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Community Awareness and Adaptation Strategy to the Effect of Climate Change in Yobe State, Nigeria

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Abstract--This study assessed community awareness and adaptation strategy to effect of climate change in Yobe state, Nigeria. Multi stage sampling technique was used to select 160 respondents in the state. Primary data collected from the respondents included the socio-economic characteristics of the respondents such as gender, age, marital status, and educational qualification, as well as their climate change awareness and adaptation strategy. The data were analyzed using descriptive statistics. Majority of the respondents in the state had low awareness to climate change and submitted that climate change has affected their socio-economic and agricultural activities in recent years. The effects identified were: reduced crop yield, shortage of water and biomass for animals due to low rainfall. It was also noticed that, there were frequent dry spells, cold spells, strong winds and thunderstorms. Similarly, high temperature causes wilting of crops and diseases. The respondents are making efforts to adapt to climate change in various ways such as planting resistant crop varieties, altering planting schedules, planting early maturing varieties and crop diversification. They however lack adequate information on how to adapt. It thus recommended that, adequate information and sensitization from the site of the government, non-governmental organizations and communities should be made available. Hence, appropriate technology as well as inputs should equally be made available in the study area.

KeyWords--*Adaptation, community awareness, climate change, effect, Yobe State.*

I. INTRODUCTION

Globally, climate change is recognized as a critical phenomenon with strong implications for socio-ecological, biophysical and human systems, and consequently human development. In Africa and many parts of the world, the impact of climate change is visible and widespread. Indeed, Nigeria is already experiencing the impacts of climate change, with more extreme weather events occurring, more variability in timing and intensity of rainfall and higher temperatures over the whole country [1]. It is evident that, Nigeria's key vulnerabilities to climate change, as stated by Nigeria's First National Communication (FNC) on climate change are: Heavy dependence of the economy and of individual livelihoods on rain-fed agriculture that is highly susceptible to fluctuations in rainfall and water supply.

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Exposure of northern Nigeria to accelerated desertification linked to increasing drought with resulting impacts on the local population and the natural resource base; Exposure of the nation's 850 km coastline to the threats of increased sea level rise and storm surge risk which could impact communities, infrastructure, coastal oil installations, endemic species of flora and fauna and spawning grounds for fish; Sensitivity of other sectors of the economy to climate variability such as Nigeria's electrical supply, which is heavily dependent on hydropower and thus is affected by fluctuations in rainfall; The pressure of high population growth in Nigeria which reduces resilience to a number of climate impacts; A lack of defined policies, low political will and limited financial resources to address the need for early action on climate change; and Limited organizational and technical capacity to respond. [3]

Yobe state being an agrarian state; evidence on climate change have indicated that, there were delayed onset date of rains particularly in Northern part of the state, increase in the number of dry days during the raining season and increase in maximum temperature, strong winds, thunderstorms respectively [11]. The state has also, experienced accelerated desertification linked to increasing drought with resulting impacts on the local population and the natural resource base. It has been estimated that, the country loses about 5.11 billion dollars to environmental degradation and desertification (UNCCD, 1999). Yobe is estimated to have account for 73% of annual loss of resources from desertification among the eleven frontline states in Nigeria [13].

Therefore, communities in the state had a serious problem of crop failure, or low yield arising from climate variability particularly the delayed onset of rains and the increasing length and frequency of dry spells during the growing season. In addition the problem of flood, high temperature and incidences of pests and diseases have also aggravated the irrigation and upland farmers' losses which consequently increase the incidence of poverty and malnutrition in the state. Unless appropriate mitigation and adaptation measures are taken, climate change will frustrate common man, particularly farmers' in their efforts to achieve sustainable agricultural production and food security. [11]

However, developing such strategies will require information from the target respondents in the study area since; the ability to adapt and cope with climate change depends on their knowledge, skills, experiences and other socio economic factors [6]. It is against this background that

this study seeks to assess community awareness and adaptation strategy to the effect of climate change and identify the community's response and their level of adaptation to climate change.

