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VULNERABILITY OF FARMING HOUSEHOLDS TO CLIMATE CHANGE AND VARIABILITY AT IKPAYONGO COMMUNITY, GWER, BENUE STATE, NIGERIA: A GENDER PERSPECTIVE

[1]Jeiyol, E.; [1]Onah, M. A.; [1]Adimanyi, O. and [2]Ukange, C.
[1]Department of Geography, Benue State University, Makurdi
[2]Gender and Environmental Risk Reduction Initiative (GERI) and
*Corresponding Author: *ejeiyol@bsum.edu.ng;*

ABSTRACT

This study assessed vulnerability of farming households to climate change and variability with gender dimension in focus at Ikpayongo community of Gwer-Easter LGA of Benue State, Nigeria. The study identified a total of 120 male-headed and female-headed farming households administered structured questionnaire on them using simple random sampling method. Livelihood Vulnerability Index (LVI) and IPCC- LVI were used to determine the levels of vulnerability, while independent two-sample student's t-test was used to test the significant difference in vulnerability levels based on gender. The result generally indicates a significant difference in the vulnerability levels between female-headed and male-headed farming households, with female–headed households having higher in terms of exposure and sensitivity factors (female = 0.492, male 0.444), social and human capital (female = 0.433, male = 0.397), and natural capital (female =0.415, male 0.368), and lower economic and communication factor (female = 0.428, male = 0.431). The overall LVI indicates that female-headed households were more vulnerable with an LVI of 0.442 for male and 0.464 for female. Similarly, the LVI-IPCC result still shows a higher overall vulnerability for female-headed households (LVI-IPCC = 0.025) compared to male-headed households with LVI-IPCC of 0.014). The study therefore concludes that female-headed farming households are more vulnerable to climate change and variability than male-headed farming households due to higher exposure and a lower adaptive capacity. The study recommends that relevant stakeholders should make concerted efforts to improve women access to more fertile lands, improved farm inputs to reduce the extent of exposure with attendant reduction in vulnerability. Increases access to credit facilities will also help boost adaptive capacity especially for female-headed households.

Key words: Climate change, gender, farming households, vulnerability

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INTRODUCTION

Climatic change is considered as one of the biggest environmental challenges confronting mankind across the globe. It has impacted unfavourably on key sectors such as health, energy, agriculture, infrastructure and tourism through rising temperatures, changes in patterns of precipitation and disease outbreaks (IPCC, 2007). The impact is expected to be higher on agricultural sector especially in developing countries where agriculture is largely climate depend particularly rain-fed, thereby making this sector highly vulnerable. These recent increases in temperatures, alteration in rainfall patterns are resulting in increasing frequency of extreme climatic events such as floods and droughts with attendant negative implications for environment and agriculture. (IPCC, 2007;

Asante and Amuakwa-Mensah, 2015; Alhassan, Kuwornu and Osei-Asare, 2019).

The term "vulnerability" has been used to portray different interpretations in different disciplines and does not lend itself to a precise and concise definition. According to Turner*et al.*(2003) vulnerability is the extent of injury likely to be caused to a system as a result of its exposure to a hazard. While the Third and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change (2014) defined vulnerability as the level to which a system is susceptible to, or incapable of coping with the adverse effects of climate change, climate variability and extremes. Vulnerability deals with the character, magnitude and degree of exposure of a system to climate change and variability, its sensitivity and adaptive capacity. In other words, vulnerability is a function of exposure and sensitivity of a system and its ability to adapt. According to IPCC (2007), adaptive capacity of a system is its ability to reduce the possible consequences of climate variability through prevailing opportunities or using measures to deal with these consequences; sensitivity is the extent to which a system is affected by climate-related stimuli either positively or negatively; covertly or overtly; and exposure is the extent to which a system is unshielded from major climate-related events. In this study, vulnerability is the extent to which a farming household are exposed and susceptible to, and their capacity to adapt to, the negative effects of climatic stresses.

