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# Climate Variability and Extreme Climate Events: Rural Women Farmers' Perception in Southwest Nigeria

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#### Abstract

This study examined the level of rural women farmers understanding of their local climate and their indigenous perception of climate variability and extreme climate events. One hundred and twenty (120) questionnaires were administered randomly to a pool of registered women farmers in the study area. Temperature and precipitation data from a local meteorological station was used to examine the perception of the sampled women farmers. The result showed that rural women farmers understand their local climate but found it highly variable and unpredictable. This was confirmed by the result of statistical analysis conducted on the temperature and precipitation data. The result further suggest a positive trend in temperature (b=0.018, P<0.05) between 1984 and 2013 and a negative trend of precipitation (b= -3.02, P>0.05) within the said period. This suggests that annul temperature has increased in the study area while annual precipitation volume has reduced. Majority of the women farmers perceive extreme climate events to be anthropogenically induce. The study concluded that while some rural farmers lack adequate knowledge of their local climate, vast majority of them understands how the climate works.

**Keywords:** Climatic variability; Extreme climate event; Women farmer; Temperature; Precipitation

### Introduction

Climate, often defined as the statistical average of prevailing weather condition over a considerable period of time is a major determinant of agricultural profitability or loss. Climate sensitivity and vulnerability has been argued to be anthropogenic induced [1,2], while other authors believe it is caused by a natural dynamic of atmospheric cycle [3]. Climate variability is defined in terms of the pattern of climate dynamics on both temporal and spatial scale, i.e. fluctuation above or below the average climate pattern [3]. Extreme climate event is often defined as the consequence of excess or deficit in climate occurrence. The severity of these events is often harmful to biodiversity and the environment.

Climate variability and extreme climate events are some of the major environmental issues affecting agricultural produce in the sub Saharan region of Africa. In recent times, records have shown a rise in events associated to extreme climate such as drought, heat wave, flooding, erosion, wildfire, degradation, loss of soil nutrient, desertification, storms etc. in this region which Ghil [3] believe are difficult to be attributed to climate change. Gleditsch [1], on the other hand, contested that anthropogenic climate change is a major proponent these disasters. The severity of these events can as well be linked to both natural and anthropogenic process (e.g., urbanization, overpopulation, deforestation, industrialization, bush burning, among others.

Furthermore, farming which is considered to be one of the most weather-dependent of all human activities is highly vulnerable to climate variability. Man has been known to possess the ability to survive and adapt to environmental changes and imbalance either by way of adaptation, mitigation or migration. This imbalance can thus pose a threat on biodiversity and the environment at large. Farming activities can as well be affected by such climate variations resulting in poor agricultural output especially among women farmers, in the rural areas where basic technologies are absent [4].

In most parts of Nigeria, women have been found to participate actively in all subsections of agriculture, namely crops, livestock, fisheries and agro-forestry where they contribute 60-80% of labour [5]. In the rural areas where level of literacy and exposure of women is low, women often engage in agricultural practice in order to support their home. Although, they also engage among other activities in craft, trading, etc. Thus, they contribute significantly to food production, processing, and marketing in Nigeria [5].

Rural women farmers in Nigeria, as expressed by [6], control, and own lesser resource especially land and mostly feel the consequence of climate events and variability more than men. Thus, this study seek to assess the level of awareness of rural women farmers to their micro-climate and also provide information on indigenous perception of rural women farmers' in the study area on climate variability and extreme climate events based on their knowledge of precipitation and temperature pattern.

#### **Materials and Methods**

The study area is Ido Osun, a rural settlement in Southwest of Nigeria. Ido Osun falls on Longitude 7°46'N and Latitude 4°24'E and has an average elevation of about 303 meters above sea level. Ido Osun is a hinterland which falls in the derived savannah ecological zone of Nigeria which is characterized by high relative humidity (about 79.9% in the morning and about 58.6% in the afternoon). Ido Osun receives an annual rainfall of 1378.6 mm and experiences 31.9°C and 21.1°C as maximum and minimum temperature respectively.

