

Trend Variation of Cassava and Rice Consumption in Nigeria: A Trend Analysis Approach

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ABSTRACT

This study was carried out to determine the trend, growth rate and direction of growth of cassava and rice consumption in Nigeria between the periods of 1970 - 2016. Secondary data were sourced from Food and Agriculture Organization Statistics for the purpose of analysis. Trend analysis was employed to make out if there exist a drift in growth of a variable over the period of time. The result showed that the trend of cassava and rice consumption were generally on the increase over the period under study with cassava and rice consumption increasing at a point in time at the observed rates (instantaneous growth rate) and also increased over a period of time as observed respectively (compound growth rate). However, the result showed a significant change in the trend of consumption of cassava and rice with coefficients (0.3451 and 0.4211) which were statistically significant at 1% probability level ($P < 0.01$), indicating an accelerated growth in cassava and rice consumption. Due to the general increase in trend observed, the study recommends effort by the government and private sector towards increasing the production of these crops in order to contain this growing demand.

Keywords: Trend analysis, growth rate, cassava, rice, Nigeria

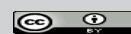
Despite its agricultural potentials, Nigeria is yet to harness its vast land resources suitable for agriculture, to not only improve its export on rice, but even to cater for its domestic consumption which will invariably serve for sufficient food security. This is evident from the fact that, rice consumption in Nigeria increases over decades and in alarming rates. However, despite the fact that domestic rice production has increased in Nigeria since the 1960s, given increases in rice land area, rice production has not been able to keep pace with rice consumption

(Chukwuka, 2016) and so is the case with cassava. The deficit has to be imported to the extent that Nigeria has become the largest importer of rice in Africa (FAO, 2012) and second in the world (Cardoni and Angelucci, 2013).

In response to the prevailing production and

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consumption deficit situation of both crops in Nigeria, successive governments intervened by increasing tariffs so that local production could be encouraged and a broad range of policies have been implemented in the sector aimed at self-sufficiency in their production. The current government seems to have adopted similar goals as its predecessors with regard to obtaining self-sufficiency particularly with regards to rice production as such high priority was given to rice production in the Agricultural Transformation Agenda (ATA) due to the growing concern about the foreign currency drains resulting from rice import.

Most of cassava farmers, businessmen, private investors and industrialists in Nigeria have not fully exploited the investment potentials in cassava despite the country's production been by far the largest in the world; a third more than production in Brazil and almost double the production of Indonesia and Thailand (FAOSTAT, 2015). In the real sense, the level of industrial utilization of cassava is low when compared to its potential to generate increased foreign exchange earnings which is expected to reach \$8.5 billion in value by 2020 as enunciated in the Agricultural Transformation Agenda of Nigerian Government (FMARD, 2013).

It has become imperative to expand supply of cassava for industrial utilization because of the need to attract indigenous and global firms and investors that have indicated interest in making investment in cassava starch and other related products in tackling the challenges now facing the production of cassava to meet industrial demand alongside the lopsidedness in the level of production of rice in Nigeria as compared to its consumption pattern. The implication is that, to meet up with the high demand for its consumption, rice has to be imported and these have been on the high side.

An overwhelming proportion of cassava produced in Nigeria goes to human consumption while a very low proportion goes to industry and foreign trade. Thus, foreign exchange generating capacity of the crop still remained largely unexploited. The rice sector in Nigeria is one of the most important remarkable agricultural developments over the decades with rice now being the structural component of the Nigerian diet, and rice imports making up an important share of Nigeria's agricultural imports (Fredric, *et*

al. 2003), there is considerable interest in increasing the consumption of local rice. As such the need for such study like this to examine the trend, growth and direction of growth in the consumption of cassava and rice as it stand to serve as a guide to assist the government and other stake holders to achieving self sufficiency in rice and cassava production which is a road map to feeding the nation's growing population.

MATERIALS AND METHODS

The study was the case of Nigeria located between Latitudes 4°14' North of the equator and Longitude 3°15' East of the Greenwich meridian line, with a land area of about 923769 km²; a North South length of about 1,450 km and a West – east breadth of about 800 km. It is comprised of 36 States and the Federal Capital Territory, located in Abuja. The total irrigable in Nigeria is 9,570 km² whereby the arable land constitute about 35%, 15% pastures; 10% forest reserve; 10% for settlements and the remaining 30% considered uncultivable for one reason or the other (FMEN, 2001).