In Nigeria, agricultural sector which is dominated by small-scale farmers who cultivate on two-hectare farm lands or less, account for about 35% of employment and contributed approximately 26% the GDP in 2019 (World Bank, 2020). Also, in Nigeria like other parts of the tropical region, climate change and variability are predicted to unduly distress farmers, making their livelihoods more vulnerable (IPCC, 2014). Despite Nigeria's reliance on crude oil, a large percentage of the population (70%), especially women, are involved in agriculture and other economic activities. The reliance on rain-fed agricultural practices, pastoral and nomadic animal husbandry activities, all dependent on favourable climate conditions, hence, vulnerable to negative impact of climate change. As such, the impact of climate change on agriculture, water resources and pastures affecting livelihoods impedes development activities and impacts on men and especially women who are economically dependent on agricultural activities (National Action Plan on Gender and Climate Change for Nigeria, 2020).

Furthermore, the effect of climate change and variability is expected to differ based on agro-ecological regions, spatial features and across socio-economic groups such as gender differentials (Boko *et al*, 2007; Alhassan *et al,* 2019). Though both male-headed and female-headed farming households within the same geographical location are exposed to the same climatic conditions, the extent of effect of the climatic stresses varies between men and women, because of differences in their levels of adaptive capacities and sensitivity. Thus, vulnerability to climate change is worsened by gender disparity (Boko *et al*. 2007; World Bank, 2010; Alhassan *et al,* 2019).

Women are the majority of the world's poor and are more often responsible for household food production, family health and nutrition, and management of natural resources—sectors that are particularly sensitive to climate change (UN Women, 2017; National Action Plan on Gender and Climate Change for Nigeria, 2020). The same is indicative of Nigerian women (National Bureau of Statistics 2011) though the extents to which women are saddled with these responsibilities vary one place to another and over time due to socio-cultural differences. Therefore, understanding the extent of vulnerability of farming households to climate change from gender perspective is key to gender mainstreaming and inclusion in leadership to address climate change and influence policy. Moreover, women contribute more than 70 percent of the labour force in the agriculture sector, 60 percent engage in food processing, while 50 percent are involved in animal husbandry in Nigeria. But despite these contributions, women are still plagued with the challenges of access to land, finance, farm implements and extension services which are likely to limited their adaptation to climate change impacts and risks on their farming activities.

Benue State in general and Ikpayongo community in particular which is about 10 km from Makurdi, the state capital is a rich agricultural area of Nigeria with oranges, mangoes, sweet potatoes, cassava, soya bean, guinea corn, yams, sesame, rice, groundnuts, and palm tree as the major crops grown. Agriculture forms the backbone of the Benue State economy, engaging more than 70 per cent of the working population. This has made Benue the major source of food production in the Nation. However, irrigation farming is still extremely limited and even completely absent in most parts of Benue state, hence, agriculture here is largely climate dependent. Men and women engage in agriculture which exposed to the same impacts of climate change, however, male-headed and female-headed farming households with disproportionate access to exposed to adaptive capacities. Therefore, knowledge and understanding on the extent of vulnerability the farming households and adaptation in the study area is scanty or non-existent in the literature which makes the study imperative.

MATERIALS AND METHODS

Study Area

Ikpayongo is an agrarian community in Gwer-East local government area of Benue state, and is located about 10km from Makurdi, the State capital. The area is found between latitude 7°43' 50"N and longitude 8°32' 10" E (Figure 1) with an estimated population of 50,000 persons. The area has a mean elevation of 110 metres above sea level (Ali, Onah, Mage, Yiyeh, Tarzoho and Iorhuna, 2022). Ikpayongo is bounded by Makurdi local government to the North, and largely under the influence of Makurdi growing into a semi-urban area. It is an important agricultural community, though largely subsistence and rain-fed agriculture. The area lies in the wet and dry savannah climate (Aw) and experiences a mean temperature of 28°c while mean monthly temperature values indicate that the coolest and hottest months are December (26^{0}C) and March (31^{0}C) respectively (Tyubee, 2008). Its relative humidity fluctuates with seasons, reaching its means monthly peak of about 92% in the rainy season, which begins in April, reaches its peak in August and decreases to end in October. The dry season on the other hand last for five (5) months (November – March). The area has a mean annual rainfall total of 1190mm and annual rainfall total ranging between 775mm and 1792mm. The area is drained by the following seasonal streams/river - Kinde, Ansaagh (river), Yakpande, Jagura and Tindi-kyula streams.

