Full Length Research Paper

Constraints to climate change mitigation and adoption among rice farmers in Ebonyi State, Nigeria

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This study analyzed the constraints to climate change mitigation and adoption among rice farmers in the three agricultural zones in Ebonyi State of Nigeria. Multiple stage random sampling technique was employed to select the 120 rice farmers. Primary data collected with the aid of questionnaire and interview schedule. Descriptive and inferential statistics were used in the analysis. Socio-economic characteristics result shows that majority (60%) of the respondents were females within age bracket of 21-50 years and majority (51.66%) married. 47.50 percent of the respondents completed primary education. Most house hold (50.83%) ranged between 6-10 persons. Majority (52.50%) involved in trading as secondary occupation. Greater proportion (65.67%) had farm size ranging 1-3 hectares with annual income between N31,000 – N40,000 (53.33%). Result indicated that rice farmers were aware of climate change such as higher temperature (15.00%), delayed rainfall (13.33%) resulting to decrease in rice yield (40.83%). The result further indicated their major constraints limiting rice farmers were socio-political, fund and infrastructure. It is recommended that rice farmers should be given enough education through effective extension services delivery to enhance their knowledge on climate change and its coping strategies, establishing meteorological stations in rural committees and government and other agencies intervention to reduce the effect on the farmers.

Keywords: Constraints, climatic change and rice farmers.

INTRODUCTION

Rice is highly sensitive to climate variation. Droughts, Floods and severe storm affects rice production greatly. The Nigeria rice sector has a lot of potentials for increased rice production as the country is blessed with rice and abundant rice growing environment (FAO, 2004). According to IPCC (2007), Nigeria is the world's second largest importer of rice, spending or US $300 annually on rice imports alone while CBN half year report has it that Nigeria spent 365 billion naira (2.24) billion US Dollars annual on rice and brown beans to the tune of 38.3 percent between half of 2010 and 2012. Import of this magnitude represents the effect of climate variability on rice (Jones, 2003).

Rice belongs to the tribe oryzeae and family gramineae. Most cultivated varieties are in the diploid species oryza sativa and oryza glaberima widely in parts of Africa. In Nigeria, rice is one of the vital cereals having gained

unprecedented acceptance among the populace due largely to rise in per capital and perhaps ease of preparation (Kebede, 1992). The Nigeria aggregate rice production increased remarkably from about 600,000 tonnes in 1980 to about 1,422,000 tonnes in 1989.

It has however become necessary to exploit to the fullest all available resources for sustainable increase in rice production to meet domestic demand. In Indonesia alone, the total damaged area and production loss because of flooding were estimated to be 266,833 ha. and 1,344 tonnes respectively. Economic loss estimated to be about US $353.7million per year affecting 4.4 million farm household or 22.4 million consumers compared with rice production. Climate change refers to any change in climate over time that alters the composition of the atmosphere and in addition to natural climate, variability observed over comparable time

periods. Climate change is a complex biophysical process. According to recent report of International Panel on Climate Change (IPCC), move intense and longer drought have been observed over wider area since 1970s particularly in the tropics and subtropics. The economics of African countries depend largely on sectors such as agriculture, fisheries and tourism that are particularly vulnerable to environmental challenges including climate variability. Among such challenges, climate change emerges as one of the most potent threats to sustainable development in Africa (Blaike, 1994). Most countries in Africa are vulnerable to those impacts mainly because of reliance on rain fed agriculture, mainly because of reliance on rain fed agriculture, lack of access to technology and improved cultural practices (Kebede, 1992). Climate change is considered the most serious threats to sustainable development with adverse impacts expected to the environment, human health, food security, economic activity, natural resources and physical infrastructure. Changes in temperature and precipitation that accompany climate change will require farmers to adopt, but precisely where and how is uncertain. At the same time, as a significant contributor of Green House Gas (GHG) and a potential sink for atmospherically carbon, agriculture can help mitigate climate change.

Problem statement

Rice (Oryza sativa) a major cereal grown by millions of people in Ebonyi State as important diet of most household but threatened by climate variability making the yield unproductive, the existence of rice and its contained sustenance depends on joint effort to fight climate change to a level (Mirijan, 2008).

Many countries of the world are vulnerable to climate change and risks associated with it. However, some areas have been found to be more vulnerable than others. According to Ijaronda (2007), one hundred most vulnerable countries include all African countries except South Africa. Another reason that further gave other climate vulnerable areas as polar region, Small Island developing states (SIDS) and mega Deltas in Ausia. These countries have their resilience eroded by poverty, degraded or threatened environments and post harvests losses. According to Karuku / asurinya et al (2006), the climate change will most likely add to and amplify these existing sources of constraints unless there is substantial socio-economic development in the continent mostly in their local ways which can be referred to as indigenous knowledge system (IKS).

