



Awareness of climate change impacts and adaptation strategies among women in Ardo-Kola, North East Nigeria

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General Note



Article is recommended to print as color version in recycled paper. *Save Trees, Save Climate.*

ABSTRACT

The aim of this quantitative survey study is to examine the level of awareness of climate change impacts and adaptations strategies among women in Ardo-Kola Local Government Area, in Taraba State, Nigeria. Primary data utilized include the socio-economic

characteristics of respondents namely, age, educational qualification, occupation and data on awareness, impacts and adaptation strategies to climate change. A multi-stage sampling technique was employed in selection of 220 respondents. The data were subjected to descriptive and chi-square analyses. Result shows that higher percentages of women (81.8%) in the study area are aware of climate change and submitted that climate change has affected their economic activities in recent years. The Chi-Square test of association revealed that education and occupation influence women's level of awareness and knowledge of the causes of climate change but age does not. The respondents' assessment of climatic element in the last 20-30 years agreed with the experts reports; that is, increase in temperature, changes in annual distribution of rainfall, increase in flooding, frequency and length of dry spells are on increase, sourcing for water and fuel wood are the major domestic activities mostly affected by climate change.

Key words: Climate Change, Awareness, Women, Adaptation, Ardo-Kola, Taraba State, Nigeria.

1. INTRODUCTION

Global concern regarding the devastating impact of climate change has emphasized the need for creating awareness and building community capacity for adaptation strategies to mitigate the effects of climate change (Naclimuthu and Vijayakumari, 1993; Sabita Aryal Khanna & Rijan Bhakta Kayastha, 2016; Ram Asheshwar Mandal et al. 2016). The need of the hour is to make people sensitive towards nature through a strong programme of climate change awareness. A consensus has emerged that developing countries are more vulnerable to climate change than developed countries because of the predominance on natural resources in their economies and scarcity of capital for adaptation measures (Fisher, 2006; Mangala De Zoysa and Makoto Inoue, 2017).

It is widely understood that women whose livelihood are mostly depended on natural resources will be more vulnerable to climate change, so they need to be educated and informed about climate change and how it can affects their lives drastically (Olorunfemi, 2010; Kinkini Dasgupta Misra, 2016; Kinkini Dasgupta Misra, 2017). Women need to be educated about matters and issues that affects their environment, farmland, water supplies, biodiversity, ecosystem and weather, so as to improved environmental awareness skills and engender a change of attitude towards their environment, thereby giving them the best chance to exploit any new opportunities that may arise (Adger *et al.*, 2003).

In Ardo-Kola area of Taraba State, Nigeria, the most evident effects of climate change include delayed onset date of rains, increase in number of dry days during the raining season, decrease in annual rainfall and increase in maximum temperature (Adebayo, 2010, 2011). The major challenges facing the study area is how to mitigate and adapt to climate change. It therefore, imperative to develop action plans that will assist people to cope with different scenarios of climate change that are prevalent in the study area.

Therefore, developing such action plans will require information from the people since the ability to adapt and cope with climate change depends on several factors such as education, access to resources, management capabilities and technology. The level of awareness of women is also crucial in formulating such action plans. The objectives of this paper is to examine the level of awareness, impacts of climate change and the adaptation strategies adopted among women in Ardo-Kola LGA. The survey focused on women who are farmers, housewives and civil servants because studies on how their level of awareness, coping mechanisms and adaptation to climate change and variability are very scanty in available literatures.

2. MATERIALS AND METHODS

2.1. Study Area

Ardo-Kola Local Government Area is located in the Northern Senatorial district of Taraba State with Sunkani as the headquarter. Ardo-Kola has a landmass area of 2,312km². It is roughly located between latitude 8° 00'N to 9° 40'N and longitude 11° 00'E to 12° 00'E of the Greenwich meridian. It is bordered by Jalingo Local Government Area to the east, Gassol Local Government Area to the west, Karim-Lamido to the north and Bali Local Government Area to the south (Figure 1). Ardo-Kola is located in the basement complex region surrounded by several mountains.

Ardo-Kola LGA has a tropical wet and dry climate. The rainfall distribution pattern in the state shows a decrease from the South to the Northern part. The rainfall duration lasts between 190 days in Northern part of the state (Oruonye and Bashir, 2011). The cessation of rainfall season ends around early November, rainfall amount varies from 1000mm. The wettest months are July and August, while the driest months are December, January and February, and the mean annual rainfall ranges to 1000mm (Oruonye and Bashir, 2011). The vegetation within the study area consists of open savannah woodland with small or medium size trees. The distribution of vegetation reflects the combined control of rainfall, topography and to a lesser extent of the soils.

