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ASSESSMENT OF CROP FARMERS VULNERABILITY, MITIGATION AND ADAPTATION MEASURES TO CLIMATE CHANGE IN NIGER STATE, NIGERIA

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ABSTRACT
This study examined the mitigation and adaptation of climate change by crop farmers in Niger State, Nigeria. Primary data was used to obtain a cross sectional data. Questionnaire was used to elicit relevant information from the respondents. Data collection lasted for two months that is from September 2014 to November 2014. Multi-stage sampling technique was used to elicit data from 280 respondents and data analysis was done using descriptive statistics. Results showed that most practised adaptation measures used included early planting, increased use of agrochemicals and weeding. Access to credit, household size, membership of association, farm size, number of hazards and topography were significant factors affecting vulnerability to climate change. The study concluded that farmers in the study area were employing one or more adaptation techniques to mitigate the adverse effects of climate change. The study recommends making available credit facilities to farmers through Government interventions to enhance farmers incomes to enable them employ adaptive measures that could be effective in alleviating negative impacts of climate change. It was also recommended that farmers should be encouraged to join farmer groups/cooperatives to increase their chances of access to agricultural credit.

Keywords: Climate change, Vulnerability, Mitigation and Adaptation.

INTRODUCTION

Agriculture remains the main source of livelihood for rural communities in sub-Sahara Africa providing employment for more than 60 percent of the population; contributing about 30 percent of Gross Domestic Product (GDP) and accounted for up to 55 percent of the total value of Africas export (Sokona and Denton (2001). The World Bank (2000) observed that 70 percent of all Africans and nearly 90 percent of Africa's poor work primarily in agriculture. Climate change affects agriculture and agriculture also affects climate change through the emission of Green House Gases (GHG) from different farming practices (Maraseni, Mustaq, and Maroulis 2009, Edwards and Harris, 2009).

The term "climate change" often refers to changes in climate which according to the Intergovernmental Panel on Climate Change IPCC (2007), are 90-95 percent likely to have been in part caused by human action. It describes changes in the variability of average state of the atmosphere over time scales, ranging from a decade to millions of years (Adejuwon, 2004). Swings in the global climate pattern have aroused attention at local, national and international levels (Onyeneke, 2010). Moreover, climate change is expected to increase with increased frequency and intensity of extreme weather conditions in Nigeria's coastal and rainforest regions (Babatunde, Ayobami and Mark, 2011). The implications for the region are that it would generally experience wetter than average climate, more extreme weather conditions, particularly erosion, sea level rise and floods (Onyeneke, Iruo and Ogboko, 2012).

Given that agriculture and fishing remains the main sources of livelihood for most rural communities in Nigeria's coastal and rainforest regions, climate change is expected to have greater negative impacts on poorer farm households as they have the lowest capacity to adapt to change in climate conditions and more vulnerable to vagaries that are climate induced. (Onyeneke, Iruo, and Ogboko, 2012; Onyencke and Madukwe, 2010). Adaptation measures are therefore important to help these communities to better face extreme weather conditions and associated climate variations (Adger, Brown, Conway and Hulme, 2003). Estimates by Building Nigeria's Response to Climate Change (BNRCC), (2011) suggest that, in the absence of adaptation, climate change could result to loss of 6 and 30 percent by the year 2050 (BNRCC, 2011). This loss is equivalent to ₦15 trillion (US$100 billion) and has the potential to significantly contribute to reductions in negative impacts from changes in climatic conditions as well as other changing socioeconomic conditions (Kandlinkar and Risbey, 2000).

According to the Inter Academy Council Report (IACR) (2004), adverse climate change impacts are considered to be particularly strong in countries located in tropical Africa that depend on agriculture as their main source of livelihood. The challenge this poses affects sustainable development on the

