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Gender-Based Vulnerability and Contributions to Climate Change Adaptation Decisions Among Farm Households in Southwest Nigeria

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Abstract: Climate change is a global phenomenon undermining the achievement of the Millennium Development Goals (MDGs) and efforts to reduce extreme poverty in Africa, Nigeria inclusive. In this regard, smallholder farmers in Nigeria are particularly vulnerable to changes in the climate that reduce productivity and negatively affect their weather-dependent livelihood systems. The purpose of this study was to provide empirical information on gender-based vulnerability and contribution to climate change adaptation decisions among farm households in Southwest Nigeria. The study was conducted in three randomly selected states of southwest Nigeria. Data collection for the study was carried out in two phases. Firstly, there was a rapid rural appraisal of the selected states followed by the second phase which was a detailed survey using a structured questionnaire administered to 360 randomly sampled farm units. The farm units were predominantly headed by male farmers (76%) while the remaining 24% were headed by females. Using household adaptive capacity approach, female headed farm households had higher climate change vulnerability index of 0.73 while male headed households had relatively lower index of 0.43. Men had higher average contribution (X=3.42) to climate change adaptation decisions in crop production than women (X=2.67) on a 4-point rating scale. In livestock production, women had slightly higher average contribution (X=3.55) to adaptation decision than men (X=3.27) on a 4-point rating scale. Based on these findings, specific policies providing increased women access to education, land, training and other farm resources like finance would be needed to alleviate their vulnerability and gender disparity in contribution to climate adaptation decision. In addition, the government through ministry of agriculture should be more committed to formulating gender sensitive policies that will help to strengthen women farmers and reverse their present institutional neglect.

Key words: Gender · Vulnerability · Climate change · Adaptation · Decision making · Southwest Nigeria

INTRODUCTION

The realization of African Green Revolution, Millennium Development Goals (MDGs) with their expected contributions to food security and economic growth in Africa is threatened by climate change. In this regard, the smallholder farmers are particularly vulnerable to changes in the climate that reduce productivity and negatively affect their weather-dependent livelihood systems. Vulnerability to the effects of climate change is the extent to which climate change may damage or harm a system or group of people [1]. Vulnerability depends not only on a system's sensitivity, but also on coping ability of the people in a system and their level of exposure to the negative impacts of climate change. The vulnerability of African farmers to the effects of climate change is expected to be most severe in Nigeria [2], where funding to agricultural research has been comparatively low [3], the current spread of agricultural information and training are poorest [4], technological changes have been the slowest [5] and where domestic economies depend heavily on rain-fed agriculture [6]. For instance, Nigeria is already experiencing low crop yields and altered animal compositions as a result of extreme weather and climate change. Recent studies have also shown that there has been precipitation decrease in the humid regions of West Africa, including parts of Nigeria since the beginning of the century [7]. The devastating effects of the changing climatic conditions on food production require adaptive responses of the farm households.

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Adaptation measures at farm household level are the responsibilities of farmers. Climate change adaptation as described by [1] is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or explores beneficial opportunities. Adaptation helps farmers to achieve their food, income and livelihood security objectives in the face of changing climatic and socio-economic conditions including climatic variability, extreme weather conditions such as droughts, floods and volatile short term changes in local and large-scale markets [8]. The responses of farmers to cope with the associated challenges of climate change in food production result from their farming decisions [9].

Farm decision making is an on-going process whereby farmers are continually making short and long-term decisions to manage risks emanating from variety of climatic and non-climatic sources [10]. In addition, [11] observed that adaptation to climate change is the result of individual farmer's decisions influenced by climatic forces internal to the farm households and external forces that affect the agricultural system at large. Farmers constantly face such challenges as tragic crop failures, reduced agricultural productivity, increased hunger, malnutrition and diseases [12] which are mostly as a result of changes in climatic conditions. Climatic and agricultural challenges have placed many farmers in the position of making critical decisions about farming, financial security and well-being that has long term consequences. The report of [13] showed that, in the context of climate change adaptation measures among farm households, gender perspective is vital for effective policies.

