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Factors Influencing Farmers Adaptive Capacities to Climate Change Alone River Niger communities in Edo and Kogi States, Nigeria

Ekemhonye, S., Nmadu, J. N., Coker A. A.A. and Ndanitsa, R. M. A.
Department of Agricultural Economics and Farm Management,
Federal University of Technology, Minna, Niger State

Abstract:- Globally, extreme weather is predicted to become more common on animals, plants and crops, which are all expected to be badly affected. In Nigeria, the effects of climate change are expected not to stop at just affecting the agricultural production, it will surely affect the lives and overall development of the country. This study factors influencing farmers' adaptive capacities to climate change in Edo and Kogi states. Descriptive statistics and ordered logit model were the analytical tools used. Results of the analyses reveal that gender, types of accommodation changes, sanitation, visit to hospital, amount spent on treatment, education and irrigation were the major factors influencing adaptation capacity to climate change in the study. The study recommends that Policy makers should provide basic amenities for respondents residing along river Niger communities, such as health care Centre's, markets, as well as access to farm land, to reduce challenges of income spent on travelling distance by respondents

I. INTRODUCTION

Climate change will affect people in Africa more than anywhere else in the world due to the nature of changes being witnessed, deteriorating terms of trade, inappropriate policies, high rates of population growth, the inequitable distribution of land, over-dependence on natural-resource based livelihoods and over-reliance on rain-fed agriculture (Intergovernmental Panel on Climate Change (IPCC, 2018)). The climate of Africa's is already changing, the continent is becoming warmer and drier. There is difficulty in predicting Rainfall. Meanwhile, floods, droughts and storms, are becoming more common and intense. Africa's average temperature rose at a rate of 0.05°C per decade from 1900 to 2000 for a total increase of 0.7°C (IPCC, 2018). Temperatures are due to rise by a further 0.2 to 0.5°C per decade, with the greatest warming occurring over the interior or semi-arid margins of the Sahara and central southern Africa (IPCC, 2018). These types of changes that is observed by IPCC, may likely cause serious implications for water resources, food security, the spread of diseases, the productivity of natural resources, sea-level rise, and desertification. Recent events, such as the poor rains in southern Africa between 2001 and 2003, and the 2012 flood in Kogi State, Nigeria, demonstrates that communities may already be suffering the consequences of less predictable weather patterns.

Climate change is expected to aggravate Africa's poverty level with rising global temperatures which are expected to increase flooding in coastal areas, cause declines in agricultural production, threaten biodiversity and the productivity of natural resources, increase the range of vector-borne and waterborne diseases, and worsen desertification; thus, they have a disproportionately adverse impact on Africa's agriculture-based economy (Mendelsohn *et al.,* 2008). The change in Climate is able to fuel poverty situation of farmers in Edo and Kogi States along river Niger communities, Nigeria by inhibiting critical investment plans at the households' level; Reduces farm productivity and income from low farm output in this area is likely to linked with the growing poverty, among rural households. In trying to find possible solutions to the problem of adaptive capacities to climate change on farmers, the following research questions will be addressed in this study: What are the socio-economic characteristics of respondents in the study area and what are the factors influencing adaptive capacities to climate change in the study areas?

II. METHODOLOGY

Data for this study were collected from primary sources. The data were obtained through administration of questionnaire to elicit information from the respondents, on the socio-economic characteristics of the farmers such as age, marital status, gender, education, household size, farming experience, farmland size, the extent of awareness of poverty diseases, annual income, types of treatment used and various adaptation measures to poverty diseases. The researcher was assisted by trained enumerators from the State's Agricultural Development Programme to carry out data collection.

III. METHODS OF DATA ANALYSIS

Objectives were achieved using descriptive statistics tools such as, mean, frequencies and percentages and ordered logit model were employed.

