Journal of Aridland Agriculture 2018, 4: 01-06
doi: 10.25081/jaa.2018.v4.3374
http://updatepublishing.com/journal/index.php/jaa/

ISSN: 2455-9377

REGULAR ARTICLE

CLIMATE CHANGE VULNERABILITY ANALYSIS OF SMALLHOLDER FARMERS IN ENUGU STATE NIGERIA: GENDER SENSITIVE APPROACH

SUNNY UME CHUKWUEMEKA[1], OFFIA ALAEZI KINGSLEY[1], CHUKWUMA UME[2*]

[1]Abia State Polytechnic, Aba, Abia State, Nigeria

[2]University of Nigeria, Nsukka, Enugu State, Nigeria

ABSTRACT

A study was conducted to understand adaptive capacity profiles of male and female farmers, about the climate change vulnerability. Survey/questionnaire approaches were employed to gather data on livelihood activities, asset holdings, social networks and supports and climate-related threats. Following this, vulnerability analysis (adaptive capacity approach) was employed to capture the vulnerability differential between female and male headed farm households. Using a multi-stage random sample of 120 farm households, gender-based vulnerability levels of male and female farm households in the study area were estimated. In addition to this, Participatory Rural Appraisal was conducted in the form of focus group discussions to understand the underlying drivers of gender-induced adaptation differential among smallholder farmers. Using information gathered from the focused groups, in-depth interviews were conducted with agricultural policymakers to link farmers' perceptions about gender and climate change adaptation in the area with that of the policy makers. The result of the study showed that female headed households in Enugu state, Nigeria, are more vulnerable to climate change impact than male headed farm households. Cultural systems, policies and practices, and unwarranted assumptions about women are top among the gender relations issues that undermine efforts in building climate change resilience among female headed farm households. Therefore, shelving of the identified beliefs systems that breed gender inequality in the area should be encouraged to enhance the adaptive capacities of female farmers, which would, in turn, reduce their level of climate change vulnerability.

Keywords: Climate change, Vulnerability, Gender, Adaptive capacity

INTRODUCTION

According to the Food and Agricultural Organization (FAO) report on climate change and food security, this change in climate properties has aggravated the challenges confronting the agriculture sector [1]. The report indicated that climate change will upset the four food security dimensions: accessibility, utilisation, availability, and stability. In addition, climate change will also have a direct impact on the livelihood assets of the rural populace, especially those with less human, material and natural ability to adjust or cope with the consequences of climate change (highly vulnerable groups), and indirect impact on the food distribution channels and market flows due to intense and more frequent extreme weather events [1].

In Nigeria, studies have shown that smallholder farmers in the country suffer the highest known climate risks in the agricultural sector due to their high vulnerability level which is because of their low adaptive capacity [2, 3]. This means that climate change impact will first affect food systems and livelihood groups with higher level of vulnerability [1]. The IPCC defined climate change vulnerability as "the degree to which geophysical, biological or socio-economic systems are susceptible to and unable to cope with adverse impacts of climate change" and Adaptive capacity as the "ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies" [4].

The potential impact of climate change on female smallholder farmers in different parts of Nigeria are well-known. [3] had reported that among smallholder farmers in Nigeria, female farmers are expected to have higher levels of vulnerability compared to their male counterparts due to their lower adaptive capacities. This, according to [3], is due to socioeconomic and institutional factors that undermine their adaptation efforts. According to [5] gender transformation, in a context of re-evaluation of institutional and socioeconomic factors and relations established over time can shape relationships between the female and male genders, and as such spur a novel research direction if meaningful transformative adaptations are to be pursued and achieved.

The aim of this study was to understand how gender-vulnerability relations affect climate change adaptation in

Received 19 December 2017; Accepted 20 January 2018

*Corresponding Author

Chukwuma Ume

University of Nigeria, Nsukka, Enugu State, Nigeria

Email: chukwuma.ume@unn.edu.ng

order to unpack evidence and lessons for policy makers on how to frame progressive strategies to transform gender relations in the study area. Specifically, the study seeks to:

i. Compare the adaptive capacity profiles of male and female-headed farm households in the area;

ii. Understand the roles of institutional factors in spurring and transforming gender relations.

