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Rural Women's Knowledge and Perception of the Consequences of Climate Change Hazards in Farming Communities of Ogun State, Nigeria

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Abstract
The study assessed rural women's knowledge and perception of the consequences of climate change hazards in farming communities of Ogun state, Nigeria. A simple random sampling procedure was used to select 159 rural women. Primary data were obtained using a structured interview guide and analysed using descriptive and inferential statistics. Results indicated that the mean age of the rural women was 36 years, 36.5% had secondary education and average income was N18, 000 per month. Findings indicated that the major knowledge statement of rural women to climate change hazard were; climate change could affect crops if not harvested on time (95.0%) and if the weather is not conducive, one can shift from crop production to livestock production or vice versa (89.2%). Also, the rural women's perception of the consequences of climate change were; the temperature which is drastically changing ($\bar{x}$ = 2.32), some plants and animal species are no more in existence ($\bar{x}$ = 2.26) and that storm is more frequent ($\bar{x}$ = 2.18). Also the major consequences of climate change indicated were; crop failure ($\bar{x}$ = 2.28), decrease of agricultural productivity and yield ($\bar{x}$ = 2.42) and food shortage ($\bar{x}$ = 2.07). There were significant association ($P < 0.05$) among age (r = 0.174), farming experience (r = 0.632), farm size (r = 0.553) and rural women's perception of the consequences on climate change. There was a significant relationship ($P<0.05$) between knowledge (r = 0.308**) and rural women's perception of the consequences of climate change. It was concluded that rural women's knowledge of the consequences of climate change was low. Based on this, it was recommended that extension agents and other relevant stakeholders should sensitise and disseminate useful information to rural women on the mitigation methods to climate change hazards in their farming communities.

Keywords: Knowledge; Perception; Climate change; Consequence; Rural women

Introduction
Rain-fed agriculture is the main livelihood of people living in most parts of Nigeria, particularly in the southwest. However, the recent modifications in weather and climate have posed a great threat to human and environment (Nwajiuba *et al* 2011). The effect of global warming and the resultant weather and climate shift imprints everywhere around the globe. Climate change is now recongnised as one of the most serious environmental, societal and economic challenges facing the world. Farmers are unable to predict the onset and cessation of rainfall as well as the occurrence and duration of dry spells that result in crop failure. Both soil erosion, which characterises the landscape of the land surface of Southwest Nigeria and floods, a common and recurrent phenomenon in the coastal and riverine areas are weather-related hazards (Ofomata, 1981). The magnitude of gully erosion and frequency of flooding has continued to increase the impact on the wellbeing and livelihood activities of men

and women that are affected.

For instance the gully in Auchi has posed numerous threats to the inhabitants of the area. Here it has caused many residential buildings and worship centers to collapse; destroying road networks and other infrastructure and degrading land for commercial and agricultural purposes. It has been observed that more buildings are perching precariously on the edge of the stream channel. The present situation in Auchi, despite the basement rock formation that comprises the Kukuruku Hills and other outcrops of rocks in Afemai land, deserve urgent attention because of the destruction the gully has caused the people of the area (Musa *et al.,* 2016)

Furthermore, Ajaero and Mozie (2011) in their assessment of gully erosion menace in Agulu-Nanka area reported that Agulu-Nankagully erosion area represents a wide area being eaten away gradually and continuously by landslide cum gully advancement processes covering the entire Aghori basin which covers many communities in the region. Their work has also shown that landslides resulting from floods and gully erosion in Nigeria cause death, loss of property and population displacement when they occur in densely populated areas. Adekalu *et al.*, (2007) and Okpala (1990) in their view say the formation of gullies has become one of the greatest environmental disasters facing many towns and villages in Southeastern Nigeria. They further emphasised that the region is fast becoming hazardous for human habitation and that hundreds of people are directly affected every year and have to be relocated.

According to the Intergovernmental Panel on climate change (IPCC, 2007), over the past 250 years, deforestation, combustion of fossil fuels, agricultural byproducts, bush burning and other human activities have degraded the environment and caused high atmospheric levels of carbon dioxide and other greenhouse gases such as methane and nitrous oxide which absorb energy radiation from the earth to space and warm the atmosphere. This had resulted in a mean global increase in temperature range of $0.3 – 0.6^{0}$ C in the 19^{th} century and by the end of the 21^{st} century it would have risen by another $1.4 – 5.8^{0}$ C. In Nigeria, drought in the north for example, has led to poor crop yields, water scarcity and forced migration. In the south, sea level rise increases the risk of flooding, salt-water intrusion and displacement of people and livestock. Erosion associated with heavy rainfall and flooding is now a frequent threat in most ecological zones in Nigeria especially in the rainforest where mudslides can occur. Loss of biodiversity is now a common trend in all ecological zones of Nigeria and this trend only makes natural resource-dependent communities more vulnerable. The United Nations Framework Convention on Climate Change, UNFCC, 2007).

