



AWARENESS AND ADAPTATION STRATEGIES TO CLIMATE CHANGE AMONG RURAL FARMERS IN UKUM LOCAL GOVERNMENT AREA OF BENUE STATE

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ABSTRACT

The study awareness and adaptation strategy to climate change among rural farmers was conducted in Ukum local Government area of Benue State, Nigeria. The objectives were to analyze the socioeconomic characteristics of the respondents, determine how knowledgeable farmers are about climate change and analyze the adaptation strategies employed by the rural farmers. Simple random and purposive sampling procedures were employed in selecting 108 respondents; and questionnaires were used for data collection. Means, percentages, frequency distribution tables and multiple regression analysis were used for data analysis. The result showed that 55.56% fall within the age group of 36 to 50 years, 60% of the Respondents were males, majority of rural farmers could read and write, about 51% were married, the result showed that 28% of the respondents which were the majority cultivated yam. Result revealed that 54% of the respondents were knowledgeable about climate change effects. The results also revealed that adaptation strategies employed by rural farmers were use of mulching/planting of cover crops, early planting, delay in date of planting of some crops, increase in cultivated land, multiple cropping and application of organic manure to cope with the effects of climate change in the study area. In addition, the results of regression analysis revealed that age (0.01), household size (0.01), income (0.05) and farming experience (0.05) were the significant factors influencing farmer's adaptation to climate change. The concludes that more than half of the farmers in the study area were aware of climate change and planting of cover crops, delay in planting and early planting were some strategies adopted by farmers to cope with it. The study recommends that more awareness be created to increase the percentage of farmers that are aware of the negative effects of climate change and farmers should be trained to embrace practices that will reduce the effect of climate change on agricultural productivity in the study area.

Keywords: Awareness, Climate, Change, Adaptation, Strategy.

INTRODUCTION

Climate change is the most complex multifaceted and serious threat the world is facing at present. Climate change according to Wikipedia is changes in statistical distribution of weather over periods of time that ranges from decades to millions of years. It can be a change in the distribution of weather events around an average (for example greater or fewer extreme weather events) the phenomena may be limited to a specific region or may occur across the whole earth. Climate change poses environmental, social, and economic challenges on a global scale (Mendelsohn *et al.*, 2006; Shongwe, 2013). Without gainsaying, climate change is a serious challenge facing the entire world today. The impacts of climate change are being felt by both developed and developing countries. These impacts are likely to be felt



more by developing countries not necessarily, because they are the highest contributors to climate variations but because they lack economic, social, and political infrastructure to respond adequately to the effects of climate change (Farauta *et al.*, 2011). Climate change impacts are felt on agricultural production, health, biodiversity, social and economic conditions and affect people and the environment in general. The expected impact of climate change varies greatly among regions, sectors and social groups and communities because resources are distributed unevenly. Climate change is predicted to worsen the incidence of drought and desertification leading to millions of people becoming refugees as a result, thereby, making perhaps the attainment of the Sustainable Development Goals (SDGs) difficult.

Adaptation to climate change is the adjustment of practices, processes and structures to reduce the negative effects particularly, the unavoidable ones, and takes advantage of any opportunities associated with climate change (Noble *et al.*, 2014). Although, African farmers have a low capacity to adapt to changing climate, however, have survived and coped in various ways over time. Better understanding of how they have done this is essential for designing incentives to enhance private adaptation. There is need to support farmers' coping strategies through appropriate public policy and investment. Thus, public and private partnership will help increase the adoption of adaptation measures which will reduce the negative consequences of predicted changes in future climate with vulnerable rural communities in Africa benefiting more (Hassan & Nhemachena, 2008). Ojo and Baiyegunhi (2018). Posited that farmers adapted to climate change in order to maximize profit by changing using mixed cropping, use of improved crop varieties and soil and water conservation practices among others. The coping strategies adopted by arable crop farmers, which are mainly initiated at the farm and village-level, are expected to enhance their farm productivities, and improve their profit as a producing unit. Therefore, this study was aimed at analysing the awareness and adaptation strategies employed by rural farmers in study area. The objectives of the study include to,

- i. analyzing the socio economic characteristic of the rural farmers ;
- ii. examine how knowledgeable farmers are about climate change ;
- iii. analyzing the adaptation strategies employed by the rural farmers ; and
- iv. Determine factors influencing the adaptation to climate change.

