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Spatio-Temporal Analysis of Cocoa Production and Exportation in Nigeria

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Abstract


The role of agriculture in the economy of an agrarian country like Nigeria cannot be overemphasized. It is a significant source of employment, revenue generation, wealth creation, poverty reduction, and the supply of raw materials for industrial development. Cocoa has been a significant source of foreign exchange earnings for Nigeria. The country ranks as the fourth largest producer of cocoa globally, following Ivory Coast, Ghana, and Indonesia. It is the largest non-oil means of earning foreign exchange through exportation. Despite its importance, the potential remains largely untapped. Currently, agriculture is facing different challenges, which makes productivity low. Among are poor financing, poor transportation network, poor storage and processing facilities, poor farmers' education, climate change, poor extension services, crude tools and machines, unstable policies and programmes of government, poor marketing systems, pest and diseases, shortage of agricultural inputs, environmental degradation, resource scarcity, conflicts, outdated agricultural practices, and various other issues. The study examined the spatio-temporal analysis of cocoa production and exports in Nigeria. Secondary data of Cocoa Output (CO), cocoa Yield (YE), and exports (CEX) were analyzed spanning from 1980 to 2020. Data were sourced from reputable national and international sources such as the Food and Agriculture Organization (FAO) and publications from the Central Bank of Nigeria (CBN). The analytical tools employed in the study included descriptive statistics (graphs) such as trends. The result showed that cocoa export is significantly determined by COs, which in turn add value to the exchange rate. Based on the findings, recommendations were suggested in the study.


Keywords: Spatio-temporal, Cocoa, Production, Export, Nigeria.

1 | Introduction

Agriculture plays a crucial role in the Nigerian economy, evidenced by its significant contributions to employment, revenue generation, wealth creation, poverty reduction, and the supply of raw materials for

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industrial development [1]. It is described as the largest non-oil export earner and the most important sector of Nigeria's economy, holding immense potential for future economic development as it has historically [2] Oyaniran [3] noted that the Nigerian agricultural sector accounts for 17.8% of the Gross Domestic Product (GDP) and employs approximately 42.7% of the total labour force. However, the country's agricultural potential remains largely untapped, posing significant implications for security and sustainable economic development.

The lack of development in agriculture is concerning, especially considering Nigeria's abundant agricultural resources and substantial efforts in agricultural planning. Adeniran and Oladun [1] listed some of the problems militating against agricultural development in Nigeria, including the following: poor financing, poor transportation network, poor storage and processing facilities, poor farmer's education, climate change, poor extension services, crude tools and machines, unstable policies and programmes of government, poor marketing systems, pest and diseases, shortage of agricultural inputs, environmental degradation, negative sociological and psychological attitude towards farming etc.

Poor agricultural output and widespread poverty have led to significant and persistent food insecurity in Nigeria, with studies indicating that up to 70% of the population is affected [4]. The agricultural sector in Nigeria faces numerous challenges spanning production, processing, preservation, and marketing [4]. These challenges stem from factors such as limited access to finance, inadequate supply to meet population growth and food demand, lack of value addition and supply-chain linkages, resource scarcity, conflicts, outdated agricultural practices, and various other issues [4], [5].

For a considerable period, cocoa has been a significant source of foreign exchange earnings for Nigeria. The country ranks as the fourth largest producer of cocoa globally, following Ivory Coast, Ghana, and Indonesia [4]–[6]. Cocoa remains vital among crops in less developed nations and is cultivated in over fifty developing countries across Asia, Africa, and Latin America [7]–[9].

It plays a crucial role in the Nigerian economy by providing employment and income for farmers, raw materials for industries, and foreign exchange earnings [6], [12]. Initially contributing about 15% to Nigeria's total exports in the 1970s [13], the cocoa sector now constitutes less than 1% of the country's export earnings [4], [5]. Despite this decline, over 200,000 rural households rely on cocoa as a primary source of income, significantly impacting the rural economy [5].

Cocoa was the predominant agricultural contributor to Nigeria's economy until the 1970s, when commercial quantities of crude oil were discovered in the country. Despite the discovery of oil, cocoa has remained a crucial and significant foreign exchange earner among the country's agricultural exports, maintaining its status as the foremost export tree crop [9], [14].

