

TREND ANALYSIS OF COCOA PRODUCTION IN NIGERIA FOR THE PERIOD OF 1981 – 2020

Ajagbe, S. A., Asogwa, B. C. and Ezihe, J. A. C.

Department of Agricultural Economics, Joseph Sarwuan Tarka University, Makurdi, Benue State. P.M.B 2373, Benue State, Nigeria.

Corresponding author email: ajagbesunday94@gmail. com

Abstract

The study analyzed the trend of cocoa production in Nigeria for the period of 1981 – 2020 (FAOSTAT, 2021). Data was analyzed using descriptive statistics such as minimum, maximum and Jarque-Bera, and inferential statistics such as t-statistic, f-statistic and Adjusted R-squared. The result of the descriptive statistics shows an upward trend in annual cocoa production in Nigeria which reaches a maximum and thereafter began to decline, reaching a point, it began a gradual rise during the period under study. The variable was normally distributed with a minimum value of 140,000 ton and a maximum of 485,000 ton. Furthermore, the result revealed that 55.80% of the variation in annual cocoa production was explained over time by trend (Adjusted R² of 0.5580), and there was an accelerated growth in annual cocoa production during the period under study with the instantaneous growth rate of 2.19% and compound growth rate of 2.21%. Based on the study, Government should review and improve on the programmes such as the National Cocoa Rehabilitation Programme that had produced good results in accelerating the growth of cocoa production in Nigeria. Farmers, Private investors and Government should invest more in cocoa production in Nigeria to take advantage of the accelerated growth and to increase it.

Keywords: Annual cocoa production, trend, growth rate.

Introduction

Cocoa is a unique crop which is consumed by those who do not grow it and grown by those who do not consume it (Oguntade, 2013). This is because, although West and Central Africa produces about 75% of world production, only 14% is processed in Africa and just 2% of global production is consumed in these regions (Oguntade, 2013). Olufikayo (2019) stated that the global cocoa market value will be worth US\$14.572 billion by 2026 from US\$10.14 billion in 2015, due to the rising inclination of younger consumers towards chocolate across the globe. Thus Globally, there is strong and growing demand for cocoa, most especially in

Eastern Europe and Latin America (Tothmihaly, 2017).

Cocoa is the leading agricultural export of the country and Nigeria is currently the world's seventh largest producer of Cocoa, after Ivory Coast, Ghana, Indonesia, Ecuador, Cameroon and Brazil, and the third largest exporter in the world, after Ivory Coast and Ghana (Hütz-Adams et al., 2016). From the 1950s to the mid-1960s, the Nigerian economy largely depended upon the export of cocoa (Bello and Mitchell, 2018). By the mid-1950s, Nigeria had become one of the world's leading cocoa exporters, with volumes reaching around 280,000 metric tons. This resulted in cocoa becoming the country's top foreign export commodity, accounting for approximately 30 percent of its foreign-exchange earnings. This trend continued until the 1960s, when agriculture represented an impressive 60 percent of Nigeria's GDP (Bello and Mitchell, 2018).

Following investments in the oil sector and the aftermath of civil war in Nigeria, the 1970s and 1980s saw a constant economic down turn and decline in cocoa production in the country (Idowu et al., 2007; Bello and Mitchell, 2018). According to Nkang et al. (2009) Cocoa production in Nigeria witnessed a downward trend after 1971 season, when its export declined to 216,000 metric tons in 1976, and 150,000 metric tons in 1986, therefore reducing the country's market share to about 6% and to fifth largest producer. Evidence has however shown that the growth rate of cocoa production has been declining, which has given rise to a fall in the fortunes of the subsector among other reasons (Nkang et al., 2009; AgroNigeria, 2013).

Previous related studies for instance, Adeniyi and Ogunsola (2014) focused on cocoa production and related social economic and climate factors, Anderson (2015) studied how to estimate a trend in a time series regression model, Adelodun (2017) reviewed literature on cocoa production in Nigeriawhile Bello and Mitchell (2018) studied the political economy of cocoa in Nigeria: a history of conflict or cooperation. Likewise, Ajiola, O. (2018) focused on accumulation and dispossession relating to cocoa production, rural development and the Structural Adjustment Programme in Southwest Nigeria, 1986 – 1996. To the best of the knowledge of the researcher, no empirical study has been directed toward trend analysis of cocoa production in Nigeria for the period of 1981 – 2020.

The specific objectives of the study are to:

- (i) describe the trend of annual cocoa production in Nigeria; and
- (ii) determine the growth rate and direction of growth of annual cocoa production in Nigeria.

The following null hypothesis was tested:

H_{01} : There is no significant growth of annual cocoa production in Nigeria.