The term "gender" refers to socially ascribed roles, responsibilities and opportunities associated with women and men, as well as the hidden power structures that govern relationships between them [14]. Gender issues focus not only on women but on the relationship among men, women and children and their roles, access to and control over resources and division of labour in meeting household needs [15]. Gender in the context of this study relates to contributions of male and female farmers to decision making in climate change adaptation in crop and livestock production activities in their farm households. Gender relation in agriculture is important because it determines household security, household well-being and many other aspects of life [16].

Literature evident in [13, 17, 18, 19, 20] suggested that gendered divisions of labour and decision-making power may affect the farm households' ability to respond to the effects of climate change. Actions to reduce the impacts of climate change on agricultural production can only be effective with an understanding of gender differentiated impacts, vulnerabilities [21]; and contributions to climate change adaptation so as to address the specific needs of men and women farmers [22]. Effective gender-based participation and responsibilities in natural resources management ensure balanced, equitable and sustainable development in developing countries. This is because, gender and climate change are cross-cutting issues [22]. The current framework in which the threats of climate change on agriculture are being addressed often times neglects gender perspectives which are crucial for successful adaptation and mitigation [20, 23].

Therefore, in adaptation to climate change, taking gender into consideration in decision making will provide better guidance for men and women farmers who are building adaptive responses. [24] added that a critical view of gender dimensions of climate change using case studies across the globe will provide critical gender-disaggregated data on climate change impacts, gender vulnerability and roles in climate change resilience for policy makers, which had been neglected until recently. Available studies recently conducted in vulnerable African countries (Nigeria inclusive), where gender and climate change adaptation are captured include the studies of [21, 25, 26, 27, 28] among others. None of these studies however focused on gender and climate change with regards to adaptation decisions. On the other hand, available empirical studies that estimated gender roles in farm decision making focused on crop and livestock production activities and never attempted to capture farming decision in relations to climate change adaptation. These are evident in [29, 30, 31, 32]. It is therefore imperative that gender-based vulnerability and contributions in climate change adaptation decision making be empirically investigated to bridge existing information gap.

MATERIALS AND METHODS

Study Area: The study was carried out in Southwest Nigeria. Southwest is made up of six states which include: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo States. Southwest Nigeria falls within latitudes 6° N, 4° S and longitudes 4° W, 6° E; covering about 114, 271 kilometere square. The average annual rainfall of Southwest Nigeria ranges between 1, 200 to 1, 500mm with a mean monthly temperature range of 18 - 24°C during the rainy season

and 30 - 35°C during the dry season [33]. Southwest Nigeria is predominantly agrarian due to the rich alluvial soil in the area. Notable food crops cultivated in the area include: cassava, maize, yam, cocoyam, cowpea, vegetables and cash crops such as cocoa, kola nut, rubber, citrus, coffee, cashew, mango and oil palm. Livestock such as goat, pig, sheep and poultry are predominantly reared in the area.

Sampling and Data Collection: Multi-stage random sampling technique was used for selecting 360 farm units for the study. Three states were purposively selected in Southwest Nigeria to ensure that the three local ecological zones in the area were covered. The three states selected were Ekiti State from derived savanna, Oyo State from guinea savanna and Ogun State from rainforest belt. From each of the three states, two agricultural zones were randomly sampled. These were Zones I and II from Ekiti State, Ibadan/Ibarapa and Ogbomosho zones from Oyo State while Ijebu Ode and Abeokuta zones were selected from Ogun State. From each of the selected six agricultural zones, two local government areas (LGAs) were randomly selected. Random sampling technique was used to select two farming communities from each of the sampled 12 LGAs making 24 farming communities for the study. From each of the selected farming communities, random sampling technique was also used to select 15 farm units giving a total of 360 farm units. Data for this study were obtained from primary source with the use of structured questionnaire. The data were gathered by the researcher with the help of five trained research assistants making six enumerators for data collection. Out of the 360 copies of questionnaire administered, 348 copies were retrieved from the respondents (farmers) representing 96.7% return rate.

Estimation Procedure: The data collected were analyzed with frequency, percentage, line graph, mean using 4-point rating scale and vulnerability analysis as detailed below.