However, the production of this important cash crop for export has declined over the years due to various factors. Villalobos [15], Nkang et al. [14], and Afolayan [16] identified some of these factors as the discovery and exploitation of oil, which led to neglect of the entire agricultural sector, low yields, inconsistent production patterns, disease outbreaks, pest infestations, and reliance on rudimentary farm tools, ageing cocoa farms and cocoa farmers themselves and inefficient marketing channels amongst other factors.

Cocoa has played a significant role in the Nigerian economy over the years. Olaiya [17], in assessing cocoa exports as a reliable alternative revenue source amidst Nigeria's declining Gross National Product (GNP), highlighted cocoa as Nigeria's primary export crop both before and after independence, albeit with periods of fluctuating production and export levels. Despite the discovery of oil, cocoa exports remain pivotal in Nigeria's agricultural sector, although its contribution to the national GDP has waned [6], [18].

During the 1950s and 1960s, cocoa was a major foreign exchange earner for Nigeria, and the country was the world's second-largest producer. However, with increased investments in the oil sector during the 1970s and 1980s, Nigeria's global share of cocoa production declined. Cocoa, being heavily reliant on global market prices, especially in countries with free market systems, exposes farmers, particularly smallholders, to the

necessity of adapting their farming practices to meet market demands [19]. This requires constant adjustment despite limitations in their production capabilities.

The relationship between exchange rates and agricultural production has been a contentious topic, continuing to spark debate among researchers. It is characterized as an empirical dilemma. While the majority of reviewed studies on this subject indicate that agricultural production shows a positive response to increases in the exchange rate, both in the short-run and long-run consistent with expectations, a few studies present contradictory findings [6].

Over the past three decades, research has documented a global increase in cocoa supply and demand, although maintaining equilibrium between supply and demand has been challenging. Fluctuations in cocoa prices are identified as a primary factor contributing to this imbalance [10]. Other influencing factors include agro-climatic conditions, input costs such as labour, fertilizers, pesticides, adoption of production technologies, competition with other crops, government regulations, and support services [10].

Cocoa, particularly in producer countries like Nigeria with free market systems, is highly dependent on world market prices. This vulnerability has become more pronounced in recent years, as Nigeria, classified as a Commodity Dependent Developing Country (CDDC), contends with multiple global crises in food, energy, climate, financial, and economic sectors. Consequently, cocoa farmers, primarily smallholders, must adapt their farming practices to meet market demands despite constraints on their production capacity [19].

Aim

This study aims to examine the trend analysis of cocoa production in Nigeria, spanning from 1980 to 2020. To achieve this aim, the Cocoa Output (CO), Yield (YE), and exports (CEX) were explored as key variables, and secondary data.

2 | Literature Review

2.1 | Historical Overview of Cocoa and Its Production in Nigeria

The cocoa tree initially originated from the Amazon rainforest in South America. After its introduction to Ghana, cocoa production quickly expanded across Africa, making West and Central Africa (WCA) the primary producers by the mid-1920s. The scientific name for the cocoa tree, "Theobroma cacao," was given by the Swedish natural scientist Carl Von Linne (1707-1778), with "Theobroma" meaning "food of the gods" [14], [16], [22], [23].

Cocoa thrives naturally in tropical rainforests, which provide ample shade, uniform temperatures, consistent humidity, and heavy rainfall, typically within 10 degrees of the equator. There are three main varieties of cocoa: Forastero, Criollo, and Trinitario. Forastero constitutes 95% of global cocoa production and is the most commonly cultivated variety [16], [23]. The highest quality cocoa beans come from the Criollo variety, known for its delicacy. However, Criollo plantations have lower yields and are more susceptible to diseases compared to Forastero, which limits its production in a few countries, with Venezuela being a significant producer of Criollo beans [23]. Trinitario, a hybrid of Criollo and Forastero, combines higher quality with better disease resistance and higher yield than Criollo [24].

WCA collectively produce about 70% of the world's cocoa. The majority of cocoa (90-95%) is produced by smallholder farmers with farm sizes ranging from two to five hectares [24]. Cocoa production relies heavily on natural resources and low-cost, semi-skilled labour rather than technology, which constitutes the dominant portion of its total production costs [26]. The cocoa tree typically reaches maturity between five and six years and can live up to fifty years. In West Africa, harvesting usually occurs between September and October, with some regions extending the harvest season from January to March. Cocoa requires abundant water and thrives in sandy to loamy soils.