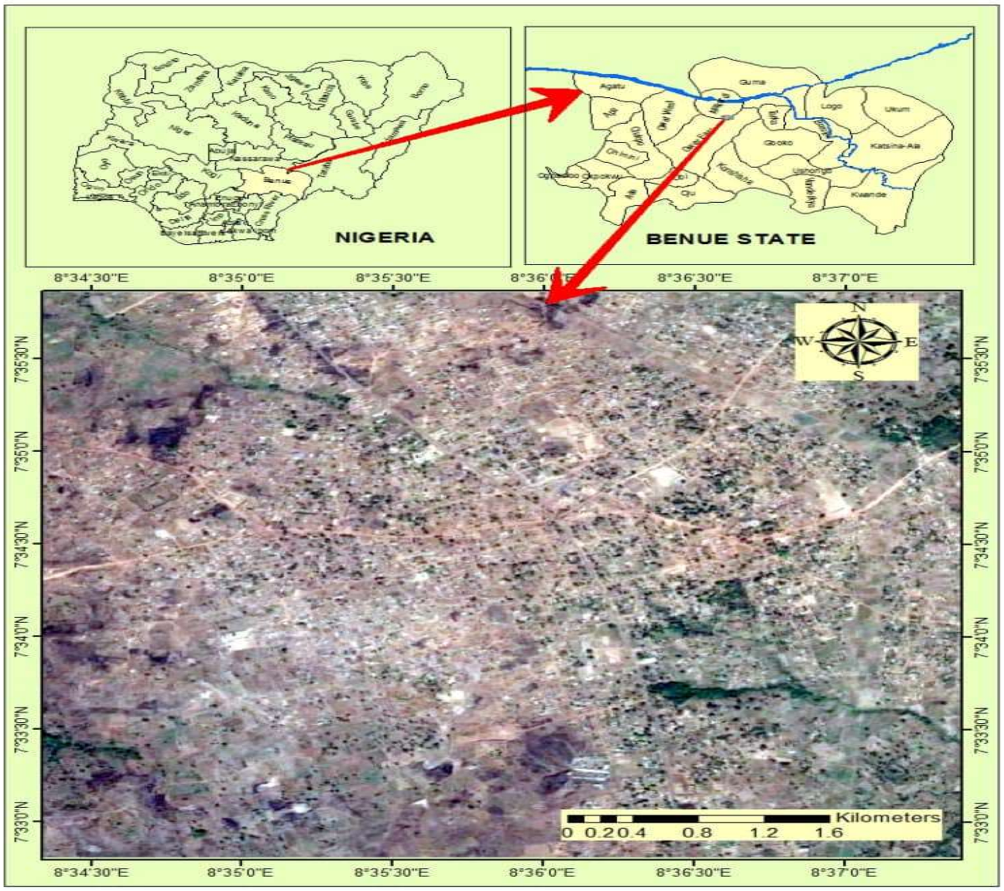


Figure 1: Ikpayongo Community of Gwer Local Government Area of Benue State, Nigeria

Experimental design

The study used structured questionnaire to collect quantitative data from respondents for the computation of vulnerability levels for farming households to climate change and variability. There were however instances where the researchers obtained additional information from respondents through follow-up interview at the cause of administering questionnaire and observation. Consequently, 120 copies of questionnaire were administered to farming household heads using simple random technique across Ikpayongo community and were all retrieved for analysis as they were administered on one-on-one basis in form of face-to-face interview.