Rating Scale Technique: To assess the level of contribution to climate change adaptation decisions by gender among the farm units, mean and standard deviation were employed using 4-point rating scale technique. The 4-point response options for measuring farmers' levels of contribution to decision making in climate change adaptation was graded as Very High Contribution, (VHC) = 4, High Contribution (HC) = 3, Low Contribution (LC) = 2 and Very Low Contribution (VLC) = 1. The decision rule on determining contributions of male and female farmers on the items was achieved using real limit of number as stated below:

Response Categories	Nominal values	Real limit
ValuesVery High contribution (VHC)	= 4	3.50 – 4.00
High Contribution (HC)	= 3	2.50 – 3.49
Low Contribution (LC)	= 2	1.50 – 2.49
Very Low Contribution (VLC)	= 1	1.00 – 1.49

Based on this computation, items with mean within 3.50 – 4.00 were regarded as Very High Contribution, items with mean values within 2.50 – 3.49 were regarded as High Contribution, while items with mean values within 1.50 – 2.49 and 1.00 – 1.49 were regarded as Low Contribution and Very Low Contribution respectively.

Vulnerability Analysis: To assess gender-based vulnerability to climate change, vulnerability analysis was employed. Using household adaptive capacity approach, the collected data were arranged in the form of a rectangular matrix with rows representing gender of household head and columns representing indicators. Thus, vulnerability is potential impact (*I)* minus adaptive capacity (*AC)*. This leads to the following mathematical equations for vulnerability.

$$V = f(I - AC) \quad (1)$$

	Indicators of Vulnerability				
Gender of HHold Head	1	2	.	.	K
MHHD	Xij1	Xij2	.	.	Xijk
FHHD	Xij1	Xij2	.	.	Xijk

The adaptive indicators assessed in this study have negative or inverse functional relationship with vulnerability. The actual values of the adaptive indicators are in different units and scales. To obtain the vulnerability indices on each of the indicators on gender basis, the methodology used by [34] for assessing Human Development Index was followed to normalize and standardize the values to lie between 0 and 1.

$$yij = \frac{Max\{Xij\} - Xij}{Max\{Xij\} - Min\{Xij\}} \quad (2)$$

where: *Xij* represents the value of the vulnerability indicator for the farm household for *x* indicator.

Max & *Min* represent maximum and minimum values of indicators respectively for the variables of interest.

When equal weights are obtained for the vulnerability indicators, simple average of all the normalized scores is computed to construct the vulnerability index using:

$$VI = \frac{\sum x_{ml} + \sum x_{mk}}{K} \quad (3)$$

VI = represent the vulnerability indicator
K = represents the number of indicators used.

After normalization, the average index (AI) for each source of vulnerability is worked out for both male and female headed households and then the overall vulnerability index is computed. The vulnerability indicators that were used to measure adaptive capacity of farm households in southwest Nigeria include:

X1 = Farming Income
X2 = Years of Formal Education
X3 = Farm Size
X4 = Number of livestock
X5 = Land Ownership Status
X6 = Number of Farm labourers
X7 = Number of Extension contacts
X8 = Access to farm credits or loan
X9 = Household working members
X10 = Access to remittances
X11 = Membership of Cooperative

RESULTS AND DISCUSSION

Gender-Based Vulnerability to Climate Change among Farming Households in Southwest Nigeria: The result presented in Table 1 showed gender-based vulnerability analysis of farming households to the impact of climate change using adaptive capacity approach. Using education of the household head as an indicator, male headed households in Southwest Nigeria having vulnerability index of 0.42 were less vulnerable to effect of climate change relative to female headed households with vulnerability index of 0.80. Considering farm size, male headed households have low vulnerability index of 0.26 compared to female headed households that have high vulnerability index of 0.86. On ownership of land for agricultural production, the vulnerability index of male headed households was 0.23 while that of female headed households was 0.75. This indicated that male headed households have more access to land which could possibly enhance their adoption of varieties of adaptation strategies to cope with climate change than female farmers. [35] reported that women in Nigeria rarely own land despite their heavy involvement in agriculture. The finding of this study agreed with the study of [36] that secure land tenure had a positive influence on the probability of adopting terrace as a farm technology in the rain-fed semi-arid lands of Kenya.

