

Impact of climate change on traditional Ledu yam title holding in Yakurr local government area of Cross River State, Nigeria

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ABSTRACT

The purpose of this study is to examine the impact of climate change on yam production and traditional Ledu yam title attainment in Yakurr Local Government Area, Cross River State, Nigeria and its implications on traditional socio-cultural institutions like the Ledu Yam title attainment. The study adopted a descriptive survey and correlational research design approach. Structured questionnaire was used in collecting data from yam farmers and Ledu yam title holders who constituted the study population. Descriptive statistical and regression analysis were used in analysing the collected data. The findings revealed that climate variability such as rainfall variability, temperature increases and extreme weather events significantly affect yam production and consequently Ledu Yam title attainment in the study area. The study therefore established that a relationship exist between climate change and yam production and consequently Ledu title holding. It is recommended that climate resilient practices as well as irrigation farming be adopted in the study area to reduce the dependence on climate.

KEYWORDS

Climate change, Yam production, Socio-cultural life, Ledu Yam title, Yakurr Local Government Area

I. INTRODUCTION

The impacts of climate change phenomena have a lot of implications on the survival of man. The negative impact of climate change was what informed leaders to converge at Copenhagen on December 7 – 8, 2000 to discuss the menace of climate change. The global concern on climate change was justified by the fact that climate change affects every aspect of human. There is no region in the world that is not vulnerable to climate change.

The impact of climate change has not spared the economic, social, cultural and political life or livelihood of any region. This is premised on the fact that the climate of a given place has overwhelming influence on the livelihood pattern of the people. The economy of any given place is totally dependent on its climate and as such any prolong change in the climate or weather conditions adversely affect the way of life of people. Unfortunately, the fragile economy of most regions is dependent on agriculture and other primary activities which respond sharply to climate variability. The negative response of these activities to climate change could be very devastating on the livelihood of the people. It is from this perspective that this paper is seeking to examine the impact of climate change on socio-cultural system

of Yakurr L.G.A with a focus on traditional Ledu yam title attainments. The rationale of the study is to stimulate large scale study on the impact of climate change socio-cultural spheres of life other than the popular environmental, economic and political perspectives. The study would provide a basis for seeking mitigation strategies towards improved agricultural production and sustenance of socio-cultural values as well as address the declining food production in rural areas.

The purpose of this study is to examine the impact of climate change on yam production and attainment of the traditional Ledu Yam title. The objectives include;

- Identify the effect of climate change Ledu yam title attainment.
- Identify the relationship between yam production and Ledu yam title attainment.

The following research questions were formulated with a view to achieve the set objectives;

- Is there any significant impact of climate change on yam production in the study area?
- Is there any relationship between yam production attainment and traditional Ledu yam title attainment?

To provide explanation to these research questions, two null hypotheses were formulated and stated in null form as;

- H_0 : There is no significant impact of climate change on yam production in Yakurr Local Government Area.
- H_0 : There is no significant relationship between yam production and attainment of traditional Ledu yam title in the study area.

The scope of the study covered yam farmers and yam title holders in Yakurr Local Government Area. It focused on climate change which is explained in terms of climate variability such as off-set and on-set of rainfall, temperature increasing, extremities of climate events such as drought, flooding etc. in the other hand, quantity and quality of yam produced by farmers and measured in number of sticks was used as measure of productivity. The conceptual and theoretical framework used in the study is built on the following concepts and theories;

A. *Concept of Climate Change*

The fifth edition of Oxford English Dictionary edited by Lucinda Conventry and Martin Nixion (1999), defined climate as the regular weather condition of a place over a prolonged time of at least 35 years. On the other hand, weather refers to the state of the atmosphere of a place at a particular time. The state of the weather of a place is described in terms of weather elements such as rainfall, temperature, sunshine, winds and humidity. A departure from the regular weather or climate pattern is what is referred to as climate change.

The United Nations Framework Convention on Climate Change (UNFCCC), defines climate change as a change in climate attributed directly or indirectly to human activities that have altered the composition of the global atmosphere. Okeke (2010), simply explain climate change as a change in contemporary climates. It is a change in the statistical distribution

of weather events over a long period of time. In other words, climate change is a long term change in the average weather condition of a place (Hare, 1995). The change becomes apparent as changes occur in annual, season or monthly temperature, rainfall, winds and other elements of climate. The observed changes in climate warming according to Columbia Encyclopaedia is the gradual increase of the temperature of the earth's lower atmosphere as a result of increase in greenhouse gases caused by human activities and natural processes.