It is generally acknowledged that climate change impacts are not gender - neutral. This is evident from current experiences of extreme climatic events such as droughts and floods. Men and women have different coping and adaptive capacities that translate to gender-differentiated vulnerabilities to the impacts of a changing climate (UNDP, 2010). Gender-based inequalities in access to assets and gendered social roles are mainly responsible for this difference in adaptive capacities to respond to the effects of climate change. Legal and sociocultural barriers also inhibit women from effectively

responding to climatic risk (World Bank, 2010). Women and men in rural areas in developing countries are especially vulnerable when they are highly dependent on local natural resources for their livelihood. In many of these contexts, women are more vulnerable to the effects of climate change than men primarily as they constitute the majority of the world's poor and are more dependent for their livelihood on natural resources that are threatened by climate change. Furthermore, women face social, economic and political barriers that limit their coping capacity, and make them vulnerable.

According to IPCC (2001), states that vulnerability is the degree to which a system is susceptible to or unable to cope with the adverse effects of climate change including climate variability and extremes. Most times, it is represented by a suite of socio-economic, political and environmental factors that represent the sensitivity and exposure of the population to climate change (Brooks *et al* 2005). Rural women, by nature, face a number of challenges that result from climate change. Men and women are not alike in terms of their vulnerabilities and their ability to prepare for or recover from shocks to their livelihoods (Adelekan, 2008). Information on adaptation to climate change at the local level and particularly among women who form a greater proportion of the agricultural workforce in Nigeria is rather scanty.It is against this background that assessment of rural women's knowledge and perception of the consequences of climate change hazards in farming communities in Ogun state, Nigeria was carried out.

Objectives of the Study

The general objective of this study was to assess rural women's knowledge and perception of the consequences of climate change hazards in farming communities of Ogun State. The specific objectives of the study were to

1. describe respondents' socioeconomic characteristics in the study area;
2. know respondents' sources of information on the consequences of climate change hazards;
3. determine respondents' knowledge on the consequences of climate change hazard;
4. determine respondents' perception on the consequences of climate change hazards and
5. identify respondents' coping strategies on the consequences climate change hazards

Hypotheses of the study

The hypotheses of the study were stated in the null form as follows:

Ho_1: There is no significant association between socioeconomic characteristics of rural women and their perception of climate change hazards.

Ho_2: There is no significant relationship between knowledge of rural women on climate change and their perception of climate change hazards.

Methodology

The study was conducted in the farming communities of Ogun State, Nigeria between July 2013 and January 2014. The study area has twenty (20) Local Government Areas with its capital at Abeokuta. For ease of administration on agricultural sector, the state is divided into four operational zones comprising Abeokuta, Ilaro, Ijebu-ode and Ikenne

covering the 20 Local Government Areas (LGA) of the state.

Sampling procedure and sample size

A multi-stage sampling technique was used to select the respondents for the study. The first stage was the random selection of two agricultural zones in Ogun State namely Abeokuta zone and Ilaro zone. The second stage involved simple random selection of two cells: Opeji and Osiele from Abeokuta zone while Ado-Odo/Ota and Ilaro were selected from Ilaro zone. The third stage involved purposive selection of four villages from each cell resulting in 16 villages. Furthermore, ten rural women were randomly selected from each village. Hence, the sample size of 159 rural women was used for the study.

A structured interview guide was used to elicit information from the respondents after it was faced and the contents was validated by professionals in the field of Agricultural Extension. Rural women's perception of the consequences of climate change hazard was measured on Likert scale of Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1) with a total number of 12 statements of opinion. Knowledge was measured as True (2) or False (1) with a total of 10 knowledge items while coping strategies to the consequences of climate change was measured on a 3-point rating scale of always used (3), occasionally used (2) and never used (1) with total number of 14 items. Data were analysed using frequency count, percentages, means, standard deviation, chart, chi-square test and Pearson Product Moment Correlation (PPMC).