On farm income, the vulnerability index of male headed households was 0.36 while that of female headed households was 0.83. This implied that male headed households have more farm income which could possibly increase their chances of adopting various adaptation strategies to cope with the challenges of climate change. This finding corroborated that of [37] that, increase in farmers' income in Northcentral Nigeria increased coping capacity and access to more adaptive technologies among the farmers. Using number of extension visits/contacts as adaptive indicator, male headed households in Southwest Nigeria having vulnerability index of 0.42 were less vulnerable and have more training to cope with climate change relative to female headed households that had high vulnerability index of 0.93. [38] reported that agricultural extension programmes and other supporting services have traditionally concentrated more on educating male farmers and hence farm women still largely depend on their husbands for information on farm inputs and other resources necessary for farm decision making. The vulnerability index of male headed households under access to credit was 0.41 while that of the female headed households was 0.89 which was relatively higher than the male.

Considering membership of farmers cooperative as opportunity to build up adaptive capacity, male headed households have vulnerability index of 0.36 compared to female headed households that have high vulnerability index of 0.80. This indicated that male headed households are more organized into farmers' cooperative societies in the area than their female counterparts. The findings of [29] showed that lack of access to supporting programmes such as cooperatives and adult education are part of the challenges facing women farmers in making adequate contribution to farm decision making. Using availability of farm labour as indicator of climate change adaptive capacity, male headed households have vulnerability index of 0.45 while female headed households have vulnerability index of 0.80. [39] found that shortage of labour constitutes a major barrier to adaptation to climate change.

Table 1: Gender-based Vulnerability Analysis of Farmers to Effect of Climate Change among Farm Households in South West Nigeria (N = 348)

		Ekiti			Ogun		Oyo		Average	
SN	Adaptive Indicators	Gender	Actual Value	Vul. Index	Actual Value	Vul. Index	Actual Value	Vul. Index	Actual Value	Vul. Index
X1	EDUCATION	MHHD	7.032	0.68	7.483	0.00	7.101	0.57	7.205	0.42
		FHHD	6.818	1.00	7.043	0.66	6.988	0.74	6.950	0.80
X2	FARM SIZE	MHHD	3.365	0.00	2.247	0.53	2.849	0.25	2.820	0.26
		FHHD	1.346	0.96	1.256	1.00	2.071	0.61	1.558	0.86
X3	LAND OWNERSHIP	MHHD	0.776	0.00	0.613	0.40	0.657	0.29	0.682	0.23
		FHHD	0.582	0.47	0.458	0.77	0.365	1.00	0.468	0.75
X4	INCOME	MHHD	100364.4	0.60	160068.6	0.00	113321.7	0.47	124584.9	0.36
		FHHD	60598.5	1.00	98534.1	0.62	73098.1	0.87	77410.2	0.83
X5	EXTENSION VISITS	MHHD	4.732	0.00	2.464	0.96	4.002	0.31	3.733	0.42
		FHHD	2.809	0.82	2.375	1.00	2.429	0.98	2.538	0.93
X6	CREDIT ACCESS	MHHD	0.363	0.71	0.535	0.00	0.408	0.53	0.435	0.41
		FHHD	0.294	1.00	0.339	0.81	0.327	0.86	0.320	0.89
X7	COOP MEMBER	MHHD	0.420	0.25	0.457	0.00	0.335	0.83	0.404	0.36
		FHHD	0.396	0.41	0.312	0.99	0.310	1.00	0.339	0.80
X8	FARM LABOURERS	MHHD	5.526	0.00	3.526	0.85	4.335	0.50	4.462	0.45
		FHHD	4.076	0.61	3.162	1.00	3.659	0.79	3.632	0.80
X9	NO OF LIVESTOCK	MHHD	23.943	0.93	22.387	1.00	26.152	0.83	24.161	0.92
		FHHD	25.451	0.27	39.354	0.23	44.282	0.00	36.362	0.17
X10	WORKING MEMBERS	MHHD	3.145	0.92	5.257	0.00	5.043	0.09	4.482	0.34
		FHHD	3.347	1.00	4.400	0.56	4.564	0.47	4.104	0.68
X11	REMITTANCE	MHHD	0.634	1.00	0.821	0.26	0.766	0.47	0.740	0.58
		FHHD	0.685	0.79	0.887	0.00	0.697	0.75	0.756	0.51

Overall Vulnerability Index (V.I)

Gender-based Vul. to Climate Change	Vul. Index
MHHD	0.43
FHHD	0.73
Zonal-based Vul. to Climate Change	Vul. Index
Derived Savanna Zone (Ekiti State)	0.61
Rainforest Zone (Ogun State)	0.53
Guinea Savanna Zone (Oyo State)	0.60

Note: MHHD = Male Headed Household

FHHD = Female Headed Household

Source: Computed from Field Survey, 2012.

