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Climate Change Mitigation and Adaptation Strategies Used by Farmers in Imo State, Nigeria

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Abstract

This study examined the strategies employed by farmers to mitigate the effects of climate change on agricultural practices. A structured interview schedule was used to collect data from 220 farmers. Frequency, percentages and mean statistic were used to present the results of the data collected. The results show that the mean age of the farmers was 51 years with an average of 22 years of farming experience. The majority (75%) of the farmers were aware of climate change within their environment. Self-observation and experience (42.4%) over the years was the source of awareness of climate change. The majority (73.6%) of the farmers opined that in recent times, flooding had increased which is an indication of climate change. Reduction in the use of generator to get power in the farmers' houses (69.1%) and crop rotation practices (67.3%) were mitigation and adaptation strategies employed by the farmers against the effect of climate change. The study recommends that government of states should enforce the policy on afforestation as a mitigation measure against climate change.

Keywords: Mitigation strategies, Climate change adaptation, Agricultural practices.

Introduction

Climate change has become a global issue in recent times manifesting in variations of different climate parameters including cloud cover, precipitation, temperature ranges, sea levels and vapour pressure (Ministry of Environment of the Federal Republic of Nigeria (MoEFRN) 2003). The variations in climate parameters affect different sectors of the economy such as agriculture, health, water resources, energy etc. The main cause of climate change has been attributed to anthropogenic

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(human) activities. For example, the increased industrialization in the developed nations has led to the introduction of large quantities of greenhouse gases (GHGs), including carbon (IV) oxide (CO2), methane (CH4) and nitrous oxide (N2O) into the atmosphere.

Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity (Nnaji, 2012). It refers to a change in climate which is attributed directly or indirectly to human activities, that alters the composition of the global atmosphere and which is in addition to natural variability observed over comparable time periods (Intergovernmental Panel on Climate Change (IPCC), 2007).

There are two responses to global climate change namely mitigation and adaptation. Mitigation refers to intervention or policies to reduce the emissions or enhance the absorption of greenhouse gases while adaptation refers to responses to the changing climate and policies to minimize the predicted impacts of climate change (Sari Kovats, nd in Women and Children Development Initiative (WACDI), 2011). Because of the speed at which change is happening due to global temperature rise, it is urgent that the vulnerability of developing countries to climate change impacts is reduced while their capacity to adapt is increased and national adaptation plans are implemented (UNFCCC, 2007 in WACDI, 2011). Adaptation options for ecosystems include control of deforestation, improved rangeland management, expansion of protected areas and sustainable management of forests (IPCC, 1997 in WACDI, 2011). Adaptation options for hydrology and water resources include water harvesting, management of water flow from dams and more efficient water usage. Adaptation measures in African coastal zones include building of sea walls and relocation of vulnerable human settlement and other socio-economic facilities. Although adaptation options, including traditional coping strategies are available, in practice, the human, infrastructural and economic response capacity to affect a timely response may well be beyond the economic means of some African countries (IPCC, 1997 in WACDI, 2011).

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Climate change adaptation is increasingly becoming an area of growing interest and engagement for many developing countries that unfortunately bear the brunt of an overheating planet caused by developed countries. The uncertain effects of a changing climate on Nigeria's economy pose significant setbacks for meeting development targets like Nigeria's aspiration to be among the twenty best performing economies of the world by the year 2020 [Vision 20:20:20] and achievement of the Millennium Development Goals (Stanley, 2012).

Stanley (2012), asserted that typical of most developing countries, Nigeria's 167 million people rely heavily on their environment as well as the natural resource base for their livelihood. The fact that Africa's most populous country runs dangerously on a mono-product economy oiled by cheap hydrocarbon deposits, underscores this heavy dependence on natural resources. Climate change-induced losses and the unsustainable use of these invaluable resources appear to be a malignant problem that has elevated itself to a real development challenge in Nigeria.

In most studies, rural farmers' level of awareness seems to be on increase regarding their experiences in change and length of seasons, incidence of environmental hazards such as flood, droughts, and crop failures, long term shift in wind speed, change in rainfall intensity and uncertainty of rain etc. (Morghadiya and Smarden, 2011). These are among the common indicators of climate change well known to rural farmers the world over. However, are people also aware that most human activities contribute to climate change? Adaptation generally is primarily tailored towards agricultural productions principally through irrigation and planting crop resistant species, most local farmers are aware that the stress on their local environment and livelihoods has increased and low capacity for adaptation is a serious issue (Jones et al., 2011 in Egbe, Yaro, Okon & Bisong, 2014). According to Pettengell (2010) in Egbe *at al* (2014), poverty, more than any other factor, determines vulnerability to climate change and limits adaptive capacity. It is pertinent to strengthen adaptation of poor farmers to increase their productivity. Ufuoku (2011)

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in Egbe *at al* (2014), corroborate this fact adaptation to climate change requires farmers to realize that the climate has changed and they must be assisted to identify useful adaptation strategies and implement them.