Nigeria is the most populous country in Africa found in the tropics with seasonally damp and very humid climate. It is affected by distinguishable four climate types that move from the Southern part to the Northern part through middle belt region of the country. The climate types include; the tropical rainforest on the equatorial Monsoon found in the Southern part of the country and influenced by the Monsoons originating from the South Atlantic Ocean, characterized with warmth and high humidity which gives it a strong tendency to produce copious rainfall, with a low temperature range. The Southern part of Nigeria experiences heavy and abundant annual rainfall of above 2,000 mm with a double rainfall maxima characterized by two high rainfall peaks, short dry season and longer dry season between and after each peaks (Aregheore, 2009). The tropical savanna climate or tropical wet and dry climate covering most of Western Nigeria to central Nigeria exhibits a well managed rainy season and a dry season with a single peak known as the summer maximum.

Trend Model

Secondary data were used in the assessing the trend

and growth rate in cassava and rice consumption over the period 1970 to 2016 and was sourced from National Population Commission of Nigeria, National Bureau of Statistics, Central Bank of Nigeria and Food and Agriculture Organization Statistics. Trend and growth analysis were used to understand if there is a drift in growth of a variable over the period of time. In modeling time trend for this study the exponential trend or log-linear as employed by Tanko, *et al.* (2010); Maikasuwa and Ala (2013); Nmadu *et al.* (2013); Jatto *et al.* (2017) taking the quantity of cassava or rice consumed a deterministic function of time trend.

The exponential model is specified as:

$$Y_t = Y_0 + (1 + r)^t \quad \dots(1)$$

Where;

Y_t = amount of cassava or rice consumed in year t ;
 Y_0 = amount of cassava or rice consumed in the base year;
 r = compound rate of growth of Y ; and t = time trend variable.

To make it amenable for econometric estimation, the growth rate model is expressed linearly by taking the logarithm of both sides:

$$\ln Y_t = \ln Y_0 + t \ln(1 + r) \quad \dots(2)$$

Where: \ln = natural logarithm and other variables are as previously defined.

However, substituting regressor in equation 2 [$\ln Y_0$ and $\ln(1 + r)$] with α_1 and α_2 respectively, we have:

$$\ln Y_t = \alpha_1 + \alpha_2 t \quad \dots(3)$$

Adding the disturbance term (v), the equation becomes:

$$\ln Y_t = \alpha_1 + \alpha_2 t + v \quad \dots(4)$$

The slope coefficient α_2 , determines the type of growth rate which could be expressed in terms of instantaneous growth rate (IGR) at a particular time, or compound growth rate (CGR) over a period of time. Thus;

$$IGR = \alpha_2 \times 100 \quad \dots(5)$$

$$CGR = (\text{antilog } \alpha_2 - 1) \times 100 \quad \dots(6)$$

The rate of change of growth was estimated using the quadratic form of the model in time trend (t) given as:

$$\ln Y_t = \alpha_1 + \alpha_2 t + \alpha_3 t^2 + v \quad \dots(7)$$

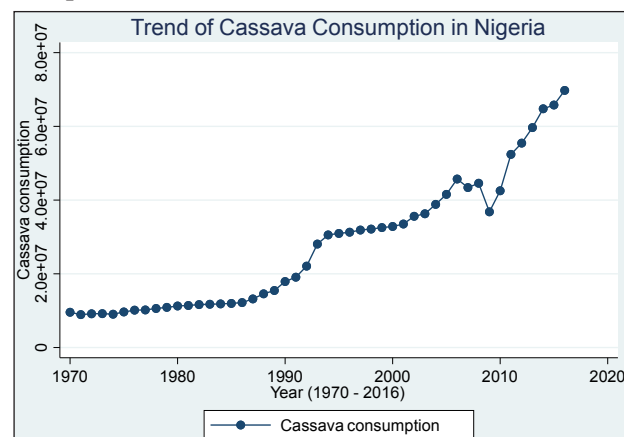
All variables as previously defined; α_1 , α_2 , α_3 are parameters to be estimated.

In determining the pattern of growth our main concern was on α_3 which reveals a measure of growth pattern following Tanko, *et al.* (2010); Maikasuwa and Ala, (2013); Jatto *et al.* (2017). If α_3 is > 0 and statistically significant it means accelerated growth in consumption of cassava or rice; if α_3 is < 0 and statistically significant, it connotes decelerated growth in consumption of cassava or rice and if α_3 is positive or negative and not statistically significant then there is stagnation in the growth of either of the crop.

RESULTS AND DISCUSSION

Trend of Cassava Consumption in Nigeria

The graphical trend analysis of cassava consumption in Nigeria from 1970 to 2016 is presented in Fig. 1. The results show that there was a steady and continuous increase in cassava consumption during the period under study. The trend of cassava consumption was on the increase from 1970 to 2009, followed by a drop in 2010.



Source: Output from data analysis, 2018.