Using number of livestock owned by the farmers as indicator of adaptive capacity, the vulnerability index of male headed households was 0.92 which was high compared to that of the female headed households was 0.17. This finding showed that the diversification of farming operation into rearing of livestock for economic benefits of households was more supported by female headed households. Considering the number of working household members as indicator of climate change adaptive capacity, male headed households has vulnerability index of 0.34 while female headed households has vulnerability index of 0.68. The number of active household members involve in economic activities suggests the human capital endowment of the household and consequently high adaptive capacity in times of shock. Using household access to remittance as a measure of adaptive capacity, the vulnerability index of male headed household was 0.58 while that of female households in southwest Nigeria was 0.51. Buttressing the significance of remittances on household livelihood sustainability and poverty reduction, [40] in a study in rural Mexico found that international remittances account for a sizeable proportion of the total per capita household income in rural Mexico and that international remittances reduce both the level and depth of poverty. Also, [41] in a study in Philippines found that remittance has significant positive effects on poverty reduction among benefited households.

Therefore, using household adaptive capacity approach which is a function of the available institutions, human and material resources to cope with effects of climate change, the result of the overall gender-based

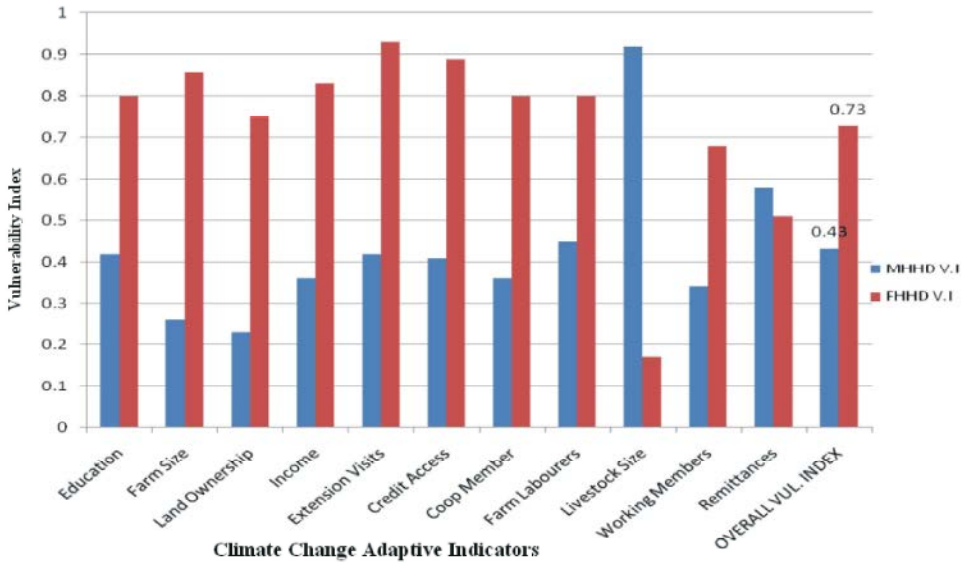

Fig. 1: A Bar Chart Showing Gender-based Vulnerability Index (V.I) to Climate Change Using Adaptive Capacity Approach among Farming Households in Southwest Nigeria
Source: Field Survey, 2012