II. METHODOLOGY

The study was carried out in Yobe State. The State as an agrarian home is located in the North East zone of Nigeria with its headquarters at Damaturu. It lies between latitude 12⁰ 00'N and longitude 11.30⁰ E, covering a land area of about 45,502 square kilometres (km²), with a population of about 2,321,591 people [7]. It should be noted that, the climate of Yobe is hot and dry for most part of the year. In northern part which is hotter and drier in places like Geidam, Bade and Yusufari; while in the southern part the climate is milder especially in the rocky areas of Gujba, Gulani and Fika Local government areas [9]. The mean annual temperature of the state is 37⁰c, while the highest mean annual temperature is 42⁰ c (Abba, 2014). Hence, it is on record that, the Annual rainfall in Yobe state ranges from 500mm-1000mm, while the rainy season normally starts from June to September in the north and May to October in the south. There is also, a dry season of between 3 to 4 month. It is therefore pertinent to note that, rainfall is one of the major climatic factor in the state and its distribution is highly irregular because, of the effect of continental air mass or Easterlies (T.C.A.M). This makes farming difficult since little differences in amount and timing of rain received determine the success and failure of critical stages in vegetation development and crop production [11].

However, in order to examine community awareness and adaptation strategies of respondents to climate change in the study area, all the three senatorial zones of the State were selected; taking one Local Government Area from each zone. The zones include: Northern senatorial zone; Central and South Zone respectively. Hence, to determine the sample size of the population in the study area, a multistage sampling technique was employed to get the respondents. In the first stage, three Local Government Areas were purposively selected in each zone: Bade in Northern zone, Bursari in Central and Fika in South zone, out of the seventeen LGAs in Yobe state, because of easy accessibility and to cut across the State. In the second stage, simple random sampling technique was used to select two villages from each Local Government Area, making a total of six villages. Thirdly, 10% of the population was randomly selected from each village, which form the sample size of (160) of the total population. The data collected were socio-economic characteristics of respondents, as well as their climate change awareness and level of their adaptation in the study area. Data on Global Reports for climate change and related periodicals were also collected. The data were analyzed using descriptive statistics, involving frequencies and percentages.

III. RESULTS AND DISCUSSION

This section presents the results and discussion of the data obtained from respondents on their socio-economic characteristics, community awareness on climate change and community's response to adaptation to the climate change.

A. Socio-economic Characteristics of Respondents

The socio-economic characteristics of the respondents identified include; age gender, marital status, Household size and educational level. The results revealed that the age of the respondents ranged between 20 and 65 years with an average of 40 years. This implies that, the respondents are middle aged and so still physically active. This has direct bearing on the availability of able bodied manpower for agricultural production and also on the ease of adoption to climate change adaptation strategies. Also, age influences the ability to seek and obtain off-farm jobs, which could increase respondents' income that could help them cope with adverse change in climate. It was also observed in Table 1, that 97% of the respondents were married and 3% were single. This shows that most of the respondents will have greater responsibility than the single, which may encourage respondents to be committed towards their participation in agricultural production and off-farm jobs. [10], noted that there is a trend for rural youth to start having responsibilities at an earlier age than urban youth. The result in Table 1, further indicates that about half (49%) of the respondents had 6-10 people in their households, while, 31% had household size of less than 6 people. This implies that respondents had dependents to cater for and this could encourage their adaptation to climate change and their participation on farming and non-farm activities thereby improving their livelihood. The result on respondents' educational level as indicated in Table 1 equally reveals that about 68% of the respondent had formal education. The respondents with no formal education were about 32%. This implies that majority of respondents had formal education. This could have implication for agricultural production and adoption measures that could result in climate adaptation. This could also be easier and faster among the educated respondents than the uneducated respondents.

TABLE: I
SOCIO –ECONOMIC CHARACTERISTICS OF RESPONDENTS IN THE STUDY AREA

Variable	Frequency
Percentage	
Age (years)	
20-29	19
30-39	52
40-49	54
50-59	34
60- above	1
Marital status	
Married	156
Single	4
Household size	
0-5	49
6-10	78
11-15	29
16-20	3
21-25	1
Level of education	
No education	51
Adult education	21
Primary	34
Secondary	38
Tertiary	5
Others	11
Total	160

B. Respondents’ awareness and assessment of climate change

Awareness of climate change:

Awareness of climate change help communities plan their socio-economic and agricultural production activities and reduce risks and uncertainties associated with farming and off-farm jobs. The distribution of the respondents according to climate change awareness is presented in Table 2. The distribution shows that majority of the respondents (about 88%) are not aware of climate change, while only about 12% seem to be aware of climate change.