This study used indicator approach to measuring vulnerability to climate change and variability as against econometric approach. The indicator approach involves choosing components/factors which the researchers considered as indicators of vulnerability and then computing indices for these components/factors. The major shortfall of the indicator approach is the subjectivity on the part of researchers in selecting the indicators of vulnerability to be incorporated in computing the vulnerability index (Alhassan, Kuwornu and Osei-Asare, 2019). However, indicator approach is still preferred over the econometric approach because it is easier to compute and comprehend by readers with low mathematical inclination. In addition, it is more appealing and intuitive than those of the econometric approach.

Several indicator methods have been developed and applied by several authors in different disciplines to measure vulnerability depending on their research objectives. They include Social Vulnerability Index (SVI) (Vincent, 2004; Cutter *et al*. 2008; Ge *et al*. 2013; Lee, 2014); Climate vulnerability index (CVI) (Pandey and Jha, 2012) Livelihood effect index (LEI) (Urothody and Larsen, 2010); Livelihood Vulnerability Index (LVI) (Hahn *et al*., 2009; Alhassan, Kuwornu and

Osei-Asare, 2019); and Vulnerability as Expected Poverty (Deressa *et al*. (2009). The LVI approach developed by Hahn *et al*. (2009) and applied Alhassan, Kuwornu and Osei-Asare, (2019), is an indicator method, was used in this study to examine farming households' vulnerability to climate change with gender perspective. The choice of LVI in informed by the fact that agricultural livelihood which is the major livelihood option in the study area is more vulnerable to climate change and variability given that it is largely climate-dependent. LVI also allows for selection of factors and indicators based on the context and relevant to the local communities in which the investigation is being conducted (Alhassan, Kuwornu and Osei-Asare, 2019; Asare-Kyei *et al*., 2014).

Selection of LVI Factors and Indicators

The following selected vulnerability factors and indicators presented in Table 1 are contextual and relevant to the local community in which the study was conducted.

The LVI factors and indicators are rearranged according to IPCC definition of vulnerability and presented in Table 2.

Table 1: Selected LVI factors and indicators

Factors	Indicators
Exposure and sensitivity Factors	Flood experience Flood frequency Drought experience (dry spells) Drought frequency Nature of rainfall Excessive heat/heat Stress Frequency of heat stress Physical protection from disaster
Social and Human Capital	Membership of farmers groups organization Free labour Training/Capacity Building Frequency of visit by extension works/officers Early disaster warning information Support from relatives Households' members health (illness) status in the last 12 months
Financial and communication Capital	Access to Credit Household Average Annual income Remittances from family or friends Access to irrigation facilities Ownership of communication gadgets Other economic activities
Natural Capital (access to land)	Access to farm Land Size of the land you have access to Nature of access to land

Source: Designed by the Authors' 2022

Table 2: Selected LVI-$_{IPCC}$ Factors and Indicators

Factors	Indicators
	Flood experience
	Flood frequency
	Drought experience (dry spells)
Exposure Factors	Drought frequency
	Nature of rainfall
	Excessive heat/heat Stress
	Frequency of heat stress
	Physical protection from disaster
	Access to farm Land
	Size of the land you have access to
sensitivity Factors	Nature of access to land
	Early disaster warning information
	Households' members health (illness) status in the last 12 months
	Membership of farmers groups organization
	Free labour
	Training/Capacity Building
	Frequency of visit by extension works/officers
	Support from relatives
Adaptive Capacity	Access to Credit
	Household Average Annual income
	Remittances from family or friends
	Access to irrigation facilities
	Ownership of communication gadgets
	Other economic activities

Source: Designed by the Authors' 2022

Measuring vulnerability to climate change and variability

The level and extent of vulnerability of farming households (female-headed and male-headed) to climate change and variability were determined by estimating two indices: the LVI based on a balanced weighted average and LVI-$_{IPCC}$ based on the IPCC vulnerability framework.

