Environment Pollution and Climate Change

Nwobodo, et al. Environ Pollut Climate Change 2020, 4:3

Research Article Open Access

Resilient Capacity of Farm Households to Climate Change along the Floodplain of River Niger in Anambra State, Nigeria

Nwobodo Cynthia Ebere[1]*, Ugwunodo Chinonso Luke[1], Ozor Nicholas[2], Asogwa Uzoamaka G[3] and Okoro John Chukwuma[1]

[1]*Department of Agricultural Extension, University of Nigeria, Nsukka, Nigeria*
[2]*African Technology Policy Studies Network (ATPS), Nairobi Kenya*
[3]*Agriculture and Rural Management Training Institute (ARMTI), Ilorin, Nigeria*

Abstract

Rising threats of flood present a precarious future for households especially the poor farmers, who often live in fragile environment and are reliant on climate-sensitive agriculture for their livelihoods. The study assessed the resilience capacity of farm households to climate change along the floodplain of River Niger in Anambra State of Nigeria. Multistage and purposive sampling techniques were used in selecting 100 household-heads. Data were collected using semi-structured interview schedule and were analyzed and presented with percentage, mean score, Spearman Rho rank order correlation and linear regression model. Results show that households' perceived resilience capacity assets were water sources available to households (M=2.84), family members as source of social capital (M=2.80), and health of household members (M=2.15). There was a significant (rho = 0.385; p = 0.000) positive correlation between household resilient capacity assets and their perceived resilient capacity. Majority (96.8%) of the respondents had very low resilience capacity to climate change. Number of years spent in school (t=0.030; p≤0.005), and farming experience (t-0.003; p≤0.05) had significant positive relationship with household resilience capacity. Improvements in availability and quality of infrastructural and social resilient assets will advance climate change resilience capacity of households in the area.

Keywords: Climate change, Resilience capacity, Farm households, Floodplain, River Niger

Introduction

Flood is a major problem facing the coastal areas of Nigeria. It often results from excessive rainfall, which cause rivers to overflow their banks, sometimes with very high destructive surge that washes away crops, submerge farmlands and cause damage to ecosystems, economic and cultural values, loss of human life and other human health effects [1,2]. Two thirds of the coastal disasters recorded each year are associated with extreme weather events such as storms or floods and are likely to become more pervasive threats due to shifts in climate, sea level rise, more intensive precipitation levels and higher river discharges [3]. Incessant flooding of coastal areas significantly affects agriculture production and seriously undermines development. About 90% of smallholder farmers living in the coastal areas rely on rain for their crop production, household food security and incomes [4]. Climate change is one of the greatest contributors to low agricultural productivity [5].

Nigeria's coastal cities are very critical to the economic health and well-being of her people, because of the rich alluvia soil which support agricultural activities [6]. The agricultural sector being dependent on rain-fed cultivation is most sensitive to climate variability [7]. The rising threats of flood present a precarious future for the households especially the poor farmers, who often live in fragile environment and are reliant on climate-sensitive agriculture sector for their livelihoods. Thus, they are highly vulnerable and most threatened by the effects of climate changes and weather shocks [8]. According to [9], climatic shock on farm households livelihood markedly affect income from agricultural production, increase costs to consumers and lead to scarcity due to disruptions in the production processes, plant development and agricultural management practices. It also has adverse effect on different capital items (infrastructure, productive assets and human capital including health) that directly or indirectly are employed in food systems leading to higher vulnerability to poverty thus exacerbating food insecurity situation of poor households [10].

The United Nations Development Programme [11] reports that low income and middle income countries experience just one third of climatic shock but incurs 81% of disaster related losses. This is attributable to lack of adequate livelihood assets and ability to harness their capabilities to resist, overcome and minimize loss on livelihood. According to Skoufias Rabassa and Olivieri [12], factors that reflect households' lower adaptive capacity and higher susceptibility to the impacts of the events include low levels of human and physical capital, insufficient access to assets and services (public or private), weak institutional structures, inexistent or inefficient social protection programmes and greater exposure to uncertainty in the physical and economic environment. These factors reveal the weaknesses of households to cope ex post or manage ex ante the events.