Both primary and secondary data were used for this study. A wellarticulated semi-structured questionnaire is the primary data source

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and it was used to elicit information on women farmers' perception of variability and extreme events of the climate. Women farmers were randomly selected from a pool of registered women farmers in Ido Osun whom have been into farming for not less than 10 years. 120 women farmers were sampled; this represents 8.5% of registered women farmers in Ido Osun. Responses captured in the questionnaires were subjected to frequency count and percentage, and thus presented in a table. The secondary data include thirty (30) year's annual rainfall and temperature data between 1984 and 2013 of Ido Osun, sourced from the archive of Nigeria Meteorological Agency (NIMET), Osodi, Lagos. The choice of rainfall and temperature variables is considerably due to the fact that these climate parameters are well known and talked about by the rural populace. Temperature and rainfall data was used for this study to ascertain the occurrence of climate variability in the study area and also to relate the climate trend with what was perceived by the respondents. The climate data (temperature and rainfall) was subjected to descriptive analysis (mean, range and standard deviation) and the results were presented in tables and graphs.

#### **Result and Discussion**

Table 1 shows the summary of mean annual temperature and precipitation between 1984 and 2013 at Ido Osun, Southwest Nigeria. The mean temperature for this period is  $26.3 \pm 0.44^{\circ}$ C while the mean annual temperature ranged between  $25.3 \pm 0.44^{\circ}$ C and  $27.0 \pm 0.44^{\circ}$ C. Temperature was shown to exhibit a significantly increasing trend within the time frame of this study (b=0.018, P<0.05). The lowest annual temperature was recorded in 1997 while the highest occurred in 1987 (Figure 1). Precipitation, on the other hand, exhibited a decreasing trend (b= -3.02, P>0.05) with a mean of 1351.7 ± 150.23 and ranged between 1014.7 ± 150.23 and 1686.4 ± 150.23. The lowest annual precipitation volume occurred in 2001 while the highest occurred in 1991 (Figure 2).

The result of the 120 questionnaires administered (Table 2) to women farmers in Ido Osun who had been a farmer for at least 10 years showed that women farmers were engaged in a variety of farming practice which include mixed farming (51.7), Crop cultivation (40.8%), Aquaculture (5.8%), Animal husbandry (1.7%). Although, some of these farmers were also engaged in other businesses such as trading (84.2%), craft (0.8%), administrative jobs (10.8%) while 4.2% are engaged in only farming. And 98.3% believe they have a cordial relationship with the male farmers. 93.3% of the respondents have

		Standard Deviation	Trend		
	Mean (Max- Min)		Regression analysis (R <sup>2</sup> in parenthesis)	P-value	F-value
Temperature (°C)	26.3 (27.0-25.3)	0.44	0.018x+26.3 (0.14)	0.042	4.54
Precipitation (mm)	1351.7 (1686.4- 1014.7)	150.23	-3.029x+1398.7 (0.031)	0.345	0.911

Table 1: The climate characteristics of Ido Osun, Southwest Nigeria.

spent at least 5 years in the study area and more than 98% of the respondents had at least primary education status, suggesting that they understand the environment and would easily understand the content of the questionnaire and its purpose.

Also, the women farmers were asked how they perceive the trends of climate parameters (air temperature and precipitation). 86.6% of the respondents believe the annual amount of rainfall has reduced while 3.4% and 10% believe that rainfall has been constant and increasing respectively. Air temperature on the other hand was perceived by 100% of the respondents to have increased within the last 30 years. Perception on possible cause of extreme climate events showed that 80.8% of the respondents believe it is caused by anthropogenic action while 4.2% perceive extreme climate events to be a natural occurrence. The remaining 15% were either not sure of the possible cause or attributed the phenomenon as being a message from their deity gods. Majority of the respondents said that they have witnessed flood, erosion, drought, storms, deficit/excessive rainfall, and excessively high temperature at least once in the past 30 years and 66% believe that the degree at which this event occurred affected their farming practice adversely while 31.4% believe the effect was bearable and 2.5% believed it had no effect on their farm practice.

