

**ADAPTIVE MECHANISMS OF RURAL FARMERS TO CLIMATE CHANGE ON CROP PRODUCTIVITY
IN ETCHE LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA**

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ABSTRACT

This study was carried out to investigate the adaptive mechanisms of rural farmers to climate change on crop productivity, in Etche Local Government Area of Rivers State. A total of one hundred and ninety respondents were randomly selected from thirty-eight rural communities in the study area. Data were collected using a well structured questionnaire and personal interview. Descriptive statistics and contingent valuation method (CVM) i.e. willingness-to-pay model were used in the assessment. The result revealed that majority (56.7%) of the respondents fall between the age range of 41-50 years, and majority (54.4%) adapts to climate change by varying planting date, while (63.2%) agreed to pay only five naira (N5.00) for a friendly environmental programme (i.e. reduction in bush-burning and green manuring). It was also discovered that farm output variations, as a result of – seasonal variation factors were the major problems encountered by the respondents in the study area. Therefore government, and non-governmental organizations, policy makers, industrialist and so on should assist rural farmers to adapt to climate change in the study area.

Keywords: Climate change, Adaptive mechanism, Sustainability, Niger Delta, Etche LGA

INTRODUCTION

Growing concerns about the impacts of climate change on crop productivity have generated lots of interest in developing adaptive mechanisms to farmers in developing countries like Nigeria, where vulnerability is high, because ability to adapt is low (Hassan et al 1998). Climate change is a threat to sustainable crop production and commensurate measures should be put in place to address it.

Climate change is expected to affect farmers' output and water resources that are vital for livelihoods in these regions where much of the population, especially the poor, rely on local supply systems, which are sensitive to climate variations. Disruptions of the existing food and water systems will have devastating implications on sustainable development and livelihoods and are expected to add to the challenges climate change already poses for poverty eradication (Dewit & Stankiewicz, 2006, IISD, 2007).

Adaptation helps farmers achieve their food, income and livelihood security objectives in the face of changing climatic and socioeconomic conditions, including climate variability, extreme weather conditions such as droughts, floods and volatile short-term changes in local and large scale market (Kandlinker & Risbey, 2000). Farmers, can reduce the potential damage by making tactical responses to these changes.

Analyzing adaptation is therefore important for finding ways to help farmers adapt in the rural economics of Nigeria on a sustainable basis.

In South-east rainforest zone of Nigeria, the common adaptation practices used by farmers are the portfolio diversification and soil conservation practices (Onyeneke and Madukwe, 2010). While in some part of the south southern mangrove swamps zone of Nigeria, the common adaptation practiced employed by farmers are delaying time of planting. After the first or second rain they watch the rain for a while to ensure that rain falls regularly enough before planting. This is done to prevent crops from drought when rain is delayed (Etiosa and Matthew 2007).

Another way rural farmers in this region overcome this problem is by using fast-maturing varieties. These fast-maturing varieties like maize with high yields have been introduced and are being used by farmers. The risk involved in this strategy is that local species are being displaced by improved species though some rural farmers still cultivate the local ones. In future, new and improved species may lead to the extinction of local ones. It is therefore important that the right mechanisms are put in place to protect local species from extinction and to strengthen community cohesiveness that will help protect traditional indigenous knowledge for responding to climatic viability in the study area.

The Niger Delta is highly susceptible to adverse environmental changes, because it is located in the coastal region of the world. Coastal regions of the world are already experiencing flooding due to rise in sea level. Amid the impact of climatic change, the region is also faced with myriads of environmental problems, resulting from oil exploration and exploitation activities (Etiosa & Matthew 2007).

While climate change will lead to increased aridity and desertification in Northern Nigeria, it will lead to flooding in the southern part especially in the coastal regions. Also farmers in this regions can no longer predict the rain and know precisely when to plant their crops. This is already having a negative impact on food security in the region, where rain-fed agriculture is practiced. Also as a result of change in rainfall pattern, farmers who plant after the first or second rain run into huge losses when the rains are delayed beyond the usual due to climatic changes.

However adaptation helps farmer achieve their food, income and livelihood security objectives in the face of changing climatic conditions. But lacks of adaptation strategy by some farmers are as a result of lack of information and poverty.

For instance, lack of information on appropriate adaptation options could be attributed to the dearth of research on climate change and adaptation options in the country. Lack of finance hinders farmers from getting the necessary resources and technologies that facilitate adapting to climate change. Adaptation to climate change is costly (Deress et al 2008), and the need for intensive labour use may contribute to this cost.