Minimizing the effect of these inevitable climatic shocks requires building resilience, taking advantage of opportunities that are vital to reduce vulnerability to future events [13]. The ability to recover from shock and still maintain good living standard is vital to survival and form the foundation of long term adaption and resilience [14]. In order to quantitatively estimate resilience capacity of households, non-parametric analytical methods are employed to combine factors such as income and access to food, assets such as land and livestock, social safety nets such as food assistance and social security, access to basic services such as water, health care and electricity into an index that gives resilience score for each household [15]. Further analysis

***Corresponding author:** Nwobodo Cynthia Ebere, Department of Agricultural Extension, University of Nigeria, Nsukka, Nigeria, Tel: +2348039462574; E-mail: cynthia.nwobodo@unn.edu.ng

Received June 18, 2020; **Accepted** July 23, 2020; **Published** July 30, 2020

Citation: Ebere NC, Luke UC, Nicholas O, Uzoamaka AG, Chukwuma OJ (2020) Resilient Capacity of Farm Households to Climate Change along the Floodplain of River Niger in Anambra State, Nigeria. Environ Pollut Climate Change. 4: 176.

indicates which pillar(s) of resilience need(s) to be strengthened to further build household resilience capacity [15].

Though, availability of asset increase household's ability to buffer or absorb the impacts of climate shock, reducing long term damage, involves not only capital but also capabilities needed in building household's resilience. Adger, Adams, Evans, O'Neill, & Quinn [16] noted that household resilience comprises not only of tangible objective elements but also their perceived resilience capability, which relates to household's cognitive and affective valuation of their own capability to anticipate, buffer, prepare for, withstand and adapt their livelihood to disturbance and change. It is the ability to take deliberate action to reduce likelihood of occurrence and the magnitude of harmful outcomes resulting from climate-related hazard [17]. Therefore, household resilience capacity can be thought to comprise a range of different capabilities and components such as preparedness and contingency [18]; innovation and learning [19]; renewal, reorganization and development [20]; personal competence, high standards, tenacity, trust in one instinct, tolerance of negative effect, control and acceptance of change [21]. These capability components with resilient assets are crucial and form the foundation of longer-term adaptation and resilience [17].

Household perceived capability will no doubt affect their ability to and how they choose to respond to disaster and therefore influence their overall resilience [22,23]. Thus, linking household level decisions and traits with their livelihood assets as a collective response to climatic hazards is vital and central to survival as well as development outcomes [19].

Purpose of the study

The overall aim of the study was to assess the resilience capacity of farm households to climate change along the floodplain of River Niger in Anambra State of Nigeria. Specifically, the study sought to:

1. Identify types of climate change shocks experienced by households in the area during the past five years;
2. Ascertain households' perceived resilient capacity to climate change; and
3. Ascertain the resilient capacity of households using resilient assets as indicators.

Hypotheses

Ho1: There is no significant relationship between households' resilience capacity assets and their perceived resilience capacity.

Ho2: There is no significant relationship between socio-economic characteristics of respondents and their resilience capacity to climate change.

Materials and Method

The study was carried out in Anambra State in southeastern Nigeria. The area is located between latitude 6°20`N and 6.33°N, and longitude 6°36'E and 6°72'E with a population of 4,055,048 and land area of 4,844km² (Wikipedia, 2016). Heads of households found along the floodplain of the River Niger constituted population for the study. Multi-stage sampling technique was used in selecting respondents. Stage one involved the purposive selection of five local government areas (LGAs) along the floodplain of River Niger. Oyi, Ogbaru, Dunukofia, Anambra East and Anambra West were purposively selected based on the severe effect of climate change in the area such as flooding and erosion. Stage two involved selection of two town communities from each of the LGAs including Nteje and Awkwuzu (Oyi LGA), Umunako and Ossomala (Ogbaru LGA), Iffitedunu and Ukpo (Dunukofia LGA), Umueze Anam and Iyiora Anam (Anambra East LGA) and Aguleri and Umuleri (Anambra East LGA) giving a total number of ten (10) communities. Stage three involved the purposive selection of ten (10) household-heads from each of the communities based on direct experiences of climate shocks in the past five years (Five years was chosen for easier recall of climate events by respondents as ten years events could be quite difficult to recall). The total sample size was one hundred (100) respondents; however only ninety five (95) copies of the instrument were considered fit and used in data analysis and presentation. Data was collected using semi-structured interview schedule.