Methodology

The study was conducted in Nigeria. Nigeria, officially known as the Federal Republic of Nigeria, is one of the largest countries in Africa and lies wholly within the tropics along the Gulf of Guinea on the western coast in Sub-Saharan Africa. Nigeria lies between latitudes 3° and 15° east of the Greenwich. The country features 36 states and its Federal Capital Territory, which is known as Abuja. The country of Nigeria features over five hundred different ethnic groups, many different languages, and declared its independence from the United Kingdom on October 1, 1960 (Worldometers, 2019).

Data for this study were collected from secondary sources. For the purpose of the empirical analysis, annual time series data spanning from 1981 to 2020 were used. The data for annual cocoa production were sourced from Food and Agriculture Organization Statistic (FAOSTAT, 2021).

Data collected for this study were analyzed using descriptive statistics such as minimum, maximum and Jarque-Bera, and inferential statistics such as t-statistic, f-statistic and Adjusted R-squared. The trend of annual cocoa production was analyzed using descriptive statistics such as minimum, maximum and Jarque-Bera. To estimate growth rate and direction of growth of annual cocoa production in Nigeria, trend model was applied.

Nigeria has a total land area of 923,768.622 square kilometers or about 98.3 million hectares, and population of 151.874 million people as of July 2010 (estimate) (Udah et al., 2015). The current population of Nigeria is 200,512,373 (about 200.512 million) as of Monday, June 3, 2019, based on the latest United Nations estimates, ranking 7th in the world (Worldometers, 2019).

Model specification

Linear trend model:

$$Acp_t = \alpha_1 + \alpha_2 t + e_t$$

Exponential trend model:

$$Acp_t = \exp(\alpha_0 + \alpha_1 t + e_t)$$

Quadratic trend model:

$$Acp_t = \alpha_1 + \alpha_2 t + \alpha_3 t^2 + e_t$$

Where,

Acp_t	=	Annual cocoa production (ton)
t	=	Time trend (years)
α_1	=	Intercept or constant of the trend equation
α_2	=	coefficient of the trend variable
α_3	=	coefficient of quadratic trend
e	=	Error term

Apriori expectation is that a^2 is positive and statistically significant which indicates acceleration in growth of annual cocoa production.

In estimating growth rate (instantaneous and compound), and consequently determine the direction of growth whether there will be acceleration, stagnation or deceleration in growth of annual cocoa production in Nigeria, the coefficient a^2 is most important parameter.

Firstly, multiplying a^2 by 100 gives the instantaneous growth rate (IGR) at a point in time.

$$IGR = a^2 \times 100$$

Secondly, taking the antilog of $(2a^2 - 1) = 100$

Lastly, to determine the direction of growth of annual cocoa production in Nigeria, if a^2 is positive and statistically significant there is acceleration in growth, and if is negative and statistically significant there is deceleration in growth, while if a^2 is negative and statistically significant there is deceleration in growth, while if a^2 is positive or negative but not statistically significant there is stagnation in the growth rate. Likewise, if a_3 is statistically significant, the trend associated with this time series is said to have a quadratic trend.

Results and Discussion

Trend of annual cocoa production in Nigeria for 1981 – 2020

Figure 1 shows the trend of annual cocoa production in Nigeria. The result revealed a low level of annual cocoa production between 1981 – 1987; this may be as a result of the oil discovery in country in the 1970s and 80s with the effort of the government concentrated more on oil than agriculture as well as the adverse effect of the Cocoa Marketing Board (Idowu, 2007; Bello and Mitchell, 2018; Olufikayo, 2019). The 1988 – 1994 witnessed a steady rise in annual cocoa production which could be as a result of the success of the Structural Adjustment Programme (SAP), introduced by then-government, on cocoa production (Kolesnik, 2017; Ajiola, 2018; Olufikayo, 2019). This was followed by a sharp decline of annual cocoa production in 1995. There was a sharp increase of cocoa production

in 1996 which continued through 1998 while another sharp decline in cocoa production was observed in 1999. Thereafter, 2000 – 2006 showed a continuous rise in annual cocoa production, reaching the maximum output (485,000 tons) of annual cocoa production of the period under study, which could be the result of the National Cocoa Rehabilitation Programme established in 1999 (Meludu *et al.*, 2017). Again, there was a sharp decline in cocoa production in 2007 with about the same level of annual cocoa production through to 2009, indicating poor performance of the Cocoa Re-birth programme launched in 2005 by the federal government. Furthermore, 2010 witnessed a slight rise in cocoa production which was followed by a continuous decline in annual cocoa production from 2011 – 2016 and finally, a gradual rise in annual cocoa production was observed from 2017 – 2020. Table 1 shows the descriptive Statistics of annual cocoa production in Nigeria for the period under. The result revealed that annual cocoa production showed negative skewness (-0.418858) to the left tail, and the Jargue-Bera probability (test of normality) showed a statistically significant probability value greater than 5% which indicated that the variable is normally distributed with a minimum value of 140,000 ton and a maximum of 485,000 ton.