Thus if farmers do not have sufficient family labour or the financial means to hire labour, they cannot adapt. Also poor access to market, entails poor link to input and output markets and this hinders farmers' adaptation to climate change (Onyeneke and Madukwe 2010).

In Etche Local Government Area of Rivers State, no attempts have been made to study the adaptation mechanisms, of rural farmers to climate change on crop productivity. Therefore the objectives of this paper are to determine the socio-economic characteristics of the respondents and how they adapt to climate change in the study area, examine their willingness-to-pay for an environmental friendly programmes (i.e. reduction in bush burning and green manuring) and examine the constraints encountered by farmers in implementing adaptation strategy towards climate change in the study area.

CLIMATE CHANGE AND IMPACTS IN THE NIGER DELTA

Udofa and Fajemirolu (1978) noted that the intergovernmental panel on climate change has linked the rise in sea level to climate change. Between 1960 and 1970 a mean sea rise of 0.462m was recorded along the Nigerian coastal water. Flooding of low-lying areas in the Niger Delta region has been observed. Also settlements in the coastal region have been uprooted by coastal erosion. In some places, like in Forcados, some oil wells have been lost to the ocean due to erosion (Awosika 1995). The inundation arising from the rise in sea level will increase problems of floods, intrusion of sea water into fresh water sources and ecosystems, destroying such stabilizing systems as mangroves and affecting agriculture, fisheries and general live hood (Okali and Eleri 2004).

FARMERS ADAPTATION TO CLIMATE CHANGE

Pearce et al 1996, McCarthy et al 2001, Onyeneke 2010) pointed out that Africa's agriculture is negatively affected by climate change and that adaptation is one of the policy options for reducing the negative impact of climate change. In the

same vein, Adger et al 2003, Kurukulasuriya and Mendelson (2006), noted that adaptation to climate change refers to adjustment in natural or human systems in respond to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities.

Common adaptation methods in agriculture include use of new crop varieties and livestock species that are better suited to their conditions, irrigation, crop diversification, adoption of mixed crop and livestock farming systems and changing planting dates (Bradshaw et al 2004, Kurukulasunya and Mendelson 2006, Nhemachena and Hassan 2007, Onyeneke 2010).

MATERIALS AND METHODS

Study Area

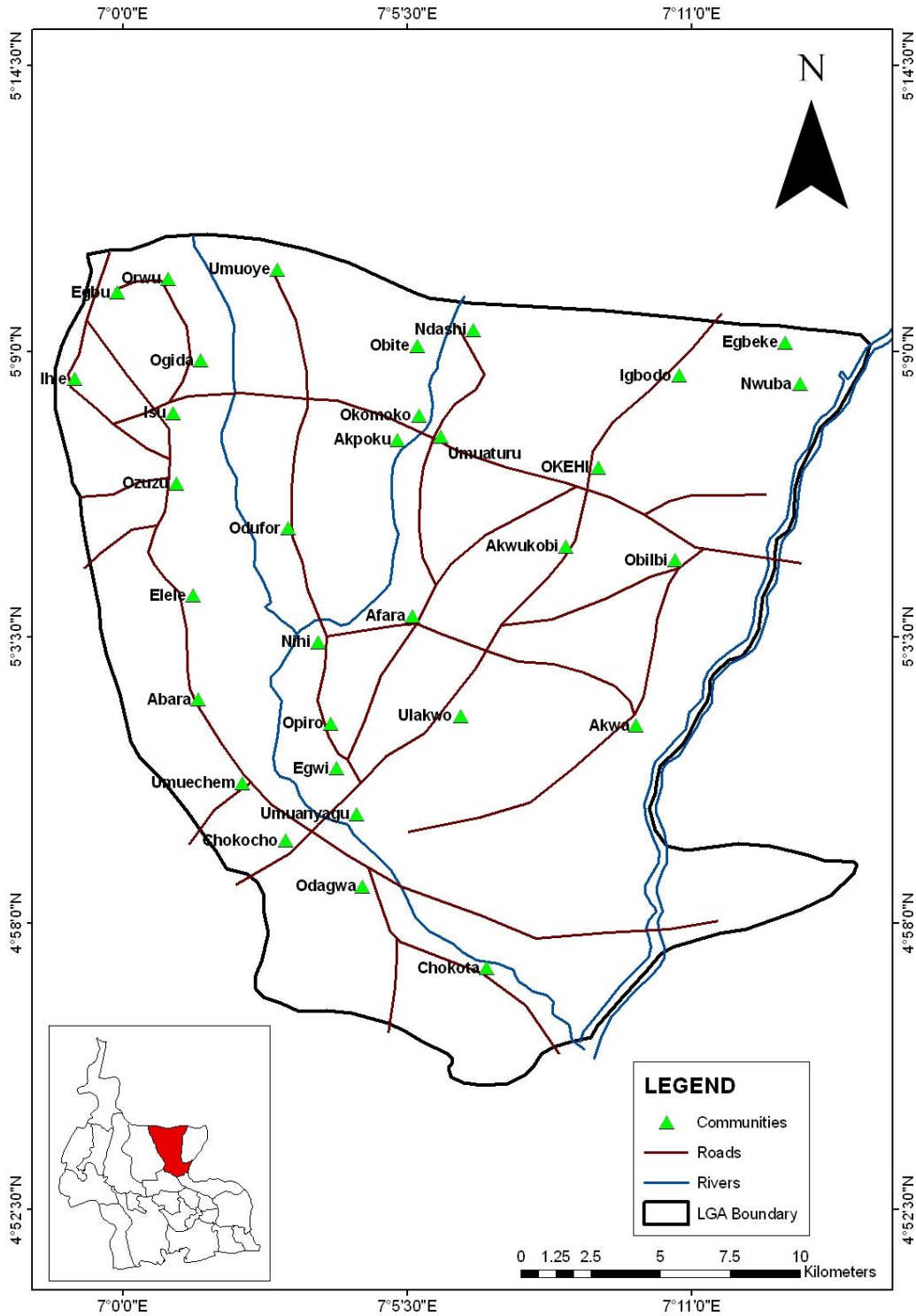
The study was carried out in Etche Local Government Area of Rivers State, Southern Nigeria. According to Wikipedia (2010), Etche is one of the 23 Local Government Area of Rivers State. It was created on 3rd March 1989 and located East of Rivers State (Etche Local Government Council 2010). It is located between latitude 4°59'27''N and 4.990833°N and between longitude 7°03'16'E and 7.005444°E. It has an area of 805 square kilometer and an estimated population of 249,454 people.