The Netherlands is the leading country in cocoa processing, followed by the United States. Cocoa and its products, including chocolate, are consumed worldwide. Per capita consumption data is imprecise, with several countries like Switzerland, Belgium, and the United Kingdom often cited as having the highest consumption. However, these figures are speculative due to the lack of a clear mechanism to distinguish how much of a country's production is consumed by residents versus visitors [20].

Cocoa was a major contributor to Nigeria's agricultural economy until the early 1970s, when the discovery of crude oil in commercial quantities shifted the economic focus [29], [31]. Despite this, cocoa has remained a valuable crop and a significant foreign exchange earner among Nigeria's agricultural exports [30]. This significance is further emphasized by Nkanget al. [14], who noted that in terms of foreign exchange earnings, no single agricultural export commodity has surpassed cocoa in Nigeria.

Table 1. Cocoa production and export in Nigeria with key indicators.

Year	Production Quantity (Ton)	Yield Hectogram/Hectare	Area Harvested (Hectares)	Export/Qty (Ton)
1980	153,000	2186	700,000	124,500
1981	174,000	2486	700,000	138,000
1982	156,000	2229	700,000	75,900
1983	140,000	2000	700,000	114,900
1984	160,800	2297	700,000	208,800
1985	160,000	2286	700,000	97,900
1986	148,000	2114	700,000	104,300
1987	150,000	2143	700,000	58,700
1988	253,000	3614	700,000	80,800
1989	256,000	3616	708,000	141,300
1990	244,000	3413	715,000	135,000
1991	268,000	3691	726,000	142,000
1992	292,000	4000	730,000	96,000
1993	306,000	4163	735,000	141,300
1994	323,000	4301	751,000	132,200
1995	203,000	2576	788,000	146,754
1996	323,000	4371	739,000	136,917
1997	318,000	4303	739,000	136,601
1998	370,000	4980	743,000	128,065
1999	225,000	3022	744,000	208,617
2000	338,000	3499	966,000	144,821
2001	340,000	3520	966,000	184,122
2002	362,000	3515	1,030,000	191,922
2003	385,000	3842	1,002,000	241,847
2004	412,000	3879	1,062,000	266,027
2005	441,000	3678	1,198,902	281,620
2006	485,000	4393	1,104,000	181,852
2007	360,570	2652	1,359,550	190,925
2008	367,020	2720	1,349,130	200,449
2009	363,510	2684	1,354,340	210,448
2010	399,200	3137	1,272,430	220,947
2011	391,000	3150	1,241,329	231,969
2012	383,000	3024	1,266,347	159,738
2013	367,000	2960	1,239,750	203,842
2014	329,870	2882	1,144,659	163,536
2015	302,066	2858	1,056,893	131,199
2016	298,029	2841	1,048,945	227,495
2017	325,000	2815	1,154,654	292,872
2018	340,000	2780	1,222,844	294,661
2019	348,448	2739	1,272,382	300,472
2020	340,163	2697	1,261,406	216,676

*Source: data compiled from Ogini et al [32].

2.2 | Agricultural Programmes and Policies under Different Regimes (1980-2020) and Impacts on Cocoa Production and Export in Nigeria

During Shehu Shagari's era as military head of state, there was a drop in the production quantity, yield, and export quantity from 1981 to 1983. This implies that the major agricultural programme of this period (Green Revolution Programme, which is operation feed the nation rebranded) had no direct bearing on cocoa production as it focused majorly on food production. The downward trend of the indices of cocoa production observed maybe due to the interplay of global demand and supply and other global factors during the period. In the same vein, there were no agricultural policies/programmes directly affecting cocoa production and export during Muhammadu's Buhari military rule (1983-1985).

From 1986 to 1993, there was a steady rise in cocoa yield and a corresponding rise in production quantity and export. This might not be connected to the policy thrust of Babangida's regime to diversify the economic base of the nation, which encouraged the production and export of cash crops during this period. It is noteworthy to state that the area of cocoa harvested (hectares), which had been stagnant before Babangida's reign also received a boost (1989-1993).