Estimating the Livelihood Vulnerability Index (LVI): According to Alhassan, *et al* (2019), the livelihood vulnerability framework is commonly used in assessing vulnerability to climate change and variability for the reason that it is a framework that makes it possible to analyze both the essential components constituting livelihood and the contextual factors influencing these components. The LVI assumes equal weights for all major vulnerability factors or components and their corresponding sub-factors/components also known as indicators. This study made use of four (4) major factors to estimate the LVI. These are exposure and sensitivity factors (ESF), Social and Human Capital (SHC), Economic (Financial) and communication Capital (ECC), and Natural Capital (access to land) (NC). Each major indicator (factor) consists of several indicators (sub-components/factors).

The indicators are measured on varied scales; hence, each indicator was standardized as an index using equation (1):

$$Index_{sc} = \frac{S_s - s_{min}}{s_{\max} - s_{min}} \ldots\ldots\ldots..(1)$$

Where:

*Ss*is the observed indicator for a particular gender *S*and S*min* and S*max* are the minimum and maximum values, respectively, for each sub-component determined using the combined data.

The indicators are now averaged using equation (2) to obtain the index of each component/factor:

$$Ms = \sum_{i/n}^{n} = 1\ indexs \ldots\ldots(2)$$

Where:
Ms is one of the Four (4) factors (ESF, SHC, ECC or NC) for a particular gender S; $Index_s$ represents the indicators, indexed by i, that make up each factor and n is the number of indicators in each factor/component.

According to Alhassan, Kuwornu and Osei-Asare (2019), after factors indices have been computed, they are also averaged to obtain the gender's LVI by using equation (3):

$$LV1s = \frac{\sum_i^4 = 1\ WM^{iMs}}{\sum_i^4 = 1\ WMs} \ldots\ldots(3)$$

Equation (3) can be rewritten as:

$$LVIs = wESFsESFs + wSHCsSHCs + wECCsECCs + wNCsNCs / ESFs + SHCs + ECCs + NCs \ldots.. (4)$$

Where:
Mi, the weights of each factor, is a function of the number of indicators that each factor is composed of. The rationale for including this is to ensure that all indicators contribute equally to the overall LVI. The LVI is scaled between 0 (least vulnerable) and 1 (most vulnerable) (Asare-Kyei *et al*., 2014; Alhassan, *et al,* 2019).

Livelihood vulnerability index based on the Intergovernmental Panel on Climate Change (LVI_{IPCC}): According toIPCC, vulnerability is a function of adaptive capacity, sensitivity and exposure which are also referred to as contributory factors. In this study, the vulnerability factors and indicators computed from equations 1-3 based in LVIs are rearranged in accordance with the IFCC vulnerability framework (adaptive capacity, sensitivity and exposure) and used in computing vulnerability index (LVI_{IPCCs})which is consistent with Asare-Kyei *et al*., (2014) and Alhassan, *et al* (2019). The LVI-IPCCs differs from the LVI when the vulnerability factors are combined. The factors are first combined into three categories, namely, exposure, adaptive capacity and sensitivity, by using equation (5):

$$CF_s = \frac{\sum_i^n = 1\ WM^i Msi}{\sum_i^n = 1\ WMi} \ldots\ldots..(5)$$

Where:
CFs, is an IPCC defined contributing factor (exposure, sensitivity or adaptive capacity) for a particular gender S, Msi are the factors for a particular gender S, indexed by i, wMi is the weight of each factor and $n$is the number of indicators in each contributing factor.

Once exposure, adaptive capacity and sensitivity are estimated, the three contributing factors are combined using equation (6) as follows:

$$LVI\text{-}_{IPCCs} = (E_s - A_s) * S_s \ldots\ldots\ldots (6)$$

Where:
$LVI\text{-}_{IPCCs}$ is the vulnerability index for a particular gender S, expressed based on the IPCC vulnerability framework,
E_s is the computed exposure index for a particular gender S
A_s is the computed adaptive capacity index for a particular gender S. and
$S_s$is the computed sensitivity index for gender S.
Note that $LVI\text{-}_{IPCCs}$ is also scaled between 0 (most vulnerable) and 1 (least vulnerable).