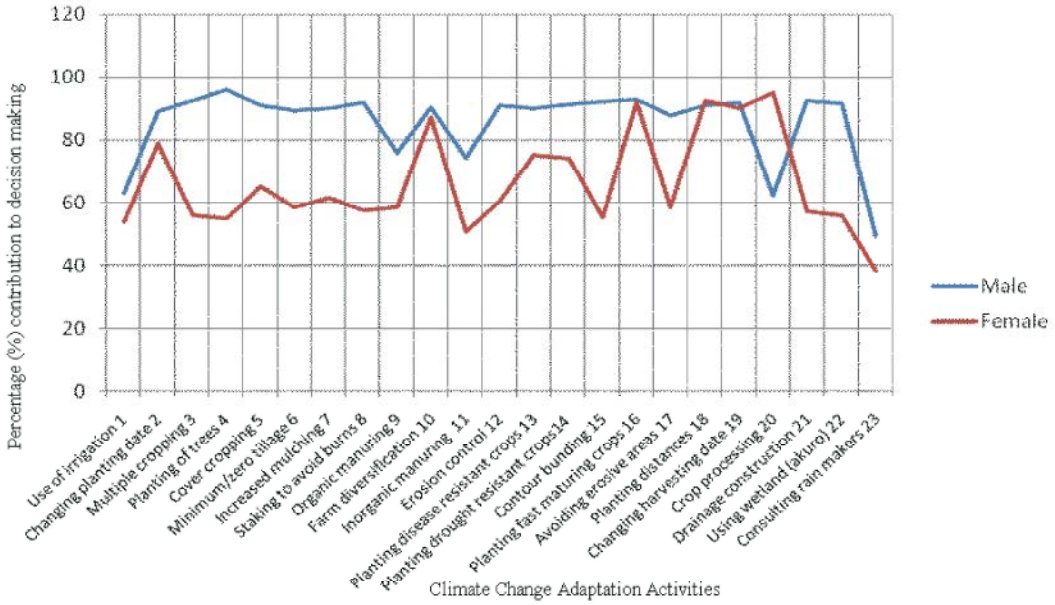

Fig. 2: Graphical representation of steadily high and relatively low contributions of men and women respectively to climate change adaptation decision making in crop production
Source: Field Survey, 2012

vulnerability analysis showed male headed farming households in southwest Nigeria has vulnerability index of 0.43 while the female headed farming households has vulnerability index of 0.73. This finding showed that, female headed farming households in southwest Nigeria are more vulnerable to the effects of climate change than their male counterpart. This finding is in line with that of [42] who assessed gender-based determinants of vulnerability to food insecurity among farming households in Nigeria and found that male headed households possessed more resources than female headed households. The authors reported further that crop output, off-farm income, total household income and available labour were significantly higher in male headed

farm households than in female headed households. In addition, [43] found that female headed households are more poverty prone than male headed farming households in North-central Nigeria.

On zonal basis, the result presented in Table 1 further showed that, farming households in derived savanna ecological zone (Ekiti) has climate change vulnerability index of 0.61, while farming households in rainforest (Ogun) and guinea savanna (Oyo) ecological zones have climate vulnerability index of 0.53 and 0.60 respectively. Fig. 1 compared gender-based vulnerability index using adaptive indicators. Therefore, using vulnerability threshold probability of 0.5 [44], the findings showed that farmers from the three local agro ecological zones in Southwest are vulnerable to effects of climate change.

Table 2: Comparative Analysis of Gender-based Contributions to Climate Change Adaptation Decision Making in Crop Production Activities among Farm Households in Southwest Nigeria (N = 348)

NS	Climate change adaptation activities involving decision making	Male Farmers Mean (X)	Female Farmers Mean (X)
1	Use of irrigation system/water storage	2.52** (0.75)	2.17* (0.86)
2	Early or late planting of crops as adaption strategies	3.55*** (0.52)	3.15** (0.73)
3	Planting different varieties of crop (multiple cropping)	3.70*** (0.50)	2.24* (0.98)
4	Planting of trees (afforestation/reforestation or agroforstry practices)	3.84*** (0.64)	2.20* (1.01)
5	Planting cover crops to help conserve soil moisture	3.63*** (0.66)	2.75** (0.87)
6	Minimum/zero tillage so as not to expose the soil to loss of nutrients	3.57*** (0.60)	2.35* (1.11)
7	Increased mulching of crops to conserve moisture and reduce heat	3.59*** (0.54)	2.46* (0.90)
8	Staking of crawling crops such as yam to avoid heat burns	3.67*** (0.56)	2.31* (1.06)
9	The use of organic manure	3.03** (0.89)	2.34* (1.04)
10	Mixed farming (diversification of farm enterprise)	3.61*** (0.70)	3.53*** (0.69)
11	The use of inorganic manure (fertilizers)	2.96** (0.90)	2.04* (1.12)
12	Making ridges across farms to reduce effects of erosion	3.63*** (0.65)	2.43* (0.97)
13	Planting pest and disease resistant crops	3.60*** (0.80)	3.00** (0.82)
14	Planting of drought tolerant crop varieties	3.64*** (0.85)	2.97** (0.91)
15	Making of contour bunds around farmland	3.68*** (0.63)	2.22* (0.98)
16	Planting of fast maturing crop varieties	3.71*** (0.68)	3.68*** (0.77)
17	Avoiding eroded/erosion prone area for farming	3.50*** (0.88)	2.34* (0.99)
18	Adopting recommended planting distance	3.63*** (0.75)	3.70*** (0.78)
19	Changing crop harvesting dates	3.67*** (0.60)	3.60*** (0.62)
20	Processing of crops to minimize post-harvest losses	2.48* (1.04)	3.81*** (0.42)
21	Construction of drainages across the farmland	3.70*** (0.59)	2.30* (1.09)
22	The use of wetlands/river valleys for production (Fadama system or *akuro*)	3.66*** (0.58)	2.24* (1.25)
23	Consult the rain maker during prolonged drought	1.98* (1.18)	1.53* (1.26)