continent. This challenge is composed of the likely impacts on the ecosystem, agricultural production, and livelihoods. Generally, losses in the agricultural sector due to climate change have economy wide consequences, like loss in gross domestic output, a decline in the income and the general deterioration on households' welfare. Climate change is also expected to exacerbate Africa's struggles with strained water resources and food security. Mendelsohn, Dinar and Dalfelt (2000) affirmed that rising global temperatures are expected to increase flooding in coastal areas, cause declines in agricultural production, threaten biodiversity and the productivity of natural resources, increase and exacerbate desertification. Thereby exerting a disproportionately adverse impact on Africa's agriculture-based economy. To make matters worse, Africa has a low adaptive capacity due to its dependence on rain fed agriculture, low levels of human and physical studies on the effects of climate change on economic variables, estimated and a very high predicted loss of income due to climate change through crop simulation experiments (Rosenzweig and Parry, 1994). Against this backdrop the present study was undertaken with the following objectives: i. to describe the socioeconomic characteristics of crop farmers in the study area; ii. identify the hazards faced by respondents, iii.identify and describe the adaptation measures used by the crop farmers to mitigate the adverse consequences of climate change.

METHODOLOGY

The study area: The study was conducted in Niger State, Nigeria. The State has its capital at Minna, and it is located in the North central zone of Nigeria. It was created out of the defunct North western State. The State lies in the Guinea savanna vegetation belt of the country with favourable climatic condition for crop and livestock production. (Nigerstategov.ng, 2006).

The location of the State is between Latitudes 8^0 20′ and 11^0 30′ North of the Equator and between Longitudes $3^0$30′ and 7^0 20′ East of the Greenwhich Meridian. The provisional result of the 2006 National Population Census showed that the State had a population of 3,950,00 (NPC, 2006). Going by the population growth rate in of 3.2% in Niger State (NPC, 2011) the population was projected to 5, 056, 321 as at 2014.

Sampling procedure: Multi-stage sampling method was used in the selection of respondents for this study. The first stage involved the random selection of one Niger State Agricultural Mechanization and Development Authority (NAMDA) Zone out of the three zones.

In the second stage, three (3) Local Government Areas (LGAS) were purposively selected out of the total number of eight (8) LGAs in the Zone. They are Agaie, Bida, and Mokwa LGAs in Zone I. The purposive selection was based on the dominant cropping enterprises in each LGA. The samples were drawn from the frame. The third stage involved a random selection of three (3) villages from each of the LGAs giving a total of nine (9) villages. The fourth and final stage involved a selection of crop farming households from each village. Data were obtained through a cross-sectional survey. Primary data was collected through structural questionnaire complemented with interview on the socioeconomic characteristics of respondents such as farmers vulnerability, years of experience in crop production, and their perceptions of adaptation measures to mitigate climate change.

Analytical Technique

The study employed descriptive analysis of frequency, percentage and means.

RESULTS AND DISCUSSION

The results of the socio-economic characteristics of the respondents are presented in Table 1. The results revealed that the average age of the respondents was 41 years. Most of the respondents were within the age range of 31-50 years and accounted for 87%. A total of 8 percent constituted those less than 40 years while 5.4 percent were over 50 years of age. This implies that a greater percentage of the respondents were still in their active working age. Age is an important variable which defines the probability of a given respondent to be vulnerable to the vagaries of climate change. Older respondents are likely to have more years of farming experience which would enable a farmer cope and adapt to climate change phenomenon.

Adaptation Measures to Mitigate Consequences of Climate Change

This study found that farmers adopted various measures to be able to adapt to the adverse consequences of climate change. The results are presented in Table 2The results revealed that all the respondents resorted to early planting and use of agrochemicals which ranked first. Increased frequency of weeding ranked 3rd whereby 89.6% of the respondents utilized the strategy as a way out of the adverse consequences. Other adaptation measures adopted in decreasing magnitude of importance use, change in the timing of land preparation (23.6%) and changing harvesting dates, mixed cropping (1.1%) and the use of wind breaks (1.1%). Migration from climate risk areas and use of wind breaks/shelter belts was also adapted by the farmers. This finding is in line with the findings of Adenike and Salman (2014) who found that