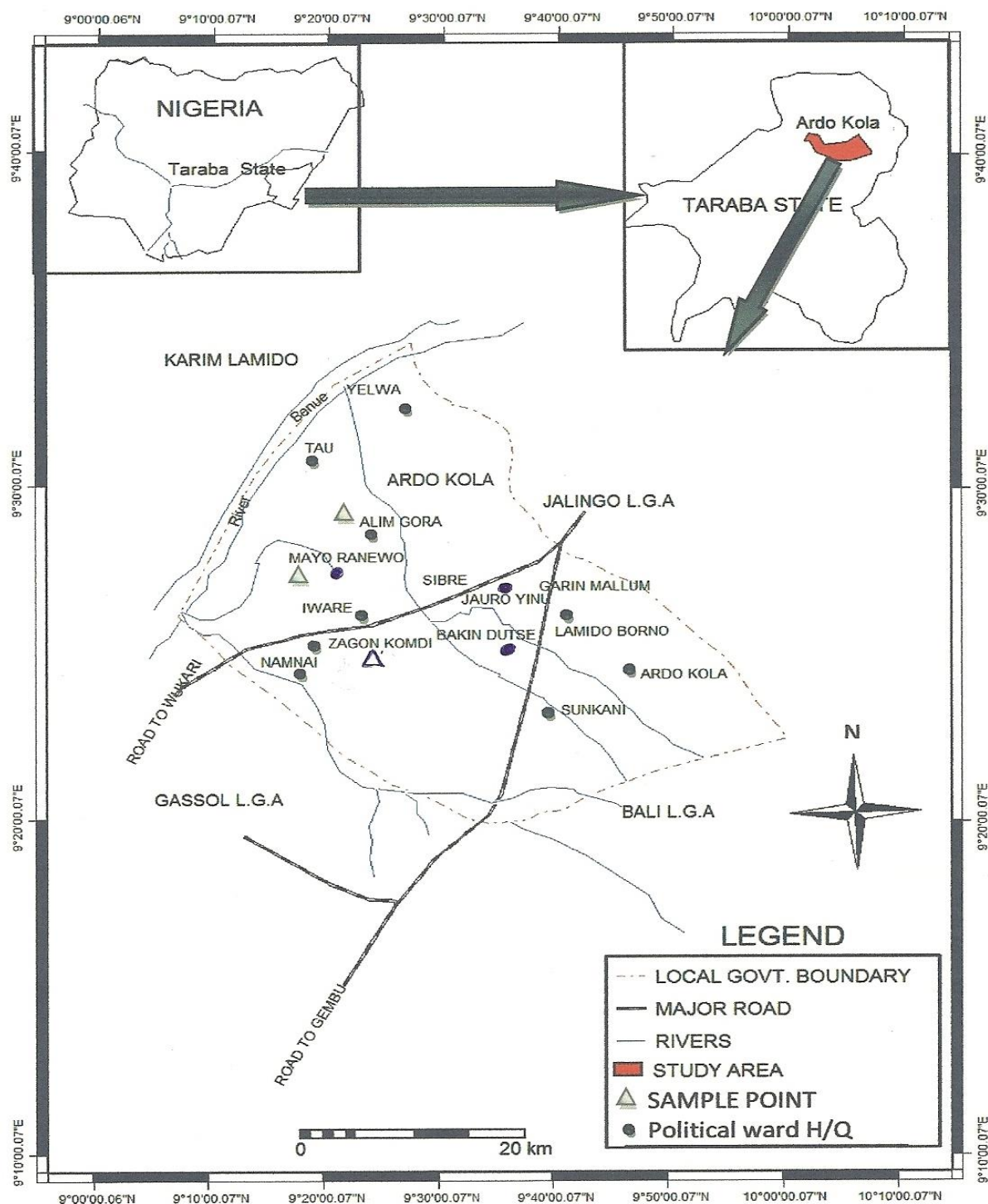


Figure 1 Study Area showing Sampling Points

2.2. Methods

Multi-stage sampling technique was employed in collecting the data. The three stages of the samples include; the first stage involved the selection of three (3) wards out of the ten wards in the study area using the highest population of women from population census data of 2006 (NPC, 2006) (Table1). The second stage was the selection of the localities for this study, 20% of the localities in each of the chosen wards were selected. The selection of the percentage was done by dividing the 20% by the total number of localities in each ward. The last stage was the selection of the number of women population, 30% of the population of women in each selected localities were used.

Table 1 Sampling for the Survey

Selected Wards	Localities	Total Population of Women in each Localities	30% No. of the Population/Nos. of Questionnaires to be Distributed
Alin-Gora	Gamawal Shonti	52	16
	Jauro Isa	59	18
	Godfrey Gai	79	24
Zangon-Kombi	Sarkin Noma	57	17
	Tunda Wada	50	15
	Bada Koshi	34	10
	Karekare/Chamba	45	14
	John Holt	55	17
	Garin Jatau	59	18
Mayo-Ranewo	DotiKofai	45	14
	DoiYulde	35	11
	KofarMunchi	49	15
	Pomi	102	31
Total			220

Both descriptive and inferential statistics were used in analyzing the data. The description statistics involves the use of means and percentages while the inferential statistic entails the use of chi square analysis. Chi-square test was used to examine the association between socio-economic variables (age, educational qualification and occupation) and awareness of climate change.