Fig. 1: Trend of cassava consumption in Nigeria (1970 – 2016)

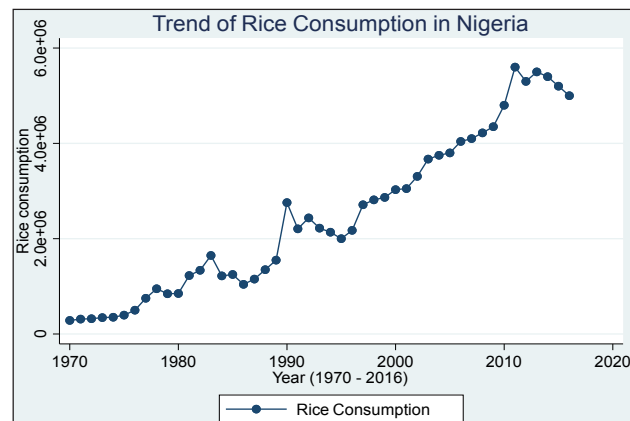
This was followed by a sharp increase from 2011 to 2016. This could be attributed to rapid growth in

population and the rising demand for the product for various uses in the local and international market. This result corroborates the findings of Onyemauwa (2010) who reported that household consumption of cassava products increased with increase in population as well as an upward trend in cassava consumption (Nweke, 2014) but contrary to that of Akinpelu *et al.* (2011) who observed a noticeable downward trend in cassava consumption.

Trend of Rice Consumption in Nigeria

The results of the trend analysis of rice consumption in Nigeria from 1970 to 2016 are presented in Fig. 2. The results show that there was a general increase in rice consumption during this period. This could be attributed to the fact that domestic demand for rice has been growing at a rapid pace in general due to changing consumer preferences, rising incomes and growing urban populations. This was found to be in line with the result of Onyekwena (2016) who recorded the main drivers of the growing demand for rice to be population growth, rapid urbanization, rising income levels, and consumers changing preferences in favor of parboiled rice. The annual consumption of rice rose from 1970 to 1985 with a drop from 1986 to 1990. This was followed by a steady increase from 1991 to 2014. However, rice consumption has been on the fall since 2015 and this could be attributed to the rising price of the product as a result of the ban on rice importation.

This supports the work of Oyinbo *et al.* (2013) and Tihamiyu *et al.* (2014) that reported an increasing trend in rice consumption in Nigeria.



Source: Output from data analysis, 2018.

Fig. 2: Trend of rice consumption in Nigeria (1970 – 2016)

Growth Rate and Direction of Growth in Cassava and Rice Consumption

The results of the growth rate and direction of growth in cassava and rice consumption in Nigeria is as presented in Table 1. The result from the trend analysis for the quadratic model shows a coefficient of determination (R^2) of 0.8425 and 0.9277 for cassava and rice consumption respectively. These imply that about 84% and 93% of the variations in cassava

Table 1: Estimated growth rates and direction of growth in cassava and rice consumption

Variable	Model	Determinants	Coefficient	R-square	IGR (%)	CGR (%)	Status
CCON	Linear	Constant (α_1)	1.8266	0.7649	9.8600	10.3600	AG
		Trend (α_2)	0.4368				
	Quadratic	Constant (α_1)	1.3595	0.8425			
		Trend (α_2)	0.0986				
		Trend ² (α_3)	0.3451***				
RCON	Linear	Constant (α_1)	0.2374	0.8543	12.8000	13.6600	AG
		Trend (α_2)	0.0157				
	Quadratic	Constant (α_1)	0.1473	0.9277			
		Trend (α_2)	0.1280				
		Trend ² (α_3)	0.4211***				

Source: Output from data analysis, 2018.

*** implies significant at 1% probability level.

CCON = Cassava consumption; RCON = Rice consumption; IGR = Instantaneous Growth Rate; CGR = Compound Growth Rate; AG = Accelerated Growth.

and rice consumption were explained by the trend variable while the remaining 16% and 7% were due to errors in estimation for cassava and rice respectively. The Instantaneous Growth Rate (IGR) of 9.86% and 12.80% as well as the Compound Growth Rate (CGR) of 10.36% and 13.66% were estimated for cassava and rice consumption showing that cassava and rice consumption in Nigeria increased at a point in time at the observed rates (instantaneous growth rate) and increased over a period of time as observed respectively (compound growth rate). The time trend variable (α_3) for the quadratic model was significant at influencing cassava and rice consumption at 0.01 probability level ($P < 0.01$) and the relationship was positive in both cassava and rice consumption growth model suggesting accelerated growth rate in the crops consumption during the period under study.

CONCLUSION

The findings of this research indicated that, there was a general increasing trend in the consumption of cassava and rice over the period of study. Therefore, the growth rate of cassava and rice consumption per annum at a point in time within the period of study (IGR) were 9.86% and 12.80% respectively while the growth rate per annum over a period of time within the period of study (CGR) were 10.36% and 13.66% respectively. Based on the findings, the study recommends that effort be made by the government and private sector towards increasing the production of these crops in order to contain this growing demand.

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