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Assessment of Climate Change Adaptive and Coping Strategies of Women Farmers in Mmaku Mountainous Community Awgu Area Enugu State Nigeria

ABSTRACT

The impact of climate change on agricultural production is a serious source of worry to farmers in rural communities in Nigeria. This is because their economies mainly depend on agriculture which is seriously affected by global climate change. The objectives of this study were to identify gaps in knowledge about climate change and to collate traditional coping and adaptive practices of climate change in Mmaku Mountainous Community Awgu Area Enugu State Nigeria. Structured questionnaires were developed and administered to 220 randomly selected farmers in Mmaku Mountainous Community, Awgu Area Enugu State. The result of the study revealed that most of the respondent knew about climate change through radio and 70 sampled respondents out of 220 stated that climate change include a range of weather parameters apart from temperature. The study concluded that increase in temperature, indiscriminate felling of trees and bush burning where the major causes of climate change in the study area. The study recommended that training and sensitization programmes are needed in the study area to create more awareness on the causes, impact and prevention of climate change. Government should as a matter of urgency provide motorized boreholes in the study area to reduce the suffering encountered by women and children in search of drinking water.

Keywords: Climate change, Adaptive and Coping Strategies of Women Farmers, Mmaku Awgu

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1. Introduction

Climate change is considered the most pressing environmental problem facing the globe today. It is affecting patterns of life and general living condition of people around the world (Nzeh and Eboh, 2011). Climate change posses threats such as gully erosion, increase frequency of extreme weather, flooding, storms, drought, desertification, rise in sea temperature, heat and cold waves, the melting of glaciers and increased insect activity (Agwu, 2011). These events have major ecological, social, economic and political import. They lead to food shortages, water scarcity, the spread of infectious diseases, lack of biomass fuel, dysfunctional hydropower, shelter insecurity, impoverishment of communities, and the violation of basic human rights (Brody *et al.,* 2008).

Climate change is not just a technical subject; it makes the poor poorer and threatens progress and the achievement of Millennium Development Goals (MDG). Some countries are more vulnerable to the impact of climate change than others. Nigeria is particularly vulnerable because it's agriculture is rain-fed and has a high population density of 150 million people on an area of 923,000 square kilometer. In Nigeria, climate change threatens water resources, agriculture, land use, energy, biodiversity and health. The scourge of climate change has already been felt in several places and Mmaku is not an exception.

Climate change adaptation and coping strategies distinguishes between farmer's short-term and long-term responses to climate variability and food insecurity (Mudzonga, 2011). Although farmer's adaptive and coping strategies may not succeed completely, they form the basis of solutions to natural disaster preparedness. Addressing the threat of increased animal and crop failure posed by climate change, will require better quantification of climate change effects, greater attention to prioritizing which forms of production system are more vulnerable, and redoubling farmers efforts in the management of land and water resources especially in drought stricken area (Kandji *et al.,* 2006). The gender perspective is important because climate change affects men and women differently. The distribution of gender roles and the importance of gender inequalities are such that women are more vulnerable to the impact of climate change than their male counterparts

Improved and sustainable livelihoods for the farmers depend on their knowledge and flexibility in relation to practices and belief system. Farmer's perception about and knowledge of management/coping strategies of climate change need to be documented to identify strengths and weaknesses as a first stage in amelioration. Gaps undoubtedly exist in farmers' indigenous knowledge about climate change in Mmaku Awgu of Enugu State Nigeria. The main thrust of this study is to assess climate change adaptive and coping strategies of women farmers in Mmaku Mountainous Community Awgu Area Enugu State Nigeria, tailoring it down to identification of gaps in knowledge about climate change and collation of traditional coping and adaptive practices of climate change in Mmaku Mountainous Community Awgu area Enugu State.