3. RESULTS AND DISCUSSIONS

The section examines the socio-economic features of the respondents. As shown in Table 2, majority of the respondents 62.2% fall between the age brackets 10-45 years of age while, 37.6% of the respondents are aged above 45 years. This implies that, there are relatively young and physically active women to assess environmental changes and this has direct bearing on the ease of climate change adaptation strategies. The same table indicates that about 25% of the respondents had no formal education, about 29% attained primary education, while about 27.7% attained secondary education. Only about 18.2% attained tertiary education. Thus, about 75% of the respondents have some form of formal education. According to the Table 2, about 39.5% of the respondents are farmers, 11.8% are fish sellers, 18.2% are traders and 14.1% are house wives while only 16.4% are civil servants. This result indicates that the highest percentages of women in the study area are involved in agriculture production than other economic activities although agriculture is facing lots of climate hazards but women still depend on it to earn their livelihoods.

Table 2 Socio-Economic Characteristics of the Respondents

		Age of Respondents				
		10 – 25	26 – 35	36 – 45	46 – 55	> 55
Wards	Alin-Gora	7	8	21	17	5
	Zango-Kombi	15	19	23	27	7
	Mayo-Ranewo	13	16	15	19	8
	Total	35	43	59	63	20

(%) 15.9 19.5 26.8 28.6 9.0

Educational level of Respondents

		Non- formal education	Primary Education	Secondary Education	Tertiary Education
Wards	Alin-Gora	12	15	18	13
	Zango-Kombi	15	34	25	17
	Mayo-Ranewo	28	15	18	10
	Total	55	64	61	40
	(%)	25	29.1	27.7	18.2

Occupation of Respondents

		Farming	Fishing	Trading	Full housewives	Civil servants
Wards	Alin-Gora	24	6	9	7	9
	Zango-Kombi	47	7	15	10	15
	Mayo-Ranewo	16	13	16	14	12
	Total	87	26	40	31	36
	(%)	39.5	11.8	18.2	14.1	16.4

Source: Author's Analysis

Women's Awareness and Assessment of Climate Change

Awareness of climate change

Awareness of climate change help women to plan their economic activities and reduces risks and uncertainties associated with the activity. The distribution according to table 3 shows that majority of the respondents about 44% are slightly aware of climate change, about 38% are strongly aware while only 18% indicated that, they are not aware of climate change. This indicates that, there is high level of awareness of climate change among women in Ardo-kola L.G.A.

The study reveals that climate change has both man-made and natural causes in the study area 35% of the respondents reveal that climate change is being caused by landuse and degradation such as deforestation, soil erosion, overgrazing etc. 26% of the respondents indicate that climatic change is caused by natural variability that is destined by God. 25% claimed that they don't know the cause of climate change. While only 14% agreed that emission of gases from domestic activities, bush burning, vehicular activities etc. causes climate change. According to the table 3, 73.2% of the respondents assess the trend of temperature (hot days) in recent years to be increasing, while about 18.2% claimed it has been decreasing and only 3.2% insisted that there have been no changes in temperature while 5.5% are ignorant. The respondents' assessment of increasing temperature agreed with the experts report on temperature trend in other parts of Northern Nigeria (Adebayo, 2010; Umar, 2011). The respondents' assessment of temperature trend corresponds with the experts report (Adebayo and Oruonye, 2012) research in Northern Taraba State. When the respondents were generally asked to assess the annual rainfall total in the last 10-20 years in their locality, 73.6% claimed that rainfall is decreasing, while 16.8% claimed that the rainfall is increasing and 5% of the respondents insist that there were no changes Table 3. The women's opinion of decreasing rainfall corroborated the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo 2009; Umar 2011). In addition, altitude contributes significantly to rainfall distribution in Taraba State as viewed by Adebayo (2002) because of orographic factor.

Table 3 Awareness of Climate Change

		Frequency	Percent
Awareness of Climate Change	Not Aware	40	18.2
	Slightly Aware	96	43.6
	Strongly Aware	84	38.2

Total		220	100.0		
		Frequency	Percent (%)		
Causes of Climate Change	Natural Variability	58	26.4		
	Emission of Greenhouse Gases	31	14.1		
	Land Use and Degradation	76	34.5		
	Don't know	55	25.0		
	Total	220	100.0		
Assessment of Temperature					
	Increasing	Decreasing	No change	Don't know	
Ward	Alin-Gora	48	3	2	5
	Zangon-Kombi	55	30	2	4
	Mayo-Ranewo	58	7	3	3
	Total	161	40	7	12
	(%)	73.2	18.2	3.2	5.5
Annual Rainfall					
	Increasing	Decreasing	No change	Don't know	
Ward	Alin-Gora	8	45	3	2
	Zangon-Kombi	20	62	5	4
	Mayo-Ranewo	9	55	3	4
	Total	37	162	11	10
	(%)	16.8	73.6	5	4.6

Source: Authors Analysis

This shows that, majority of the respondents especially farmers claimed that temperature is increasing. The respondents' assessment of increasing temperature agreed with the experts report on temperature trend in other parts of Northern Nigeria (Adebayo, 2010; Umar, 2011). The increase in temperature has the tendency to inflict more harm on the environment and ecosystem. The women's opinion of decreasing rainfall corroborated the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo 2009; Umar, 2011).