Testing for difference in means of livelihood vulnerability indices

The need to test for statistical difference in the means of the LVIs and $LVI\text{-}_{IPCCs}$ for both gender groups (female-headed and male-headed households) is informed by the fact that the computed vulnerability indices are averages, hence the test will establish the gender that is most vulnerable to climate change impact and risks on their agricultural livelihood. The Student's t-test is deployed here because it is suitable for larger samples (N equal or greater than 30) where equal variance (homogenous population) and normal t distribution are assured (Anyadike, 2009). Consequently, this study used the independent two-sample student's t-test (two-tailed) to test for significant differences in the means of the LVI factors, overall LVI, Intergovernmental Panel on Climate Change (IPCC) vulnerability contributory factors and the $LVI\text{-}_{IPCC}$ indices. The equation is given by (7):

$$t = \frac{(\mu F - \mu M)}{\sqrt{\frac{\sigma^2_F}{N_F} + \frac{\sigma^2_M}{N_M}}} \ldots\ldots\ldots (7)$$

Where:
μF and μM denote the means of computed vulnerability indices for the female-headed and male-headed households, respectively, $\sigma^2{}_F$ and$\sigma^2{}_M$ denote the standard deviations of the vulnerability indices for the female-headed

and male-headed households, respectively, and $N_F$and $N_M$denote the sample size for female-headed and male-headed households, Respectively.

RESULTS AND DISCUSSION

Gender livelihood vulnerability index assessment

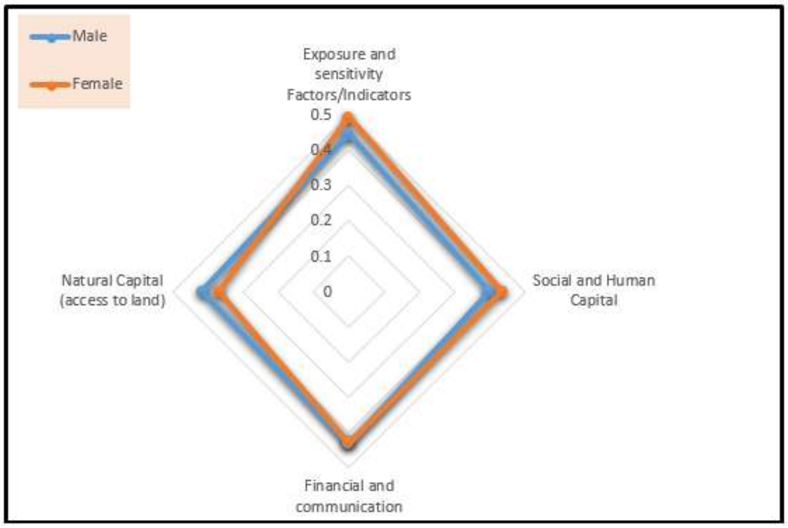
The result of gender (male and female*)* perspective of farming households' vulnerability to climate change and variability using LVI is presented in Table 3 and Figure 2. The LVI of the factors shows female-headed households have higher exposure and sensitivity index of 0.492 compared to male-headed households with 0.444 which suggests that female farmers are more exposed and susceptible to climate change impacts and risks. The same scenario played out in terms of social and human capital where female farming households have higher index of 0.433 and as against male with 0.397. The index is an indication of lesser social and human capital for female-headed households, hence the likelihood of higher vulnerability. The reverse is the case in term of economic and communication capital where male-headed households have slightly higher index of 0.431 compared to female with 0.428 which can be attributed to the fact that women in the study area are involved in multiple economic activities besides farming to diversify their income base compared to men. The shows that, females are more vulnerable in terms of natural capital which include limited access to land with an index of 0.368 for female and 0.415 for male-headed households. The Overall LVI shows that female-headed farming households and more vulnerable with 0.464 and as against 0.442 for their male counterparts.

