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CONSTRAINTS TO CLIMATE CHANGE ADAPTATION AMONG CASSAVA FARMERS IN ABIA STATE, NIGERIA

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ABSTRACT

Climate change is currently a major human security issue globally which poses threats to agriculture, malnutrition, shelter, security, disease and poverty in developing countries. This paper identified constraints to climate change adaptation among cassava farmers in Abia State, Nigeria. A multistage random sampling technique was used in the selection of agricultural blocks, cells and cassava farmers. A structured questionnaire was administered to 120 randomly selected cassava farmers. The data was analyzed using descriptive statistics and inferential analysis (Varimax factor analysis). The result of study showed that a good proportion (55%) of the farmers were men, with mean age of 45.5 years, 43.3% acquired secondary education and cultivated on mean farm size of 1.1 hectares. The result also showed that cassava farmers in the study area used improved cassava varieties ($\bar{x}$ = 3.6)*, mixed cropping* ($\bar{x}$ = 3.5)*, early planting* ($\bar{x}$ = 3.4) *and fertilizer application* ($\bar{x}$ = 3.2) *as adaptation strategies to cope with climate change. The constraints to climate change adaptation among cassava farmers include; limited availability of farmland, un-inherited land ownership, non-availability of farm inputs, non availability of credit facilities, lack of awareness on coping or resilience, limited access to weather forecast, government irresponsiveness to resultant effect of climate change, limited access and high cost of labour. It is therefore recommended that regularly trainings on climate change and variability, accessibility to meteorological data, steady availability of improved cassava varieties to farmers and review of Land Use Act of 1990 in Nigeria to increase access to land to farmers were advocated.*

Keywords: Constraints, Climate change, Adaptation, Cassava Farmers.

INTRODUCTION

In Nigeria climate change had been impacting agriculture, land use, water resources, health and other aspects of human life. According to Nigerian Environmental Study/Action Team (NEST) (2004), the term climate change is used to describe a marked change in the long-term 'average' of a region weather condition. BNRCC (2012) views climate change as a long term shift in climate due to human activities and natural variability. The indications that climate change is occurring are trend in warming temperatures, varying rainfall patterns, more frequent extreme weather events (such as storms, high rainfall intensity, floods, droughts, and heat waves).

In Nigeria, agriculture is the main source of food and major employer of labour employing about 60% of the population. It is predominantly a rain fed system and hence vulnerable to climate change (Nigeria's First Communication under United Nations Convention, NFNC, 2003). For instance, cassava growth failure can result if rain does not fall at all under rain fed agriculture, or if it does not fall at the right time. Despite the fact that cassava (*Manihot esculenta crantz*) plant grows and produces well in the Nigeria environment, it has shown different growth behaviour and yield in

different years as a result of differences in the annual weather condition (FAO, 2010). This is because climate variability has possibility of degrading soil and water resources and subsequently subsistence agricultural production, which is largely practised by root and tuber crops farmers (Pidwirny and Sidney, 2007).

Adaptation to climate change refers to adjustments in natural or human systems in response to actual or expected climate stimuli or their effects, which moderate harm or exploits beneficial opportunities (IPPC, 2007). African farmers are the most vulnerable to climate change variation due to low capacity to adapt to these changes. Adaptation helps the farmer achieve their food, income and livelihood security objectives in the face of changing climatic and socio-economic conditions, including climatic variability, extreme weather conditions such as drought and floods, and volatile short term changes in local and large scale markets (Nhemachena and Hassan, 2008). Adaptation is one of the policy options for reducing the negative impact of climate change and include; diversification to new plant species and varieties that would have higher resistance to temperature and rainfall, adopting minimum or zero tillage, introduction of new irrigation, improved use of fertilizer or verifying the amount and timing of application, crop diversification, change in planting dates and promotion of organic fertilizer and use of meteorological forecasts (Tologbonse, *et al*., 2010; Bradshaw *et al*., 2004). Ozor *et al*., (2010) in their study identified limited availability of land, high costs and poor ownership systems (tenure), poor climate change information and agricultural extension service delivery, high cost of farm inputs and processing facilities, high cost of irrigation facilities, government irresponsiveness to climate change risk management, credit constraints, labour constraints and income constraints as major barriers to climate change adaptation among farmers in south eastern Nigeria.