The sustenance of Babangida's agricultural policies during Abacha's era (1993-1998) also seemed to birth a positive result as cocoa production (in terms of yield) and export also rose. A series of agricultural programmes and presidential initiatives accompanied the reign of Olusegun Obasanjo as the democratically elected president of Nigeria. Notable among these are the Cocoa Rebirth Programme and the establishment of the Nigerian Cocoa Development Commission (NCDC). During this period we also witnessed a rise in production and exports, except for 2007. Some of these policies/programmes are fraught with implementation challenges.

The Yar'Adua's 7-point agenda was focused on food security and paid little attention to the cocoa sector. As a result, cocoa production declined from 2007-2009 and managed to rise again in 2010. While there were agricultural programmes during President Goodluck Jonathan and Muhammadu Buhari's democratic rules, cocoa production (based on the yield and production quantity figures) and export did not fare well under their watch. It was a downward trend from 2010 to 2020. The implication of this is that agricultural policies/programmes during these regimes had no significant positive impact on cocoa production and export.

Table 2. Agricultural programmes and policies under different regimes (1980-2020) and impacts on cocoa production and export in Nigeria.

S/N	Head of State/President	Date of Assumption of Office/Period of Governance	Agricultural Policies/Programmes Initiated During Period in Government	Impacts on Cocoa Production and Export
1	Shehu Shagari	(1 st October, 1979-31 st December, 1983)	Green Revolution Programme (1980)	
2	Muhammadu Buhari	(31 st December, 1983-27 th August, 1985)	Increase in the number of river basin authorities	
3	Ibrahim Babangida	(27 th August, 1985- 26 th August, 1993)	Abolition of the marketing boards and introduction of trade liberalisation policy under Structural Adjustment Programme (SAP), the 1988 national agricultural policy document produced by the Federal Min. of Agric. & Natural Resources (FMARD), introduction of Export Expansion Grant (EEG) in 1986, establishment of national directorate of employment, national agricultural insurance scheme, national agricultural land development authority, FADAMA under world bank, directorate for foods, roads & rural infrastructure.	The scrapping of the Cocoa Board engendered significant changes in cocoa marketing resulting in a monumental increase in cocoa prices for cocoa farmers and a significant cocoa production boom of 1987-1989. Trade liberalization improved cocoa export and competitiveness.

Table 2. Continued.

S/N	Head of State/President	Date of Assumption of Office/Period of Governance	Agricultural Policies/Programmes Initiated During Period in Government	Impacts on Cocoa Production and Export
4	Ernest Shonekan	(26 th August, 1993- 17 th November, 1993)	Merger of DFFRI with Federal ministry of water resources	
5	Sani Abacha	(17 th November, 1993- 8 th June, 1998)	Continuation of Babangida's programmes	
6	Abdusalam Abubakar	(8 th June, 1998 -29 th May, 1999)		
7	Olusegun Obasanjo	(29 th May, 1999-29 th May, 2007)	Establishment of Nigeria Cocoa Development Commission (NCDC) year 2000, Cocoa Rebirth Programme (2005), seedling subsidy policy offshoot of cocoa rebirth programme. series of other presidential initiatives meant to increase food production in line with vision 2020, including National Economic Empowerment and Development Strategy (NEEDS), National Special Programme on Food Security (NSPFS), Root and Tuber Expansion Programme (RTEP), etc.	Positive impacts as a result of the cocoa rebirth programme and establishment of NCDC fizzled out after the exit of President Olusegun Obasanjo due to policy summersault.
8	Umaru Musa Yar'Adua	(29 th May, 2007- 5 th May, 2010)	7-points Agenda including agricultural policy targeted at ensuring food security.	
9	Goodluck Jonathan	(5 th May, 2010- 29 th , May 2015)	Agricultural Transformation Agenda (ATA) and Youth Empowerment in Agricultural Programme (YEAP)	A sharp decline in cocoa production during this regime shows the failure of programmes or non-relevance to cocoa sector growth.
10	Muhammadu Buhari	(29 th , May 2015- 29 th , May 2023)	Redesigned and reintroduced suspended EEG (2017), sustained past policies of Goodluck Jonathan, and introduced the school feeding programme and anchor borrowers programme.	

3 | International Trade Theories and its Application to Agriculture in the Sub-Sahara Africa

Despite the significant advancements made by the World Trade Organization (WTO) in expanding global trade by reducing barriers such as quotas, subsidies, and import tariffs, restrictions persist in the trade of raw agricultural commodities. These restrictions have hindered the anticipated mutual gains from trade as advocated by international trade theories [21], [22]. Agricultural commodity trade, among its many benefits, provides a variety of food choices for populations, maintains stable food supply and demand dynamics for efficient exchanges [23], [24], and stimulates economic growth, particularly in developing countries where agriculture constitutes a significant share of export products and foreign earnings.