The results of the two-sample t-test are also presented in Table 3. The result indicates significant difference in the male-headed and female-headed households in terms of the factors except natural capital. The overall two-sample t-test also indicates difference (t-value and p-value of 17.009 and 0.0000) male-headed households and that of females which implies that female significantly more vulnerable that male farming households to climate change on their agricultural livelihood. The findings of this study are similarly to those of Alhassan, Kuwornu and Osei-Asare (2019). The authors reported a significant difference in the vulnerability levels of female-headed and male-headed farming households and that female–headed households were more vulnerable to livelihood strategies, socio-demographic profile, social networks, water and food factors of the LVI. Also, they found that the vulnerability indices revealed that female–headed households were more sensitive to the impact of climate change and variability. However, female-headed households have the least adaptive capacities. In all, female-headed farming households are more vulnerable to climate change and variability than male-headed farming households. The implication of these finding is that even though women in Africa actively engage in agriculture, they are more vulnerable to climate change impacts and risks due to high exposure and limited adaptive capacity.

Table 3: Vulnerability of Farming Household to Climate Change using Livelihood Vulnerability Index (LVI) and Result of Two Sample *t*-test

Factors	Indicators	Index of Indicators (S_{si})		Index of Factors (M_{si})		Two Sample *t*-test	
		Male	Female	Male	Female	*I* Value	*p*-Value
Exposure and sensitivity Factors	Flood experience	0.500	0.500	0.444	0.492	11.15	0.000
	Flood frequency	0.434	0.291				
	Drought experience (dry spells)	0.500	0.500				
	Drought frequency	0.332	0.738				
	Nature of rainfall	0.365	0.500				
	Excessive heat/heat Stress	0.500	0.500				
	Frequency of heat stress	0.419	0.405				
	Physical protection from disaster	0.500	0.500				
Social and Human Capital	Membership of farmers groups organization	0.368	0.346	0.397	0.433	13.92	0.000
	Free labour	0.345	0.540				
	Training/Capacity Building	0.355	0.433				
	Frequency of visit by extension works/officers	0.379	0.367				
	Early disaster warning information	0.458	0.346				
	Support from relatives	0.415	0.478				
	Households' members health (illness) status in the last 12 months	0.458	0.522				
Economic (Financial) and communication Capital	Access to Credit	0.500	0.500	0.431	0.428	11.06	0.000
	Household Average Annual income	0.404	0.424				
	Remittances from family or friends	0.500	0.500				
	Access to irrigation facilities	0.352	0.359				
	Ownership of communication gadgets	0.448	0.511				
	Other economic activities	0.382	0.276				
Natural Capital (access to land)	Access to farm Land	0.419	0.408	0.415	0.368	6.81	0.021
	Size of the land you have access to	0.476	0.435				
	Nature of access to land	0.350	0.261				
Overall LVI				**0.442**	**0.464**	**17.01**	**0.000**

Source: Computed from field data



2: Gender Vulnerability Radar Chart

Livelihood vulnerability index based on the Intergovernmental Panel on Climate Change

The results of the computed indices for the vulnerability factors are presented in Table 4. Based on the Contributory Factor Index (CFI), female-headed households were more vulnerable with adaptive capacity (CFI-adaptive) of 0.430 than male-headed households with CFI-adaptive capacity 0f 0.405 in terms of adaptive capacities. However, male-headed households were more sensitive to climate change and variability with CFI-Sensitivity of 0.443 than female-headed households with CFI-Sensitivity of 0.412. In terms of level of exposure, male-headed households have CFI-Exposure of 0.436 which is significantly less than that of female-headed households with CFI-Exposure of 0.491. Though they are both operate within the same geographical location and experience similar climatic conditions, men have access to better arable land than women thereby limiting men exposure level to impact of climate-related hazards and risks on their farms. The LVI_{IPCC}i ndicates that female-headed farming households were more vulnerable to climate change impacts and risks with LVI_{IPCC} of 0.025) than male-headed households with LVI_{IPCC} of 0.014).