The change in natural patterns has great impacts in human activities and the environment. The impacts of climate change can be appreciated from the viewpoint of Adewale (2016) who highlighted that climatic conditions of a place determine the seasons, and the seasons in turn determine the period particular events or activities occur. This implies that the climate of a place determines when particular crops are planted or when certain socio-cultural activities would take place. It therefore follows that climate change affects human life including their socio-cultural activities. IPPCC (2002) corroborated the above and highlighted that climate change affects agricultural production through altered rainfall patterns, temperature increases and extreme weather events.

In affirming the assertion Ajetomobi, Abiodun and Hassan (2010) stated that in Nigeria, climate variability expressed in terms of on-set and off-set of rainfall significantly reduced crop yield. The reduction in crop yield like in the case of yam production has socio-cultural implications as it affects the attainment of traditional Ledu yam title in the study area. The impact of climate change on agricultural production is very obvious in the case of yam production. This is because agriculture is highly climate-sensitive. Adequate rainfall often enhances tuber formation, while erratic rainfall reduces yield aligned with the above assertion and concluded that temperature increase and rainfall variability negatively affect yam output and conferment of yam title.

The ideal climate conditions favourable for yam cultivation as stated by Onwueme & Charles (1994) area;

- Annual rainfall of 1000 – 1500mm, well distributed throughout the growing season;
- Optimum temperature range of between 25° and 30°C;
- Relative humidity range of between 70% and 90% during the growing season;
- Daily sunlight of between 6- and 8-hours climate change tends alter the climate conditions favorable to the cultivation of yams. Climate change has altered rainfall distribution and temperature patterns.

Hence, introducing frequent droughts and high incidence of flooding, resulting in reduced yam yield, poor tuber quality, delayed planting and increased production cost. Climate variability has affected yam yield because yam is a tropical crop that grows best under warm, humid conditions with well distributed rainfall.

B. Ledu Yam Title

Ledu yam title is traditional yam title awarded exclusively to farmers who have demonstrated outstanding achievement in yam production in Yakurr Local Government Area. Ledu yam title is the highest honor or recognition accorded to a farmer who through

immense physical strength, efficient management of patrician labour and intimate knowledge of the soil and seasonal cycles is able to cultivate and harvest a prescribed stack of yams in particular farming season (Ubi, 1986). Yam title is usually awarded to a farmer who has met certain criteria outlined by the Ledu traditional institution, such as production of large quantity of yams (four hundred sticks of yams), accumulation of surplus of yams to feed the community and demonstration of generosity and social responsibility among others. Yam titles are given according to the quantity of yam harvested in a particular year.

The titles are graded as follows; "Agah Adeni" that 100 stack of yams, "Agah Joe" (200 sticks of yam) and Ledu (400 stacks of yam). The highest and most respected title is the "Ledu yam title". Forde (1950) argued that Ledu Yam title, a socio-cultural activity is not only food production event but a measure of wealth, masculinity and industriousness of the recipients. The title confers high social status, prestige and influence on the awardees. Ottengberg (1968) and Andah (1990) highlighted the significance of yam title holding to include; the preservation of Yakurr tradition and culture by reinforcing values of hard work, endurance and communal recognition. It also encourages large scale yam cultivation to support both household livelihood and local economy.

Historically, only the rich were able to earn the Ledu yam title. Hence, it was social status symbol that many struggled to attain. The trend has recently changed. The conferment of the prestigious Ledu title has been on the decline over the years. Infact, the title is almost facing extinction in recent time. The gradual extinction of the title is traceable to climate change and soil impoverishment. The decline in the number of people attaining Ledu title in recent years implies a decline in agricultural productivity in the study area. The observed decline is traceable to link between climate change, yam production and Ledu yam title holding.