Note: Figures in parentheses represent the standard deviation.

*** indicates Very High (VH) contributions to farming decision making.

** indicates High (H) contributions to farming decision making.

* indicates Low (L) contributions to farming decision making

Source: Computed from Field Survey, 2012.

Table 3: Comparative Analysis of Gender-based Contributions to Climate Change Adaptation Decision Making in Livestock Rearing Activities among Farm Households in Southwest Nigeria. (N = 348)

SN	Climate change adaptation activities involving decision making	Male Farmers Mean (X)	Female Farmers Mean (X)
1	Intensify supplementary feeding system	3.43** (0.74)	3.55*** (0.81)
2	Dip and Dose system in livestock rearing	2.73** (0.99)	2.89** (0.92)
3	Improved fence camps for livestock	3.51*** (0.89)	3.57*** (0.83)
4	Rearing of disease and pest resistant livestock varieties	3.45** (0.76)	3.63*** (0.84)
5	Construction of shelter for animals using non-conductors of heat	3.57*** (0.71)	3.66*** (0.91)
6	Culling of infected animals	3.35** (0.92)	3.65*** (0.62)
7	Decrease in stocking rate of animals	3.52*** (0.87)	3.60*** (0.84)
8	Distributing livestock herds in different places to reduce disease spread	3.50*** (0.63)	3.64*** (0.79)
9	Rainwater harvesting for livestock rearing	2.02* (1.05)	3.75*** (0.55)
10	Intensify shading of livestock pens	3.63*** (0.70)	3.56*** (0.73)

Note: Figures in parentheses represent the standard deviation.

*** indicates Very High (VH) contributions to farming decision making.

** indicates High (H) contributions to farming decision making.

* indicates Low (L) contributions to farming decision making

Source: Computed from Field Data, 2012.