MATERIALS AND METHODS

Study area

The study area for this research is Enugu state, Nigeria. The state is one of the five states in the South East geo-political zone of Nigeria. Enugu state was selected purposively because: (a) majority of the rural dwellers in this state engage in small-scale farming, (b) the state is regarded as the capital and policy-making seat of the South-east geopolitical zone, (c) the state is reported to have experienced marginalisation of women in climate change adaptation decision making [6]. Enugu state has a population of about 3,267,837, with approximately 1:1 ratio of male and female. The state is divided into 3 Agricultural Zones [AZs] based on the similarities in soil characteristics and by meteorological properties [7]. The zones include Enugu zone, Awgu zone and Nsukka zone. The state is in a tropical rainforest zone, with a mean daily temperature of 27oC and monthly rainfall of 18 mm. In recent times, the state has experienced a dramatic deviation from the regular rainfall patterns with a difference of 281 mm of precipitation between the wettest and driest months in the year. The average temperature increase is estimated at 0.30C per decade [7]. The topography is undulating with an elevation between 1,700m and 2,900m above sea level [7].

Sampling procedure

As employed in [8, 9], a multi-stage (four stage) sampling technique was employed to select 120 farm households to be surveyed. In the first stage, the three agricultural zones (AZs) of the state were selected. In the second stage, two Local Government Areas (LGAs) within each of the three zones were randomly selected. In the third stage, two communities (Cs) were randomly selected from each of the selected LGAs. In the fourth stage, ten farm household heads (HHs) (5 male-headed and 5 female-headed) were proportionally selected from the two Cs, proportional selection was done to reflect the actual population. Semi-structured questionnaires were administered only to the household heads as their decisions are assumed to affect the entire household.

Data collection

For this study, both primary and secondary data were used. Data were collected between June 1st, 2017 to 10th of July 2017, a period of 41 d. The study utilised a mixed methods approach in obtaining the primary data. Context-specific qualitative data were combined with quantitative data sourced through household surveys of 120 farm household heads using pretested semi-structured questionnaires. Questionnaires were structured to generate data covering the broad and specific objectives of the research. The primary data obtained include data on the socio-economic characteristics of the farmers such as gender, age, marital status, farm size, education, farming experience, farm income. Others include data on the farmers' level of awareness of climate change indicators [4], their level of contribution to decision-making in climate change adaptation practices, and the climate change coping strategies employed by the farmers. This approach and indicators have also been adopted and successfully employed in similar studies such as in [8, 9, 11].

Finally, using a Participatory Rural Appraisal method, qualitative data on the underlying institutional factors and barriers mitigating efforts in improving women's adaptive capacity were collected. The participatory appraisal was necessary to elicit historical narratives on the subject. it provides an insider perspective and gives an opportunity for the farmers to get involved in analysing the challenges affecting their livelihood, and to proffer realistic recommendations [12]. Specifically, the Participatory Rural Appraisal was conducted in the form of a focus group discussions which lasted for an average of 45 min. The sample size for the focused group was kept at six farmers per time, although in two cases farmers who were not initially invited to the meetings were allowed to join the group. Two focus groups each (male group and female group) were conducted at Nsukka and Enugu zones, but due to the limited number of volunteering male farmers at Awgu zone, only the female focus group session was held in the zone. The focused group with the female farmers were conducted separately from the focused groups with the male farmers. This was to allow for free flow of conversation within the group as the women might not freely and completely air their views in the presence of their male counterparts. This avenue was used to obtain responses to the farmers' view on the role of policy and social norms in creating a gendered society. Using information gathered from the focused groups, an in-depth interview was conducted with agricultural policymakers in the zones to link the farmers' perceptions with that of the policy makers. Local government officials, Agricultural Development Programme (ADP) officials and experts from the African Climate Change Adaptation Initiative (ACCAI-UNN) were interviewed.

Data analysis

The types of analysis employed were informed by the research objectives and data collected. Studies on livelihoods and climate change resilience often employ Vulnerability Analysis (VA) technique by combining data on various elements of vulnerability. For example, the technique of combining sensitivity, exposure and adaptive capacity elements of vulnerability was employed by [13] and [14] to locate vulnerable hot spots in different regions. Similarly, in calculating the vulnerability differential between male and female-headed households in Enugu state, Nigeria, [11] employed the Adaptive Capacity Approach (ACA) of the VA to assess and compare climate change vulnerability between male and female headed households in the South-west Nigeria. The ACA is based on the hypothesis that an increase in adaptive capacity (potential adaptation) will lead to a reduction in vulnerability [11]. The variables (adaptive capacity indicators) that were used to measure the adaptive capacity of farm households in Enugu state Nigeria are presented in table 1. in Enugu state Nigeria are presented in table 1.