C. Climate Change and Socio-Cultural Activities

Most rural areas in tropical Africa including Yakurr Local Government Area solely depend on nature for their livelihood. The socio-cultural life of most communities is mainly expressed in terms of agriculture, hunting, fishing etc. These activities are totally dependent on climate. Any change in climatic conditions of a region would significantly affect the activities. The drought of 1982-84 in the Sahelian region of Africa for instance resulted in a sharp fall in crop yield. Such fall in crop production had adverse impact on the socio-cultural pattern of the rural inhabitants including Ledu yam title in Yakurr Local Government Area of Cross River State. This is particularly true because climate change affect the natural resources (water, biodiversity, soil) for which yam cultivation depend on. Nwosu (2015) opined that farmers lose their farmlands and crops either as a result of excessive rainfall which could lead to flooding or harsh climate conditions. The consequences of this include a drop in quantity of crop production leading to increased hunger and famine.

Eleri (2011) argued that prolonged temperature increase in parts of Africa can cause drought and desert encroachment, a development which together can trigger poor agricultural harvest. Environmental impact of climate change has significantly reshaped the socio-cultural life of rural dwellers especially in communities where cultural identity and livelihoods are closely linked to natural systems. This is very true as rural economy is heavily dependent on climate sensitive sectors such agriculture, fishing and livestock rearing, climate variability such as drought, floods and erratic rainfall tend to reduces agricultural productivity and

threatens food security in many regions. FAO (2018) in explaining the impact of climate change on the socio-culture of rural dwellers argued that food practices are central to rural culture and stated that climate induced crop failure, reduces access to traditional foods, thus affect cultural rituals, festivals and dietary customs linked to agriculture. Ledu title conferment which is linked to yam production is not excluded from the impact of climate change. Yam production has declined in the study area due to the impact of climate change. This is attributed to the shift in on-set and off-set of rainfall over some years in the study area.

The theoretical framework of this study is anchored on the theory of sustainable livelihood developed by Robert Chambers and Gardon Conway in 1992. The theory provides a comprehensive framework for analysing the response of rural households to environmental and socio-economic changes. The theory explains how individuals and communities utilize available resources (assets) to sustain their livelihoods under varying external conditions. The key components of the framework are Natural Capital (Land, Soil fertility and rainfall while human capital consists of knowledge, farming skills and labour. Others are physical capital (tools and infrastructure) and social capital (Networks, cultural institutions) such as the Ledu yam title system. These assets are influenced by external factors like climate change, government policies and institutions.

The theory can be applied to the study in the following contexts;

- Climate change (rainfall variability temperature rise, flooding) represents a vulnerability context that directly affects natural capital, particularly land productivity for yam cultivation.
- Yam production serves as a livelihood strategy through which farmers convert natural and human capital into food and income and
- The Ledu yam title institution represents social capital where agricultural success (yam yield) determines social status and cultural recognition.
- Conceptually the framework explains the relationship of the variables used in the study as follow;
- Climate change – tends to affect natural capital and natural capital determines yam production while yam production influence social capital the Ledu title attainment.

The theory is relevant to the study as it explains how environmental shocks (climate change) disrupt rural livelihoods. It also demonstrates how agricultural productivity underpins cultural systems. It therefore provides a basis for understanding the interaction between ecology and indigenous institutions.

II. MATERIALS AND METHODS

A. The Study Area

Yakurr Local Government Area is located in the south west of middle Cross River, about 120 kilometres northwest of Calabar. It spans approximately 150 square kilometres. It is bounded in North by Abi Local Government Area, East by Obubra, South by Biase and West by Ikom Local Government Areas, respectively. The study area is located approximately between Latitudes 5.50 N and 6.00N and longitude 8.20E and 8.50E. This position places

Yakurr at a critical ecological and cultural crossroad between the tropical rainforest zone and the Savanna belt. The area is known for its fertile land suitable for agriculture. The area is noted for yam, cassava and palm produce cultivation. Infact about 80% of the population is engaged in crop farming. The area has been experiencing rapid population growth. The population as at 1935 was estimated at 22,000. In 1953 the population grew to 38,000 while in 2006, it has reached 196,450 (NPC, 2006). The projected population in 2022 was 298,900.