Socio-economic characteristics of respondents were collected by asking them to indicate their sex (male or female), age (years), educational level (no formal education, primary school attempted, primary school completed, etc), number of years spent in acquiring formal education; household size (number of persons in their respective households), primary occupation (farming, trading, artisanship etc), and duration of stay in the present community (years). In order to obtain information on the types of climate change shocks experienced by households, respondents were asked to tick "yes" or "no" from a list of possible climate related shocks to indicate which their respective households have personally experienced in the past five years.

To obtain data on perceived resilient capacity of households, respondents were provided with a list of possible resilience capacity indicators including infrastructural/physical capital, human capital, financial capital, and social capital. They were asked to rate the extent to which each of those helped them in recovering from the shocks of climate change in the past five years on a three-point scale of very efficient (3), moderately efficient (2), not efficient(1) with a mean value of 2. Information on households' potential resilient capacity assets was collected by asking respondents to fill in the amount (number) of each type of assets they owned e.g. houses, animals, and crops, and the distances (in kilometres) of basic social amenities (including standard hospital, standard market, formal financial institution, work place and school) to their residents.

In order to determine the climate change resilient capacity of households in the area, their resilient capacity assets were grouped into household assets, farm assets, access to communication and transportation networks, and distance to social/physical facilities. Each group of assets was scored e.g. radio = 1, television = 2, Fan = 3, refrigerator = 4; poultry = 1, sheep = 2, goat = 3, pig = 4 etc. Each score was then multiplied by the corresponding number of each of the item owned and all the values added up to obtain a composite score for each household. The distance of household residence from public amenities were gotten in kilometres and an inverse of household's distance from each amenity was calculated. The summation of all the values for an individual household was given as the household's respective resilience capacity asset. Respondents were later grouped into five based on their resilient capacity assets as obtained above to: very high resilience capacity, high resilience, moderate resilience, low resilience, and very low resilience capacity. In order to obtain information on the relationship between household perceived resilient capacity and their resilient capacity, each household's respective resilience capacity asset score was used to run a spearman rho rank order correlation to determine whether there was any relationship between perceived resilient capacity of households and their resilient capacity assets. Data on socio-economic characteristics were presented using percentage and mean scores, objective 2 was presented with mean score while objective

3 was presented with percentage score. Hypothesis 1 was analyzed with Spearman Rho rank order correlation while hypothesis 2 was analyzed using linear regression model.

Results and discussion

Socio-economic characteristics of respondents

Table 1 reveals that majority (51.6%) of the respondents were female showing that there were more female- than male-headed households in the area. A greater proportion (34.1%) of the respondents was aged 61 years and above. The mean age was around 54 years. This implies that majority of the respondents were aging and may soon leave farming to other less tedious works. Majority were married (77.9%), the mean household size was 6 persons. A greater proportion (44.2%) has completed primary school. Majority (97.9%) had farming as major occupation. A greater proportion (33.8%) had farming experience of 21-30 years. The mean years of farming experience was 31.34 years. The mean monthly household income was N56, 805.46. A greater