Results and Discussion

Socioeconomic characteristics of the respondents

The socioeconomic characteristics of the respondents are presented in Table 1. Findings reveal that the mean age of the respondents was 36 years. Many (35.9%) of the rural women belonged to the age range of 30-39 years while 27.7% were in the age range of below 30years. It can be inferred from the result that the rural women were in their active, reproductive and productive working age. Results in Table 1 also reveal that most (74.2%) of the respondents were married while 8.8% were single. This implies that there were more married women within the farming communities. The result is similar to the findings of Fakoya *et al* (2009) that there were more (80.8%) married rural women in farming communities in Ogun State. In addition, 50.3% respondents were Christians while 39.0% practice Islam. Findings further revealed that 36.5% had secondary education while 23.9% had post-secondary education. It therefore inferred that some rural women within the farming communities in Ogun were literate. This result agrees with the finding of Adamu *et al* (2003) that 20.0% of rural women had secondary education. Furthermore, the mean income of the women per month was N18, 000. Most (56.0%) earned less than N20, 000 per month while (30.2%) earned between N20, 000 and N39, 000 monthly. The mean farming experience and the standard deviation was 9±9.35 respectively. Majority (69.8%) of the respondents had a farming experience below 10years while (22.6%) had farming experience between 10 and 19 years. This is an indication that the rural women were not involved so much in farming activities compared to their male counterparts. This may be because women took care of their children and they were involved in domestic works/chores at home. This

Table 1: Socioeconomic characteristics of respondents (n= 159)

Variables	Frequency	Percentage	Mean age ($\bar{x}$)	Std. Deviation
Age (years)				
Below 30	44	27.7	36years	8.26
30 – 39	57	35.9		
40 – 49	37	23.3		
50 & above	21	13.2		
Household size (persons)				
3 – 5	112	70.4	5 person	3.29
5 & above	47	29.6		
Religion				
Christianity	80	50.3		
Islam	62	39.0		
Traditional	17	10.7		
Marital Status				
Single	14	8.8		
Married	118	74.2		
Divorced	7	4.4		
Widowed	11	6.9		
Separated	9	5.7		
Educational status				
No formal education	15	9.4		
Primary education	36	22.6		
Secondary education	58	36.5		
Post secondary education	38	23.9		
Adult education	12	7.5		
Average income (₦)				
Less than N20,000	89	56.0	N18,000	13.50
N20,000 – N39,000	48	30.2		
N40,000 – N59,000	15	9.4		
N60,000 – N79,000	5	3.1		
N80,000 & above	2	1.3		
Farming Experience (Years)				
Below 10	111	69.8	9years	9.35
10 – 19	36	22.6		
20 & above	12	7.5		
Farm size (hectares)				
Below 1	14	8.8	2 hectares	5.60
1 – 2	108	67.9		
3 – 4	27	17.0		
5 & above	10	6.3		

Source: Field Survey(2013)

corroborates the findings of Fakoya *et al* (2009) that women farmers had a mean year of farming experience of 10 years. In terms of farm size, the mean was 2 hectares with standard deviation of 5.60. Most (67.9%) of rural women cultivate an average of 1-2 hectares of land while 17.0% cultivate 3-4 hectares of land.

Rural Women's Sources of Information on the Consequences of Climate Change Hazards

Results in Table 2 show the information sources and types of climate information received. Findings indicated that 38.4% of the rural women received climate information through the radio 27.6%

Table 2: Rural Women's Sources of Information (n= 159)

Variable	Frequency	Percentage
Sources of information		
Radio	61	38.4
Extension Agents	26	16.4
Metrological stations	7	4.4
Weather stations	7	4.4
Fellow farmers	14	8.4
Personal experience	44	27.6
Type of climate information		
Rainfall	62	39.0
Sunshine	19	11.9
Windstorm	1	0.6
Wind	2	1.3
Cloud	10	6.3
Temperature	38	23.9
Sea level	27	17.0

Source: Field Survey, (2013)

through personal experience, 16.4% through extension agents while 8.8% received climate information through fellow farmers. Furthermore, findings indicated that 39.0% of the respondents received information on rainfall, 23.9% on temperature while 17.0% received information of sea level rise. The results imply that radio and personal experience were the major information sources to those rural women in the farming communities of the study area. In addition, rainfall was the major concern of the respondents which had great impact on their production. This result agrees with the findings of Ofomata (1981), Zakieldeen (2009) and United Nation Development Programme (2010) that rain-fed agriculture is the main livelihood of people living in most parts of Nigeria. Food security was mainly determined by rainfall and people were directly dependent on climate-sensitive resources for their livelihoods.

Rural Women's Knowledge on Climate Change Hazards

The rural women's knowledge scores on the consequences of climate change hazards are presented in Table 3. Findings indicate that climate change could affect crops if not harvested on time (95.0%);if the weather was not conducive, one can shift from crop production to livestock production or vice versa (89.2%); mulching is essential to reduce the intensity of sun on crops (86.1%) and loss of nutrient caused by climate could be replaced by fertiliser application (81.1%). The result is in line with that of FAO (2008) who claimed that more than 90 % of many African Countries experience crop loss due to climate change. This also corroborates the view expressed by Zakieldeen (2009) that the most vulnerable people are the women whose livelihoods were exposed to the severity of drought and variability of rainfall (in terms of amount, distribution and frequency).