2.RESEARCH DESIGN AND METHODOLOGY

2.1 Description of the study area

This study was conducted in Mmaku Awgu area of Enugu State. Mmaku is made of three Autonomous communities namely; "Aguness Mmaku", "Mmaku Ugwu" and "Mmaku Agbo". The area lies approximately between latitude 6^0 6^1 and 6^0 9^1 North and longitude 7^0 25^1 and 7^0

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28[1] East. It has a projected population of 198,134 persons (NPC, 2006 and NBS, 2007) and population density of 2260 persons per square kilometer (NPC, 2006 and NBS, 2007). About 70% of the population is made up of subsistent farmers who cultivate crops such as yam, cocoyam, cassava, maize and vegetables. The climate consist of rain forest vegetation and little savannah vegetation. The rain forest vegetation consists mainly of trees with some shrubs, grasses and climbers. The savannah vegetation is characterized by grasses and few shrubs and trees which occurs in the hilly areas ("Mmaku" to " Owelli" to "Amolli"). This is because those hills consist of hard rocks, which do not support the growth of luxuriant trees but supports the growth of shallow rooted plants mainly grasses. Rainfall distribution pattern in the area is bimodal with peaks in July and September and a short dry spell around mid August. Harmttan starts from the month of November or sometime December till the January or February of the coming year (Iloege, 1992). The soil type is classified as rocky loamy soil.

2.2 Population and sample size determination

The population of the study was made up of all categories of women in Mmaku community. The women were categorized into two, namely; "the core farmers" and "working class farmers " (partial farmers). The core farmers in the community were one hundred and fifty, while the working class farmers were Ninety four. A total of three hundred and fifty women were randomly identified for the study, but due to time and large population size it was reduced to 232 using YaroYameni's model (1964) as shown below:

$$n = \frac{N}{1 + N(e)^2}$$

Where n

n	=	sample size
N	=	the population
e	=	5% tolerable errors
I	=	Constant

The sample size of core women farmers

$$n = \frac{256}{1+ 256\ (0.05)^2}$$

$$n = \frac{256}{1+256\ (0.0025)}$$

$$n = \frac{256}{1+0.64}$$

$$n = \frac{256}{1.64}$$

$$n = 156$$

The sample size of working class women or partial farmers

$$n = \frac{94}{1 + 94(0.05)^2}$$

$$n = \frac{94}{1 + 94\ (0.0025)}$$

$$n = \frac{94}{1+0.235}$$

$$n = \frac{94}{1.235}$$

$$n = 76$$

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Total sample size = 156 + 96 = 232

2.3 Data collection

Data were collected from Primary source. The Primary data were derived from a set of well structured questionnaire. The questionnaire was administered to the respondents with the help of research assistant who was very familiar with the localities, interview schedule was used to supplement the structured questionnaire for uneducated respondents (women farmers). Information collected were, sources of knowledge about climate change, knowledge of climate change, causes of climate change, impact of climate change, traditional coping and adaptive strategies to heat waves/excessive heat, traditional coping and adaptive strategies to famine/drought, collection of firewood, sources of power, stream dry up period and sources of drinking.

2.4 Data analysis

Two hundred and twenty questionnaires were returned out of 232 administered to respondents. A total of 220 questionnaires were used for data analysis. The major tool of data analysis employed was descriptive statistics in form of frequency counts and percentages. Statistical analysis was executed using Statistical Package for the Social Sciences (SPSS) Release 17.00 edition 16 (SPSS, 2006) statistical software.