Several studies on climate change and agriculture have focused on its agricultural and biological consequences to the neglect of its adaptation strategies (Adejuwon, 2004). Not much has been done for major crops such as cassava in the agro-ecological zone of many developing countries. Therefore, there has been a dearth of information relating to farmers adaptation methods and the barriers to adaptation to climate change in the study area. In view of the above facts, this study intends to analyze the constraints to climate change adaptation among cassava farmers in Abia state, Nigeria. Specific objectives of this study were to;

1. describe selected socio-economic characteristics of cassava farmers in the study area
2. ascertain farmers' adaptation strategies to reducing effect of climate variability and change on cassava production
3. determine the constraints to climate change adaptation by farmers in the study area

MATERIALS AND METHODS

This study was conducted in Abia State, Nigeria. Abia State lies between longitudes 7^{o} 23^{1} and 8^{o} 2^{1} East of the equator and latitudes 4^{o} 47^{1} and 6^{o} 12^{1} North of the Greenwich Meridian. The State is located East of Imo State and shares common boundaries with Anambra, Enugu and Ebonyi States in the North West and North East respectively. On the East and South East, it is bounded by Cross River and Akwa Ibom States and by Rivers State on the South. Abia State is made up of 17 local government areas and most of the people especially, the rural dwellers are engaged mainly in small scale farming. They engage in arable crop production such as cassava, yam, rice, maize and sweet potatoes.

The research was conducted in the three agricultural zones of Abia State, namely, Umuahia, Ohafia and Aba. A list of cassava farmers were collected from Agricultural Development Project (ADP) which formed the sampling frame. A multistage random sampling technique was used in the selection of agricultural blocks, circles and cassava farmers. First two (2) blocks each were randomly selected from the three agricultural zones (Umuahia zone – Ikwuano block, Isiala Ngwa North, Ohafia zone – Uzuakoli block, Isuikwuato block, Aba zone – Obingwa block and Ukwa West) to give a total of 6 blocks. From the selected blocks two circles were randomly selected to give a total of 12 circles. Finally, ten cassava farmers each were randomly selected from the selected circles and this gave a sample size of 120 cassava farmers. A structured questionnaire was used in soliciting information from the farmers. Data for the study were analyzed with factor analysis and descriptive statistics such as frequency counts, percentages and mean scores. Objectives i and ii were achieved using descriptive statistics while objective iii was analyzed with factor analysis (varimax rotation) The adaptation measures used by farmers in the study area was measured using a 5 – item statement rated on a 5 point Likert type scale of Always 5, Often 4, Occasionally 3, Seldom 2, Never 1. A midpoint was obtained thus; 5+4+3+2+1 =15/5 =3.00. Based on the mid score decision rule, any mean score greater than or equal to 3.00 implied use of stated adaptation measures and mean score less than 3.00 denotes non use of adaptation measures by farmers. In determining the constraints to climate change adaptation, factor analysis with varimax rotation was used in accordance with Ozor *et al.,* (2010). Factors mainly responsible were designated as component factors. Constraint items were itemized and respondents scored each item to the component factors as; Not Important (O), Important (1) and Very Important (2). Only variables with factors loadings of 0.40 and above at 10% over lapping variance was used in naming the factors, variables that have factor loading of less than10% loaded with more than one constraints were discarded.