Table 1: Adaptive capacity indicators of farm households in Enugu state Nigeria

Adaptive capacity indicators	Variables
Farm income	Income level (in Naira)
Level of education	Years of formal education (in years)
Land ownership status	Farm size (In hectares)
Access to farmers' cooperative	Dummy (*1 = yes, 0 otherwise*)
Number of farm labourers	*Continuous (number)*
Extension visit	Number of extension visit in the last cropping season *Continuous (number)*
Access to farm loan	Dummy (*1 = yes, 0 otherwise*)
Years of farming experience	*Continuous (number)*
Occupation outside farming	Dummy (*1 = yes, 0 otherwise*)
Information on disaster warning	Access to mass media to listen and other means *Continuous (number)*

***Source**:* Adapted and modified from [11]

Each of the variables was assigned equal weight values, for standardization purpose, and the average taken as the value for the adaptive indicator [15]. The values of the adaptive indicators were normalised so that they will be free from their respective units and lie between min=0 and max=1. The normalisation was done using the formula employed in UNDP method of normalising life expectancy variables in the Human Development Index (HDI) calculation, which was also adopted in [15, 16]. The equation is given as;

$$NSv = \frac{Sv - Smin}{Smax - Smin}$$

Where;

NS_v = Normalised value for the component

S_v = value of the component

S_{max} and S_{min} = the maximum and the minimum possible values respectively

The vulnerability Index (VI) was now generated as potential impact minus adaptive capacity. Therefore, VI = *f*(I–*NSV*)

Where:

I = potential impact (Exposure+Sensitivity)

The Average Vulnerability Indicator of each component is calculated as:

AVI = Σ[(1-NSVN)] ÷ N

Where:

Σ(1-NSVN) = Summation of all the normalised vulnerability scores for each component

N = number of observations for each component for each gender,

When the Average Vulnerability Indicator (AVI) of each component was determined, then the Vulnerability Index (VI) for each gender was calculated by simply finding the mean of all the vulnerability variables of the male headed and female headed households. Therefore,

VI = Σ [(ΣNSVN) ÷ N]k/K

Where K = number of observations for each gender

RESULTS

All the household heads sampled in this study agreed to take part in the survey. The percentage of missing responses to the survey questions was less than 3% for all the 120 questionnaires administered to the household heads. A listwise deletion was employed in handling observations with the missing data. The result of the data analysis is presented in table 2. Table 2 presents the values of the components of the Average Vulnerability Indicators (AVI) for each gender. The table also shows the values for the overall gender-based vulnerability index and the vulnerability index by zones. The result represents the comparison between vulnerability indicators of the Female Headed Households [FHHs] and Male Headed Households [MHHs]. How

Table 2: Gender-vulnerability differential among farm households in Enugu state, Nigeria

Adaptive capacity indicators		Agwu	Nsukka	Enugu	Average
	Gender	Vul. index	Vul. index	Vul. index	Vul. index
Farm income	MHHH	0.64	0.78	0.68	0.70
	FHHH	0.70	0.81	0.57	0.69
Level of education	MHHH	0.58	0.55	0.40	0.51
	FHHH	0.59	0.69	0.46	0.58
Land ownership status	MHHH	0.15	0.66	0.69	0.50
	FHHH	0.25	0.92	0.70	0.62
Access to farmers' cooperative	MHHH	0.15	0	0.30	0.15
	FHHH	0.25	0	0.45	0.23
Number of farm laborers	MHHH	0.49	0.61	0.60	0.56
	FHHH	0.61	0.67	0.84	0.70
Extension visit	MHHH	*0.70*	*0.57*	*0.86*	*0.82*
	FHHH	*0.80*	*0.75*	*0.93*	*0.71*
Access to farm loan	MHHH	*0.30*	*0.40*	*0.25*	*0.31*
	FHHH	*0.55*	*0.55*	*0.35*	*0.48*
Years of farming experience	MHHH	0.43	0.47	0.92	0.60
	FHHH	0.48	0.42	0.87	0.59
Occupation outside farming	MHHH	0.60	0.40	0.30	0.43
	FHHH	0.95	0.75	0.45	0.71
Information on disaster warning	MHHH	0.78	0.89	0.57	0.74
	FHHH	0.83	0.61	0.56	0.66