Previous research report by Rejaskeran, (1993) on limited documented information on weather and climate patterns using scientific techniques. The need to take urgent steps to address the issue of climate change is recognized in the New partnership for African Develop-

ment (NEPAD) action plan to implement African Climate Change Strategy (Nyong, 2008). This action plan made to complement Bangladesh Centre to Advanced Studies (BCAS), World Metrological Organization (WMO), Intergovernmental Panel on Climate Change (IPCC), United Nation Environmental Programme (UNEP), Global Change System for Analysis Research and Training (START, Institute of Research Assessment (IRA). According to Ekong (1998), In addition, rural people in various African and Nigeria communities have applied certain strategies to mitigate vagaries of environment, though making for adaptation. According to Peneluno (2008), adaptive capacities of the local rice farmers in developing countries are low, a fact that such capacities have been sustained over the years in their respective countries.

Therefore, suggestions was put up by WMD for further research on the most appropriate adaptation strategies to include more resistant crops to pest, drought, flood or high temperature.

As a result of the enormity of this climate change problem, Nigerian government considered worthwhile as a policy ingredient under vision 2020 to ensure effective integration of climate change mitigation and adaptation knowledge into Nigerian Development Initiative as the country strives towards achieving the vision. In spite of the enormous suggestions by International and Nigerian organizations, Ebonyi State farmers still have little or no idea of climate change (Chika, 2010) The inherent technology for mitigating the effect of climate change is difficult for farmers to comprehend (Bronson, 2000). It was also difficult for farmers to identify at what time of the year that would be safe for planning to avert the damaging effect of climate change (Chika, 2010).

However, since the scenario of climate change in Ebonyi State, climate change mitigation in the state remains worrisome and pathetic. The participation of the rice farmers in developing initiatives involving mitigation measures had been for from encouraging it does not seen that much is bating achieved among rice farmers in order to either mitigate or imbibe adoption measure in climate change under rice production IPCC (2007), hence, the following questions this research is set to address in the socio-economics characteristics of farmers vis a vis their perception of climate change mitigation and adoption; level of farmers awareness on effect of climate change on rice production; major manifestation of climate change effect on rice production, coping strategies to climate change by farmers; and effective constraints to rice farmers in mitigation as adoption to climate change in rice production in Ebonyi State.

Objective of the study

The broad objective is to ascertain constraints to climate

change mitigation on rice farmers in Ebonyi State. Specifically to;

i. describe the socio-economic characteristics of rice farmers in Ebonyi State;

ii. identify some major manifestations of climate change and analyze their effects on rice production;

iii. identify constraints to mitigation and adaptation to climate change.

Justification of the study

The fact that climate change has been a global terror to agrarian world, given rise to food insecurity, it requires effort to reduce menace from this phenomena. This study will contribute to possible ways of mitigating or adapting of climate change by broadening the knowledge of rice farmers in Ebonyi State.

Theoretical Model of Adaptation and Mitigation of Climate Change

Theory of Adoption and Mitigation:

Ebonyi State is over dependent on agriculture but lack the capacity to cope and or adapt to climate extremes (Rarieya, 2007). It is on this note that farmers in Ebonyi State need to be sensitized on the importance of climate change. This depends on the climate related information which must be a guide to farmers through proper orientation. The mitigation and adoption of climate change by farmers must be possible through development of storage positive attitude toward information received from extension agents on climate change. Their attitude could lead to development of certain strategy to cope or mitigate (Rarieya, 2007). These processes are because of some complexities imposed by process of adaptation and mitigation have led to propound conceptual framework
on climate change mitigation and adaptation constraints (Chika, 2010).
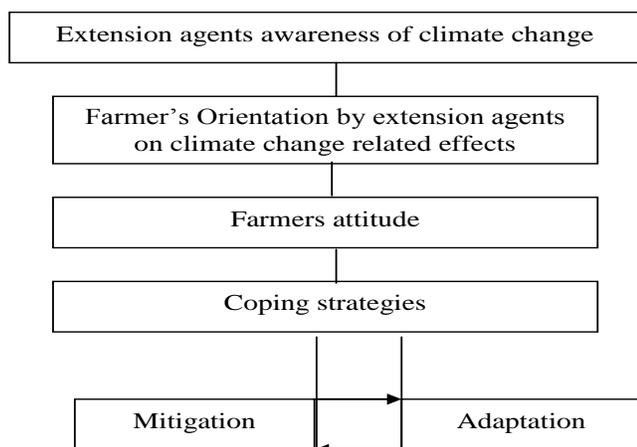
Study Area

Ebonyi State is located in the South Eastern part of Nigeria. Bordered in the East by Cross River State, in the North by Benue State, in the West by Enugu State and in the South by Abia State, Ebonyi has approximate land mass of 5,932 sq. km. which lies $7^{o}3^{1}$N and longitudes $5^{o}4^{1}$E and 6o451E. Ebonyi State has a projected population of about 2.1 million people (NPC, 2006). The State is made up of thirteen local government area, and has three agricultural zones namely North, Central and South. The vegetation is mixture of Sarama and Semi-tropical Forest. Agriculture is the main stay of the economy with predominance of small scale farmers. Major crops include: yam, Rice, Cassava, Maize, Cocoyam, Groundnut, etc.