3. RESULTS AND DISCUSSION

3.1. Knowledge about climate change in Mmaku Awgu Area of Enugu State

The data presented in Table 1 reveals that 41.4% of the total respondents knew about climate change through radio, 38.2% have heard about climate change through television and 16.8% heard about climate change through friends. Only 3.6% knew about climate change through their family members. The result indicated that farmers' knowledge of climate change are more common through radio. In recent survey conducted by Ministry of Agriculture, in 2000 in Mafeteng district Lesotho showed that 50% of the total sampled farmers, source their knowledge about climate change through the mass media especially radio. 29% of the interviewed men claimed that their knowledge to climate change was rooted in their own observation of the impact of climate in their Agricultural practice. According to Akliu (2002), information about climate change is largely confined within the academia and research institution thus limiting their availability to end users. Table 1 also indicates that 70 sampled respondents out of 220 stated that climate change include a range of weather parameters apart from temperature, 23 respondents said climate change was only increase in temperature over a long period (over 20 -30 years) and 37 respondents said that both changes in weather including temperature over a long period was climate change, 10 persons said that it was changes in cloud and 5 respondents said it was change in rainy season. However, 75 respondents did not know about climate change. Overall, we classified the responses here into three namely; no knowledge about climate change, inadequate knowledge about climate change and adequate knowledge about climate change. 48.6% of respondents had adequate knowledge about climate change, 17.3% had inadequate knowledge about climate change and 34.1% had no knowledge of climate change.

Mores, Table 1 shows that 46 respondents representing 20.9% of the total sampled respondent stated that burning of fossil fuels mostly from energy causes climate change, 63

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respondents representing 28.6% said that bush burning is one of the causes of climate change, and 21 respondents representing 9.5% agreed that industrialization is among the causes of climate change, 12 persons representing 5.5% was of the view that farming activities especially livestock, manure and fertilizer application causes climate change. However, 78 respondents, representing 35.5% said that indiscriminate felling of trees was actually the cause of climate change in Mmaku Mountainous Community, Awgu area Enugu State. Combustion of fossil fuel has been reported as one of the major causes of climate change (SACAU, 2009). The main gases that causes climate change are carbon dioxide, methane and nitrous oxide often emanate principally from the burning of fossils fuel, forest destruction and agriculture thus through rice field cultivation, keeping of livestock and water (Fisher, 2009, Bashir and Brody, 2006 and Aguilar, 2008). Also, the data presented in Table 1 shows that six respondents (2.7%) stated that excessive rainfall/flood was one of the impact of climate change, 17 respondents (7.7%) said that drought/famine was among the impact of climate change, 29 respondent (13.2%) is of the opinion that increase incidences of diseases was one of the impact of climate change, 10 persons (4.6%) observed that heat waves was a sign of climate change. However, 112 respondents (50.9%) said that crop failure/poor crop yields were among the signs of climate change

3.2. Traditional coping and adaptive practices of climate change in Mmaku Awgu Area of Enugu State

The results in Table 2 reveals that 88 sampled respondent (40%) out of a total of 220 swim often in the stream during heat waves/excessive heat period as a traditional and adaptive strategy, 18 persons (8.2%) do nothing during heat period, while 114 respondents (51.8%) drink a lot of water during heat waves/excessive heat period in Mmaku Mountainous Community, Awgu area Enugu State. Also, Table 2 shows that 145 (65.9%) respondent of the total sampled respondent (220) buy food from market in big town during famine/drought, 33 persons (15%) change planting practice during famine/drought, while 42 respondent (19.1%) change livelihood/occupation during famine/drought in Mmaku community.

Furthermore, Table 2 shows that 9 respondents representing 4.1% of the total sampled respondent said that it is men that collect firewood in Mmaku Mountainous Community, Awgu area Enugu State, 82 respondents representing 37.3% is of the view that it is women that collect firewood, four respondents representing 1.8% said that every individual irrespective of gender collect firewood, while 125 respondents representing 56.8% is of the opinion that children collect firewood in Mmaku Mountainous Community, Awgu area Enugu State. Table 2 also indicate that 102 respondents out of a total of 220 sampled respondent said that source of power in Mmaku is through National grid and 104 respondents said that source of power is kerosene, while 14 respondents is of the view that source of power in Mmaku community is through generator. Moreso, Table 2 indicates that 217 of the respondents that is 98.6% said that the stream dries up within three to six month, while three respondents representing 1.4% said that the stream dries up within six to nine months in Mmaku community However, Bendy *et al*.,2010 reported that streams, springs and river water are prone to climate change which may come as a result of intense heat wave. Also in Table 2, 28 respondents (12.7%) get drinking water from borehole, 21 respondents (9.6%) of gets their drinking water from hand dug well, while 171 respondents (77.7%) of gets drinking water from stream in the community