TABLE II
AWARENESS OF CLIMATE CHANGE

Awareness	Respondents	Percentage
Yes	20	12.5
No	140	87.5
Total	160	100.00

C. Assessment of temperature trend:

The assessment of temperature trend in the State by the respondents is presented in Table 3. The temperature trend in the State has been increasing as claimed by majority of the respondents (about 78%). Only about 11% of the respondents stated that temperature trend in the state has been decreasing, while about 6% claimed to have noticed no change. The increase in temperature in question has the tendency to inflict more harm not only on agricultural production but also on the ecosystem.

TABLE III
ASSESSMENT OF TEMPERATURE

Temperature trend	Number	Percentage
Increasing	125	78.1
Decreasing	17	10.6
No change	10	6.2
Don’t Know	8	5.0
Total	160	100.00

D. Assessment of annual rainfall trend:

Average annual rainfall in the state has been fluctuating due to effect of climate change. The distribution of the respondents according to their assessment of rainfall trend in the area is presented in Table 3. The results indicated that, (about 75%) respondents claimed that rainfall trend has been decreasing, while about 17% opined that rainfall trend has been on the increase. Only about 4% of the respondents claimed not to have noticed any change in rainfall trend in the area. Again, this opinion corroborated the previous research findings on general decline in annual rainfall in many part of Nigeria [8]; [12]; [1].

TABLE IV
ASSESSMENT OF ANNUAL RAINFALL

Rainfall trend	Number	Percentage
Decreasing	120	75.0
Increasing	27	16.9
No change	7	4.4
Don’t Know	6	3.7
Total	160	100

E. Assessment of onset dates of rains:

The trend in the onset dates of rains was assessed among respondents and the distribution is presented in Table 4. The distribution shows that majority of the respondents (about 79%) claimed to have noticed delay in the onset dates of rains in the area, while about 9% claimed to have noticed early trend in the onset dates of rains. However, about 8% of the respondents claimed not to have noticed any change, while about 4% claimed ignorant. This study has revealed that climate change has brought about delay in the onset dates of rains in the area.

TABLE V
ASSESSMENT OF ONSET DATES OF RAINS

Trend of onset	Number	Percentage
Delay	127	79.0
Early	15	9.3
No change	12	7.5
Don’t Know	6	3.7
Total	160	100

F. Effect of climate change:

On the effect of climate change on farming the distribution in Table. 5 shows that majority of the respondents (91%) claimed that climate change has affected their farming activities in the last ten years, while only 9% of the respondents claimed not to be affected by climate change in recent years. This study has revealed that climate change has affected farming activities in recent years of Yobe State.

TABLE VI
EFFECTS OF CLIMATE CHANGE ON FARMING ACTIVITIES IN THE LAST 10 YEARS

Awareness of climate change	Respondents	Percentage
No	145	90.6
Yes	15	9.3
Total	160	100 %

G. Effect of low rainfall on farming activities:

Rainfall amount in recent years has fluctuated in the State due to climate change. The distribution of respondents on how low rainfall affected their farm activities is presented in Table 6. The distribution shows that majority (about 83%) of the respondents had their crop yield reduced, about 13% had reduced water for animal, while about 4% had reduced grass or biomass. This therefore implies that low rainfall brought about by climate change has affected agricultural activities in the State.

TABLE VII
WAYS LOW RAINFALL AFFECTED FARM ACTIVITIES

Low rainfall effect	Number	Percentages
Reduced crop yield	133	83.1
Reduced water for animals	21	13.1
Reduced grass/biomass	6	3.7
Total	160	100%

H. Effects of extreme/high temperature on farm activities:

The results in Table 7 revealed that high temperature resulting from climatic change has affected agricultural

production in the State. The distribution of the respondents according to the effect of extreme/high temperature shows that, majority of the respondents (about 81%) stated that high temperature has brought about wilting of their crops, 15% had their farm produce spoiled, while about 4% had their livestock dead. It is evident from this result that, high temperature brought about by ozone layer depletion has affected agricultural production in the State.