The rural farmers, whose livelihoods depend on the use of natural resources, are likely to bear the brunt of adverse impacts of climate change. This makes the need for farmer to adapt to climate change very imperative for optimum output. Adaptation measures to climate change have to do with living with climate change, for example agroforestry, conservation agriculture, inter-cropping, biodiversity and collection of rainwater for agricultural use referred to as rainwater harvesting. Therefore the pertinent questions that arises are: what are the socioeconomic characteristics of these rural farmers? If yes what are the sources of their awareness? What is Climate change called in the local language of these rural farmers? What are the adaptation and mitigation strategies used by farmers to cushion the effects of climate change? This questions are what this study seeks to answer.

The specific objectives of this study includes to:

1. determine the socioeconomic characteristics of the farmers;
2. ascertain the awareness of the farmers of climate change;
3. identify local names these farmers call climate change; and
4. assess the adaptation and mitigation strategies farmers use cushion the effects of climate change.

Methodology

The study was carried out in Imo State which is among the five states in the Southeast geopolitical zone of Nigeria. It lies within latitude 4º 45'N and 7º 15' N and longitude 6º 50'E and 7º 25'E and covers an area of about 5100 square kilometres (www.imostate.gov.ng). Administratively, Imo State comprises of three senatorial zones namely: Okigwe, Orlu and Owerri zones. The population of the state stands at 3,927,563 and the population density varies from 230 persons per square kilometer in Oguta /Egbema areas to about 1,400 persons per square kilometer in

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Mbaise, Mbano, and Mbaitoli areas (National Population commission, 2006). Rainfall distribution is bi-modal with peaks in August and September. The rainy season begins in March and lasts till October. Variation in annual rainfall is between 1990 mm-2200 mm. Temperature is uniform in the State with mean annual temperature of about 20ºC. The annual relative humidity is 75% (www.imostate.gov.ng). The State lies within the rainforest agro ecological zone of Nigeria.

The population for the study comprised of all farmers in Imo state. A multistage sampling technique was used to sample one of the three senatorial zones being Okigwe zone, from this zone, random sampling was used to select four local government areas (LGAs) out of the six LGAs in the zone. From these LGAs, 2 autonomous communities were randomly selected making it a total of 8 communities sampled for the study. Two village communities were then sampled from each of the autonomous communities randomly and this gives a total of 16 villages sampled. From each of these villages, lists of farmers were obtained from which 15 practising farmers were sampled. This brings the total sampled farmers to 240 farmers, but 20 copies of the questionnaire used to collect data from the sampled farmers were not fund to be useable as such 220 farmers' responses was used for the study. A structured interview schedule was used to collect data. The socioeconomic characteristics of the farmers was measured by sex, marital status, age among others while awareness was measures on a Yes or No options. The farmers were masked to supply the sources of awareness as well as the local name of climate change. To identify the adaptation and mitigation strategies, farmers were asked to indicate from the list of variables their perceived strategies they use. Frequency, percentages and mean statistics were used to summarize the results of the data collected.

Results and Discussion

Socio-economic characteristics of the respondents

The result presented on Table 1 shows that the majority (60.0%) of the respondents are female while the remaining 40% are male. The implication of these distribution of

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these respondents shows that the area study could have been a female dominated farming communities. The mean age of these farmers is about 51 years. The results also shows that the majority (85.9%) of these farmers are married. The marital status shows that most of these farmers already have families they are responsible to and therefore needed more resources and food to take care of these members of the family. On their highest educational level, the results show that 23.6% of the respondents is secondary school completed This result implies that these farmers have a low levels of education probably due to the fact that they are rural dwelling people and may not have access to good schooling facilities or even be able to afford further schooling.

The average house hold size among these respondents is seven persons. This shows that theses farmers have an average size household that is their household sizes are not too large and are not really small in size. This could be as a result of the culture and believes of these people. On the years of farming experience, the average number of years in farming is 21.6 years, this is an indication that these farmers have a good years of experience in farming to qualify them to able to respond to the issues relating to climate change in their farming experience even as it relates to adaptation and mitigation strategies employed by them as well as other co farmers like them in their communities.