Etche Local Government Area is made up of more than fifty communities out of which thirty-eight (38) communities were randomly selected, they are: Abara, Afara, Akpoku Akwa, Akwu/Obuor, Akwukabi, Chokocho, Chokota, Egbeke, Egbu, Egwi, Elele, Igbo, Igbodo, Ihie, Ikwerengwo, Isu, Mba, Ndashi, Nihi, Nwuba, Obilbi, Obite, Odagwa, Odufor, Ogida, Okehi, Okomoko, Okoroagu, Opiro, Orwu, Ozuzu, Ulakwo, Umuanoyagu, Umuaturu, Umuebulu, Umuechem and Umuoye. (Etche Local Government Council, 2010).

The major occupation is farming. Five (5) rural farmers were randomly selected from each of the thirty-eight (38) communities, giving a total sample size of one hundred and ninety (190) respondents for the study.

Data Analysis

Simple descriptive statistics, and contingency valuation method (CVM) were used to analyze the data collected.



**Figure 1. Map of Etche Local Government Area showing the Selected Communities
Inset: Map of Rivers State, Nigeria showing Etche L.G.A.**

RESULTS AND DISCUSSION

Table 1: Socio-economic characteristics of respondents in the study area.

Variables	Frequency	Percentage
<u>Age (year)</u>		
Below 30	40	21.1
31-40	50	26.3
41-50	80	42.1
Above 50	20	10.5
<u>Gender</u>		
Male	80	42.1
Female	110	57.9
<u>Marital Status</u>		
Single	10	5.3
Married	180	94.7
<u>Number of wife(ves)</u>		
1	135	71.1
2	42	22.1
3	10	5.3
4	5	1.6
<u>House hold Size</u>		
1-5	140	73.7
6-10	40	21.1
11-15	10	5.3
16-20	-	-
<u>Religion</u>		
Christianity	148	77.9
Traditional	42	22.1
Islam	-	-
<u>Education</u>		
Primary	76	40
Secondary	15	7.9
OND/NCE	4	2.1
HND/BSC	1	0.5
No formal education	94	49.5
<u>Farming Experience (in years)</u>		
1-5	2	1.1
6-10	3	1.6
11-15	20	10.5
16-20	10	5.3
21-25	35	18.4
Above 25	120	63.2
<u>Farm income (₦)</u>		
30000 – 60000	136	71.6
61000 – 90000	45	23.7
91000 – 120000	3	1.6
121000 – 150000	5	2.6
Above 150,000	1	0.5