Variables	Frequency	Percentage	Mean
Sex			
Male	46	48.4	
Female	49	51.6	
Age			
≤ 20 years	0	0	
21-30	5	5.5	
31-40	13	13.8	53.7
41-50	26	27.5	
51-60	19	20.1	
61 years and above	32	34.1	
Marital status			
Single	0	0	
Married	74	77.9	
Widowed	20	21.1	
Divorced/separated	1	1.1	
Educational level			
No formal education	8	8.4	
Primary school attempted	2	2.1	
Primary school completed	42	44.2	12.4
Secondary school attempted	8	8.4	
Secondary school completed	34	35.8	
Tertiary education	1	1.1	
Major occupation			
Farming	93	97.9	
Trading	2	2.1	
Farming experience(years)			
1-10	8	8.5	
11-20	18	19	
21-30	32	33.8	31.3
31-40	10	11.7	
41 years and above	27	28.6	
Household size			
1-5 person	48	50.5	
6-10 persons	46	48.5	6
11-15 persons	1	1.1	
Monthly household income			
10,000-40,000	49	51.6	
40,001-80,000	22	23.1	56, 805.46
80,001-120,000	14	14.8	
120,001-160,000	10	10.5	
Duration of stay in the current community (years)			
≤ 1-20	17	17.9	
21-40	28	29.5	41.4
41-60	35	36.8	
61 years and above	15	15.8	
Source: Field survey, 2016			

Table 1: Socio-economic characteristics of respondents.

proportion (36.8%) had stayed in the present community for 41-60 years while the mean years of stay in the present community was 41.1 years.

Nwaru [24] noted that large household size is expected to enhance labour availability. The larger the household size, the more likely the farm labour will be available to enhance farm activities. Amaze and Olayemi [25] stressed the importance of education in enhancing information acquisition and utilization and improving productivity of farmers. This implies that literacy of the household-heads could help them in obtaining information on climate change issues in other to build resilience. Agriculture being the main victim of climate change implies that their major likelihood activity is very vulnerable to the threats of climate change. Having lived in the present community for more than four decades, respondents could be more knowledgeable on what changes have occurred and also should have developed some adaptation mechanisms to the impacts of climate change.

Climate change shocks experienced by households

Table 2 shows the climate change shocks experienced by households in the past five years. These shocks include: disease and pest infestations in the farm (100%), reduced quality of crop produce (100%), damage of crops in the field by winds (98.9%), reduced yield of crops (98.9%), and high temperature/temperature variation (97.9%). Others were: wilting of crops in the field (96.8%), rotting of root and tubers in storage (96.8%), loss of land due to flood (93.7%), low/too much rainfall (93.7%), loss of properties to flood (92.6%), loss of human lives to flood (88.4%), and increased illnesses among households members (85.3%). Loss of appetite in animals due to high temperatures (77.9%). increase in mosquito population (73.7%), loss of livestock's to flood (61.1%), loss of land fertility due to leaching (60.0%), and high mortality rate of livestock's due to high temperatures (43.2%) were also identifies in the area. These findings show that almost all the respondents have had personal experiences on the different climate change impacts during the past five years. It is therefore obvious that they are highly vulnerable to the effects of climate change and would therefore need improved resilience against the menace.

Nwaiwu et. al. [5] reported steady temperature increases in Southeast Nigeria, and this has caused decline in agricultural production [26]. High temperatures increase the emergence of pest and diseases of crops and livestock with resultant reduction in yield and quality of produce. A study by Mmom & Aifesehi [27] revealed yield losses in major staples such as cassava, yam, potatoes, plantain and banana resulting from climate change. Nebedum & Emodi [28] noted that climate change has exacerbated diseases and pest in livestock production in Nigeria (including foot rot and mange), causing mortalities of livestock which is cutting investment profits by 20% per annum. Climate change is therefore a major threat to agricultural production and productivity in the area. It is impacting heavily on the lives and livelihood of rural people especially those who live and farm around these areas that are very vulnerable to the threats.

Perceived resilience capacity of households

Table 3 reveals a self-valuation of respondents on areas where they thought they have resilience capacity to climate change. Results show that respondents were of the general opinion that they only had resilience capacity in the areas of water sources available to their households (M=2.84; SD = 0.468); family members as source of social capital (M=2.80; SD = 0.412), and health of household members (M=2.15; SD = 0.402). These findings mean that households assessment of the areas they had resilience to climate change were just limited to