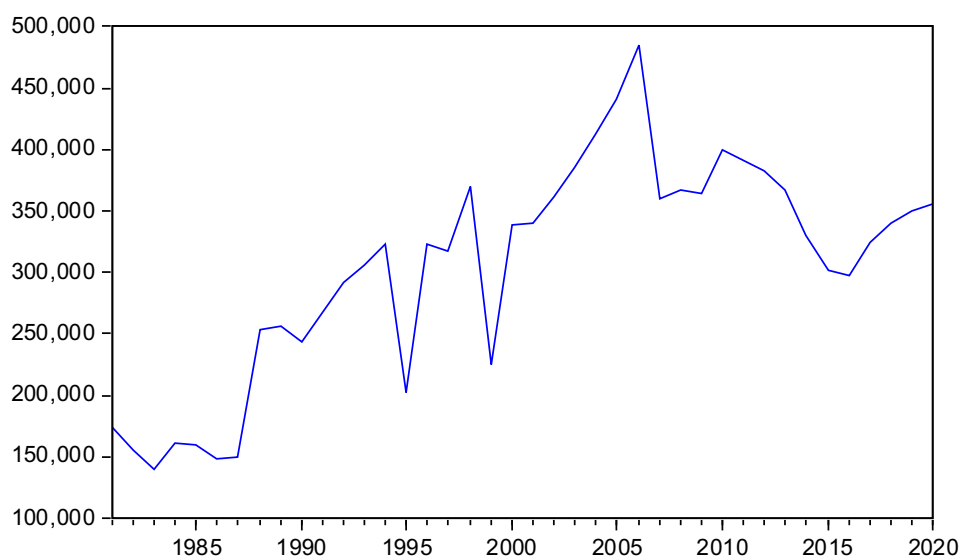


Figure 1: Trend of Annual Cocoa Production in Nigeria from 1981 – 2020

Source: FAOSTAT, 2021

Table 1: Descriptive Statistics of Annual Cocoa Production in Nigeria (1981 – 2020)

ACP

Mean	304110.6
Median	324000.0
Maximum	485000.0
Minimum	140000.0
Std. Dev.	88720.66
Skewness	-0.418858
Kurtosis	2.357151
Jarque-Bera	1.858370
Probability	0.394875
Sum	12164425
Sum Sq. Dev.	3.07E+11
Observations	40

Source: Author's computation (2021)

Growth rate and direction of growth of annual cocoa production in Nigeria

Table 2 shows the trend analysis of annual cocoa production in Nigeria for the different trend models. The exponential trend model was selected as the model of best fit for rate of change in the annual cocoa production data on the basis of its lowest Akaike information criterion (AIC) and highest F-statistic. The adjusted (H_{01}) which states that there is no significant growth in annual cocoa production in Nigeria, is rejected.

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Table 2: Trend Model Regression of Annual Cocoa Production in Nigeria

Model	Determinant	Coefficient	T-value	Prob.	Adj. R ²	AIC	F Stat (Prob.)	DW
Linear	Constant	195172.5	10.3361	0.0000	0.5298	24.9184	44.9478 (0.0000)	0.7327
	Trend	5586.570	6.7043	0.0000				
Quadratic	Constant	108968.4	5.4871	0.0000	0.7543	24.2928	60.8645 (0.0000)	1.4428
	Trend	19197.75	8.1491	0.0000				
	Trend ²	-349.0047	-5.9764	0.0000				
Exponential	Constant	12.14857	173.8164	0.0000	0.5580	-0.0951	50.2280 (0.0000)	0.7041
	Trend	0.0219	7.0872	0.0000				

Source: Author's computation (2021)

Table 3 shows the instantaneous and compound growth rates of annual cocoa production in Nigeria. From the coefficient of trend of the exponential trend model (0.0219), the instantaneous growth rate was 2.19% which represents the fraction by which annual cocoa production grew during a very short period of time (1 year). The compound growth rate was 2.21% which is the mean annual growth of cocoa production during the 40 years under study.

Table 3: Growth Rate of Annual Cocoa Production in Nigeria

Instantaneous growth (%)	Compound growth (%)
2.19	2.21

Source: Author's computation (2021)

Conclusion and Recommendations

The study shows an upward trend with an intermittent downward trend in annual cocoa production in Nigeria which reaches a maximum, thereafter began to decline and finally, a gradual rise in annual cocoa production during the period under study. The variable was normally distributed with a minimum value of 140,000 ton and a maximum of 485,000

ton. The study also revealed that 55.80% of the variation in annual cocoa production was explained over time by trend (adjusted R^2 of 0.5580), and there was an accelerated growth in annual cocoa production with an instantaneous growth rate of 2.19% and compound growth rate of 2.21% during the period under study.

Based on the result obtained and the conclusion made, the following have been recommended;

1. Government should review and improve on programmes such as the National Cocoa Rehabilitation Programme that had produced good result in accelerating the growth of cocoa production in Nigeria.
2. Farmers, private investors and government should invest more in cocoa production in Nigeria to take advantage of the accelerated growth and to increase the growth rate.

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