According to Ubi (1986) Yakurr people employed a vigesimal (base 20) system in counting where intermediary numbers are built upon specific linguistic markers. In this system 'Ledu' translate directly to four hundred, while "Agah-Joe" is 200 and "Agah-atani" is 100. Accordingly, the attainment of 400 sticks of yam (Ledu) represents the highest standard of achievement in traditional yam harvest. In the context of yam title, attain the count of "Ledu" signifies that the farmer has produced 400 stacks or specific units of yams. This is fit that requires immense physical strength efficient management of patriclan labour and intimate knowledge of the soil and seasonal cycles. The title therefore identifies the holder as a master producer and a farmer of 400 stacks of yam who can provide surplus food to ensure the economic stability of his lineage and community. The Ledu title is not hereditary, it is achieved status based on merit, productivity and individual contribution to the community according to Obeten, (2017).

III. METHODOLOGY

The study adopted descriptive survey and correlational research design. This is to enable the collection of data on farmers and yam title holders on the perception of climate change and yam title institution. The correlational design provided opportunity for examining the association between climate variables and yam production as well as the relationship between Ledu title attainment and yam production. The study population is the yam farmers and yam title holders in the study area. A sample size of two hundred and fifty farmers was used for the study. This constitutes about 10% of the farmers' population. Multi-stage sampling technique was used in selecting the respondents as follows; in stage one of the multi-stage sampling, five communities (Ugep, Ekor, Mkpiani Agoi and Nko) were randomly selected. In the second stage, the 25 farmers were randomly selected from each community while in stage 3, purposive selection of Ledu title holders was used in selecting the respondents.

Structured questionnaire covering socio-economic characteristics of respondents, climate change indicators, yam production data and Ledu title participation was used in data collection. To ensure content validity of the designed instrument, a content validity test was conducted by experts. Equally a reliability test was conducted using Cronbach's Alpha (acceptable threshold 710.70). This was to ensure that the instrument measured what it was design to measure.

The collected data was analyzed using descriptive statistical techniques such as mean ($\bar{x}$), frequency and simple percentages and inferential statistics like regression Analysis using SPSS. The limitation of the study included limited access to long term climate records and poor records keeping on Ledu title practices.

IV. RESULT AND FINDINGS

The results of the study are presented as follow;

A. Conferment of Ledu yam title:

The conferment of Ledu yam title between 1980 and 2026 is as presented in table 1.aA

Table 1: Conferment of Ledu Yam Title in Yakurr L.G.A 1980-2026

Sn	Year	Community								
		Ugep	Ekori	Nkpani	Nko	Idomi	Agoi	Assiga	Total	%
1	1980-85	4	2	2	1	1	1	1	12	19.92
2	1986-91	3	2	3	1	2	2	1	14	23.34
3	1992-97	2	3	2	2	1	2	-	12	19.92
4	1998-2003	2	2	2	1	-	1	1	9	14.94
5	2004-2009	1	1	-	1	1	1	-	5	8.30
6	2010-2015	1	-	1	-	1	-	-	3	4.92
7	2016-2021	1	1	1	-	-	-	-	3	4.92
8	2022-2026	-	-	1	-	-	1	-	2	3.32
	TOTAL	14	11	12	6	6	8	3	60	100

Table 1 shows that 60 yam farmers were conferred with traditional Ledu yam title between 1980 and 2026. A yearly analysis of the conferment of the title shows that between 1980 and 1985, 12(19.92%) were conferred while between 1986-1991, 14(23.20%) were conferred. The number of farmers and the percentage of conferment for other years were as follows; 1992 to 1997, 12(19.92%) 1998-2003, 9(14.94%), 2004-2009, 5(8.3%), 2010-2015, 3(4.92%) and 2022 to 2026 2(3.32%) respectively. This result shows a general decline in the numbers of conferment of the Ledu yam title over the years.

The conferment of the title declined from 20% in 1985 to 3.3% in 2026. The decline in the conferment implies a decline in agricultural production in the study area. The consequence of this is obvious, especially as agriculture is the main source of sustenance in the study area.

Based on this result, it becomes necessary to establish why there is a decline in the conferment of Ledu yam title over the years. This was achieved through the testing of the formulated hypothesis as follow;

1. Hypothesis I:

Which states that there is no significant impact of climate change on yam production was stated using One-way ANOVA as shown in Table 2.