Variables	Frequency	Percentage
Disease and pest infestation In the farm	95	100
Loss of land due to flood	89	93.7
High mortality rate of livestock's to high temperature	41	43.2
Loss of human lives to flood	84	88.4
Loss of properties to flood	88	92.6
Communal conflict as a result of scarcity of resources	18	18.9
Drought	8	8.4
Scarcity of water	18	18.9
High temperature / temperature variation	93	97.9
Low/too much rainfall	89	93.7
Loss of livestock's to flood	58	61.1
Damage of crops in the field by winds	94	98.9
Wilting of crops in field	92	96.8
Rotting of root and tubers in the storage	92	96.8
Increased illnesses among households members	81	85.3
Loss of appetite by animals due to high temperatures	74	77.9
Reduced quality of crop produce	95	100
Reduced yield of crops	94	98.9
Reduced animal reproduction	25	26.3
Loss of land fertility due to leaching	57	60
Increase in mosquito population due climate change	70	73.3
Lightening due weather	25	26.3
Emergency of new pest and diseases	20	21.1
Loss of lives due to weather	2	2.1
Multiple responses Source: Field survey, 2016		

Table 2: Distribution of respondents according to climate change shocks experienced in the past five years.

Variables	Mean (M)	Std. Dev.
Infrastructural/physical capital		
Access roads	1.04	0.202
Communication network	1.31	0.463
Electricity	1.06	0.245
Transportation system	1.25	0.461
Water source available	**2.84***	0.468
Standard market	1.98	0.461
Human capital		
Labour available to household	1.88	0.756
Health of household members	**2.15***	0.412
Education of household members	1.95	0.422
Skills of household members	1.86	0.346
Years of work experience of household members	1.87	0.334
Financial capital		
Household savings	1.68	0.733
Supplies of credit/loan to household	1.06	0.245
Regular remittance e.g. salary, pension to households	1	0
Social Capital		
Family members	**2.80***	0.402
Religious groups	1.91	0.547
Kindred groups	1.49	0.543
Cooperatives	1.09	0.294
Social clubs	1.8	0.629
Traditional rulers/Igwes	1.14	0.375
Aid/donor organizations	1.02	0.144
Government agencies	1	0
*Values ≥ cut-off point of 2.0		
Source: Field survey, 2016		

Table 3: Perceived resilience capacity of households to climate change.

their water sources, family members as a source of succour and other emotional helps during disasters and the good health status of the household members.

Adger et al., [16] noted that household resilience capacity comprises not only of tangible objective elements but also their perceived resilience capability, which relates to household's cognitive and affective valuation of their own capability to anticipate, buffer, prepare for, withstand and adapt their livelihood to disturbance and change. Looking at the results from household perceived resilience capacity, it reveals that households in the area do not think of themselves as having sufficient resilient capacity. This is true as households' rating of majority of the resilience indicators including access roads, communication network, electricity, transportation system and so on fall below average. Skoufias et al., [11] stated that factors that reflect households' lower adaptive capacity and higher susceptibility to the impacts of the events include low levels of human and physical capital, insufficient access to assets and services (public or private), weak institutional structures, inexistent or inefficient social protection programmes .When people do not have good access roads and transportation system, it is difficult to evacuate them in times of disasters such as flood. They will also find it difficult to take their farm produce to nearby towns even when there is early warning of impending climate shocks. On the other hand, poor communication network combined with lack of electricity are serious impediments to access to timely weather-related information.

On the other hand, findings reveal that households considered family members as the only source of social capital which aids their resilience to climate change. Other aspects of social capital including religious groups, kindred groups, cooperatives, social clubs, traditional rulers, donor organizations and government agencies were not considered as a source of resilience capacity by the households. These findings indicate that households were more or less on their own as they may not have received substantial aid from any of these other organizations. The implication is that as the households already had very low resilience capacity in terms of other social safety nets, a general lack of aid from relevant social organizations further heightens their vulnerability to the shocks posed by climate change.