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These was achieve using ordered logit model following the classification of Asante and Egyir (2006), farmers were categorized into low, moderate and high adapters to climate change. The three dependent variables (low, moderate and high) obviate the applicability of a

binary choice model and allows for the use of the ordered logit model. Hence, representing farmers' adaptive capacity as *AC*, and predicting the probability that a farmer will have a particular adaptive capacity given his characteristics:

$$Prob\ (AC_{ij}) = Z_{ij}\,\theta + \tau_{ij} \quad (1)$$

Where:
AC = low, moderate and high adaptive capacities which were assigned values of 0, 1 and 2, respectively in equation (1).
Z = vector of explanatory variables;
θ' = a vector of regression coefficients; and
τ = the error term with a logistic distribution.

The marginal effect was derived as:

$$\frac{\partial AC_{ij}}{\partial Z_i} = AC_{ij}\,(\theta_{jk} - \sum_{m=n}^{j-1} b\,\theta_{m=n} ACmk\ ) \quad (2)$$

The variance (Var) of the error term of adaptive capacity to climate change τ is:

$$Var\ (r_{ij}) = \frac{\pi 2}{6} \quad \text{(Green, 2003)} \quad (3)$$

The variable influencing respondents, adaptive capacity to climate change in the study areas is specified as:

$$AC_{ij} = \theta_0 + \theta_1 AGE + \theta_2 MAR + \theta_3 HHS + \theta_4 OFFARM + \theta_5 AILAND + \theta_6 ACREDIT + \theta_7 HEDU + \theta_8 DTM + \theta_9 COT + \theta_{10} VTHC \quad (4)$$

Variable	Definition and measurement	Expected sign
AGE.	Age of farmer (in years)	Positive
MAR	Marital status (married=1,0 otherwise)	Positive
HEDU	Education (Numbers of years of formal education)	Positive
HHS	Household size (Numbers of individuals)	Positive
OFFARM	Income obtained from off-farm business (Naira)	Positive
SHIL	Sizes of hectares of irrigable land (Hectare)	Positive
ACREDIT	Access to credit. (Access=1, No access=0)	Positive
DTM	Distance to market from resident (kilometer)	Negative
COT	Cost of treatment of diseases (Naira) and	Negative
VTHC	Numbers of visit to healthcare/facility (kilometer)	Negative

Table 1:- Variable Influencing Respondents, Adaptive Capacity to Climate Change

IV. RESULTS AND DISCUSSION

➢ *Socioeconomic Characteristics of the Respondents*

The socioeconomic characteristics of the respondents such as age, marital status, level of education, household size, farm size and cost of treatment of diseases in the area were considered in this study are presented in Table 2. The results show that majority of the respondents (37.4%) were between ages 41 and 50 years. The mean age of the respondents was 48 years. This finding is in line with that of Nwalieji and Uzuegbunam (2012), which reported that majority of farmers are still within the middle, active and productive ages, hence can engage efficiently in farm production. This implies that respondents will have strong adaptive capacity to climate change in their active and productive age. The trend is the same across the two States.

Majority (76.5%) of the respondents were married, while (23.5%) were either single, divorced, separated or widowed. Marriage has been reported to confer some level of responsibility on individuals that are involved, like provision of food items, clothing, shelter, healthcare for household (Omoare, 2016). The trend is similar across the two States.

Variables	Kogi State (n=178) Frequency & Percentage	Edo State(n=180) Frequency & Percentage	All States (n=358) Frequency& Percentage
Age (Years)			
21-30	10(5.6)	8(4.4)	18 (5.0)
31-40	29(16.3)	31(17.2)	60(16.8)
41-50	70(39.3)	64(35.6)	134(37.4)
51-60	49(27.5)	49(27.2)	98(27.4)
Greater than 60	20(11.2)	28(15.6)	48(13.4)
Means	48.0	48.0	48.0
Marital status			
Single	16(8.9)	16(8.9)	32(8.9)
Married	138(77.6)	136(75.6)	274(76.5)
Separated	7(3.9)	9(5.0)	16(4.4)
Widow	10(5.7)	13(7.2)	23(6.4)
Divorced	7(3.9)	6(3.3)	13(3.6)