Source: 2017 field survey

OVERALL GENDER-BASED VULNERABILITY INDEX

MHHH = 0.55

FHHH = 0.61

VULNERABILITY INDEX BY ZONE

AGWU ZONE = 0.56

NSUKKA ZONE = 0.59

ENUGU ZONE = 0.59

Using farming income as a vulnerability indicator (1– Adaptive Indicator), the overall vulnerability score was higher for MHHs (0.70) compared to FHHs (0.69). This means that the FHHs have higher income adaptive capacity compared to their male counterparts. However, FHHs showed a higher vulnerability score in terms of farming income across Agwu zone (female: 0.70; male: 0.64) and Nsukka zone (female: 0.81; male: 0.78), while the vulnerability was higher for the MHHHs in Enugu zone (female: 0.57; male: 0.68). The FHHs reported a higher average vulnerability score in terms of school attendance/levels of education when compared with their male counterparts (female: 0.58; male 0.51). This means that MHHs had higher educative adaptive capacity compared to their female counterparts. This is consistent across the three zones. The average reported land ownership status resulted in a vulnerability score of 0.62 for FHHs and 0.50 for MHHs. Across the zones, with respect to land ownership, FHHs demonstrated less capacity with higher vulnerability score.

FHHs also had higher vulnerability score (lower adaptive capacity) in terms of access to loan, access to farmers' cooperatives and access to disaster warning information compared to MHHs. On the average, FHHs vulnerability score was found to be 0.08 more than their male counterparts in terms of access and ease of joining farmers' cooperatives (table 2). Interestingly, all the male and female respondents in Nsukka zone were members of one farmers' cooperative or another. In terms of access to credit or loans, the table shows that FHHs had higher vulnerability score across the three zones. On the average, the vulnerability scores were (FHHs=0.48 and MHHs=0.31). However, the result of the analysis showed that in terms of access to disaster warning information, MHHs were more vulnerable on the average with a vulnerability score of (MHHs=0.74 and FHHs=0.66). In Nsukka zone (MHHHs=0.89 and FHHs=0.61), in Enugu zone (MHHHs=0.57 and FHHHs=0.56). Only in Agwu zone was the vulnerability score higher for the FHHs (MHHs=0.78 to FHHs=0.83).

Further, FHHs also showed a higher vulnerability score in terms occupation outside farming and number of farm labourers. However, in terms of farming experience (number of years spent in farming occupation) and the number of extension visits, the FHHHs had a higher vulnerability score compared to their male counterparts. Across the zones, a higher proportion of the FHHs reported relying solely on agriculture for income, while more of the MHHs had off farm streams of income. The vulnerability scores for off farm jobs stood at 0.71 for FHHs and 0.43 for MHHs. Similarly, the average vulnerability indicator in terms of number of farm labourers, the FHHs were found to have less adaptive capacity with a vulnerability score of 0.70 for FHHs and 0.56 for MHHs. Across the three zones, FHHs also have higher vulnerability score (table 2). Table 2 also shows that FHHs had less extension agent visits but more farming experience than their male counterparts. When the three zones were averaged, the vulnerability score was higher for FHHs than MHHs in terms of extension agent visits but lower in terms of farming experience (table 2).

Overall, when the entire vulnerability scores for the vulnerability indicators were aggregated to obtain the gender-based vulnerability index, FHHs had a higher vulnerability index than MHHs (FHHs=0.61 and MHHs=0.55), signifying their relatively higher vulnerability (lower adaptive capacity) to climate change impacts. In terms of zones, the result of the analysis showed that smallholder farmers in Agwu zone are relatively higher adaptive capacity to climate change impacts (VI = 0.56) compared to Enugu zone and Nsukka zones with an overall vulnerability scores of 0.59 each. For further clarification, fig. 5 presents a bar chart of the Adaptive capacity indicators and the average vulnerability scores for the male and female-headed households.