In recent decades, there has been a significant increase in the study of international trade in agriculture and food globally [25]. International trade, dating back to the 16th century, has evolved with changes in the landscape of agricultural trade across the world. However, more emphasis has been placed on trade in processed food and agricultural products compared to raw agricultural products [24], which constitute a substantial portion of markets in poorer countries.

3.1 | Trade Liberalisation Policy and Nigerian Agriculture

Trade liberalization involves the process of reducing or eliminating restrictions on international trade. This typically includes actions such as lowering or eliminating tariffs, expanding or removing import quotas,

abolishing multiple exchange rates, and eliminating administrative permits or foreign exchange allocation requirements for imports. In recent years, agricultural trade has garnered increasing attention as a catalyst for global economic growth and equity. By expanding markets and reducing distortions caused by high levels of protectionism in agriculture, global trade not only fosters competition but also stimulates growth in a sector closely linked to poverty alleviation and food security.

The primary objective of agricultural trade is often seen as creating an environment where the world's poorest populations can benefit from significant opportunities to increase their incomes and improve their quality of life. According to estimates by the World Bank, more rapid economic growth resulting from a global reduction in trade barriers could potentially lift 300 million people out of poverty by 2015, representing a reduction in poverty rates by as much as 13%.

In Nigeria, the concept of "trade liberalization" gained prominence with the implementation of the IMF SAP in 1986. The primary objective of SAP was to restructure and diversify the economic base of the country. It aimed to achieve this by establishing a realistic and sustainable exchange rate for the Naira through measures such as trade and payment liberalization, tariff reforms, commercialization, and privatization of public enterprises [26].

Proponents of trade liberalization argue that it promotes economic integration and global output expansion. Market liberalization allows investment funds to flow freely from industrialized countries to developing nations where they are most needed. Consumers benefit from lower-priced products because reduced tariffs make goods from technologically advanced industrialized countries more affordable. Similarly, producers gain by accessing broader markets for their goods. Countries themselves benefit from increased access to modern technology and the opportunity to negotiate multilateral or bilateral trade agreements [33].

3.2 | Structure of Cocoa Markets in Nigeria before and after Trade Liberalisation

Historically, cocoa-producing countries' domestic markets have been marked by government interventions through national trade policies and direct control over marketing channels. These interventions included measures such as imposing high export tariffs and quotas, which effectively insulated domestic markets from price signals in global markets [34], [35]. However, with the advent of trade liberalization reforms, governments began to withdraw from such interventions gradually.

The introduction of SAP in 1986 led to the liberalization of the cocoa sector. The sector, before the liberalization witnessed a decline in terms of export and low producer prices due to poor management by the Nigerian Cocoa Board. Liberalization in the sector aims to encourage competition and improve efficiency among the participants in the sector, which is expected to result in increased exports and better income for the key players [27]. Some of the cocoa marketing institutions that sprang up after the liberalization of the cocoa sector in Nigeria include local buying agents, Licensed Buying Agents (LBAs), cooperatives, exporters, and warehousing agents [27].

4 | Empirical Review

Ogini et al. [32] examined the short-run and long-run supply responses of cocoa in Nigeria to price changes and other factors. They employed a single supply response function and incorporated co-integration and Vector Error Correction procedures in their analysis. Overall, their study revealed positive supply responses from cocoa growers in Nigeria to changes in incentives.

Howai et al. [28] noted a significant decline in cocoa bean exports from Trinidad and Tobago, dropping from approximately 6,213 tonnes in 1970 to 517 tonnes in 2009, despite increasing prices during the same period. They investigated the supply response of cocoa farmers to prices and other factors using a modified Nerlovian model in logarithmic form. The regression results indicated a short-run price elasticity of supply of 0.36 and

a long-run price elasticity of supply of 1.07. Additionally, variables such as lagged dry season rainfall and lagged wet season rainfall significantly influenced cocoa supply.