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Household size (Number)			
1-5	68(38.3)	57(31.7)	125(34.9)
6-10	78(43.8)	83(46.1)	161(44.9)
11-15	25(14.0)	22(12.2)	47(13.1)
16-20	2(1.1)	12(6.7)	14(3.9)
Greater than 20	5(2.8)	6(3.3)	11(3.1)
Means	7.0	7.0	7.0
Educational status			
Non formal education	20(11.3)	16(8.9)	36(10.0)
Primary school	69(38.8)	79(43.9)	148(41.3)
Secondary school	47(26.4)	53(29.4)	100(27.9)
Tertiary education	42(23.5)	32(17.8)	74 (20.8)
Occupation			
Farming	92(51.6)	106(58.8)	198(55.3)
Fishery	42(23.6)	38(21.1)	80(22.4)
Civil servant	7(3.9)	8(4.4)	15(4.1)
Trading	16(9.0)	15(8.3)	31(8.8)
Other Businesses	21(11.8)	13(7.4)	34(9.4)
Cost of Treatments (₦)			
≤ 5,000	74(41.5)	57(31.7)	131(36.6)
5,001- 10,000	53(29.8)	58(32.2)	111(31.0)
10,001-15,000	17(9.6)	27(15.0)	44(12.3)
15,001-20,000	23(11.8)	24(13.3)	47(13.1)
20,001 and Above	11(6.2)	14(7.8)	25(7.0)

Table 2:- Socioeconomic Characteristics of Respondents
Source: Computation from field survey, 2017.

It was further discovered that the means household size of the farmers were 7 persons. This is an indication that the household size was relatively large. This is partly caused by rural household labour set up which relies on household members for production. Other studies such as that conducted by Andrew, Christopher and Emmanuel, (2016). shows that household size is an important asset in terms of working together in household economic activities. Under this situation, it implies that farmer will save cost of labour and be able to provide their basic needs to combat poverty diseases. The trend is the same across the two State.

The result also shows that majority (41.30%) of the respondents had primary education. This implies that most respondents in the area completed their primary education. This is an indication that respondents in the sampled States are literates. The trend is similar across the two States. This finding agrees with that of Ajibefun, Igbalajobi and Fatuase, (2013), Who reported that educated farmers are expected to be more receptive to improved farming techniques and therefore showed higher level of adaptive capacity to climate change than farmers with less education.

Farming were the major occupation of respondent 55.30% in the area. This implies that majority of the respondents residing in the area depend on farming for their livelihood. This result is in agreement with Okunade (2006) who revealed that majority of people residing in rural areas are farmers. The trend is similar for the two States.

The majority of respondents (36.60%) spend less than ₦5,000 on poverty diseases treatment, followed by (31.00%) between ₦5000 - ₦10,000, while (32.40%) were above ₦10,000. This implies that majority of the respondents spent less than ₦5,000 in the treatment of poverty diseases in the States. These finding is in agreement with Abiodun and Abayomi, (2013) who reported average treatment costs of malaria to be ₦1,448 and ₦3,453.67. The trend of the respondents is similar across the two States.

- *Factors influencing adaptive capacities to climate change*

Factors influencing adaptive capacity to climate change is estimated across the States is presented in Table 3. The result reveals that chi-square value is significant at 1% level indicating overall significance of the model. The results show that formal education, household size and off farm income significantly affected adaptive capacities to climate change. This is agreeing with a priori expectation since all the independent variables were expected to bear positive sign. This implies that they are more likely to increase adaptive capacity to climate change. While marital status was not in agreement with a priori expectation. This could be as a result of excess resource and time spent by respondents on family issues compared to that of farming activities. This finding was in line with Omoare (2016), who reported that marriage confer some level of responsibility on individuals that are involved, like provision of food items, clothing, shelter, healthcare for household.