Furthermore, the result of the independent two-sample student t-test presented in Tables 4 and 5 showed that with the exception of sensitivity factor, there are significant differences in the means of the LVI_{IPCC} and the IPCC vulnerability CF for female-headed and male-headed farming households. This result suggests regardless of the fact that the two sexes farm under the same climatic conditions, female-headed households were more exposed with relatively more limited adaptive capacities, which generally make them more vulnerable. Again, this finding is in agreement with those of Alhassan, Kuwornu and Osei-Asare (2019) and Nabikolo *et al*. (2012), who revealed that female-headed households were more vulnerable to climate change in Ghana and eastern Uganda respectively because of low adaptive capacity.

Table 4: Vulnerability of Farming Household to Climate Change using IPCC-LVI and Result of Two Sample *t*-test

Factors	Indicators	Index of Indicators(S_{si})		Index of Factors (M_{si})		Two Sample *t*-test	
		Male	**Female**	**Male**	**Female**	***i*-Value**	***p*-Value**
Exposure Factors	Flood experience	0.500	0.500	0.436	0.491	17.03	0.000
	Flood frequency	0.434	0.291				
	Drought experience (dry spells)	0.500	0.500				
	Drought frequency	0.332	0.738				
	Nature of rainfall	0.365	0.500				
	Excessive heat/heat Stress	0.500	0.500				
	Frequency of heat stress	0.419	0.405				
sensitivity Factors	Physical protection from disaster	0.500	0.500	0.443	0.412	10.35	0.000
	Access to farm Land	0.419	0.408				
	Size of the land you have access to	0.476	0.435				
	Nature of access to land	0.350	0.261				
	Early disaster warning information	0.458	0.346				
	Households' members health (illness) status in the last 12 months	0.458	0.522				
Adaptive Capacity	Membership of farmers groups organization	0.368	0.346	0.405	0.430	9.638	0.000
	Free labour	0.345	0.540				
	Training/Capacity Building	0.355	0.433				
	Frequency of visit by extension works/officers	0.379	0.367				
	Support from relatives	0.415	0.478				
	Access to Credit	0.500	0.500				
	Household Average Annual income	0.404	0.424				
	Remittances from family or friends	0.500	0.500				
	Access to irrigation facilities	0.352	0.359				
	Ownership of communication gadgets	0.448	0.511				
	Other economic activities	0.382	0.276				
Overall LVI_{-IPCC}				**0.014**	**0.025**	**18.59**	**0.003**

Source: computed from field data

Table 5: Summary of IPCC-LVI

Contributory Factors	Computed Index		Two Sample t-Test	
	Male	**Female**	**t-Value**	**p-Value**
Exposure Factors	0.436	0.491	17.03	0.000
Sensitivity Factors	0.443	0.412	10.35	0.000
Adaptive Capacity	0.405	0.430	9.638	0.000
Overall LVI_{IPCC}	**0.014**	**0.025**	**18.588**	**0.003**

Source: computed from field data

CONCLUSIONS

Agriculture remains one of the most vulnerable sectors to climate change and variability related hazards and risks especially in rural communities of the developing countries given that agriculture here is largely climate-dependent. The impacts and vulnerability are however disproportionate against women with limited adaptive capacity. The results in this study demonstrated empirically that while that both male-headed and female-headed farming households were vulnerable to the effects of climate change and variability, female-headed households are more vulnerable particularly in terms of exposure and adaptive capacity. The study therefore recommends that relevant stakeholders should make concerted effects to improve women access to more fertile lands, improve farm inputs to reduce the extent of exposure with attendant reduction in vulnerability. Increases access to credit facilities will also help boost adaptive capacity especially for female-headed households.

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