Samuel and Nahanga [36] analyzed cocoa production in Ghana from 1990 to 2011, employing Johansen co-integration and OLS regression methods. The co-integration test results revealed a long-run equilibrium relationship between cocoa bean production, area harvested, world price, cocoa exports, and Real GDP PerKapita (RGDPK), all of which were statistically significant. Furthermore, the OLS regression results indicated a positive association between annual CO and area harvested, as well as cocoa exports and RGDPK in Ghana. However, contrary to expectations, the results showed a negative relationship between cocoa bean production and the world price.

Gama et al. [29] conducted a study to assess the impact of cocoa export volume and cultivated area on changes in cocoa producer prices using data spanning from 1970 to 2018. They employed unit root tests, co-integration tests, and vector error correction models to analyze the data. The unit root tests indicated that all variables were integrated in the first order. The Johansen co-integration test was utilized to identify co-integrating relationships and assess the long-run effects of producer prices on the variables. Results from the Vector Error Correction Model revealed that cocoa producer prices adjusted slowly to changes in both cocoa export volume and area under cocoa production. In the short run, the analysis indicated a positive response of producer prices to cocoa exports, while the area harvested showed a significant negative relationship with producer price variations, on average.

Poku [30] investigated the impact of nominal exchange rate changes in Ghana on annual domestic producer prices of cocoa, a traditional export crop, and maize, a non-traditional export crop, spanning from 1966 to 2008. The study noted that nominal exchange rate changes in Ghana reflected a gradual transition from a fixed to a flexible exchange rate regime since independence. Using an Autoregressive Distributed Lag (ARDL) model, it was observed that exchange rate transmission was notably weak for both crops, indicating it did not significantly affect domestic producer prices of cocoa and maize in Ghana. For cocoa, market intervention was identified as the primary reason for this phenomenon, whereas the nature of maize as a non-traditional export with limited export supply contributed to the lack of exchange rate transmission in its sub-sector. Additionally, the transmission of world prices to domestic producer prices for both crops was also statistically insignificant.

The empirical results indicated that cocoa production and CO positively impacted agricultural investment, growth, and development. Conversely, lending interest rates hurt agricultural investment in Nigeria. Based on these findings, the study recommended that the government and stakeholders in the agricultural sector should enhance macroeconomic policies, such as interest rates, inflation management, and income levels, to foster increased investment that can positively contribute to agricultural development in Nigeria.

5 | Materials and Method

This study made use of secondary data which were majorly sourced from relevant national and international bodies and websites like the Food and Agricultural Organization (FAO), Nigeria Cocoa Board Cocoa Statistics (various issues), World Cocoa Foundation (WCF), world year currency book International Cocoa Organisation (ICCO), Nigeria's National Bureau of Statistics (NBS), which are released periodically across different issues. They include yearly world and producer price of cocoa, yearly production quantity (output), export quantity, and area harvested for the period under review. Trend analysis was used to achieve the study's aim.

6 | Results

6.1 | The Trend in Annual Cocoa Yield in Nigeria (1980-2020)

The maximum yield for the period under review is 4980 kg/ha, the minimum is 2000kg/ha, and the mean is 3172kg/ha. There is irregular movement in the time plot, as shown in *Fig. 1*, depicting a non-seasonal movement of the cocoa yield.

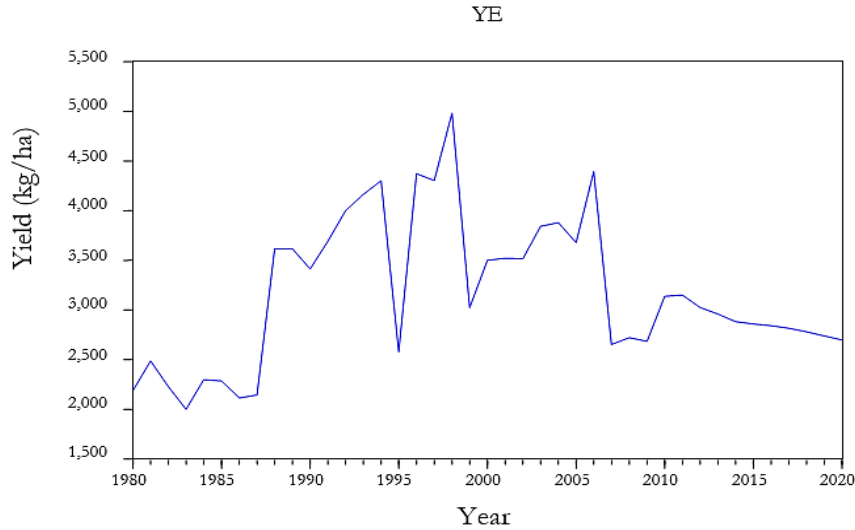


Fig. 1. Graph showing the trend in cocoa yield in Nigeria (1980-2020).

