Effects of Climate Change on Cassava Productivity in Ilesa – East Local Government Area, Osun State, Nigeria

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Abstract

This paper reviews the effects of climate change on cassava productivity in Ilesha – East Local Government Area of Osun State, Nigeria. Simple random sampling procedure was used to select 117 cassava farmers. The data were obtained from the primary source with the aid of both structured questionnaires and interview schedule and analysed using the descriptive statistics such as frequency tables, percentage and mean and the regression model. The study identified that there is no significant relationship between the recent effects of climatic variability and the cassava yield in the study area, this was shown by the result of regression analysis and it indicates that the quantity of cassava harvested by the farmers does not vary with the current effects of climate change though there are may be other factors that show negative impacts on cassava productivity like cassava varieties, soil nutrients, credit facilities, pests and diseases and some other socio- economic characteristics. But, many studies conducted on effects of climate change in some states in Nigeria and other countries revealed that in the long run climatic variability will show serious effects on the agricultural sector. The advice is that, with the present little effects coping measures should be developed as a matter of urgency for adaptability and sustainability of the agricultural sector, the mainstay of Nigerian economy.

Keywords: Climate change, Cassava, production

Introduction

Basically, climatic condition as predetermined by the weather pattern and its elements over a long period of between 30 to 40 years is known as *climate*. This is different from weather which is the atmospheric condition within a very short period of time of at most two weeks. The classical period as determined by the World Meteorological Organization is 30 years during which a number of changes in the variables that determine the predominant climatic pattern in the regions are known. The climatic elements include rainfall, temperature, sunshine intensity, relative humidity, atmospheric pressure, cloud cover, snow, dew, frost and wind.

Generally, climate change refers to a long term alterations in global weather patterns like rises in temperature over time, rainfall fluctuation and storm activity evolved from the potential consequences of the greenhouse effects and continuous deforestation(). In recent usage, in the context of environmental policy the term *climate change* often refers only to changes in modern climate including the rise in average surface temperature known as global warming. Of course, climate is constantly changing and the signal which indicates that the alterations are occurring can be evaluated over a range of temporal and spatial scales. We can consider climate to be an integration of complex weather conditions averaged over a significant area of the earth expressed in terms of both the mean of weather and properties such as temperature, radiation, atmospheric pressure, wind, humidity, rainfall and cloudiness amongst others and the distribution or range of variation of these properties usually calculated over a period of 30 years. As the frequency and magnitude of seemingly unremarkable events change, such as rainstorms, the mean and distribution that characterize a particular climate will start to change. Therefore, climate as defined is influenced by events occurring over periods of time through global processes taking centuries. The consequences of changes may be as important as those that arise due to variations in mean climatic variables (Hulme, et al 1999, Carnell and Senior, 1998).

The amount of rainfall, intensity and distribution are characteristics affected by climate change and the certainties surrounding the global warming arguments have reflected in diverse studies on climate change in Nigeria (Rao, 2006 and Adefolalu, 2006). Climate change has been a topic of recent interest by the scientists and the researchers on this field. The two major factors affecting crop yield and productivity are weather condition and soil nutrient Wright, (1993), thus to improve the production of any crop it is rationale to understand the average weather conditions of such area that is the climatic parameters such as rainfall, temperature, relative humidity, sunlight etc that affect the agricultural sector (Fasola, 1986). The objectives of the study are to examine the effects of climate change on cassava productivity and identify ways by which farmers can increase their productivity when there is ambient change in climate in the study area.

Climate change is one of the most serious threats to Nigeria agricultural sector and food security because of its sensitivity and vulnerability to high ambient temperature and rainfall fluctuations. For instance, higher temperatures lower the yield of desirable crops while encouraging weeds and pests' proliferation and changes in precipitation patterns increase the likelihood of short-run crop failure and long run production declines, thus its variability creates a huge challenge for food production (Deutsche Bank Research, 2009). Climate change drive extreme weather events such as hurricanes and floods and the increased risks of droughts and floods due to rising temperature, crops yield looses are imminent (Deutsche Bank Research, 2009). Global and regional climate changes are affecting all economic sectors to some degrees but the agricultural sector is perhaps the most sensitive and vulnerable, because agricultural production remains very dependent on climatic resources. However, according to Intergovernmental Panel on Climate Change (IPCC, 2007) report the earth is likely to warm by $0.2^{o}C$ per decade for the next two decades and to rise between

0.6^{o}C and 4.0^{o}C by the end of the century depending on future emissions, as a result, climate variability will impact food production in several ways.