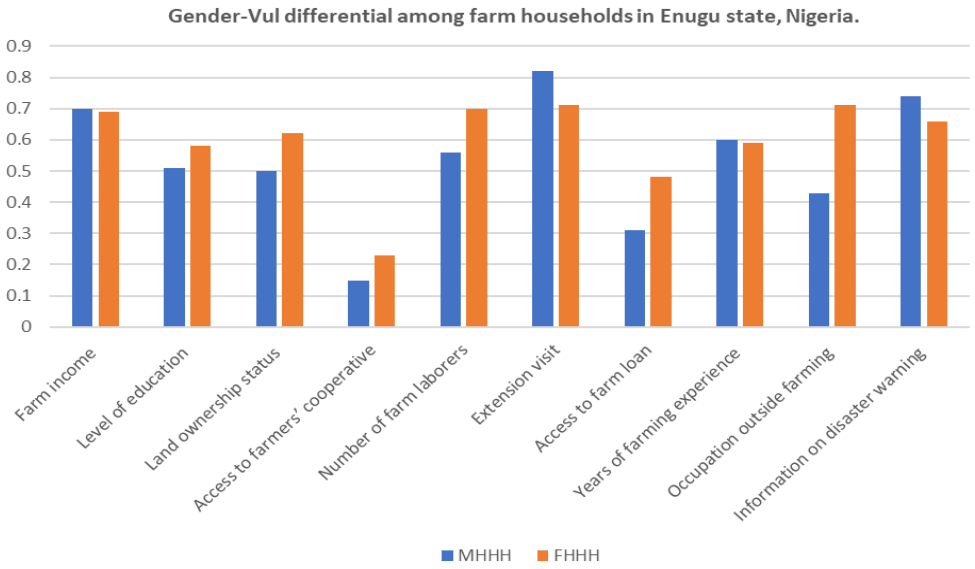

Fig. 1: Gender-adaptive capacity indicators of farm households
Sources: Field Survey (2017)

DISCUSSION

The aim of this research was to understand the adaptive capacity profiles of male and female farmers, and using knowledge of factors that underline determinants and extent of adaptation to inform/shape institutional interventions for resilience building. Compared to most states and regions in Nigeria, there is a reduction in the vulnerability gap between male and female-headed households in Enugu state. This is judging from the vulnerability scores from this study which was based on the adaptive capacity of FHHs and MHHs in the area. This is also confirmed by the participatory rural appraisal with farmers and interviews with policy makers who have experienced a certain level of gender equality in recent times about to climate change adaptation efforts in the area. This means that there has been a level achievement in bridging the vulnerability gap between FHHs and MHHs and improving climate change resilience in the regions [5]. Notwithstanding, in most of the adaptive capacity indicators assessed in this study, women were still more vulnerable when compared to their male counterparts.

Adaptive capacity assessment is important as programmes for community assistance can be channelled to improving targeted adaptive capacity of FHHHs. For instance, it was observed from the focused groups that FHHHs in Agwu zone on the average spend more time on their farms and, unlike other zones in the area, they also have access to artificial wells developed by female cooperative societies where they can harvest rainwater for use during dry seasons. These adaptation strategies have likely decreased their vulnerability as reflected in their higher farm income level compared to their male counterparts. What this suggests is that efforts in providing water assistance for female farmers in Enugu and Nsukka zone might be of great help in improving their adaptive capacity and generating more income. The implication of MHHHs having a lower vulnerability score in terms of farming income in the other two zones (Enugu and Nsukka zones) implies that they have higher income capacity to employ more coping strategies as compared to the female counterparts. This is in line with the findings of Agabi (2012) who reported that an increase in the farming income of farm households in Nigeria increases their coping strategies and access to adaptation technologies.

Using education of household head as an indicator, FHHs were found to be more vulnerable, hence having lower educative capacity to adapt to climate change impact. This finding corroborated the study by Rockefeller Foundation (2008) who reported that MHHs have greater educative capacity to adopt more coping strategies compared to FHHs with. Similarly, as gathered from the group discussion with the farmers, because the female farmers were perceived by the extension agent to be less educated, a higher proportion of the extension visits were still targeted at the MHHs. The high vulnerability index in terms of extension visits (0.82) for the FHHH implies that only about 20% of the female farmers surveyed have access to extension services. This corroborates the claim made by [17] that FHHs in the country have lower training to cope with climate change and improve adaptive knowledge. However, although the MHHs have a relatively lower V. I in terms of extension visits, the high vulnerability score for both gender, MHHH=0.71 and FHHs=0.82 generally reflects the low level of agricultural extension activities in the area. This suggests that facilitating extension programmes might constitute an appropriate intervention in the area at large.