METHODOLOGY

Ukum Local Government was created in September 1991 by the Administration of General Ibrahim Badames Babangida out of the then Katsina-Ala local government area of Benue State. The local Government is inhabited by the Tiv tribe, the people of Ukum Local Government Area are predominantly farmers farming a wide range of crops from roots and tubers to arable crops to grains and cereals to vegetables and tree crops, they are also domesticating animals from cattle's, small ruminants, poultry etc. The local government is bordered to the east by Wukari Local Government Area of Taraba State to the South and West by Katsina –Ala and Ilogu Local Government Areas respectively, the Local Government Area lies between latitude 6° degrees and 7° degrees north and longitude 9° degrees and 10° degrees south of the equator. According to the census figure of 2006, Ukum Local Government Area has a population figure of 216, 930.

Sampling Technique and Sample Size

The sample size for this study was determined based on the preliminary survey conducted in the study area, the population stood at 161,000 using Taro Yamane's formula to select 116 respondents for the study randomly:



$$n = \frac{N}{[1 + (Ne^2)]} \text{-----(1)}$$

Where:

n = required sample size

N = population sample

e = error limit at 5% (standard error of 0.05)

Table 1: Distribution of selected respondents from the selected study communities

S/No.	Council Ward	Community	Sampling Frame	Sample Size	Interval
1	Adzendeshi	Chit0	12	9	1.40
2	Aterayange	Ater	11	8	1.40
3	Boikyo	Ayati	12	9	1.40
4	Kendav	Tyogbenda	11	8	1.40
5	Kundav	Alabar	10	7	1.40
6	Lumbuv	Vaase	13	9	1.40
7	Mbatiam	Tine nune	10	7	1.40
8	Mbayenge	Jootar	14	10	1.40
9	Mbazun	Kyado	11	8	1.40
10	Tsaav	Afia	21	15	1.40
11	Tyuluv	Gbagir	12	9	1.40
12	Ugbaam	Adogo	11	8	1.40
13	Uyam	Zaki Biam	13	9	1.40
Total			161	116	

Source: Preliminary Survey. 2021

One hundred and sixteen respondents were randomly selected in the study area from the preliminary Sampling frame obtained out of which only one hundred and eight of the questionnaires were correctly field and returned.

Data Collection and Analysis

Data were obtained through the administration of questionnaires to the respondents. Data obtained for this research were analysed using percentages, frequency distribution tables, and ordinary least square regression analysis.

Model Specification

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e_i \text{-----(2)}$$

Where

Y_i = Adaptation Strategy (Dummy 2 for Adapted 1 for Non Adapted)

X_1 = Age of respondents (in years)

X_2 = Sex of the respondents (Dummy 2 for male 1 for female)

X_3 = No. of years spent in formal education (in years)

X_4 = Household size (No. of persons)

X_5 = Income (₦)

X_6 = Farming experience (years)

β_1 – β_6 –parameter estimates

e_i = Random error term



RESULTS AND DISCUSSION

Distribution of the respondents Based on Socio-economic Characteristics

Table 1 shows the age distribution of the respondents in the study area. The results revealed that majority (55.56%) of the respondents fell within the age group of 36-50 years while (18.51%), and (12.04%) fell within the age group of 51 Years and above, and (13.89%) fell within the group of less than 20 years while, (12.04%) of the respondents fell within the age group of 20-35 years' respectively. The result also showed (60.18%) of the respondent were males, while (39.81%) were females, it therefore means that majority of the respondents in the study area are males. The result shows that majority (55.56) had first school leaving certificate and senior secondary school certificate, (18.51) had H.N.D, B.SC and above, (13.89%) of the respondents had no formal education and (12.04%) had, OND, ND and NCE certificates respectively, Since those with primary school and secondary schools were more, it then means that, majority of the respondents are primary and secondary school holders This result corroborates the previous research finding on education level of farmers in Adamawa State, that majority of the farmers were literate, the could atleast read and write. (Adebayo *et al.*, 2012).