Table 2: One-way ANOVA of Impact of Climate Change and Ledu Yam title conferment

Source of variation	Sum of Square (SS)	Degree of freedom (df)	Mean Square (ms)	F	Sign of f
Between Groups	152.38	2	50.79	7.010	.002
Within Groups	175.22	8	1.52		
TOTAL	327.60	10			

Result from table 2 shows the calculated F as 7.010 and the critical value as 3.40 at 2 and 8 degrees of freedom at 0.05 level of significance. Based on this result, the null hypothesis (H₀) which stated that there is no significant impact of climate change on yam production in the study area was rejected. Consequently, the alternate hypothesis (H_i) which stated that there is significant impact of climate change on yam production in the study area was accepted.

The implication of this finding is that climate change has great impact on yam production in the study area. This finding implies that the climatic factors which favour yam cultivation will also favour the conferment of tradition Ledu yam title. In otherwards, unfavorable climate conditions would negatively affect yam cultivation and consequently Ledu yam title conferment.

Table 3: Coefficient of variation to showing the relationship between climate change and yam production.

Variable	Unstandardized coefficient (B)	Std error	Std Coefficient Beta	T
(Constant)	5.24	0.842	-	6.193
Rainfall variability	-0.432	0.09	-0.40	-4.749
Extreme weather event	-0.289	0.087	-0.225	-3.322
Rising Temperature	-0.315	0.104	-0.276	-3.029

Table 3 shows that all variables of climate change (rainfall variability, extreme weather events and rising temperature have significant negative impact on yam production in the study area. This finding agrees with Nwosu (2015) who asserted that climate change negatively affects yam production upon which yam title is measured. In other words any variable that negatively impact yam production, will also negatively affect Ledu title holding in the study area.

The second hypothesis which stated that there is no relationship between yam production and traditional Ledu title attainment was tested using regression model. The result is as presented in Table 3.

Table 4: Regression analysis showing the relationship between yam production and traditional ledu yam title attainment

MODEL	R	R-Square	Adjusted R Square	Std Error
1	0.741	0.549	0.543	0.984

Table 4 shows that yam production explains 54.9% of the variation in Ledu yam title attainment. This implies that a relationship exist between yam production and Ledu yam title holding

Further statistical treatment of the data using ANOVA is presented in table 4 below;

Table 5: The relationship between yam production and attainment of Ledu yam title using Analysis of Variance (ANOVA)

MODEL	Sum of square	Df	Mean square	f	Sig
Regression	134.562	1	134.562	13.8915	0.00
Residuals	110.438	117	0.944		
TOTAL	245.000	118			

The model is highly significant ($P < 0.05$) indicating that yam production strongly influences Ledu yam title attainment. The coefficient of variation of the variables presented in Table 5 shows a positive relationship between yam production and Ledu yam title attainment.

Table 6: Coefficient of variation showing influence of yam production on Ledu title attainment

Variable	Unstandardized Coefficient (B)	Std Error	Beta	t	Sig
(constant)	1.876	0.512	-	3.644	0.00
Yam production	0.658	0.056	0.741	11.788	
TOTAL	245.000	118			

The result showed that yam production has a strong positive and significant influence on traditional Ledu yam title attainment. This implies that increase in yam production will lead to increase in Ledu title attainment.

The results of this analysis showed that the null hypothesis (H_0) which stated that yam production affect the attainment of Ledu yam title was rejected while the alternate hypothesis which states that yam production affect the attainment of Ledu yam title was accepted. The findings of the study are as follows;

That climate change negatively impact yam production. This is evident as climate variability significantly affects yam production and climate variability has resulted in poor yield of yam and therefore a reduction in yam production in the study area.

The regression model result revealed that rainfall variability ($B = -0.401$, $P < 0.05$), temperature increase CB = -0.276 , $P = 0.05$) and extreme weather events ($\beta = 0.255$) $P = 0.05$) have significant negative effects on yam production. The result also revealed that yam production significantly influences Ledu yam title attainment ($\beta = 0.74$, $P < 0.05$).

V. DISCUSSION OF THE FINDINGS OF STUDY

The findings of that study are discussed under the following;

- That climate change negatively affects yam production in the study area.
- That yam production positively affects traditional Ledu yam title attainment and conferment in the study area.
- That there is a link between climate changes, yam production and the attainment and conferment of Ledu yam title in the study area.
- That as climate change impacts negatively on yam production, yam production in turn affects Ledu yam title conferment. In other words, climate change directly affects yam production and indirectly affects Ledu yam title conferment. This can be explained from the view point that yam production is total dependent on the prevailing climatic condition while Ledu yam title is dependent on yam production. It therefore follows that any factor that disrupts yam production will negatively affect yam title conferment in the study.