Table 4 Summary of the Chi Square results on Association between Women Socio-Economic Characteristics and their Level of Climate Change Awareness in the Study Area

		Age of Respondents					Total	Chi-Square Value	DF	Critical Value
		10-25	26-35	36-45	46-55	> 55				
Awareness of Climate Change	Not Aware	14	9	9	8	0	40	13.34	8	15.51
	Slightly Aware	25	28	21	15	7	96			
	Strongly Aware	18	31	14	10	11	84			
	Total	57	68	44	33	18	220			

Educational level of Respondents

		Non- formal education	Primary education	Secondary education	Tertiary education				
Awareness of Climate Change	Not Aware	23	10	7	0	40	141.83	6	12.59
	Slightly Aware	33	21	24	18	96			
	Strongly Aware	16	9	26	33	84			
	Total	72	40	57	51	220			

Occupation of Respondents

		Farming	Fishing	Trading	Housewiv es	Civil Servant				
Awareness of climate change Total	Not Aware	9	5	11	15	0	40	61.58	8	15.51
	Slightly Aware	36	9	19	11	21	96			
	Strongly Aware	26	11	12	0	35	84			
		71	25	42	26	56	220			

Source: Authors Analysis

In order to test for association to determine if women environmental awareness depends significantly on their socio-economic characteristic (age, education and occupation), the data were subjected to chi-square test. Table 4 shows the summary of the chi square results.

(a) To test whether there is association between age of women and their level of climate change awareness in the study area

Table 4 displays the Chi-Square distribution of the respondents' age in the study area. The X^2 calculated (13.34) is less than X^2 critical (15.51) at significant level of 0.05. This means that, the alternative hypothesis is accepted in favor of null hypothesis is rejected which states that, there is no association between women's age and their level of climate change awareness, which means that women's age does not determine the level of their climate change awareness. Therefore, this means that both aging and younger women are able to adapt, improved ideas and innovations towards climate change.

(b) To test whether there is association between education of women and their level of climate change awareness in the study area.

Table 4 displays the Chi-Square distribution of the respondents' education level in the study area. The X^2 calculated (141.83) is greater than X^2 critical (12.59) at significant level of 0. This means that the null hypothesis is rejected in favor of the alternate hypothesis which states, there is association between the women's level of education and their awareness of climate change. The results revealed that level of education of the respondents determines their level of awareness of climate change in the area. This implies that as the level of education of the respondent increases their level of awareness of climate change also increases. Therefore adaptation measures that could result in climate change will also be easier and faster among the educated women than the uneducated women in the study area.

(c) To test whether there is association between occupation of women and their level of climate change awareness in the study area

Table 4 also shows the Chi-Square distribution of the respondents' occupation in the study area. The X^2 calculated (61.58) is greater than X^2 critical (15.51) at significant level of 0. This means that the null hypothesis is rejected in favor of the alternate hypothesis which states that occupation of women determines their level of climate change awareness in the study area. By implication, there is association between the women occupation and their level of climate change awareness. Therefore, farmers are more aware of climate change because of their regular observation through the onset and cessation of rainfall while the civil servants based on mass media and scientific observation.

Women's Assessment of Changes in Climatic Elements

Table 5 Causes of Climate Change

		Frequency	Percent (%)
Causes of Climate Change	Natural Variability	58	26.4
	Emission of Greenhouse Gases	31	14.1
	Land Use and Degradation	76	34.5
	Don't know	55	25.0
	Total	220	100.0

Source; Author's Analysis

The study reveals that climate change has both man-made and natural causes in the study area. From the distribution of the causes of climate change as presented in Table 9, 35% of the respondents reveal that climate change is being caused by landuse and degradation such as deforestation, soil erosion, overgrazing etc. 26% of the respondents indicate that climatic change is caused by natural variability that is destined by God. 25% claimed that they don't know the cause of climate change. While only 14% agreed that emission of gases from industries, domestic activities, bush burning, vehicular activities etc. causes climate change. Therefore this study concludes that, there is high level of awareness in the study area, and the highest cause of climate change is land use and degradation.

Table 6 Assessment of Temperature

		Assessment of Temperature			
		Increasing	Decreasing	No change	Don't know
Wards	Alin-Gora	48	3	2	5
	Zangon-Kombi	55	30	2	4
	Mayo-Ranewo	58	7	3	3
	Total	161	40	7	12
	(%)	73.2	18.2	3.2	5.5

Source: Author's Analysis

The assessment of temperature trend in the Study area by the respondents is presented in Table 6. From table 6, 73.2% of the respondents assess the trend of temperature (hot days) in recent years to be increasing, while about 18.2% claimed it has been decreasing and only 3.2% insisted that there have been no changes in temperature while 5.5% were ignorant. This shows that, majority of the respondents especially farmers claimed that temperature is increasing. The respondents' assessment of increasing temperature agreed with the experts report on temperature trend in other parts of Northern Nigeria (Adebayo, 2010; Umar, 2011). The increase in temperature has the tendency to inflict more harm on the environment and ecosystem.