From table 1 above, majority (42.1%) of the respondents falls under the age range of 41-50 years, showing that farmers in the study area are at their active age range. Also, it was discovered that 57.9% of the farmers are female. They commonly intercropped cassava with maize and vegetables. This is in line with the findings of IFAD 1994, & Mafimiaebi 2007 that,

cassava production, processing and marketing of its various products in Africa are dominated by females. Also (94.7%) of the respondents are married with majority (71.1%) having only one wife and (73.7%) has a house hold size of 1-5 persons. It was also found out that (77.9%) of the respondents are Christian worshippers, only (22.2%) are traditional worshippers; this is because Christianity adherents populate Etche Local Government Area of Rivers state. Also 40.0% of the respondents had primary education, while (49.5%) had no formal education. Most of the respondents (63.2%) has above 25 years of farming experience and 71.6% has an income range of ₦30,000 to ₦60,000 only.

Table 2: Distribution of respondents according to their adaptive mechanisms on climate change in the study area

Adaptive mechanisms		
Practiced by farmers in the study area	Frequency	Percentage
(1) Varying planting date	109	54.4
(2) Using different crop Varieties.	58	30.5
(3) Practicing soil and water Conservation	3	1.58
(4) Planting trees around farm	1	0.5
(5) Multiple crops under dry land	3	1.58
(6) Farming to non-farming	10	5.3
(7) Specialized crop under dry land	2	1.1
(8) Mixed multiple crops/livestock under dry land	4	
Total	190	100

Source: field survey 2012.

From table 2 above, majority of the respondents (54.4%) adapted to climate change by varying planting dates of their various crops. Respondents, adjusted to climate change by cultivating different crops varieties that can withstand the seasonal variation problems caused by climate change. It was also discovered that majority of the youths in the study area deviated from farming to non-farming activities like selling of petroleum products in retail form while some are into motorcycle transportation business. They are represented by 5.3%. This adaptive strategy practiced was as a result of the facts that youths do not realize enough income from farming activities because of the problem caused by climate change on their crops. This finding is in consonance with the findings of F.A.O. (2009).

Mixed multiple crops under dry land and livestock under dry land are another adaptive strategies practiced by the respondent in the study area. Those who practice this adaptive mechanisms are represented by 2.11%. The reason being that the strategy is not a common adaptive strategy in the study area. This is also common with planting trees and specialized crop under dry land which are represented by 0.5% and 1.1% respectively.

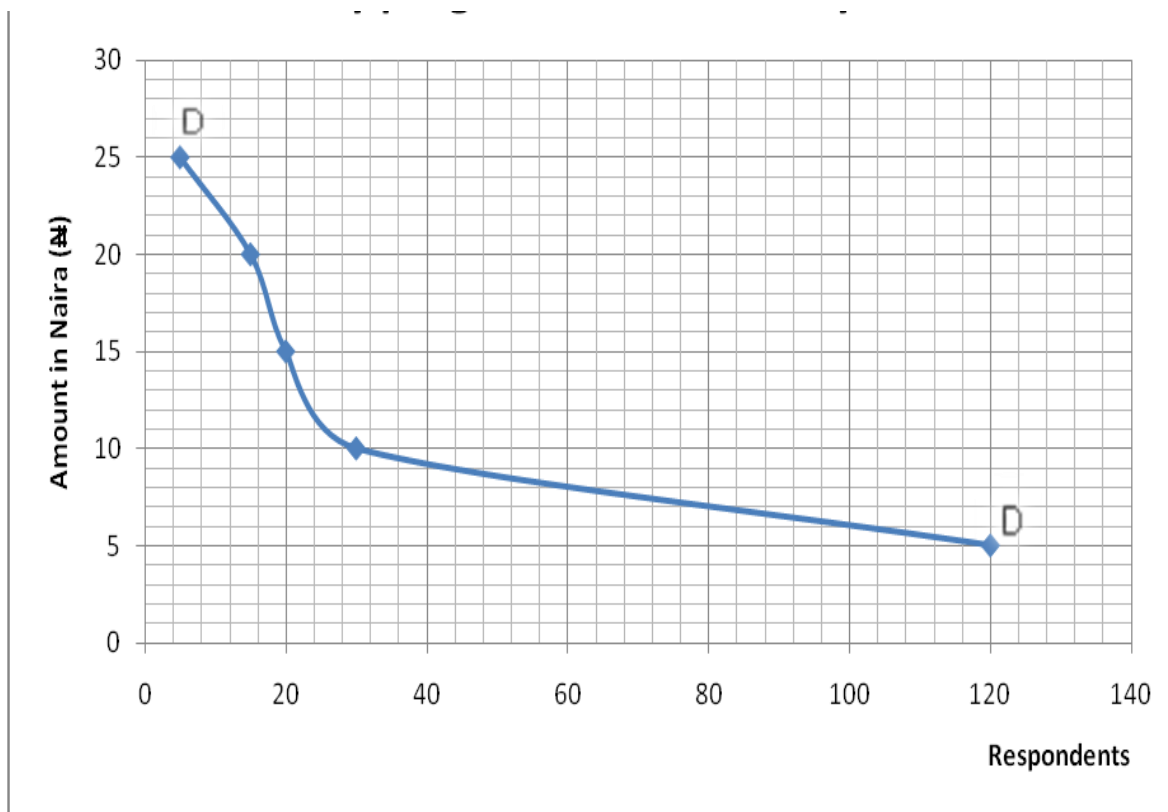
However tree planting is not a new phenomenon, it is being undertaken in some arid areas in a much more comprehensive way. Various patterns of tree planting is an important adaptive method that should be introduced.