The result in Edo State also reveals that, formal education and household size were significantly affected adaptive capacities strategies to climate change. This is in agreement with a priori expectation. The implication is that increase in any of this variables will increase the probability of respondents increasing adaptive capacities to climate change. While off farm income and marital status were not in agreement with a priori expectation. This could be as a result of lesser time and energy respondents committed toward farming activities compared to nonfarm sources of financial income. Finding is in agreement with that of Ali, Rahurt and Mottaleb, (2017) who reported that as climate change poses a threat to the livelihood by reducing crop yield, food security and increasing poverty level. If respondents do not have adaptive strategies to such climate effect they may, then lookout for alternative sources of nonfarm income.

Explanatory Variables	Pooled Coefficient & Z-values	Odds Ratio	Edo State Coefficient & Z-values	Odds Ratio	Kogi State Coefficient & Z-values	Odds Ratio
Age (Year)	0.01230 (0.23)	1.0154	0.0214 (0.51)	1.0141	0.0190 (0.16)	1.0252
Marital status	-0.4617 (0.18) **	1.6438	-2.0094 (0.15)*	3.1263	0.5238 (0.153)	1.8949
Formal education (Year)	0.0198 (0.04) ***	1.0600	0.3684 (0.14) **	1.0741	0.5253 (0.15) *	1.0560
Household size (Number)	0.0284 (0.06) **	1.0632	0.0358 (0.18) *	1.0722	0.4593 (0.11)	1.0706
Off farm income(Naira)	1.2406 (0.13) ***	1.0800	1.68e-08 (0.17) **	1.0000	1.8606 (0.12) ***	1.8520
Irrigation farming (Hectare)	0.2965 (0.21)	1.3243	0.3498 (0.61)	1.1641	0.4543 (0.53)	1.2575
Access to credit (Naira)	0.2266 (0.86)	1.0395	0.4156 (0.59)	1.2033	0.2666 (0.61)	0.8521
Distance to market (Kilometer)	-0.0443 (0.14) **	0.9064	0.0622 (0.04)	0.8649	0.0771 (0.16)	1.1022
Cost of treatment (Naira)	0.0000 (0.41)	0.9999	0.0001 (0.72)	0.9999	0.0001 (0.89)	1.0000
Visit to hospital (kilometer)	0.0179 (0.57)	1.0103	0.0312 (0.36)	1.0279	0.0238 (0.69)	0.9905
LR chi-square	70.14		36.40		40.77	
Pseudo R^2	0.0000		0.0001		0.000	
Log likelihood	0.0778		0.1049		0.1092	

*Z-values are in parenthesis, *p<0.10 level of significant, **p<0.05 level of significant and ***p<0.01 level of significant.*

Table 3:- Estimate of Factors Influencing Adaptive Capacities to Climate Change
Source: Field survey, 2017

Furthermore, the result in Kogi State, reveals that formal education and off farm income were significantly affected adaptive capacities to climate change. This is agreeing with a priori expectation since, all the independent variables were expected to bear positive sign. Compared formal education and off farm income with other variables, they are more likely to have adaptive capacities to climate change, implying that increase in years of formal education and off farm income will increase the probability of respondents increasing adaptive capacities to climate change. This finding is in agreement with findings of Adjei and Buor, (2012). who reported that personal characteristics like years of education influence farmers' adaptive capacities to climate change.

V. CONCLUSION AND RECOMMENDATION

Based on the empirical evidence emanating from this study, it was concluded that the major factors influencing adaptive capacities to climate change were education, household size, off farming income, access to credit, distance to health Centre, cost of treatment, visit to hospitals and irrigation farming. The study recommends that policy makers should provide basic amenities for respondents residing along river Niger communities, such as health care Centre's, markets, as well as access to farm land, to reduce challenges of income spent on travelling distance by respondents.

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