Resilient capacity of households

Table 4 reveals the distribution of households according to their resilient capacity assets. Results show that majority (96.8%) of the households had very low resilience capacity; 2.1% had low resilience capacity and 1.1% had very high resilience capacity. This finding indicates that farm households in the area had very low resilience capacity to climate change. The implication is that they are very vulnerable and as such may not recover from possible shocks from climate change. According to the International Fund for Agricultural Development [29], developing countries are critically short of resources for fighting climate change. Over 3 billion people live in rural areas of developing countries with poor quality natural resources, limited communication and transportation networks and weak institutions [29]. All these combine to make rural households highly vulnerable to climate threats. A study by Barua et. al., [30] showed that limited resources, limited livelihood opportunities, lack of access to health care and education contributed to the weak resilience of households and make it extremely difficult for them to manage risk posed by climate change.

Relationship between household resilient capacity assets and their perceived resilience capacity

Ho1: There is no significant relationship between households' resilience assets and their perceived resilient capacity.

Table 5 shows the relationship between household resilient capacity assets and their perceived resilient capacity. The results show that there is a significant (rho = 0.385; p = 0.000) positive correlation between household resilient capacity assets and their perceived resilient capacity. This implies that improvement in household resilient capacity assets increases their perceived resilient capacity. The null hypothesis is therefore rejected for the relationship between household resilience capacity assets and their perceived resilience capacity.

Relationship between socio-economic characteristics and resilient capacity of households

Ho2: There is no significant relationship between socio-economic characteristics of respondents and their resilience capacity to climate change

Table 6 shows the regression estimate of the socio-economic factors affecting household resilience capacity to climate change. Results show that among the factors investigated, number of years spent in school had significant (t =2.213; p = 0.030) positive relationship with resilience capacity of households in the area. This finding imply that the more the number of years spent in school by a household-head, the more the resilience capacity of his/her household to climate change, in other words, acquiring more formal education increases resilience capacity of households to the effects of climate change. Westerman et. al., [31] stated that access to formal education increases resilience to climate disasters. Therefore, education is an important factor in improving resilience of individuals to the effects of climate change. The findings is consistent with that of Piera [32] who found that literacy had tangible influences over peoples' ability to perform adaptation practices such as in areas of livelihoods diversification, access to market exchange, benefits from social protection measures, governance modification and transformation inequalities.

Similarly, farming experience of household-heads had significant (t=3.033; p=0.030) positive relationship with resilience capacity of households to climate change. In other words, the more the years of farming experience of a household-head, the more resilient his/her household would be to the effects of climate change. Farming experience will no doubt improve resilience capacity as individuals would be more likely to learn from past experiences and be able to anticipate the impending dangers that could occur as a result of climate change. The individual will also be able to build more capacity over time. According to Yaro [33], strengthening resilience of rural people involves conscious effort in adopting practices that protect vulnerable people. The implication of this finding is that farmer-to-farmer extension could be encouraged to build household and community resilience in the area. More experienced farmers should therefore be encouraged to share their experiences with others in order to help

Variable	Frequency	Percentage (%)
Very low resilience (≤100,000)	92	96.8
Low resilience (100,001-200,000)	2	2.1
Moderate resilience (200,001-300,000)	0	0
High resilience (300,001-400,000)	0	0
Very high resilience (≥400,001)	1	1.1
Source: Field survey, 2016		

Table 4: Distribution of households according to their resilient capacity to climate change.

		Household resilient capacity assets
Household resilient capacity assets	Correlation coefficient	1
	Sig. (2-tailed)	
	N	95
Household perceived resilient capacity	Correlation coefficient	385
**. Correlation is significant at the 0.01 level (2-tailed).		

Table 5: Spearman rho correlation between household resilient capacity assets and their perceived resilient capacity.

	Unstandardized Coefficients		Standardized coefficient		
Model	**B**	**Std. Error**	**Beta**	**T**	**Sig.**
Constant	32.4	3.036		10.671	0
Sex	-0.841	0.814	-0.116	-1.033	0.305
Age	-0.056	0.032	-0.22	-1.772	0.08
Marital status	1.369	1.064	0.157	1.287	0.202
Number of years spent in formal education	0.129	0.059	0.219	2.213*	0.03
Farming experience	0.09	0.03	0.363	3.033*	0.003
Household size	0.007	1.155	0.005	0.047	0.963
Monthly household income	0	0	0.007	0.071	0.944
Duration of stay in current community	0.037	0.022	0.193	1.732	0.087
Predictors: (Constant): Sex, Age, Marital status, Number of years spent in formal education, Farming experience, Household size, Monthly household income, Duration of stay in current community; Household resilient capacity to climate change; R= 0.492, R2 =0.242; R2 adjusted = 0.172; p≤ 0.05					

Table 6: Multiple regression estimate of socio-economic factors affecting resilience capacity of households.

them build resilience. The null hypothesis is therefore rejected for the relationship between number of years spent in school, farming experience of household-heads and their resilience capacity.