Table 3: Distribution of respondents according to various amount of money (₦) they are willing-to-pay for a friendly environmental programmes (reduction in bush burning and green manuring) in the study area.

Amount in naira (₦) respondents are willing-to-pay for an environmentally friendly programme	Frequency	Percentage
5	120	63.2
10	30	15.8
15	20	10.5
20	15	7.9
25	5	2.6
TOTAL	190	100

From table 3 above, majority of the respondents (63.2%) are willing-to-pay only ₦5, for an environmentally friendly programme, their reason being that they are peasant farmers and lack money to pay for any environmental programme despite the benefits. The least of respondents (2.6%) agreed to pay ₦25, being that, they are eager to adopt the friendly environmental programme. This result has shown that, government agencies, international NGOs and policy makers must assist our local farmers to adapt to climate change in their farming activities.

Figure 1: Shows the graphical responses of willingness-to-pay for an environmentally friendly programme by respondents in the study area.



Source: Field Survey 2012.

Table 4: Distribution of respondents according to difficulties encountered as a result of climate change in the study area are as follows:-

S/N	Difficulties Encountered	Frequency	Percentage
1	Farm output variations as a result of seasonal variations factors	75	31.5
2	Rotten/withered problems due to excess rainfall and excess sunlight.	45	18.9
3	Lack of forecasting.	48	20.2
4	Lower income	50	21.1
5	Millipedes/rodents problems	20	8.4
	Total	138	100

Multiple responses Recorded

Table 4, shows that majority of the respondents (31.5%) complained that farm output variation as a result of seasonal variation were their major problems. Farmers at times experienced normal farm output and severer reduction in farm output in the study area. The severer reduction in farm output is always experienced by farmers in the study area. This finding is in line with FAO (2009) “that changing temperatures and weather patterns reduces farm output availability because it negatively affects the basic elements of food production.

Also (21.0%) complained of low income as their major problem caused by climate change. As farmers are faced with the problem of seasonal variation or climate change, there is no doubt that their farm income will be reduced drastically.

Furthermore (20.2%) of the respondents complained that lack of forecasting were their major problem. This lack of forecasting was as a result of the facts that farmers experienced variation in farm output. So farmers in the study area cannot forecast what their output would look like in future harvest. Only (8.4%) of the respondents complained that millipede/rodents infestation was their major problem. This was as a result of the fact that farmers normally experienced either excess rainfall or excess sunlight at times. This was also the case of rotten/unfiltered problems experienced by (18.9%) of the respondents in the study area.

SUMMARY

Moving forward it is critical to understand and react to the challenges facing Niger Delta regions in Nigeria. The most vulnerable communities to the impacts of climate change inhabit this region, coupled with the devastating effects of oil companies on their environment are highly significant. With the projected impacts of climate change, including on ecosystems, water availability, and agriculture on the whole, practical adaptation measures, including policies, which will build the resilience of communities to climate change, are more important than ever. Without adaptation efforts to the threats of changes in climate, the people of this region may be forced to consider other livelihood options, including migration, in order to cope with the extreme changes.

Recommendations

Based on the findings of this study, the following recommendations are outlined:

- Government and Non-Governmental Organizations, should assist rural farmers, adapt to climate change.
- Rural farmers should be encouraged to diversify crop types and varieties, including crop substitution to address the environmental variations and economic risks associated with climate change.
- Rural farmers should continue to change time of their farm operations to address the changing duration of growing seasons and associated changes in temperature and moisture.
- Rural farmers should be encouraged to diversify source of household income in order to address the risk of climate-related income loss.

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