TABLE VIII
EFFECT OF EXTREME/HIGH TEMPERATURE

Temperature effect	Number	Percentages
Wilting of crops	130	81.2
Spoilage of farm produce	24	15.0
Death of livestock	6	3.7
Total	160	100%

I. Community adaptation to climate change

Respondents' effort to adapt to climate change:

Table 8 shows the distribution of respondents on whether there were efforts made by communities to adapt to climate change. The information reveals that majority of the respondents (about 72%) stated that they have made efforts to adapt to climate change, while only about 28% claimed not to have made any effort to adapt to climate change. This reveals that most of the respondents in the study area have made efforts to adapt to climate change.

TABLE IX
EFFORTS TO ADAPT TO CLIMATE CHANGE

Effort	Respondents	Percentage
Yes	115	71.8
No	45	28.1
Total	160	100 %

J. Adequacy of adapting information

The respondents were asked on whether they had adequate information on how to adapt to Climate change and their responses is presented in Table 9. The distribution shows that more than half of the respondents (about 75%) claimed not to have enough information on how to adapt to climate change, while about 25% claimed to have enough information. This study reveals that many farmers in the area do not have enough information on how to adapt to climate change. This corroborates the findings of [4] in Jemaa local government area of Kaduna state, Nigeria.

TABLE X
ADEQUACY OF INFORMATION ON HOW TO ADAPT

Responses	Number	Percentage
Yes	120	75
No	40	25
Total	160	100 %

K. Factors limiting adaptation to climate change:

Adaptation to climate change in the State is constrained by various factors. The distribution of the respondents on these

factors is presented in Table 10. The table shows that about 66% of the respondents claimed that lack of information was the main factor hindering adaptation to climate change, while about 22% complained of appropriate technology. Also, about 9% of the respondents claimed on the lack of necessary input as the factor hindering adaptation to climate change, while only about 3% complained of labour. This study reveals that lack of adequate information is the main factor hindering adaptation to climate change.

TABLE XI
FACTORS HINDERING ADAPTATION

Limiting Factors	Number	Percentages
Information	105	65.6
Appropriate technology	35	21.8
Necessary input	15	9.3
Labour	5	3.1
Total	160	100.00

L. Adaptation measures:

Adaptation measures embarked upon by the respondents to minimize the effect of climate Change in the area is presented in Table 11. The distribution shows that about 56% of the respondents use seed tolerant variety, while about 19% alter their planting schedule. Also, about 15% of the respondents' plant early maturing seed, about 6% use different tillage system, and about 3% diversify their crops. This study has revealed that farmers adapt different adaptive measures to minimize the effect of climate change in the area.

TABLE XII
ADAPTATION MEASURES BEING USED BY COMMUNITIES

Adaptation measures	Number	Percentages
Tolerant seed variety	90	56.2
Altering plant scheduled		
Planting early maturing seed	30	18.7
Using different tillage system	25	15.6
Crop diversification	10	6.2
	.5	3.1
Total	160	100.00

IV. CONCLUSION

Majority of the respondents in chosen communities of the state are not aware of climate change and they submitted that climate change has affected their farming activities in recent years. The effects mentioned include lesser income, reduced crop yield, shortage of water and biomass for animals due to low rainfall and frequent dry spells. Similarly high temperature causes wilting of crops and diseases while excessive rainfall leads to destruction of farmlands and properties by flooding. The farmers are making efforts to adapt to climate change in various ways such as planting tolerant varieties, altering planting schedules, planting early maturing varieties and crop diversification. They however lack adequate information on

how to adapt. Thus, the following recommendations were made towards effective mitigation of adaptation to climate change in the state; farmers should adjust planting dates to avoid crop failure due to late onset and early cessation of rains; Extension agents should be trained on climate change science to enable them pass adequate information to farmers on appropriate adaptation measures or strategies; farmers should be encouraged to go into dry season farming with support from relevant agencies.

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