On the other hand, there was no significant relationship between sex ($t = -1.033$; $p = 0.305$), Age ($t = -1.772$; $p = 0.080$), marital status ($t = 1.287$; $p = 0.202$), household size ($t = 0.047$; $p = 0.963$), and monthly household income ($t = 0.071$; $p = 0.944$) and resilience capacity of households to climate change. It may not be surprising that household income does not have significant effect on their resilience capacity as majority of the households were low income earners. Their income would not be substantial enough to help them bounce back after shocks. The null hypothesis is therefore accepted for the relationship between sex, age, marital status, household size, monthly household income and their resilience capacity to climate change.

Conclusions

Based on the findings of the study, it can be concluded that farm households in the area experience quite a number of climate shocks ranging from effects of extreme events such as floods and high temperature on crops, livestock, infrastructure as well as health of farmers. Households' perceived resilience capacity assets were limited to water sources available to them, family members as source of social capital, and health of household members. Generally, farm households in the area had very low reliance capacity to the effects of climate change. Households' resilience capacity assets improve their perceived resilience to climate change. It was recommended that policy makers and development agencies should improve the availability and quality of infrastructural and social resilient assets to households in the area. Also, social organizations including traditional rulers, churches, kindred groups, cooperatives and social clubs in the area could create opportunities for both members and non-members to enjoy some social benefits in times of disasters, conflicts and other climate change related shocks. Farm households on the other hand should take opportunities of possible self-help organizations as well as other social capital in their environment to enhance their resilience capacity to climate change. Knowledge and information sharing on climate change among these farmers are particularly important. Opportunities for less experienced farmers to learn adaptation strategies from the more experienced ones should be encouraged. Education should also be promoted among households in the area as this has been found to improve resilience capacity.