Considering farm size and land ownership status, FHHs were also more vulnerable than their male counterparts. In fact, the bulk of the discussions and major theme emanating from the Participatory Rural Appraisals centred on the inability of the women to access larger farming plots to increase production. Most of the women who have large farm size only acquire these plots on rents and must pay a lot out of their harvest proceeds to keep them and are therefore left with very little income at the end. This finding agrees with the report in [18] that "women in Nigeria rarely claim ownership on land despite their heavy involvement in agriculture". Similarly, in terms of access to loan and farm credit, the high V. I of the FHHs indicates they are more constrained in increasing their financial base which consequently reduces their adaptation capacity. A study conducted in Ghana, West Africa by [19] showed that increase in farmers' access to credit facilities increases their possibility of purchasing improved varieties of seeds and fertilisers and adopting new adaptation technology. This also has a connection with the inability of the FHHs to employ adequate labour force on their farms. Study by [20] showed that access to farm credit facilitates the number of labourers employed by a household. The high farm labour vulnerability score of FHHs in the area suggests that they have lower labour force to effect climate change adaptation strategies. However, it was observed that most female heads with many persons in their households usually employ them as labourers in the farm. This was particularly the case in Agwu zone where most of the household members were employed as farm labourers. This explains the low vulnerability score of the FHHs in the zone as regards to farm labour, unlike the case in Enugu and Nsukka zones. Using access to cooperative societies as vulnerability indicator, it was observed that most of the farmers belong to one form of cooperative society or another. In fact, in Nsukka zone, all the farmers surveyed belonged to farmers' cooperative societies. The farmers mentioned that through cooperatives societies, it was easy for them to access subsidised inputs such as improved seeds and fertilisers. Additionally, it was observed that most of the cooperatives were gender based, with the female farmers forming their own cooperatives. This shows the importance of gender-based farmers' cooperatives. A gender-based farmers' cooperatives helped the farmers contribute freely to farming decisions as well as directly accessing available resources themselves.

Using on off-farm occupation as a vulnerability indicator, FHHs had a higher vulnerability score which means that greater percentage reported relying only on farming for income. In fact, In Agwu zone, for instance, the Vulnerability score for the FHHs was as high as 0.95 showing a high dependency on agriculture. But, on the average, over 60% of MHHH in the three zones reported collecting natural resources, engaging in carpentry and palm wine tapping as different means of off-farm income. Improving the livelihood diversification strategies of the women in the area, therefore, presents a very good way of improving their resilience, as this will help cushion any shock or loss resulting from climate change.

Overall, the adaptive capacity approach presents the material, institutional and human resources available to cope with climate change impact. The result of the analysis showed that using adaptive capacity approach, FHHs in Enugu state, Nigeria were more vulnerable to climate

impacts than MHHs. This finding although in line with previous studies (11,19], showed a close-up of the vulnerability gap between male and female headed households. For instance, [11] reported an overall vulnerability index of (FHHH=0.73 and MHHH=0.43), while in this study, the overall vulnerability index is (FHHH=0.61 and MHHH=0.55). although this variation might also be attributed to the fact that the studies were conducted at different locations and with varying adaptive capacity indicators.

According to zones, the result also showed a close match between the three zones that make up Enugu state, Nigeria. Interestingly, Nsukka zone and Enugu zone have the same vulnerability index (0.59 each). However, contrary to expectation, Agwu zone, which is considered as the least developed zone according to the indigenes, in terms of infrastructure and state government interventions, among the three zones that make up the state, has the lowest vulnerability index. This finding can be attributed to the high farm income of the farmers in Agwu zone, because of their personal efforts in developing improvised adaptation technology due to their high interest in agriculture, and their better access to land which might have enhanced their ability to adopt varieties of adaptation strategies.

CONCLUSION

This study established the existence of climate change adaptive capacity differential between MHHs and FHHs in Enugu state, Nigeria. By incorporating context-specific evidence from rural farmers, the underlying gender relations and cultural orientations undermining the adaptive capacity of FHHs were explored. Transforming gender relations and cultures must form the bed rock for building resilience among farm households in the area. Based on the findings from this study, shelving of the identified belief systems that hamper adaptive capacities of females in the area should be encouraged. It has become obvious that with such belief systems on ground, adaptation efforts might be jeopardised. Since gender relations issues are produced by people through interaction, through a deliberate effort by the people, the unwarranted assumption about women and the enshrined belief systems can also be changed.