Table 3: Knowledge of rural women to climate change hazard (n=159)

s/n	Knowledge Statements	YES	NO	Mean values
1	Climate change could affect crops if not harvested on time	151(95.0)	8(5.0)	1.62
2	Mulching is essential to reduce the intensity of sun on crops	137(86.1)	28(13.8)	1.60
3	Loss of nutrients caused by climate change could be replaced by fertiliser application	129(81.1)	30(18.9)	1.54
4	Water from rivers and streams could be used for irrigation whenever rainfall starts late.	126(79.2)	33(20.8)	1.56
5	Rainy and dry seasons determine the types of crops to plant	123 (77.3)	36 (22.6)	1.50
6	Indiscriminate bush burning and deforestation should be reduced	121 (76.1)	38 (23.9)	1.49
7	If the weather is not conducive, one can shift from crop production to livestock production or vice versa	110 (89.2)	49 (30.8)	1.42
8	Storage of grain crops could reduce the effect of climate change	102 (64.2)	57 (35.8)	1.37
9	Prompt weeding is essential to reduce the effect of climate change	90 (56.6)	69 (43.4)	1.45
10	Weather and metrological stations help to reduce climate change	77 (48.4)	82 (51.6)	1.34

Source: field survey (2013)

Rural Women's Perception on the Consequences of Climate Change Hazards

Results in Table 4 indicate the rural women's perception on climate change. Results show that as perceived by the women, temperature is normal in recent times ($\bar{x}$ = 2.32), as some plant and animal species are no more in existence ($\bar{x}$ = 2.26), storm is now more frequent ($\bar{x}$ = 2.18), flood is more severe in recent times ($\bar{x}$ = 2.07) and there is an increased frequency of drought ($\bar{x}$ = 2.05).These were the major rural women's perceptual statements on climate change. It implies that the effect of climate change on agriculture is enormous and has caused some useful and medicinal plants to go into extinction. However, the least perceptual statement on climate change by the rural women were that they perceived that climate was changing ($\bar{x}$ = 1.48), temperature has been on the increase in recent times ($\bar{x}$ = 1.67) and that rainfall no longer starts and ends at normal periods. The findings is in consonance with that of Toan (2014) who noted that climate change is occurring in the form of changing rainfall patterns and temperatures.

Table 4: Rural women' perception of the consequences of climate change hazards (n= 159)

Perceptual Statement	SA	A	D	SD	$\bar{x}$	S.D
Temperature is normal in recent time	26 (1 6.4)	61 (33.4)	58 (36.5)	14 (8.8)	2.32	0.82
Some plant and animal species are no more in existence	27 (17.0)	79 (49.7)	29 (18.2)	24 (15.0)	2.26	0.89
Storms are more frequent now	31 (19.5)	81 (50.9)	29 (18.2)	18 (11.3)	2.18	0.84
Floods are more severe in recent time	40 (25.2)	73 (45.9)	29 (18.2)	17 (10.7)	2.07	0.85
There is a seasonal incidence of flooding	37 (23.3)	84 (52.8)	16 (10.1)	22 (13.8)	2.05	0.85
There is an increased frequency of drought	37 (23.3)	71 (44.7)	41 (25.8)	10 (6.3)	2.05	0.75
There is now a change in planting dates due to climate change	41 (25.8)	87 (54.7)	24 (15.1)	7 (4.4)	1.92	0.68
There is an observed change in temperature	51 (32.1)	71 (44.7)	25 (15.7)	12 (7.6)	1.91	0.80
There is an increase in volume of rainfall	73 (45.9)	67 (42.1)	13 (8.2)	6 (3.8)	1.72	0.77
Rainfall does not start and end at normal periods	66 (41.5)	83 (52.1)	10 (6.3)	0(0.00)	1.64	0.60
Temperature has been on the increase in recent times	69 (43.4)	77 (48.4)	6 (3.8)	7 (4.4)	1.62	0.62
I perceived that climate is changing	101 (63.5)	41 (25.8)	17 (10.7)	0(0.00)	1.48	0.68

Source: Field Survey, 2013. SA= Strongly Agree, A=Agree, D=Disagree, SD=Strongly Disagree, x = Mean, S.D=Standard Deviation

Rural Women's Coping Strategies with the Consequence of Climate Change Hazards

Findings in Table 5 indicate that the major coping strategies adopted by the rural women within the farming communities were; application of fertilisers ($\bar{x}$ = 1.75), planting of short mature crop varieties ($\bar{x}$ = 1.69), use of weather forecasting ($\bar{x}$ = 1.68), seeking of monetary support to diversify livelihoods ($\bar{x}$ = 1.66), use of irrigation and ground water ($\bar{x}$ = 1.65), and planting of trees. This implies that the respondents still provide coping strategies to ameliorate the consequences of climate change.