Table 1: Distribution of respondents according to socioeconomic characteristics

Variables	Frequency	Percentage	Mean
Age			
< 31	21	7.5	41
31 – 40	154	55.0	
41 – 50	90	32.1	
> 50	15	5.4	
Total	280	100.0	
Sex			
Male	268	95.7	
Female	12	4.3	
Total	280	100.0	
Marital Status			
Married	262	93.6	
Single	18	6.4	
Total	280	100.0	
Household Size			
<11	181	64.4	10
11 – 20	79	28.2	
21 – 30	17	6.1	
>30	3	1.1	
Total	280	100.0	
Educational Status			
Primary	72	25.7	
Secondary	79	28.2	
Tertiary Edu.	55	19.6	
Adult Edu.	10	3.6	
Quranic School	64	22.9	
Total	280	100.0	
Occupational Status			
Part-time Farming	92	32.9	
Full-time Farming	188	67.1	
Total	280	100.0	
Sec. Occupation			
Agro-trading	34	19.3	
Livestock	60	33.6	
Transport	48	27.1	
Agro-processing	69	38.6	
Construction	11	6.4	
Civil Servant	58	32.9	
Total	280	100.0	

Source: Field Survey, 2014

majority of the households in Ondo State, Nigeria adopted adaptation measures which include diversion to other crops, diversion to non-farm activities, irrigation, increased used of agrochemicals and change in planting and harvesting dates, to circumvent climate change so as to enhance farm productivity.

Table 2: Adaptation Measures Employed to Mitigate Adverse Consequence of Climate Change.

Measures	*Frequency	Percentage	R
Early Planting	280	100.0	1
Conservation	3	1.1	7
Tillage	248	88.6	4
Use of Agrochemicals	280	100.0	1
Weeding	251	89.6	3
Mixed Cropping	3	1.1	7
Change in the Timing Land Prep.	66	23.6	5
Changing Harvesting Dates	66	23.6	5
Migration	3	1.1	7
Wind breaks	3	1.1	7

Source: Field Data, 2014

*** Multiple Responses recorded**

Vulnerability of Farmers to Climate Change Phenomenon

Results in Table 3 presents Climate Change phenomenon respondents were vulnerable to. A total of 80.0% of respondents reported that they had never experienced drought while 20.0% of the respondents in the study area experienced drought once, 50.7% of the respondents had never experienced fire incidence while 49.3% experienced fire incidence once, In the case of pastoral agricultural conflicts, 90.0% of the respondents did not face the constraint while 10.0% of the respondents had the problem once which indicated that majority of the farmers in the study area had once faced disasters that had occurred naturally, since they faced natural disasters which may affect their yield and livelihood. This implies that climate change, which is attributed to natural climate cycle and human activities such as deforestation has adversely affected farmers in the study area, This result corroborates the findings of Zoellick (2009). As the planet warms, rainfall patterns shift, and extreme events such as droughts, floods, and forest fires become more frequent. Farmers (who constitute the bulk of the poor in Africa) face challenges of tragic crop failures, reduced agricultural productivity, increased hunger, malnutrition and diseases.

CONCLUSION AND RECOMMENDATIONS

The study concluded that farmers in the study area were vulnerable to effect of climate change as most of them were lacking in resource endowment that could make them withstand the challenges so as to become less vulnerable to climate change. Farmers

also preferred early planting and use of agrochemicals, increased frequency of weeding in the farm, and they also employ different adaptation techniques to mitigate the adverse effect of climate change.

Table 3: Vulnerability and Experience of Farmers to Climate Change Phenomenon in the last two years

Variables	Frequency	Percentage
Drought		
Nil	224	80.0
Once	56	20
Total	280	100.0
Fire		
Nil	142	50.7
Once	138	49.3
Total	280	100.0
Pastoral Conflict		
[illegible]	29	90.0
[illegible]	251	10.0
[illegible]	280	100.0
[illegible] of Climate [illegible] Observed		
Delayed Rainfall		
Yes	29	10.4
No	251	89.6
Total	280	100.0
Early Rainfall		
Yes	215	76.8
No	65	23.2
Total	280	100.0
Haillstorm		
Yes	4	1.4
[illegible]	276	98.6
[illegible]	280	100.0
[illegible] Much Rain		
[illegible]	160	57.1
	120	42.9
[illegible]	280	100.0
Less Rainfall		
Yes	43	15.4
No	237	84.6
Total	280	100.0

Source: Field Survey, 2014

The study revealed that farmers were vulnerable to climate change, it is therefore recommended that farmers be assisted through Government interventions of credit facilities to enable them assess inputs early. Prompt assessment of inputs such as planting materials and agrochemicals would enable farmers to put in place mitigation options against climate change as revealed from the research results.

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