ACKNOWLEDGEMENT

The authors wish to express their profound gratitude to the board of the Climate Bursary Fund, University of Leeds, United Kingdom for providing the finances required for the data collection of this research work

AUTHORS' CONTRIBUTIONS

Authors contributed equally to the overall study and manuscript preparation and approved the final version of the manuscript for publication.

REFERENCES

1. Food and Agriculture Organization [online] Climate Change and Food Security Available at: http://www. fao. org/forestry/ [Accessed 13 May 2017].
2. Suleman Iguda. An appraisal of climate change and agriculture in Nigeria. Journal of Geography and regional planning. 2014. pp.176–184.
3. Anselm A E. Challenges of agricultural adaptation to climate change: The case of cassava post-harvest in Southeast Nigeria, International Journal of Climate Change Strategies and Management, 2013, 5(4):455-470.
4. IPCC. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Annex I., M. L. Parry, et al., Eds., Cambridge University Press, Cambridge, UK, 2007. 976pp.
5. Eakin, H., Tompkins, E. L., Nelson, D. R. and Anderies, J. M. Hidden costs and disparate uncertainties: Trade-offs involved in Approaches to Climate Policy. In: Adger, N., et al. ed(s). Adapting to climate change: thresholds, values, governance. Cambridge Univ Press, 2009. pp. 212-226.
6. Ekwe, O. C., Apeh, A. C. and Odoh, O., Dealing with our apathy through the radio : analysis of the role of frcn nn 9 ko umunwanyi programme in influencing women to participate in politics., 2014. 32(2009), pp.70–82.
7. Ifeanyi, Enete. Impact of climate change on agricultural production in Enugu state. Journal of earth science and Climate change, 2014.
8. Mutabazi, K., et al. Assessing the determinants of poverty and vulnerability of smallholder farmers in a changing climate: the case of Morogoro region, Tanzania. Regional Env. Change, 2015. 15, 1243-1258
9. Enete, A. A. and T. A. Amusa. Determinants of women's contributions to farming decisions in cocoa based agro-forestry households of Ekiti State, Nigeria. FACTS Reports, the International Journal of Field Actors. 2010. Vol. 4.
10. Stangor, Charles. Research Methods for the Behavioral Sciences. 2007. 3rd ed. Boston, MA: Houghton Mifflin Company
11. Amusa T. A. Gender and farm household decision on climate change adaptation in south east, Nigeria. Unpublished Phd thesis, University of Nigeria, Nsukka, 2010.
12. Rockefeller Foundation. Climate change adaptation in African Agriculture, Stockholm Environmental Institute. Available at: http://www.fao.org/ [Accessed, 13 May 2017]
13. Agrawala, S., Ota, T., Ahmed, A. U., Smith, J. and Van Aalst, M., Development and climate change in Bangladesh: Focus on coastal flooding and the Sunderbans, Organisation for Economic Co-operation and Development (OECD), Paris. 2003.
14. Eriksen, S. and Kelly, P. M, 'Developing credible vulnerability indicators for policy assessment', Mitigation and Adaptation Strategies for Global Change 2006. 12, 495–524.
15. Tewari, H. R. *et al.* Livelihood vulnerability index analysis: An approach to study vulnerability in the context of Bihar., 2010. pp.1–13.
16. Hahn, M., Riederer, A. and Foster, S. O. The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability. 2009.
17. Apata T. G, *et al.* Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria. International Association of Agricultural Economists' 2009 Conference, pp.1–15.
18. Julia, A. and Okhimamhe, A. Gender and climate change in Nigeria: a study of four communities in north-central and south-eastern Nigeria. Heinrich Böll Stiftung, 2009 pp.1–71.
19. Füssel, H. M. Adaptation planning for climate change: concepts, assessment approaches, and key lessons. Sustainability Science, 2007. 2, 265?275.
20. Heinrich Böll Stiftung Nigeria. Gender and Climate Change in Nigeria. [online] Available at: https://ng. boell. org/ [Accessed 14 May 2017].