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4. CONCLUSION AND RECOMMENDATION

The results demonstrated that climate change is affecting Mmaku mountainous community area of Enugu State. Increase in temperature, indiscriminate felling of trees, bush burning where major causes of climate change in the study area. Although women farmers adopted numerous adaptation strategies to climate change effects, they noted that most of the strategies are increasing tasking and might not stand the test of time especially with the increasing negative signs/impacts of climate change, which resulted in crops failure/poor crop yield. Climate change causes severe loss in livestock, adding pressure to food security among household. Also, significant impact of climate change was the drying up of water in the study area that lasts between three and six months. Improvement of equitable access to appropriate information and communication technology skills should be adapted by farmers. Training and sensitization programmes are needed in the Mmaku Awgu to create more awareness and improve knowledge about the causes, impacts and prevention of climate change. Government should as a matter of urgency provide motorized borehole in the study area to reduce the suffering encountered by women and children in search of drinking water.

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Table 1. Knowledge about climate change in Mmaku Awgu Area of Enugu State

	Sources of knowledge about climate change	
Option	**Frequency**	**Percentage (%)**
Radio	91	41.4
Television	84	38.2
Friends	37	16.8
Family	8	3.6
Total	220	100
	Knowledge of climate change	
Knowledge	**Frequency**	**Percentage (%)**
Change in weather over a long period (over 20 - 30 years)	70	31.8
Increase in temperature over a long period (over 20 - 30 years)	23	10.5
All of the above	37	16.8
Don't know	75	34.1
Change in cloud	10	4.5
Change in rainy season pattern	5	2.3
Total	220	100
	Causes of climate change	
Option	**Frequency**	**Percentage (%)**
Burning of fossil fuel (mostly from energy)	46	20.9
Bush burning	63	28.6
Indiscriminate felling of trees	78	35.5
Industrialization	21	9.5
Farming (livestock, manure and fertilizer)	12	5.5
Total	220	100
	Impact of climate change	
Option	**Frequency**	**Percentage (%)**
Excessive rainfall/flood	6	2.7
Drought/famine	17	7.7
Increase incidences of diseases	29	13.2
Water shortages	46	20.9
Crop failure/poor crop yields	112	50.9
Heat waves	10	4.6
Total	220	100

Source: Field survey, 2015

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Table 2. Traditional coping and adaptive practices of climate change in Mmaku Awgu Area of Enugu State

	Heat waves/excessive heat	
Option	**Frequency**	**Percentage (%)**
Swim often in the stream	88	40
Drink a lot of water	114	51.8
Do nothing	18	8.2
Total	220	100
	Famine/drought	
Option	**Frequency**	**Percentage (%)**
Buy food from market in big town instead of getting it from farm	145	65.9
Batter out property for food	0	0
Exchange members of family food	0	0
Change planting	33	15
Change livelihood/occupation	42	19.1
Plant different more resistance crops	0	0
Total	220	100
	Collection of firewood	
Option	**Frequency**	**Percentage (%)**
Men	9	4.1
Women	82	37.3
Children	125	56.8
All	4	1.8
Total	220	100
	Sources of power	
Option	**Frequency**	**Percentage (%)**
National grid	102	46.4
Kerosene	104	47.3
Generator	14	6.3
Total	220	100
	Stream dry up period	
Option	**Frequency**	**Percentage (%)**
1 – 3 month	0	0
3 – 6 months	217	98.6
6 – 9 month	3	1.4
9 – 12 months	0	0
Total	220	100
	Sources of drinking water	
Option	**Frequency**	**Percentage (%)**
Borehole	28	12.7
Hand dug well	21	9.6
Stream	171	77.7
River	0	0
Total	220	100

Source: Field survey, 2015