Socio-economic characteristics of farmers

The result in Table 1 shows that more than half (55%) of the farmers were males with mean age of 45.5 years. These show that cassava farming in the study area is dominated by men who were in their productive age of accepting and making farm decisions with regards to coping with effects of climate change. This result conforms to the findings of Ojo (1999) who asserts that conservativeness of the farmer, his risk-bearing ability to cope with after effects of natural disaster and manual labour decreases with advancing age. The Table also revealed that a fairly good proportion (40.8%) of the farmers acquired secondary education. Education is essential factor for affecting desirable changes in attitude, skills and knowledge of individuals (Unamma *et al.,* 2004). The cassava farmers had a mean farm size of 1.1 hectares. The result implies that most of the farmers own small sizes of farmland. This may be attributable to the land tenure system prevalent in the study area which encourages small holdings. IPCC (2007) further reports that the tropical forest and rangeland are under threat from population pressure and system of land use. The mean farming experience of the cassava farmers was 15.5 years and ₦125, 500.00 (mean annual farm income). This result agrees with Shetty (2005) who reports that more farming experience improves awareness of potential benefits and willingness to participate in local natural resource management and conservation activities. This implies that the respondents were widely experienced, matured and could achieve a better understanding of adaptation

strategies. The poor income level of farmers could be attributed to the subsistence level of farming prevalent in the rural areas (Akpabio, 2005).

Table 1: Distribution of Cassava Farmers According to socioeconomic variables (n= 120)

Variables	Frequency	Percentage
Gender		
Male	66	55.0
Female	54	45.0
Age (years)		
20-30	3	2.5
31-40	21	17.5
41-50	41	34.2 $\bar{x}$ = 45.5 years
51-60	28	23.3
61-70	27	22.5
Education (years)		
No Formal Education	15	12.5
Primary Education	46	38.3
Secondary Education	49	40.8
Tertiary Education	10	8.4
Farm Size (hectares)		
0.5-1.0	21	17.5
1.1-1.5	27	22.5
1.6-2.0	39	32.5 $\bar{x}$ = 1.1 ha
2.1-2.5	20	16.7
2.6-3.0	13	10.8
Farming Experience (years)		
1-10	20	16.7
11-15	40	33.3
16-20	52	43.3 $\bar{x}$ = 15.5 years
21-30	8	6.7
Annual Farm income (₦)		
50,000-100,00	50	41-7
101,000-150,000	65	54.2 $\bar{x}$ = ₦125,500
151,000-2000,000	5	4.1

Source*: Field Survey Data, 2012*

Farmers Adaptation Strategies to Coping with Effects of Climate Change in Abia State, Nigeria

The distribution of respondents according to different adaptation measures adopted in coping with climate change in the study area is shown in Table 2. The Table reveals that 33.3 percent of cassava farmers with a mean 3.6 used improved cassava varieties as an adaptation option in coping with climate change. Improved cassava varieties have been proved to be pest and disease resistant, high yielding and drought tolerant. It also assures the farmer of early maturity thus averting changes in climate. Mixed cropping was always used by farmers (26.7%) with a mean of 3.5 in coping with climate change variability. The farmers adopted this method in order to insure their crops in case of any crop failure, so that other component crops planted with cassava will be utilized by the farmer and his family. Another coping strategy often employed by the farmers is early planting (29.2%) with mean of 3.4. In the study area, farmers located in the swamp areas plant cassava cutting when flood in their fields is reduced and harvest the roots before the peak of rains of the next farming season. This will prevent rotten of cassava roots in the field. Cassava farmers (31.7%) always use fertilizers ($\bar{x}$ = 3.2) as a measure to coping with adverse effects of climate change. Application of fertilizers to crops helps improve crop yield thus encouraging vigorous growth and early maturity of crops that will withstand adverse weather conditions.

Table 2: Farmers Adaptation Strategies in Coping with Climate Variability and Change on Cassava Production

Coping Strategies	Always	Often	Occasionally	Seldom	Never	Mean	Rank
Zero Tillage	90(15.0)	170(25.0)	78(21.7)	46(19.2)	23(19.2)	**2.9**	5th
Early Planting	155(25.8)	140(29.2)	75(20.8)	38(15.8)	10(8.3)	**3.4**	3rd
Meteorological Forecast	85(9.2)	88(18.3)	90(25.0)	44(18.3)	35(29.2)	**2.6**	7th
Use of Fertilizers	190(31.7)	72(15.0)	45(12.5)	50(24.2)	20(16.7)	**3.2**	4th
Mixed Cropping	160(26.7)	152(31.7)	69(19.2)	36(15.0)	9(7.5)	**3.5**	2nd
Diversification	100(16.7)	40(8.3)	90(25.0)	56(23.3)	32(26.7)	**2.7**	6th
Use of Improved Cassava Varieties	200(33.3)	128(26.7)	69(19.2)	30(12.50)	10(8.3)	**3.6**	1st

Source: *Field Survey Data, 2012*

Decision Rule: 3.0 and above is used

Less than 3.0 is not used

Always 5, Often 4, Occasionally 3, Seldom 2, Never 1

Values in parentheses are percentages.