The respondents' assessment of temperature trend corresponds with the experts report (Adebayo and Oruonye, 2012) research in Northern Taraba State which shows that there is an upward movement in temperature this element over the years in the study area. This upward trend in temperature is the reflection of the global warming resulting into general increase in the earth's temperature.

Table 7 Assessment of Onset Dates of Rain

		Frequency	Percent (%)
Onset of Rain	Delay	188	85.5
	Early	30	13.6
	No change	2	.9
	Total	220	100.0

Source: Author's Analysis

The trend in the onset dates of rain was assessed among respondents is presented in Table 7. Rainfall has been decreasing with delayed onset and early cessation, respondents especially farmers assessed the annual rainfall pattern in the last 10-20years in their locality, majority of respondents about 86% claimed to have noticed delay in the onset dates of rain in the area, about 14% of the respondents claimed to have noticed early trend in the onset dates, while only 9% claimed not to have noticed any change. The women's opinion of delayed rainfall corroborated with the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo, 2009; Umar, 2011). Therefore, this study has revealed that climate change has brought about delay in the onset dates of rains in the study area as indicated by a larger percentage of respondents who agreed that climate change delays onset of rain. Hence, the respondent's assessment corresponds with the experts report (Adebayo and Oruonye, 2012) who reported that onset date of rain exhibited an upward trend in the study area. This indicates that rain is starting late and hence the beginning of growing season is being delayed in the study area.

Table 8 Assessment of Cessation Dates of Rain

		Frequency	Percent (%)
Cessation of Rain	Delay	24	10.9
	Early	192	87.3
	No Change	4	1.8
	Total	220	100.0

Source: Author's Analysis

The trend in the cessation dates of rains was assessed among respondents and the distribution is presented in Table 8. The distribution shows that about 87% of the respondents claimed to have noticed early cessation dates of rains in the area, while about 11% claimed to have noticed delayed cessation trend in the dates of rains. However, about 2% of the respondents claimed not to have noticed any change. The respondents' opinion of decreasing rainfall corroborated with the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo, 2009; Umar, 2011). This study however, revealed that climate change has brought about early cessation dates of rains in the area as indicated by the largest percentage of the respondents and this also corresponds with the expert findings (Adebayo and Oruonye, 2012) that cessation date of rain displays a downward trend in the study area indicating that rains now end earlier in the area.

Table 9 Assessment of Annual Rainfall

		Annual Rainfall			
		Increasing	Decreasing	No change	Don't know
Wards	Alin-Gora	8	45	3	2
	Zangon-Kombi	20	62	5	4
	Mayo-Ranewo	9	55	3	4
	Total	37	162	11	10
	(%)	16.8	73.6	5	4.6

Source: Author's Analysis

Table 9 shows the assessment the annual rainfall total in the last 10-20 years in their locality, 73.6% claimed that rainfall is decreasing, while 16.8% claimed that the rainfall is increasing and 5% of the respondents insist that there were no changes. The women's opinion of decreasing rainfall corroborated the previous research findings on general decline in annual rainfall in many parts of Nigeria (Odjugo 2009; Umar 2011). This corresponds with expert findings (Adebayo and Oruonye, 2012) as they reported annual rainfall decreases with increasing latitude. In addition, altitude contributes significantly to rainfall distribution in Taraba State as viewed by (Adebayo, 2002) because of orographic factor. The trend showed a general downward trend of annual rainfall in Ardo kola.

Table 10 Assessment of Frequency of Dry Spells

		Dry Spells		
		Increasing	Decreasing	No change
Wards	Alin-Gora	38	15	5
	Zangon-Kombi	58	26	7
	Mayo-Ranewo	62	6	3
	Total	158	47	15
	(%)	71.8	21.4	6.8

Source: Author's Analysis

On the length and frequency of dry spells during the growing season was assessed by all the respondents in wards and the distribution are presented in Table 10. About 71.8% of respondents noticed an increase in the occurrence of dry spells in the study area, while 21.4% observed that it is decreasing and about 6.8% claimed not to have noticed any change. This observation of increasing length and frequency of dry spell is in line with the findings of Sawa and Adebayo (2011) that, dry spells during the growing season are on the increase in the Sudan Sahelian Zone of Northern Nigeria.