The women farmers were tested based on their perceived knowledge of air temperature and rainfall. The result shows that a vast majority of the sampled women farmer have some knowledge of the climate pattern, indicating the view of previous studies that rural farmers are aware of climate variability [7,8]. Most of the farmers' perceived air temperature to be increasing and annual rainfall volume to be decreasing, this was affirmed by the meteorological record of temperature and precipitation which showed a decreasing trend in rainfall and an increasing trend in air temperature. Also, both Figures 1 and 2 showed a high variability in temperature and rainfall, this attests



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Question	Options	Frequency	Percentage
	No formal education	17	14.2
	Primary education	58	48.4
Level of education	Secondary education	34	28.3
	Tertiary education	11	9.2
	>5 years	8	6.7
	5-10	50	41.7
Length of residency	11-20	21	17.5
	21-40	29	24.2
	>41	12	10.0
	Trading	101	84.2
	Craft	1	0.8
Secondary occupation	Administrative	12	10
	Solely Farming	5	4.2
	others	1	0.8
	Cordial relationship	118	98.3
Relationship with opposite sex farmer	Shabby relationship	2	1.7
	Mixed farming	62	51.7
<b>F</b>	Crop cultivation	49	40.8
Farm practice	Aquaculture	7	5.8
	Animal husbandry	2	1.7
	Yes	94	78.3
Knowledge of climate variability and	No	24	20.0
	Not sure	2	1.7
	Anthropogenic actions	97	80.8
Likely cause of extreme climate event	Natural Occurrence Others	5 18	4.2 15
	Flood	32	26.6
	Drought	22	18.3
Indigenous climate events	Storms	18	15
	Excessive rainfall	42	35
	Others	6	5
	Adversely	78	66.1
To what degree does events of extreme	Bearable	37	31.4
	No effect	3	2.5
	Huge reduction	46	38.3
	Slight reduction	58	48.3
Annual rainfall volume	No changes	4	3.4
	Slight increase	9	7.5
	Increase	3	2.5

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Page 4 of 4

Annual rainfall pattern	Rain comes late in the year	42	35.0
	Rain comes early in the year	14	11.7
	Rain is unpredictable	64	53.3
Annual temperature changes	Slight increase	4	3.3
	Increase	50	41.7
	Larger increase	66	55.0
	Yes	111	96.5
Ability to adaptation to climate dynamics	No	4	3.5
Source: Field work, 2014			

Table 2: Summary of results from administered questionnaires.

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to the women farmer's response of the climate being unpredictable. As previous authors have recommended [9], awareness, climate education, adequate information on proper agricultural practice, capacity building and encouragement of proper integration of both indigenous and global adaptation mechanisms. Also, through government intervention, such as; sensitization, loan/aid and other proper funding on sustainable adaptation and mitigation techniques.

#### Conclusion

This study investigated the rural women farmers' perception of climate variability and extreme climate event based on their indigenous understanding of air temperature and rainfall. Their perceptions were compared to records of temperature and rainfall in a synoptic station within the locality of the study area. The results obtained from analysis of meteorological data (30-year record of temperature and rainfall) suggested that there have been a considerable variation in the amount of both rainfall and temperature received in the study area. The result also suggested that rainfall volume has reduced and its pattern is unpredictable [10]. Result of perception of the local women farmers showed that to a very large extent are aware of the variations of their local climate and thus perceived it to be anthropogenically induced. Majority of the respondents have witnessed flood, erosion, drought, storms, deficit/excessive rainfall, and excessively high temperature which are indices of extreme weather and climate and thus claimed they adapted indigenously during the occurrence of these events. This study therefore concludes that typical women farmers in Southwest Nigeria understands their local climate, but their ability to cope with extreme events is minimal due to lack of information and technicalknow-how in proper adaptation and mitigation methods.