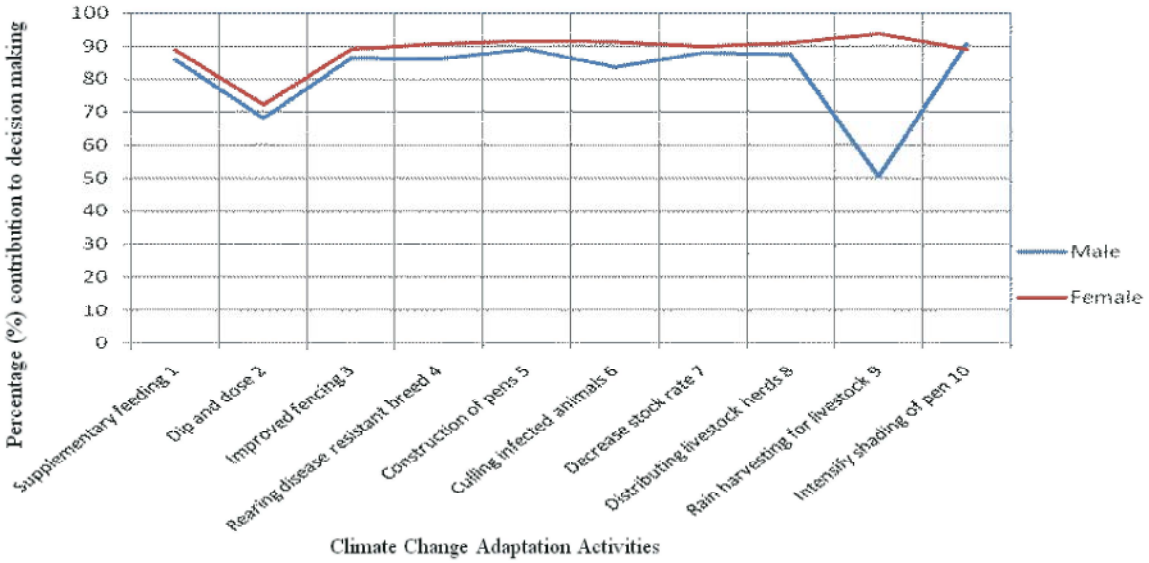

Fig. 3: Graphical representation of steadily high and relatively low contributions of women and men respectively to climate change adaptation decision making in livestock rearing
Source: Field Survey, 2012.

Gender-Based Contributions to Climate Change Adaptation Decision Making in Crop Production Activities among Farming Households in Southwest Nigeria: Table 2 presented the indices of variations in gender-based contributions to decision making in climate change adaptation in crop production activities among farming households in Southwest Nigeria. The result showed that the contributions of male farmers to decision making in the 23 identified adaptation activities in crop production were exceedingly very high while that of the women were relatively low. This finding agreed with the reports of [45] that even though women are more involved in farming activities, men still play dominant roles when it comes to decision making and allocation of farm resources. The report of a study conducted by [46] showed that women's low level of income and economic resources in the society limit their contributions to household farm decision making.

The generally very high contribution of men over women in climate change adaptation decision making in crop production activities was further showed in Fig. 2. The figure presented the graphical representation of the steadily very high contributions of men to adaptation decision making than women.

Gender-Based Contributions to Climate Change Adaptation Decision Making in Livestock Rearing Activities among Farming Households in Southwest Nigeria: The result presented in Table 3 showed that the contributions of male farmers to climate change adaptation decision making in livestock production activities was low relative to that of women farmers. The generally very high contributions of women than men to decision making in adaptation in livestock production activities was further showed in Fig. 3. In affirmation, [47] in their study found out that women's participations were relatively higher in various post harvest activities and livestock management activities than other agricultural activities. The report of [48] showed that women play significant roles in food crop production and rearing of livestock; hence, their high contributions to decision making in adaptive activities in livestock production. This findings of this study disagreed with that of [49] while assessing gender responsibility in smallholder mixed crop-livestock production systems of Jimma zone, South West Ethiopia where the author found that men are largely the decision makers in livestock production and are in charge of general herd management.

CONCLUSION AND RECOMMENDATIONS

In general, using household adaptive capacity approach, the result of gender-based vulnerability analysis showed that female headed farming households in Southwest Nigeria were more vulnerable to the devastating effects climate change with higher vulnerability index of 0.73 as against male headed households with vulnerability index of 0.43.

On zonal basis, farmers in the three local agro-ecological zones in Southwest Nigeria are vulnerable to the effect climate change giving vulnerability threshold probability of 0.5 [34, 44]. For instance, farming households in derived savanna ecological zone (Ekiti) has vulnerability index of 0.61, while farming households in rainforest (Ogun) and guinea savanna (Oyo) ecological zones had vulnerability indices of 0.53 and 0.60 respectively. On gender-based contributions to decision making in climate change adaptation activities in crop and livestock production among farming households in Southwest Nigeria, male farmers dominated decision making as regards climate change adaptation activities in crop production while women on the other hand dominated decision making relating to climate change adaptation in livestock production activities. The results of the study confirmed gender disparities climate change vulnerability and contributions to adaptation decision between male and female farmers in their farm households. Based on these findings, the study therefore recommended the formulation of specific policies that provide increased women access to education, land, training and other farm resources like finance to alleviate their vulnerability and gender disparity in contribution to climate adaptation decisions. In addition, the government through ministry of agriculture should be more committed to formulating gender sensitive policies that will help to strengthen women farmers and reverse their present institutional neglect.

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