6.2 | Trend in Annual Cocoa Production Quantity (Output) in Nigeria (1980-2020)

The trend, as shown in *Fig. 2*, revealed a low level of annual cocoa production between 1981 and 1987, which may be a result of the oil discovery in the country in the 1970s and 80s with the effort of the government concentrating more on oil than agriculture.

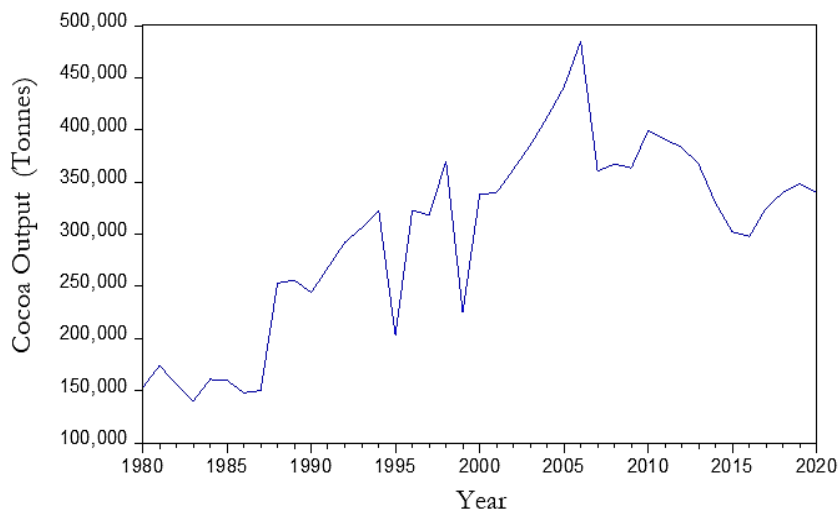


Fig. 2. Graph showing the trend in cocoa production quantity in Nigeria (1980-2020).

6.3 | The Trend in Official Exchange Rate in Nigeria (1980-2020)

A detailed analysis of the exchange rate trend reveals that fluctuations during the study period were influenced by various governmental policies in Nigeria aimed at managing foreign exchange.

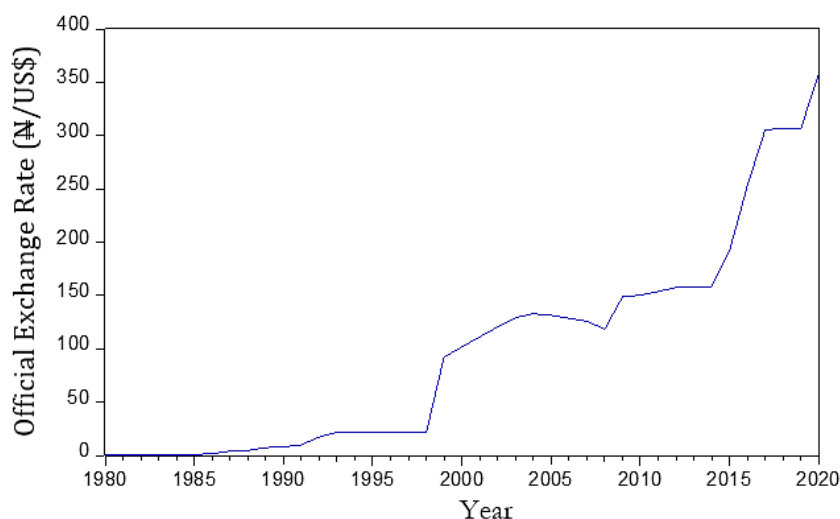


Fig. 3. Graph showing the trend in the official exchange rate in Nigeria (1980-2020).

6.4 | The Trend in the Parallel Exchange Rate in Nigeria (1980-2020)

In general, the official and parallel exchange rates follow similar trends throughout most years, with notable exceptions during the period between 1993 and 1995, where they diverged significantly.