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Table 1: Percentage distribution of respondents according to their socio-economic characteristics

Variable	Percentage (n-240)	Mean (M)
Sex		
Male	40.0	
Female	60.0	
Age (years)		
20-29	10.0	
30-39	15.0	
40-49	20.9	50.6
50-59	20.9	
60-69	9.6	
70 years and above		
Marital status		
Single	14.1	
Married	85.9	
Divorced	0.0	
Educational level		
No formal Education	17.7	
Primary school attempted	5.5	
Primary school completed	8.2	
Sec. school attempted	12.7	
Sec. school completed	23.6	
OND/NCE	16.8	
HND/ First degree	15.5	
Higher degrees (MSC/ Ph.D.)	0.0	
Household size (number)		
1-3	12.3	
4-6	32.2	
7-9	38.2	7
10-11	17.3	
Years of farming experience (Years)		
1-10	29.5	
11-20	30.9	
21-30	10.9	21.6
31-40	18.6	
41-50	9.1	
50 years and above	0.9	

Awareness of climate change

Figure 1 shows the majority (75.0%) of these farmers are aware of climate change around them while the remaining 25% of them do not know about climate change.

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On the sources of these their awareness, the respondents show in Table 2 that the greater proportion (42.4%) of those farmers aware of climate change became aware of climate change around them from self-observations and experiences over the years. While 29.1% of them were from the radio and 24.2% of them indicated that their awareness of climate change came from their interactions with enlightened farmers. The remaining 4.2% of these farmers got their awareness of climate change from the television. The implication of this that the awareness of climate change is usually a thing of experience and observation of changes in the environments over time which also brings about adjustments made to cope with the changes.

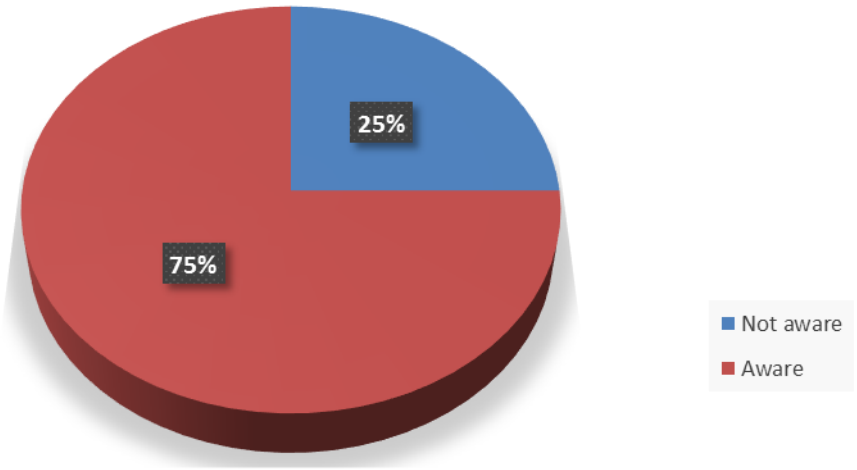

Figure 1: Percentage distribution of Farmers' on their wareness of climate change

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Table 2: Percentage distribution respondents accoridng to their sources of awareness of climate change

Source of awareness	Percentage (n= 166)
Self-observation and experience over the years	42.4
Interaction with enlightened farmers	24.2
Radio	29.1
Television	4.2

Local names Climate change is called among these farmers

The majority (55.8%) of the respondents do not have any idea of what climate change is called in their local language as presented in Figure 2, the results further shows that locally, climate change is called the following: *Mgbanwo ubochi* (13.3%), *Mgbenwe eluigwe* (12.7%), *Ntughari ubochi* (12.7%) and *Mgbanwo uruku* (5.5%). This result shows that there is no definite name for climate change among these farmers and that people had different names for it. *Mgbanwo ubochi* meaning "changes of the days" this could imply the various changes in day length, raining seasons, dry seasons, unset of rains and harmatthan.