   Ebonyi State is predominantly a rural setting with majority of the rural population engaged in farming and petty trading. It has two major seasons Dry and Wet seasons.

Sampling Procedure

Purposive multi-stage random sampling techniques were used in the selection of the respondents involving all genders of rice farmers. Ebonyi is purposively selected as a known rice producing State in the South East Nigeria. Ebonyi is made up of three agricultural zones.

Data Collection and Analysis

Data collected from Primary and Secondary sources. Both descriptive and inferential statistics was used in the analysis. Objectives I and II were analyzed using frequency courts and percentage while objective III was analyzed by factors analysis.

RESULTS AND DISCUSSION

   The result of data analysis was according to the specific objectives of the study which include to; describe the socio-economic characteristics of rice farmers; identify some major manifestations of climate change and analyze their effects on rice production and identify constraints to mitigation and adaptation to climate change.

   The socio-economic characteristics of the respondents may affect their ability to cope and adapt to climate change effects in a particular area. The factors considered are: age, sex, marital status, educational level, household size, occupation, farm size, monthly income, farming experience, membership of rural organization, and contact with extension agents in a month.

Table I: Frequency Distribution of the socio-Economic Characteristics of the Respondent.

Variable	Response	Frequency	Percentage
Age (Years)	20 – 30	18	15.00
	31 – 40	21	17.50
	41 – 50	49	40.83
	51 – 60	22	18.33
	Above 60	10	8.33
Sex	Male	48	40.00
	Female	72	60.00
Marital Status	Single	29	24.17
	Married	62	51.66
	Widow	10	8.33
	Widower	11	9.17
	Divorced	8	6.67
Educational Level	No formal Education	22	18.33
	Primary Education	57	47.50
	Secondary Education	31	25.83
	Tertiary Education	10	8.33
Household Size	1 – 5	21	20.83
	6 – 10	61	50.83
	11 – 25	14	11.67
	15 – 20	17	14.17
	Above	3	2.50
Occupation	Hunting	11	9.17
	Trading	63	82.50
	Civil Servant	18	15.00
	Others	28	23.33
Farm Six	1 – 3	79	65.83
	4 – 6	23	19.17
	7 – 10	19	9.17
	Above 10	7	5.83
Monthly Income	N11,000 – N20,000	19	15.83
	N21,000 – N30,000	24	20.00
	N31,000 – N40,000	64	53.33
	N41,000 – N50,000	12	10.00
	Above N50,000	1	0.83
Farming Experience	1 – 6	4	3.33
	7 – 12	11	9.17
	13 – 18	44	36.67
	19 – 23	56	46.67
	Above 23	5	4.17
Membership of Rural Organizations	Yes	38	31.67
	No	82	68.33
Contact with Extension Agents in a month	Once	52	43.33
	Twice	38	31.66
	Thrice	13	10.56
	Others	17	14.17

Source: Field Survey 2013

In table 1 above, age of respondents show that majority 40.83 percent fall with the age bracket of 41–50 years while few 8.33 percent fell with age bracket of above 60years. It showed that most of the respondents were middle-aged men and women involved in rice production. The above result indicated 60 percent of the respondents to be female while male 40 percent and implied that females involved in rice production more than the males. It implied that female were more than male in the rice farming and 51.66 percent of the female were married. Majority of the respondent (47.50 percent) attended primary education while very few 8.33 percent attended tertiary education.

Household size of 6 -70 persons had greater percentage of 50.30 and produced more family labour for rice production.

In occupation, it was indicated also in table 1 that most of the respondents 52.50 percent engaged in trading as their secondary occupation. The farm size result should that the farm size majority 65.83 percent ranged

Table 2: Percentage Distribution of major Manifestation of Climate Change and Their Effects on Rice Production.