Constraints to Climate Change Adaptation among Cassava Farmers in Abia State Nigeria

The constraints to climate change adaptation among cassava farmers in Abia state is shown in Table 3. The Table reveals that land constraint factor (1) loadings include; limited availability of farm land (0.626) and inherited system of land ownership (0.799). Benhin (2008) noted that farm size and land tenure status are some of the major determinants of speedy adoption of adaptation measures to climate change. Under factor 2 (poor climate change information and agricultural extension service delivery), the factors were identified as inadequate knowledge of how to cope or build resilience to climate change (0.439), lack of access to weather forecast technology (0.554) and government irresponsiveness to climate change management (0.408). Weather forecasts are supposed to guide farmers on climate variability, so that they can be informed on the decisions on how to cope with it. This is in agreement with Ozor *et al.,* (2010) who obtained a similar result. Regarding factor 3 (high cost of farm inputs) the variables loaded include non availability of farm inputs (0.552) and high cost of improved varieties (0.474). This could pose threats to the coping strategies of the farmers. Relly (1996) opined that climate change might constitute significant addition to the stresses already borne by farmers such that adapting to it might be beyond their resource capabilities. This is in agreement with Ozor*et al.,* (2010) who obtained a similar result. The only variable that loaded high in factor 4 (labour constraints) is high cost of labour (0.498). Some analysis of constraints to climate change adaptation show that shortage of farm labour is one of the major constraints to adaptation by farmers (Deressa, 2009). Factor 5 (Credit constraint) just have one variable loaded – non-availability of credit. Lack of access to credit is a major problem encountered by farmers in adapting to the effects of climate change (Benhin, 2006).

Table 3: Constraints to Climate Change Adaptation among Cassava Farmers in Abia State, Nigeria

Constraints	Items				
Limited availability of land for farming	0.626*	0.311	0.278	0.139	0.131
Traditional land ownership in rural communities	0.799*	0.365	0.193	0.042	0.220
Non-availability of farm inputs e.g. improved seeds	0.114	0.109	0.552*	0.102	0.100
Non-availability of credit facilities	0.162	0.102	0.121	0.129	0.445*
High cost and unavailability of fertilizer	0.017	0.258	0.052	0.181	0.125
Lack of awareness on coping or build resilience to climate change	0.345	0.439*	0.065	0.066	0.286
High cost and inaccessibility of improved cassava varieties	0.221	0.196	0.474*	0.103	0.133
Limited access to weather forecast technologies	0.311	0.554*	0.286	0.180	0.112
Government irresponsiveness to resultant effect of climate change	0.091	0.408*	0.092	0.186	0.042
High cost of labour (wage rate)	0.241	0.355	0.127	0.501*	0.213

Source: *Field Survey Data, 2012*

1 = Land constraints
2 = Poor climate change information and agricultural extension service delivery
3 = High cost of farm inputs
4 = Labour constraints
5 = Credit constraints
* Factor loading from 0.4 and above are constraints

CONCLUSION AND RECOMMENDATIONS

The study revealed that the farmers adapted strategies such as use of improved cassava varieties, mixed cropping, early planting and fertilizer use in coping with effects of climate change in the study area. The findings also revealed that the major constraints to climate change adaptation include; limited availability of farmland, un-inherited land ownership, non-availability of farm inputs, unavailability of credit facilities, lack of awareness on coping or resilience, limited access to weather forecast government irresponsiveness to resultant effect of climate change, limited access and high cost of labour

The study therefore recommends training for farmers on early warnings in climate variability and change, availability of improved cassava resistant varieties and access to meteorological data.

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