Table 11 Assessment of Frequency Flood in the last 10-20 years

		Frequent	Flood		
		Increasing	Decreasing	No change	Don't know
Wards	Alin-Gora	45	3	4	6
	Zangon-Kombi	64	19	4	4
	Mayo-Ranewo	61	3	4	3
	Total	170	25	12	13
	(%)	77.3	11.4	5.5	5.9

Source: Author's Analysis

The incidence of flood in the study area was assessed by the respondents in the three wards and the distribution is presented in Table 11. The for increasing flood incidence was 77.3%, while those of decreasing flood incidence was 11.4% of the respondents and 5.5% of the respondents insist that there was no change in flood incidence while about 5.9% claimed ignorant. The respondents' observation of increasing incidence of flooding in the study area corroborated with the findings of Oruonye (2012). In the months of increased rainfall in August and September, it is usually accompanied with floods. The floods are being aggravated in the study area as well as some parts of the state by release of excess water from Lagdo dam in Cameroon. With the highest percentage of the respondents noticing increase in flood is an indication of high level of awareness on the impact of climate change and this will therefore make it possible for respondents to effectively adapt.

Table 12 Effects of Climate Change on Women's Activities

		Frequency	Percent (%)
Climate Change Effect	Yes	204	92.7
	No	16	7.3
	Total	220	100.0

Source: Author's Analysis

On the effect of climate change on women's activities, the distribution in Table 12 shows that majority of the respondents (93%) claimed that climate change has affected their various economic activities such as farming, fuel wood collection, water collection etc, while only 7% of the respondents claimed not to be affected by climate change in recent years. Therefore with the highest percentage of the respondents noticing the effects of climate change on their activities is an indication of high level of awareness on the effects of climate change and hence, adaptation measures will be effective in the study area.

Table 13 Economic Activity most affected by Climate Change

		Frequency	Percent (%)
Economic Activities	Farming	89	40.5
	Fishing	43	19.5
	Water Collection	27	12.3
	Fuel Wood Collection	59	26.8
	Office Duty (White Collar Jobs)	2	.9
	Total	220	100.0

Source: Author's Analysis

Various economic activities in recent years have been affected due to climate change in the study area. The distribution of respondents' views on various economic activities affected by climate change is presented in Table 13. Majority of respondents about 40% had their farm activities affected by climate change due to delay onset and early cessation of rains. This respondents' observation of delayed onset of rain/beginning of planting season has been confirmed by experts' findings in northern Nigeria, for example, (Adebayo, 1998; Sawa and Adebayo, 2011). About 27% claimed fuel wood sourcing as economic activity mostly affected by climate change, this is due to high rate of deforestation, as people have to travel far to source for fuel wood. In the same vein Maharjan *et al.*, (2011) reported that, Tharu community of Nepal suffered loss of timber and fuel wood species due to climate change. About 20% claimed fishing is the most economic activity affected by climate change, this is due to increase in flood incidence and increase in dry spells in recent years. While about 12% claimed water sourcing as economic activity is most affected by climate change. Based on the various economic activities observed by the respondents affected by climate change, this shows high level of climate change awareness.

Table 14 Effects of Climate Change on Water Resources

		Frequency	Percent (%)
Climate Change Effects	Water temperature increases	60	27.3
	Changes in annual rainfall	73	33.2
	Increase of flooding	40	18.2
	Devastating of ecosystem	28	12.7
	Storm intensity	19	8.6
	Total	220	100.0

Source: Author's Analysis

On the effect of climate change on water resources, the distribution in Table 14 shows that majority of the respondents (33.2%) claimed that climate change has affected water resources through changes in annual rainfall, this observation has been confirmed according to the (IPCC, 2007) an increase in the average temperature is very likely to lead to changes in precipitation and atmospheric moisture because of changes in atmospheric circulation and increases in evaporation and water vapor while 27.3% of the respondents claimed increases in water temperature and this observation corroborate IPCC (2007) findings that temperatures are changing in the lower atmosphere from the earth's surface all the way through the stratosphere (9 to 14 miles above the Earth's surface) and most climate change scenarios project that greenhouse gas concentrations will increase through 2100 with a continued increase in average global temperatures.

About 18% claimed increase of flooding as one of the factors of climate change, and (IPCC, 2007) states that the primary factors driving current flooding include the expansion of ocean, sea or river water caused by warmer temperatures, melting of mountain glaciers and small ice caps. About 13% claimed devastating of ecosystem and only 9% of the respondents claimed storm intensity. As show in Plate I, women have to walk longer distance to fetch water. This study therefore revealed that there is high level of climate change awareness in the study area with the highest percentage of respondents who agreed with changes in the distribution of rainfall.



Plate I Women Carrying Water from Stream to their Homes at Garin Jatau in Zangon Kombi Ward

Table 15 Effect of Climate Change on Fuel Wood

		Frequency	Percent (%)
Climate Change Effects	Deforestation	107	48.6
	Reduced biomass	102	46.4
	Don't know	11	5.0
	Total	220	100.0

Source: Author's Analysis

The distribution of the respondents about the effect of climate change on fuel wood is presented on Table 15. Majority of the respondents about (49%) agreed that deforestation is the major effect of climate change on fuel wood. Fuel wood users access woodlands and forests either for domestic and economic gains. In response to myriad challenges caused by the decline of woodlands and forests due to fuel wood harvesting, there has been a recent increase in efforts to understand, coordinate and mitigate negative effects of excessive fuel wood harvesting. Over time, over-reliance on fuel wood has led to shortages of wood around those woodlands. This corresponds with the findings of (Shackleton, 2004) that due to the lack of skills and few income generation opportunities, most people have resorted to selling fuel wood. Fuel wood also forms a key source of energy in most of rural areas as shown in Plate II; women have to walk to far forest to fetch fuel wood. About 46% of the respondents claimed that decrease in biomass for fuel is one of the effects of climate change, while only 5% of the respondents are ignorant. Therefore based on the above observation, there is high level climate change awareness among the respondents with effects on their fuel wood collection in the recent years.



