level of awareness on climate change.

Table 7: Results showing the significant relationship between the personal characteristics of arable crop farmers and level of awareness of farmers (chi-square test)

Statements	SA	A	U	SD	D	TOTAL
Climate is changing	56 (72.62)	105 (79.00)	12 (13.50)	2 (8.25)	1 (2.62)	176
The climate is changing due to human activities	86 (72.62)	78 (79.00)	6 (1350)	4 (8.25)	2 (2.63)	176
The temperature is rising	91 (72.62)	78 (79.00)	4 (1350)	3 (8.25)	0 (2.63)	176
There is high level of sunshine intensity	79 (72.62)	92 (79.00)	4 (1350)	1 (8.25)	0 (2.63)	176
Rainfall is decreasing every year	82 (72.62)	83 (79.00)	8 (1350)	3 (8.25)	0 (2.63)	176
The yearly rains are not supporting crop production as before	77 (72.62)	82 (79.00)	12 (1350)	5 (8.25)	0 (2.63)	176
The weather is becoming dry every year	84 (72.62)	71 (79.00)	15 (1350)	6 (8.25)	0 (2.63)	176
There is serious awareness on climate change	26 (72.62)	43 (79.00)	47 (1350)	42 (8.25)	18 (2.63)	176
TOTAL	581	632	108	66	21	1408

Source: Field Survey, 2011

Note: Expected counts are printed in bracket

DF = 28, $\alpha = 0.05$, P-Value = 0.000 $X^2_{cal} = 440.599$, $X^2_{Tab} = 41.34$

The result from table 7 revealed that the X^2_{cal} (440.599) is greater than the X^2_{Tab} (41.34) meaning there is significant relationship between the personal characteristics of the arable crop farmers and there level of awareness. This implies that H_{O1} is rejected i.e null hypothesis is rejected.

Ho₂: Climatic change has no significant relationship on arable crop production in the study area.

Table 8: Results showing the significant relationship of climate change on arable crop production in the study area (Chi-Square Test)

EFFECTS	SA	A	U	SD	D	TOTAL
There is increase in cost of food crops due to climate change	43 (71.36)	94 (82.00)	35 (15.82)	3 (4.64)	1 (2.18)	176
Climate change has lead to crop infestation and diseases	64 (71.36)	82 (82.00)	25 (15.82)	4 (4.64)	1 (2.18)	176
Climate change has led to decline of forest resources	74 (71.36)	91 (82.00)	8 (15.82)	3 (4.64)	0 (2.18)	176
Climate change has lead to shortage of farm produce during the dry season	63 (71.36)	93 (82.00)	17 (15.82)	3 (4.64)	0 (2.18)	176
There have been increased incidences of flood during	80	89	5	2	0	176

raining season	(71.36)	(82.00)	(15.82)	(4.64)	(2.18)	
There have been increased incidences of drought during dry season	80 (71.36)	89 (82.00)	5 (15.82)	2 (4.64)	0 (2.18)	176

Source: Field Survey, 2011

Note: Expected counts are printed in bracket

DF = 40, $\alpha = 0.05$, P-Value = 0.000, $X^2_{cal} = 182.362$, $X^2_{Tab} = 67.50$

The results from table 8 reveal that the X^2_{cal} (182.362) is greater than the X^2_{Tab} (67.50), meaning that climatic change has significant effect on arable crop in the study area. This implies that the null hypothesis (H_{02}) is rejected.

H₀₃: There is no significant relationship between the farmers' perception on climate change and the coping strategies of climate change

Table 9: Results showing the significance relationship between the farmers' perception on climate change and the coping strategies (Chi-Square Test)

Coping Strategies	YES	NO	TOTAL
Planting of different varieties of crops	127 (99.75)	49 (76.25)	176
Changing in cropping pattern	121 (99.75)	55 (76.25)	176

Source: Field Survey, 2011

Note: Expected counts are printed in bracket

DF = 7, $\alpha = 0.05$, P-Value = 0.000, $X^2_{cal} = 212.597$, $X^2_{Tab} = 14.07$

The result from table 9, revealed that the X^2_{cal} (212.597) is greater than the X^2_{Tab} (14.07), meaning there is significant relationship between the farmers perception and coping mechanism used during climate change. This implies that the null hypothesis (H_{03}) is rejected.

1. Conclusion and Recommendations

- a. The analysis revealed that change in climate patterns (rainfall, temperature, etc.), and the destruction of the natural resource base leads to the unpredictable and inconsistent rainfall pattern, warmer temperature, increased deforestation and frequency of drought, changes in the livelihood patterns of communities, increased incidence of diseases and crop infestation, increased rural urban migration. More of the coping mechanisms are more on planting different varieties of crops, change in cropping pattern, mulching, the use of chemical fertilizers and adoption of new technologies.
- b. The perceived barriers to adoption of modern technique were
 - c. insufficient improved seeds, inadequate access to new technology, insufficient current knowledge on adaptation methods, insufficient information on weather incidence and inadequate money to acquired modern techniques all influences the drive towards adapting to climate change.
 - c. The knowledge and information gap concerning the effect of climate change, information, dissemination, awareness programmes and training programmes calls for immediate action. Therefore, the following recommendations are made based on the findings of the study:
2. Policies must aim at promoting farm-level adaptation through emphasis on the early warning systems and disaster risk management and also, effective participation of farmers in adopting better agricultural and land use practices
3. There is an urgent need for meteorological reports and alerts to be made accessible

when necessary to farmers in an understandable form.

4. Massive campaign on the reality of climate change, their impacts, its serious consequences on food crop production and modern adaptation measures is highly recommended. This could be achieved by organizing seminars on climate change regularly for them.
5. Credit facilities like loans and other incentives should be provided to farmers to enable them acquire adaptive facilities.
6. Extension services should be improved in the study area. This is with the aim of educating the farmers on the suitable coping strategies on climate change.

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