References

1. WHO (2002). Floods : climate change and adaptation strategies for human health / report on a WHO meeting, London, United Kingdom 30 June-2 July 2002. Copenhagen : WHO Regional Office for Europe.
2. Hajat S, Ebi KL, Kovats S, Menne B, Edwards S, et al. (2003) The human health consequences of flooding in Europe and the implications for public health. J Appl Environ Sci Public Health 1(1):13–21.
3. Adger WN, Hughes TP, Folke C, Carpenter SR, Rockstrom J (2005) Social ecological resilience to coastal disasters. Science 309(5737):1036-1039.
4. Treichel V (2010) Putting Nigeria to work: a strategy for employment and growth (English). Directions in development; countries and regions Washington, D.C. : World Bank Group
5. Nwaiwu IUO, Orebiyi JS, Ohajianya DO, Ibekwe UC, Onyeagocha O, et al. (2014) Effects of climate change on agricultural sustainability in Southeast Nigeria – Implications for food security. Asian J Agric Ext Eco Socio 3(1):23-36.
6. Olaore AY, Aja GN (2014) The impact of flooding on the social determinants of health in Nigeria: A Case for North-South institutional collaboration to address climate issues. Dev Count Studies 4(22): 6-12
7. Agbo FU, Arua RN, Okonkwo EA. (2015) Effects of climate variability on the choices of livelihood among farm households in Anambra State, Nigeria. Afri J Agri Res 10(44):4134-4141.
8. https://www.adaptation-undp.org/sites/default/files/downloads/training_tna_iras_may_2012.pdf
9. CB Field, V Barros, TF Stocker, D Qin (2012). IPCC (2012) Managing the risks of extreme events and disasters to advance climate change adaptation (SREX).
10. Food and Agriculture Organization (FAO). (2008) Climate change and food security: a framework document. Rome.
11. United Nations Development Programme (UNDP). (2013) UNDP Strategic Plan, 2014-2017 : changing with the world : helping countries to achieve the simultaneous eradication of poverty and significant reduction of inequalities and exclusion.
12. Skoufias E, Rabassa M, Olivieri S. (2011) The poverty impacts of climate change: a review of the evidence. Pol Res Working Paper.5622
13. Department for International Development (DFID) (2011). Defining Disaster Resilience: A DFID Approach Paper.
14. Tanner TM, Lewis D, Wrathall D, Bronen R, Cradock-Henry N, et al. (2015) Livelihood resilience in the face of climate change. Nature Clim Change 5, 23–26 (2015).
15. Karfakis P, Lipper L, Smulders M. (2012) The assessment of the socio-economic impacts of climate change at household level and policy implication. In: Meybeck A, Lankoski J, Redfern S, Azzu N, and Gitz V. (eds.). Proceedings of a Joint FAO/OECD Workshop on building resilience for adaptation to climate change in the agriculture sector.
16. Adger N, Adams H, Evans L, O'Neill S, Quinn T. (2013) Human resilience to climate change and disasters: Response from University of Exeter.
17. Self Help Africa (SHF) (2015). Resilience programming framework.
18. Twigg J. (2009) Characteristics of a disaster-resilient community: a guidance note (version 2). London: University College London.
19. Adger WN. (2000) 'Social and ecological resilience: are they related?' Prog Human Geography 24(3): 347-364.
20. Folke C. (2006) Resilience: the emergence of a perspective for social–ecological systems analyses. Global Environ Change 16 (3):253-267.
21. Singh, Kamlesh, Yu, Xiao-nan (2010). Psychometric evaluation of the Connor-Davidson Resilience Scale (CD-RISC) in a sample of Indian students. J Psych 1(1):23-30.
22. Jones L, Boyd E. (2011) Exploring social barriers to adaptation: insights from Western Nepal. Global Environ Change 21(4): 1262-1274.
23. Graber R, Pichon F, Carabine E. (2015) Psychological Resilience: Capturing the State of the Research. Literature Review. London: Overseas Development Institute
24. Nwaru JC. (2004) Rural Credit Market and Arable Crop Production in Imo State of Nigerian; unpublished PhD dissertation Michael Okpara University of Agriculture Umudike Nigeria.
25. Amaze PS, Olyemi JK (2000). The Influence of Education and Extension Contact on food crop production in Gombe State. Nig J Agri-busi Rural Dev 1:80-90
26. Akinbobola TO, Adedokun SA, Nwosa PI. (2015) The impacts of climate change on composition of agricultural output in Nigeria. Am J Environ Prot 3(2):44-47.
27. Mmom PC, Aifesehi PE. (2013) Impact of the 2012 flood on water quality and rural livelihood in the Orashi province of the Niger Delta, Nigeria. J Geograph Geol 5(3):216-225.
28. Nebedum EE, Emodi NV (2016). Climate change and its impacts in Nigerian Economy. J Scientific Res Rep 10(6):1-13.
29. International Fund for Agricultural Development (IFAD) (2010). Climate change: Building resilience of poor rural communities
30. Barua A, Katyaini S, Mili B, Gooch P. (2013) Climate change and poverty: building resilience of rural mountain communities in South Sikkim, Eastern Himalaya, India. Reg Environ Change 24(1):267-280
31. Westerman K, Oleson KL, Harris AR. (2012) Building socio-ecological resilience to climate change through community-based coastal conservation and development: Experiences in Southern Madagascar. West Ind ocean J Mar Sci 11(1):87-97

32. Piera F. (2011) The role of literacy in pro-poor climate change adaptation. A dissertation submitted to the school of international development of the University of East Anglia in part-fulfilment of the requirement for the degree of Master of Arts in Education and Development, September, 2011

33. Yaro JA. (2013) Building resilience and reducing vulnerability to climate change: Implication for food security in Ghana.