Cassava as a crop originated from South America and it's extensively propagated as an annual crop in the tropical and sub tropical regions for its edible starchy tuber as root. It is an annual crop that may often be left longer than 12 months and usually planted as a sole crop or in combination with other crops. Production is all year round activity and it does well in a warm, moist climate. Cassava is very tolerant and has the ability to grow on marginal land where other food crops cannot grow well, but for its highly yield and productivity moderate climatic condition and best soil properties like a light, sandy loam soil of medium fertility and good aerations or drainage are all crucial Akanbi and Olabode, (2004) . Hence, extreme weather conditions such as prolonged drought and excessive amount of rainfall that leads into flood may be detrimental to cassava outputs.

Methodology

The study was undertaken in Ilesha East Local Government Area of Osun State. The Local Government Area consists of four (4) major communities where cassava farmers are being dominated. From the four villages 117 cassava farmers were selected using simple random sampling procedure and structure questionnaires was employed for the collection of the primary data used for the analysis. Also descriptive statistics such frequency table, mean, and percentages were used to analyse the socio-economic characteristics of the respondents while regression analysis was run to determine the effect of climate change on cassava productivity of the farmers in the study area. The regression model was implicitly specified as

$AC1 = \beta + \alpha \sum x + e$

where,

AC= Revenue

X_{1} = Age

X_{2} = Sex

X_{3} = Education

X_{4} = Family Size

X_{5} = Main Occupation

X_{6} = Member of social organisation

X_{7} = Source of Loan

X_{8} = Amount of loan quantity of cassava (kg)

X_{10} = Price of cassava (N)

X_{11} = Income realization

U_{e} = Error term

Result and Discussion

Result of Socio Economic Characteristics

The result of social- economic analysis represented on Table 1 shows the age, sex, marital status, education level, family size, farming experience, occupation distribution of the respondents. The age distribution revealed that the mean age is 44.83 years and it implies that majority farmers are young and still within their useful ages. It also shows that 75.2% of the farmers were male while the rest percentage (24.8%) was female; it means that males are involved in cassava farming than their female counterparts. A large percentage (64.1%) of the cassava farmers were married, this may reduce the cost of hired labour if the farmers engage their families in the activities on the farm. Most (96.5%) of the respondents have family size ranges between 0- 10, it implies that many of them have responsibility to discharge.

The result of the farming experience shows that 52.3% of the farmers had more than 10years experience and only 35% of farmers are practising cassava farming as their major occupations and almost half (46.2%) of the farmers rely mainly on their personal savings for cassava production. Also very few of them belong to one or the other association.

Table 1: Distribution by Socio Economic Characteristics

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Socio economic variables	**Frequency (No = 117)**	**Percentage(%)**
Sex		
Male	88	75.2
Female	29	24.8
Age		
<20	5	4
21-40	43	37
41-60	43	37
>60	26	22
Marital status		
Married	75	64.1
Single	10	19.9
Widowed	23	10.3
Divorce	3	2.6
Separated	4	3.4
Major Occupation		

Yes	41	35.0
No	76	65.0
Level of education		
Primary	70	6.0
SSCE	13	11.0
Tertiary	18	15.4
Others	79	**67.6**
Year of Experience		
1-10	61	52.3
11-20	43	36.4
>20	13	11.3
Association		
Yes	35	29.9
No	82	70.1
Total	**117**	**100**

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Source: Field survey, 2010

Result of Cassava Production and Climate Change Effects

Table 2 indicates the features of cassava production and climate change effects in the study area. It shows that 30.2% of the farmers produce less than 1000kg/ha of cassava, 22.3% of farmers produce between 1000- 2000kg/ha while 26.1% of the farmers produce greater than 4000kg/ha of cassava tuber. The result also revealed that 25.9% of the farmers earned greater than ₦60.000: 00 per production period which means that ¼ of the cassava producers in the study area gained higher profit and also 26.7% of the farmers earned ₦10, 000:00 as revenue. Based on the effects of climate changes on cassava yield and productivity in the study area, about half (50) % of the respondents agreed that low sunlight can cause reduction in productivity, some 38.5% believed that it can lead to cassava leaves discolouration while little (11.1%) of them said that low sunlight amount can cause low output. Again, majority of the farmers (96.5%) agreed that rainfall distribution has effect which can be negative or positive on the cassava output while very few (3.5%) do not agree that climate change can lead to pest infestation while the rest (57.8%) do not agree that it can lead to pest infestation.