SN	Manifestation of Climate Change	Frequency	Percentage
i	Decrease in rice yield	49	40.83
ii	Increase in rice yield	17	14.17
iii	Frequent rainfall and hails forms	19	15.83
iv	Delayed rainfall	52	43.33
v	Less clearly defined season	49	40.83
vi	Dry periods during raining season	32	26.67
vii	Increased intensity of sunshine	43	35.83
viii	Temperature in higher	54	45.00
ix	Timing of farming operation affected	33	27.50
x	Soil fertility affected	47	39.17
xi	Increased flooding	33	27.50
xii	Increased erosion	29	24.50
xiii	Increased speed of wind	23	19.17
xiv	Others	20	16.67
	Total	**500**	**16.67**

Source: Field Survey, 2013.
* Multiple Responses

Table 3: Various Rotated Factor Matrix on Constraints to Mitigation and Adaptation to Climate Change in the study Area.

Variables code	Variables name	Factor I socio-political constraints	Factor II financial constraints	Factor III infrastructural constraints
VO_1	Lack of information	0.402	0.002	0.001
VO_2	Low Literary level	0.569	0.024	0.112
VO_3	Poor social network	0.321	0.021	0.103
VO_4	Lack of Improved seeds	0.322	0.009	0.041
VO_5	Farm size	0.213	0.112	0.233
VO_6	Land use policies	0.789	0.211	0.101
VO_7	High cost of improve crops varieties	0.009	0.421	0.002
VO_8	Non availability processing facilities for value chain addition	0.012	0.002	0.513
VO_9	High cost in organic fertilizer	0.022	0.391	0.001
VO_{10}	Lack of irrigation scheme	0.024	0.099	0.401
VO_{11}	High cost of constructing dams	0.100	0.670	0.200
VO_{12}	Ineffectiveness indigenous strategies	0.100	0.203	0.221
VO_{13}	Lack of finance	0.011	0.491	0.212
VO_{14}	Poor extension services	0.044	0.022	0.211
VO_{15}	Lack of access to weather forecasts	0.021	0.233	0.241
VO_{16}	High cost of farm labour	0.003	0.392	0.214
VO_{17}	Poor response to climate change related issues	0.201	0.113	0.004
VO_{18}	Lack of government politics on mitigation and adaption	0.024	0.067	0.391

Source: Field Survey 2013.

between1-3 ha. It implied that respondents were small scale farmers, with a low monthly income leading to extreme poverty as indicated in the study. In table 1, the result should that the respondent had great experience, belonged to rural organizations and had contact with extension agents.

The result obtained in table 2 showed that these were major manifestations of climate change which guilty influenced rice production in the study area

The result of factors analyzed in table 3 indicated that three principal component factors were extracted. This was done based on the high loaded variable. Since the purpose was to identity new factors, it boils down to identifying the variable that loads high for each factor. These variables loading high were used in naming each extracted factor. Kaiser (1958) developed a single rule thumb that variables with coefficient of (0.30) or more have high leading and may be used in naming a factor. The names of the three factors were socio-political, financial and infrastructural constraints.

Factor I was named socio-political constraints due to the factors that load higher under it include: VO1 – lack

of information (0.402), VO2 – Low library level (0.569), Vo3 – Poor social network (0.321), Vo4 – Lack of improved seed (0.321), Vo6 – Land use policies (0.789), Vo18 – Lack of government polices on mitigation and adaptation (0.391).

Factor 2 was considered and named financial constraints because the variables that loaded high under it related closely to financial issues. These include: Vo, - high cost of improved crop varieties (0.421), Vo9 – high cost of inorganic fertilizer (0.391), Vo10 – Lack of irrigation scheme (0.399) Vo11 – high cost of constructing dams (0.670), Vo13 – Lack of finance (0.491) and vo14 – high cost of farm labour (0.392).

Similarly, factor 3 was considered and named infrastructure constraints because the high loaded variables identified under these constraints relate so much to problems due to infrastructure. They include: Vo8 – non availability of process facilities for value chain addition (0.513), vo10 – Lack of irrigation scheme (0.401).

CONCLUSION

Climate change in Nigeria is accompanied by greater variability in rainfall and temperature. Temperature more as will have detrimental effects on agriculture because of increase in the number of extreme hot days, reduction in rainfall and soil moisture, and an acceleration of crop development that would lead to premature ripening and lowering yields in crops such as cereals, increased rainfall variability would result in move frequent floods and droughts and larger runs of wet and dry years to give rise to frequent changes in agro climatic characteristics and increased variability in yield of crops in Ebonyi State. Based on the findings, farmers, planning agencies and other decision makers needs to able to compare alternative crops management strategies that will allow them to cope better with climate variability, government, non-government organization and all agencies concerned with climate change ones should also direct attention to rural areas where the bulk of foods are produced.

Meteorological station should be established in rural communities for collection of climate based information, analyzed and disseminated to the rural farmers using local languages and rice farmers in Ebonyi State enlightened on various measures of adoption and mitigation they can adopt to reduces the risk of climate change.

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