The study established that climate change variables (rainfall variability, temperature increase and extreme weather events) have significant negative effect on yam production. This finding aligns with earlier studies of which emphasized the sensitivity of yam cultivation to climatic conditions, Ezea and Ezea (2017) and Morton (2007). Rainfall variability (on and off set) which is identified as the most influential variable affecting yam output is affirmed by Baines and Butler (2020) who opined that inconsistent rainfall pattern significantly disrupted planting calendars and reduce yam yield. Ayala et al (2021) also stated that irregular rainfall leads to poor sprouting and reduced yam tuber formation.

The negative effect of temperature increase highlighted in the findings is also in line with Knox et al (2012) and Nwalieji and Uzuegbunam (2012) assertions that temperature rise accelerates evapotranspiration, reduce soil moisture and inhibit tuber development. The study also established that extreme weather events such as flooding, prolonged dry spells significantly reduce yam production. This is corroborated by Nwosu 2015 who opined that climatic events increase crop failure rates in the Savanna regions.

The highlighted findings generally confirm that climate change poses serious threat to yam production in the study area where farming is predominantly rain-feed. The findings which established that yam production has a strong positive and statistically significant effect on traditional Ledu yam title attainment is consistent with the Yakurr socio-cultural system where yam production is a key determinant of prestige Ledu title holding. This finding aligns with some anthological studies such of Ewah (2016) which emphasized the role of agriculture success in shaping traditional systems in most African societies. The implication of this finding is that declining yam production driven by climate change will lead to reduced number of Ledu title holders and a decline in the participation of traditional practices and gradual erosion of cultural heritage of the society. A decline in the attainment of Ledu yam title proems food-security due to the reduction of yam production in the study area.

VI. SUMMARY OF THE STUDY

The study examined the impact of climate change on yam production and the effect of yam production on traditional Ledu yam title attainment in the study area. Descriptive and correlational research design was used in the study. Structured questionnaire was used for data collection after testing the validity and reliability of the instrument. The study was

anchored on sustainable livelihoods framework. This framework explained how environmental change influence livelihood outcomes and social systems like the Ledu yam title system. The study formulated and tested two hypotheses using regression analysis. The null hypotheses were rejected while the alternate hypotheses which stated that climate change significantly impact yam production in the study area and the second which stated that yam production significantly affect traditional Ledu yam title attainment were respectively accepted. The results showed that climate variability negatively affect yam production while climate change indirectly affects attainment of Ledu yam title among farmers. The implication of this finding is that climate change tends to weaken the Ledu institution through reduced agricultural productivity.

VII. CONCLUSION

The study concludes that climate change negatively affects yam production while yam production in turn affects traditional Ledu yam title attainment. It is concluded that the decline in yam production due to climate change tend to undermine the foundation of Ledu yam title system which depends on or sustained agricultural success. It follows that while climate change impacts negatively on yam production, yam production consequently affects Ledu yam title attainment. The study therefore established a linkage between climate change, reduced yam production and decline in Ledu title attainment. The latter is socio-cultural in dimension.

RECOMMENDATIONS

The following recommendations are proffered base on the findings of the study.

- Agricultural adaptation strategies including adoption of climate resilient practices such as early planting, mulching and use of improved seedlings should be adopted by farmers.
- Irrigation farming should be adopted by farmers to reduce dependence on rainfall.
- Awareness should be created on the impact of climate change and mitigation strategies among the farmers.
- Government and non-governmental organizations (NGO) should formulate policies that enable farmers acquire farm inputs, improved seedlings and capital for sustained farming.
- Community based agricultural programmes should be initiated with a view to sustaining cultural heritage.

A. *Suggestion for Further Studies*

The following suggestions are put forward for further studies;

- A comparative study on the impacts of climate change on socio-cultural activities at different scales should be conducted.
- A study that uses longitudinal data in examining long term trends in yam production and some socio-cultural practices should be facilitated.
- Studies on impacts of climate change on the traditional institutions like new yam festival, fishing festival should be undertaken.

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