Table 5: Coping Strategies to Climate Change (n= 159)

Coping Strategies	AU	OU	NU	$\bar{x}$	S.D
Application of inorganic fertilisers	53 (33.3)	82 (51.6)	24 (15.1)	1.75	0.62
Planting of short maturing crop varieties	53 (33.3)	88 (55.3)	18 (11.3)	1.69	0.58
Use of weather forecasting	56 (35.2)	87 (54.2)	16 (10.1)	1.68	1.58
Seeking of monetary support to diversify livelihoods	65 (40.9)	68 (42.8)	26 (16.3)	1.66	0.65
Use of irrigation/ground water	63 (39.6)	76 (47.8)	20 (12.6)	1.65	0.61
Tree planting	15 (47.2)	52 (32.7)	33 (20.2)	1.62	1.73
Varying of planting periods/dates	84 (90.3)	77 (48.4)	18 (11.3)	1.61	0.57
Water storage from rain	75 (47.2)	59 (37.6)	25 (15.8)	1.61	0.67
Erection of contour bunds around farmlands	82 (51.6)	47 (29.6)	30 (18.9)	1.60	0.74
Practice of home gardening	95 (59.7)	52 (32.7)	12 (7.6)	1.39	0.52
Planting of new crop varieties	97 (61.0)	50 (31.4)	12 (7.6)	1.34	1.52
Prompt weeding	130 (81.8)	20 (12.6)	9 (5.7)	1.13	0.34

Source: Field survey, (2013) AU=Always Used, Occasionally Used, NU=Never Used, x = Mean value, S.D = Standard deviation

Test of significance between rural women's socioeconomic characteristics and perception on the consequences of climate change hazards

The results of the hypothesis testing are presented in Tables 6a and 6b. The socioeconomic characteristics measured at nominal level were religion, marital status and educational status while socio economic characteristics measured at interval levels were age, household size, average income, farming experience and farming size. Findings indicate a significant relationship among educational status (χ^2 = 13.116, df = 4), age (r s= 0.174), farming experience (r= 0.632,), farm size (r= 0.553,) and perception on the consequences of climate change hazards. The findings imply that the rural women in the study are literate (i.e. have the ability to read and write), the year of farming experience can influence and is the basis for having a basic knowledge of climate change.

Table 6a: Test of significance between rural women's socioeconomic characteristics and perception on the consequences of climate change hazards

Variables	Chi-Square Value	Df	P-Value	Decision
Religion	0.665	2	0.721	Not significant
Marital Status	9.399	5	0.094	Not significant
Educational Status	13.116	4	0.01	Significant

Source: Field Survey (2013)

Table 6b: Test of significance between rural women's socioeconomic characteristics and perception on the consequence of climate Change hazards

Variables	r-value	P-value	Decision
Age	0.174*	0.03	Significant
Household size	-0.084*	0.39	Not significant
Average Income	0.04*	0.58	Not significant
Farming experience	0.632**	0.00	Significant
Farm Size	0.553**	0.00	Significant

Source: Field Survey (2013)
* Correlation is significant at the 0.05level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Test of relationship between knowledge and perception of climate change

The result of hypothesis two is presented in Table 7. Findings indicate that there is a positive and significant relationship between knowledge and perception on the consequences of climate change hazards by rural women (r= 0.308**, P<0.05). It inferred that the rural women's knowledge of the consequences of climate change hazards would influence their perception. The hypothesis was therefore rejected and the alternate hypothesis that there is a significant relationship between the knowledge and perception of the consequences of climate change hazards was accepted.

Table 7: Test of relationship between knowledge and perception of climate change

Variables	r-value	P-value	Decision
knowledge and perception of the consequences of climate change hazards	0.308**	0.001	Significant

Source: Field Survey (2013), ** P-value is significant at 0.01 levels (2-tailed)

Conclusion and Recommendation

From the findings of the study, it can be concluded that rural women's knowledge of the consequences of climate change hazards is substantially low. Also, rural women have a favourable perception towards the consequences of climate change hazards and it has a direct impact on agricultural production. It was therefore recommended that extension workers should intensify effort to bring timely and relevant information on the mitigating and coping strategies of consequences of climate change hazards to rural women

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