Plate II Women Carrying Fuel wood from Far Forest to their Home Doi Kofai in Mayo-Ranewo Ward

Table 16 Effects of Climate Change (Rainfall) on Farming Activities

		Frequency	Percent (%)
Climate Change Effects	Reduced Crop Yield	119	54.1
	Reduced Water for Animals	81	36.8
	Reduced Fodder/Biomass	16	7.3
	Don't know	4	1.9
	Total	220	100.0

Source: Author's Analysis

Rainfall amount in recent years has fluctuated in the study area due to climate change. The distribution of respondents on how low rainfall affected their farm activities is presented on Table 16. The Table shows that majority about (54%) of the respondents had their crop yield reduced, about 37% had reduced water for animal, while about 7% had reduced fodder or biomass. This revealed that climate change has affected agricultural activities in the study area with highest percentage of respondents who agreed that, it's reducing crop yield. Based on the interview conducted, some respondents complained of diverse decrease in the crop yield in the recent years due to delay onset and early cessation of rain. This means that, there is high level of climate change awareness among the respondents as show in Plate III, women working on their farm. Hence, more alternative strategies will be effectively adapted.



Plate III Women Working on their Farm at Gamawal Shonti in Alin-Gora Ward

Finally when we observed the bar graph below, distribution of annual rainfall in the study area has the highest effect of climate change Figure 2.

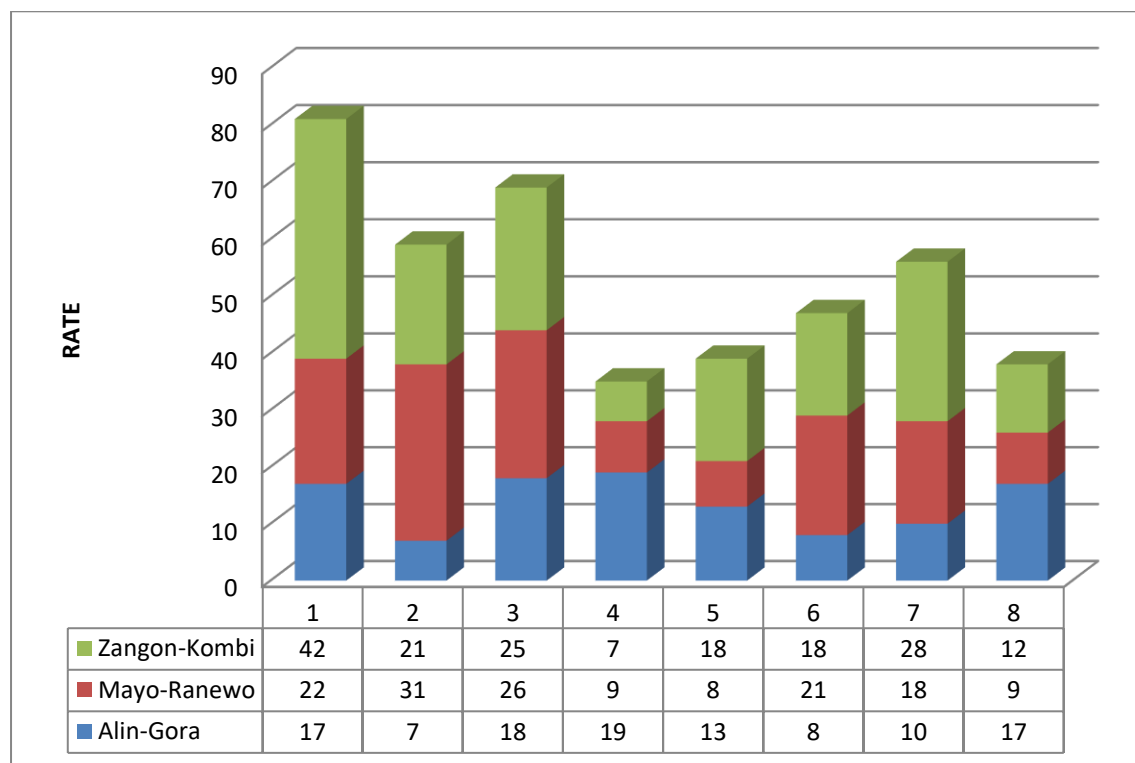


Figure 2 Component Bar graph showing the effects of climate change in Ardo-Kola Local Government Area