Mgbenwe eluigwe means "changes at the heavenly bodies". This could imply that the farmers who call climate change *Mgbenwe eluigwe* have observed that there has been changes in the way the heavenly bodies such as moon, sun and clouds function. Thee bodies are respondsible for the various weather. *Ntughari ubochi*which means "changes of the day" means that there are changes in the days, which were not the case many years before and as such since the primary concern of these farmers related to farming these changes could have also have been observed as it affects their faming. *Mgbanwo uruku* which means changes of the clouds or the climate gives the best understanding of the concept of climate change. Even though the latter gives the best description of the concept, only about 6% of the

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respondents see it that way which is a reflection of their understanding of the concept of climate change. The significance of this findings is to further establish the fact that among these farmer, there are clear indication of experiences of climate change and their best means of understanding the phenomenon among these farmers.

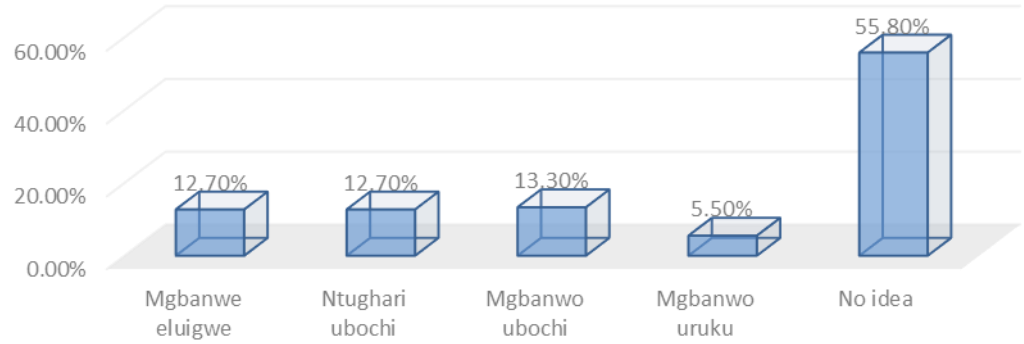

Figure 2: Percentage distribution of the names given to climate change among respondents

Mitigation and adaptation strategies to cushion the effect of climate change

Table 3 shows the various strategies indicated by these farmers as their ways of cushioning the effects of climate change. From the result presented, the strategy with the highest proportion (69.1%) of respondents was reduction in the use of generators for electrification, this was followed by crop rotation (67.3%), then mixed cropping practices (65.5%) and then use water channels as draining system (63.2%). Also following among these strategies are Mulching (60.9%), regular weeding to avoid breed of some insects' pests (60.5%), conservation of soil moisture through appropriate tillage operation (58.2%) and then proper conservations of seeds (53.6%). All these listed strategies could be said to those strategies with high adoption rates since more than half of these farmers make use of them as mean of mitigating and adapting to climate change to cushion it effects.

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On the other hand, afforestation (6.4%), avoidance of deforestation/tree feeling (11.8%), planting of pest and disease resistant crops (24.5%), breeding of drought and heat resistant crop varieties (27.7%) and planting of cover crops (31.8%) all had less than half of the farmers indicating their practicing of these strategies which implies a low adoption of these practices. It can be observed here that strategies that are related to more to mitigation are more among those strategies with low adoption of practice.

Generally, the results reveal that the farmers have devised various ways to reduce the effects of climate change. These strategies must have been tested by these farmers and found to be effective and as such reflect in their perception. Land management practices such as improved rotation, improved fallows and improved grazing and reduced tillage could serve as mitigation/ adaptation strategies (Guardian Environment Network, 2009).

Table 3: Percentage distribution of respondents accoridng to mitigation and adaptation strategies to cushion the effect of climate change

Adaptation strategies	Percentage
Crop rotation	67.3
Use of water channels as draining system	63.2
Use of organic manure	45.9
Planting of cover crops	31.8
Mixed cropping practices	65.5
Planting of pest and disease resistant crops	24.5
Mulching	60.9
Regular weeding to avoid breed of some insects pest	60.5
Breeding of drought and heat resistant crop varieties	27.7
Conserving of soil moisture through appropriate tillage operation	58.2
Mitigation strategies	
Afforestation	6.4
Proper conservation of seeds	53.6
Avoidance of deforestation/ tree feeling	11.8
Reduced the use of generators for electrification	69.1

Conclusion and Recommendation

The farmers from this study are well aware of the climate change and self-observation and experience over the years was the key source of this awareness.

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Though most of these farmers do not have a clear native expression of the concept but they devised strategies to cushion the effects of climate change and still be able to make a living from their farming activities despite the reality of climate change in their environment.

Therefore, the study recommends that government of states should enforce the policy on afforestation as a mitigation measure against climate change, in addition, there is need for government at all levels to engage extension agents who should teach farmers climate friendly practices that mitigate climate and enable effective adaptation.

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