The result of the marital status of the respondents shows the distribution of the respondent according to marital status, the result of the study revealed that, (16.66%) of the respondents were single (50.93%) were married while (32.40%) of the respondent were divorced since more of the respondents are married it shows that majority of the respondents are married This results corroborates previous research outcome on marital status by farmers in Nigeria that farmers marry so that, there will be more labour on their farms (Mustapha *et al.* 2012; Bawa, 2011; Ozor and Nnaji, 2011). Men marry s. The result according to the distribution of the respondents based on the types of crops they grow. The results revealed that, (27.77%) of the respondents grow yam (18.51%) of the respondents grow cassava (17.59%) of them grow groundnut (17.59%) of the respondent also grow maize while 18.51% of the them grow rice in the study area since the number of respondent that grows yam is more, it means that majority of the respondent in the study area grow yam.



Table 1: Distribution of Respondents Based on Socio-economic Characteristics

Variable	Frequency	Percentage %
Age		
Under 20	15	13.89
20-35	13	12.03
36-50	60	55.56
51 and above	20	18.52
Total	108	100
Gender		
Male	65	60.18
Female	43	39.82
Total	108	100
Education Background		
No formal education	15	13.89
FSL and SSCE	60	55.56
OND, ND, and NCE	13	12.04
H.N.D, BSC and MA	20	18.51
Total	108	100
Marital status		
Single	18	16.67
Married	55	50.93
Divorced	35	32.40
Total	108	100
Crop Grown		
Yam	30	27.77
Cassava	20	18.51
Groundnut	19	17.59
Maize	19	17.59
Rice	20	18.51
Total	108	100

Source: Field Survey, 2021

Respondents' Knowledge on Climate Change

Table 2: shows the results of the respondents based on knowledge on climate change; from the result obtained (53.70%) of the respondents were aware of climate change and its effects while 46.30% of the respondents were not aware of the climate change. Hence the number of the respondents who are aware of climate change is more, it means that, majority of the respondents are aware of climate change. This result agrees with the previous research findings on awareness of climate change by farmers (Enete and Onyekuru, 2011; Anyoha et al., 2013; Ifeanyi, 2016) who reported that large percentage of farmers in Nigeria are aware of climate change through various means

Table 2: Distribution of Respondents Based on Knowledge of Climate Change (N=108)

Variable	Frequency	Percentage %
Yes	58	53.70
No	50	46.30

Source: Field Survey, 2021



Adaptation Strategies to Climate Change by the Respondents

Table 3 shows the result of adaptative measures to climate change in the study area. The results showed that most of the farmers (93.5%) of the respondents use mulching and cover cropping to prevent the direct penetration of heat on crops when newly planted which was ranked 1st. The results also revealed that, (88.9% and 84.3%) of the respondents used early planting and delay in planting date as a strategy to adapt to climate change which was ranked 2nd and 3rd respectively. 88.9% of the respondents especially farmers that irrigate their farms do early planting for crops like vegetables, which is usually irrigated and only (11.1%) of the respondents did not employ this strategy, the study also revealed that, (84.3%) of the respondents use delay in planting date as a strategy to adapt to climate change since one of the effect of climate change is delay or changes in rainfall patterns. This strategy was ranked third amongst the strategies employed. The result of the study reveal that, another strategy employed by the respondents was increased cultivated land for crops in the study area, since one of the negative effect of climate change is reduced yield /production output, in order to cope farmers, increase cultivated land in order to increase output of their farms.

Multiple cropping was another strategy employed by farmers in the study area as represented by (58.3%) of the respondent's farmers plant many crops for some crops to serve as shield to other crops that do not need too much of sun. Another strategy employed by farmers to cope with climate change in the study area was diversification into other ventures in a situation climate change affect the farmer negatively some the respondents diversified into keeping of livestock at the household level while some of them diversified into petty trading as indicated by (28.7%) of the respondents. According to Benhin (2006) one of the strategies which serve as an important form of insurance against rainfall variability is increasing diversification by planting crops that are drought tolerant and/or resistant to temperature stresses. Maize is predominantly grown among farmers in guinea savannah of the study area

Table3: Distribution of Respondents According to Adaptation Strategies to Climate Change in the Study Area (N=108)