KEY: Effects of Climate Change

1	Changes in Rainfall Distribution
2	Flooding
3	Devastating of Ecosystem
4	Storm Intensity
5	Deforestation
6	Reduced Biomass
7	Reduced Crop Yield
8	Reduced water for animals

Table 17 Adaptation Measures being used to Reduce Water Scarcity

Adaptation Measures				
		Expansion of Rainwater Harvesting	Water Storage	Don't know
Wards	Alin-Gora	20	22	16
	Zangon-Kombi	33	45	13
	Mayo-Ranewo	19	22	30
	Total	72	89	59
	(%)	32.7	40.5	26.8

Source: Author's Analysis

Adaptation measures embarked upon by the respondents to minimize the effect of climate change on water resource in the area is presented in Table 17. The distribution shows that about 40.5% of the respondents claimed water storage such as in drums or mudpot, while about 32.7% opted for expansion of rainwater harvesting; this is by making a mudpot in form of reservoir beneath the earth crust. Also, only about 26.8% of the respondents are ignorant. This study revealed that respondents have different adaptive measures to minimize the effect of climate change to reduce water scarcity, but more and better alternatives are needed to minimize the effects.

Table 18 Adaptation Measures being used by Farmers

Adaptation Measures				
		Adjustment of Planting Dates	Switching to other Crops Varieties	Crop Relocation
Wards	Alin-Gora	19	24	15
	Zangon-Kombi	24	50	17
	Mayo-Ranewo	23	28	20
	Total	66	102	52
	(%)	30	46.4	23.6

Source: Author's Analysis

Adaptation measures embarked upon by the respondents to minimize the effect of climate change for farming activities in the area is presented in Table 18. The distribution shows that about 46.4% of the respondents use other crops varieties, while about 30% alter their planting dates. Only, about 23.6% of the respondents used crop relocation. This study has revealed that farmers adapt different adaptive measures to minimize the effect of climate change in the area. Interview conducted revealed that some farmers have switched over from rice to maize due to crop failure arising from early cessation of rain.

Table 19 Adaptation Measures being used to Improve Land Management

		Adaptation Measures		
		Tree Planting	Harvesting of Mature Trees	Don't know
Wards	Alin-Gora	15	20	23
	Zangon-Kombi	36	39	16
	Mayo-Ranewo	23	22	26
	Total	74	81	65
	(%)	33.6	36.8	29.5

Source: Author's Analysis

Adaptation measures embarked upon by the respondents to minimize the effect of climate change on land in the study area is presented in Table 19. The distribution shows that about 33.6% of the respondents use tree planting, while about 36.8% claimed harvesting of mature trees, and only about 29.5% of the respondents were ignorant. This study shows that, there is high level of climate change awareness in the study area, as these alternative measures are taken to improve land management.

4. CONCLUSION

The study on climate change awareness and adaptation strategies among women in Ardo-Kola L.G.A was aimed at assessing the fundamental concepts of women awareness about the causes and impact of climate change. The study examined and evaluated the level of women's awareness about climate change and the adaptation strategies employed by women in managing climate change in Ardo-Kola L.G.A of Taraba State. There was a correlation between education and occupation influence on women's level of awareness and knowledge of the causes of climate change, but age, do not affect their level of awareness.

Women in the study area are aware of climate change and submitted that climate change has affected their economic activities in recent years. Increase in air and water temperature, increasing in flooding, changes in annual rainfall etc. were some of the effects of climate change identified with water. While deforestation and reduced biomass were the effects associated with fuel wood resources. For farming activities, reduced crop yield, shortage of water and fodder for animals due to low rainfall and frequent dry spells were identified.

Significant efforts are being made by women in the study area as the study reveals to adapt to climate change in various ways such as expansion of rainwater harvesting, water storage, adjustment of planting dates, switching to other crop varieties, crop relocation, tree planting and harvesting of matured trees. However, lack of adequate information on adaption still remains a big challenge for women.

RECOMMENDATIONS

The following recommendations are proffered towards effective adaptation to climate change in the study area:

1. Government, Non Governmental Organizations (NGOs) and National Council of Women Societies should intensify environmental education and awareness campaign on climate change impacts and adaptation strategies.
2. Incorporate women in Ardo-Kola area into policy making about matters that concerned the management of environment.
3. The State Ministry of Environment should prepare a strategic plan for combating climate change and other environmental problems especially among women.
4. Also there is a need for proper environmental education and awareness among women in order to impact new values, attitude, skill and knowledge that will help them to adapt to climate change strategies.
5. Tree planting should be pursued vigorously by all stakeholders with Government providing the necessary inputs and encouragements.
6. Taraba State government through the relevant agencies (example ADP, Ministries of Education, Environment, etc) should establish weather stations in all the L.G.As headquarters in the state to enhance access to climatic data for regular monitoring.

FUTURE ISSUES

We believe that women is at the centre of food security and therefore new research frontiers would be how to climate-proof women in Agriculture in the face of a changing climate.

DISCLOSURE STATEMENT

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