Table 2: Distribution by cassava production and climate change effects

Cassava production and climate change effects	Frequency (No = 117)	Percentage(%)
Farm accessibility		
Near	50	42.7
Far	67	57.3
Source of water		
Rainfall	108	92.3
Irrigation	9	7.7
Sunlight Effect		
Reduction in productivity	59	50.1
Reduction in size	13	11.1
Leaves Discolouration	45	38.5
Rainfall effect		
Yes	105	96.5
No	12	3.5
Pest infestation due to Climate Change		
Yes	49	50.4
No	68	57.8
Source of loan		
Personal saving	54	46.2
Relative	6	5.1
Cooperative	10	8.5
NACB	1	0.9
Commercial bank	1	0.9
Money lender	2	1.8

Others	43	36.8
Quantity of Cassava		
<1000	35	30.2
1000-2000	26	22.3
2000-3000	17	14.6
3000-4000	10	8.54
>4000	31	26.1
Revenue Earned		
10,000	31	26.7
10,000-20,000	13	11.2
20,000-40,000	29	25.0
40,000-60,000	13	11.2
>60,000	31	25.9
Total	**117**	**100**

Source: Field survey, 2010

Result of Logit Regression Analysis

Based on the result the coefficients of age, sex, family size, member of social association, quantity of cassava, price of cassava and income realization were not statistically significant at all levels of significance meaning that the present of each of the variables has on impact on the cassava production level and the climate change which further implies that most of these variables are not relevant in the model. But, the coefficients of educational status and that of the amount of loan obtained were significant at 10% respectively while the main occupation and source of loan were also significant at 1% and 5% levels and it shows that their inclusion in the model is of importance which means that they served as the influence variables in the analysis. Again, the result revealed that the Chi-square value was 45.023 with the log- likelihood value of -94.618.

Table 3: Result of Logit Regression Analysis

Variables	Coefficient	Standard Error	T-Ratio	Significance Level	Mean
Constant	0.868	0.204	18.05	0.000	2.38
Age	0.017	0.017	0.983	0.309	44.83
Sex	-0.046	0.641	0.955	0.943	0.24
Education	1.462	0.408	4.314	0.000***	11.76
Family size	-0.053	0.039	0.943	0.138	2.73
Main occupation	1.774	0.574	0.680	0.002*	0.060
Association	0.000	0.000	1.000	0.994	0.070
Source of loan	0.100	0.520	0.905	0.055**	1.000
Loan obtained	0.000	0.000	1.000	0.009*	1.871
Quantity of cassava	-0.000	0.000	1.000	0.165	19031.9
Price of cassava	0.000	0.000	1.000	0.422	52387.1
Income realization	0.34	0.000	1.000	0.881	0.500

Source: Field survey, 2010

Conclusion and Recommendations

This study was basically focused on the effects of climate change on cassava productivity in Ilesha- East L.G.A, Osun state, Nigeria. 117 respondents were randomly selected and interviewed with the aid of well structured questionnaires to gather all the necessary information for this research. The data collected were analysed using descriptive statistics, chi-square and logit regression model and at the end of the analysis, it was found that quantity of cassava produced has negative relationship with the effect of climate change. It means that currently, the effects of climatic variability show no or little impact on cassava yield and productivity and it can also be concluded that as years pass by the effects of climate change and global warming can be obviously seen on the most agricultural products especially in the developing countries due to their vulnerability. In spite of this, the following recommendations were suggested in order to cope with future effects of climate change and to meet the demand of cassava with ever increasingly population in Nigeria: the farmers should go back to the cultural farming practices to conserve the soil water and cool down the ambient temperature that affects the growth of crops on the farm, improved varieties of cassava that very tolerant and resistant to the effects drought and flood as the case may be should be available for the farmers and lastly irrigation scheme for artificial water supply must be constructed by the federal government for the farmers to use during the dry season.

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