VARIABLE	YES	PERCENTAGE (%)	NO	PERCENTAGE (%)	RANK
Multiple Cropping	63	58.3	45	41.7	5 th
Delay in planting date	91	84.3	17	15.7	3 rd
Early Planting	96	88.9	12	11.1	2 nd
Increased Cultivated land	75	69.4	33	30.6	4 th
Mulching/use of cover crops	101	93.5	7	6.5	1 st
Diversification	31	28.7	77	71.3	6 ^t

Source: Field Survey, 2021

Factors influencing the Adaptation to Climate Change by The Respondents

Table 4. Shows factors influencing adaptation to climate change in Ukum Local Government Area of Benue State Nigeria. Four functional forms were tried, which included linear, semi-log, double log, and exponential forms. The models were examined in terms of appropriateness. The Linear functional form was found to be the best fit. The equation was significant at 1% level with a coefficient of determination (R^2) of about 66. The value of the R^2 implies that about 66% of the adaptation to climate change is influenced by the four variables included in the model. Three variables were significant with their coefficients



conforming to economic criteria, meaning a positive relationship exists between these variables and the dependent variable, increase in the coefficient of any of these variables leads to an increase in the dependent variable, which is adaptation to climate change in the study area. Age of the rural farmers was statistically significant at ($P \leq 0.01$) and positive.

Implying an increase in age will lead to an increase in the chances of adapting to climate change by the respondents in the study area by 2.4%. Household size was statistically significant at ($P \leq 0.01$) and positive implying an increase in Household size will lead to increase in the chances of rural farmers adapting to strategies that will cope with the effect of climate change by 14.9%. This result agrees with the findings of Onubuogu et al. (2014) who reported that large household size is a proxy for labour availability. Income of Rural Farmers was also statistically significant at ($P \leq 0.05$) and positive implying increase in income of rural farmers will increase the chances of farmers adapting to strategies that will cope with climate change in the study area by 32%. Danso-Abbeam et al. (2021) found that rural non-farm income increase smallholder farmers' adaptive capacities and farmers would have used less adaptation techniques if they had not participated in non-farm work. Efforts to boost rural development must provide more employment opportunities for farmers, particularly during the off-cropping time. This will help farmers improve their ability to adopt more climate change adaptation strategies and, consequently increase farm productivity. Rural farmers' farm experience was also positive and statistically significant at ($P \leq 0.05$) implying that as the farm experience of farmer's increase, Chances of Adapting to Strategies that will cope with climate change by rural farmers will also increase. The findings also support Deressa et al. (2008) that farmers with many years of farming experience could be more efficient; have better knowledge of farming conditions and climatic situation.

Table 4. Factors influencing Adaptation to Climate Change by The Respondents

Adaptation	Coef.	Std. Err.	t	$P > t $	[95% Conf. Interval]	
Age	.0246309	.0028947	8.51	0.000***	.0188886	.0303731
Sex	-.0339425	.0556298	-0.61	0.543	-.1442971	.076412
Education	-.0062212	.0056074	-1.11	0.270	-.0173449	.0049024
House hold size	.0149692	.0056184	-2.66	0.009***	-.0261145	-.0038239
Income	3.26e-07	1.56e-07	2.08	0.040**	1.58e-08	6.36e-07
Farm experience	.0099575	.0048982	2.03	0.045**	.0002408	.0196743
_cons	.77519	.1635267	4.74	0.000***	.4507971	1.099583

*** Significant at 0.01% ** significant at 0.05% * significant at 0.10%

Number of obs=108 Prob > F = 0.0000 R-squared = 0.6622 Adj R-squared = 0.6422 F(6, 101)

Source: Field Survey 2021

CONCLUSION AND RECOMMENDATION

This Study concludes that a good percentage of rural farmers are aware of climate change and have equally adapted strategies such as multiple cropping, early planting, delay in planting date, increased cultivated land, mulching/use of cover crops and Diversification into other investments. This study however recommends that more awareness be created to increase the percentage of farmers that are aware of the negative effects of climate change



and farmers should be trained so as to embrace practices that will reduce the effect of climate change on agricultural productivity in the study area.

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