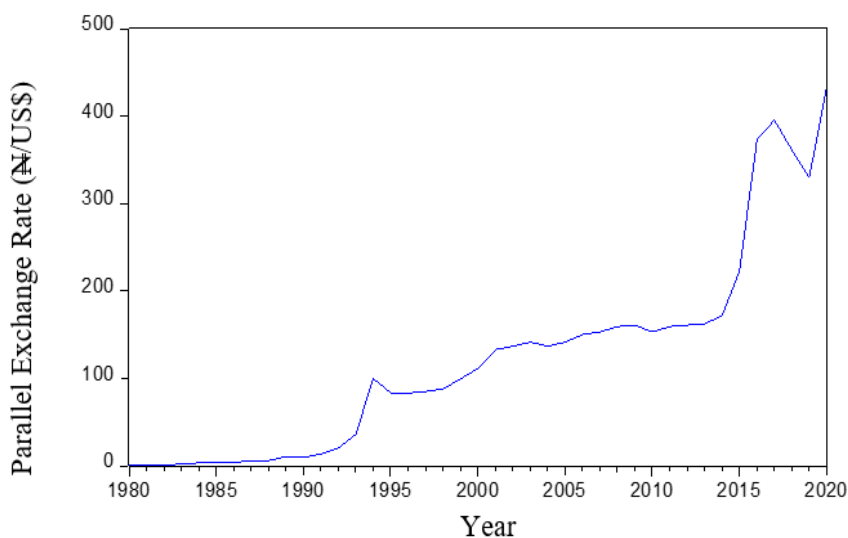


Fig. 4. Graph showing the trend in the parallel exchange rate in Nigeria (1980-2020).

6.5 | The Trend in Area of Cocoa Harvested in Nigeria (1980-2020)

A fixed expanse of land (700,000 hectares) harvested from 1980 to 2020 is shown in *Fig. 5*. There was a steady increase from 1989 to 1999, rising from 708,000 hectares to 744,000 hectares. It suddenly rose to 966,000 hectares in the year 2000, an appreciable increase over the past years and maintained the same figure in 2001.

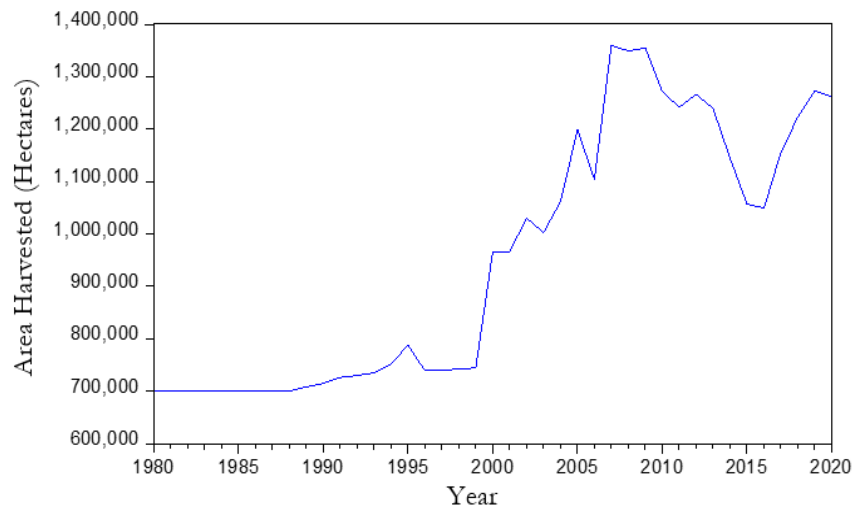


Fig. 5. Graph showing the trend in cocoa area harvested in Nigeria (1980-2020).

6.6 | The Trend in Cocoa Export in Nigeria (1980-2020)

Nigeria has a comparative advantage in the exportation of cocoa, and among the determinants highlighted to be positively significant are the world total export of cocoa (in tonnes), Nigeria's total output of cocoa (tonnes) & exchange rate (Naira per US dollar) [21]. The summary of the trend of cocoa export in Nigeria is shown in Fig. 6. The export quantity kept fluctuating just as the production quantity. This can best be described as non-cyclical. Periods of rise in export quantity are 1980-1981, 1983-1984, 1985-1986, 1987-1989, 1990-1991, 1992-1993, 1994-1995, 1998-1999, 2000-2005, 2006-2011, 2012-2013 and 2016-2019. Other periods experienced a decline in export quantity.

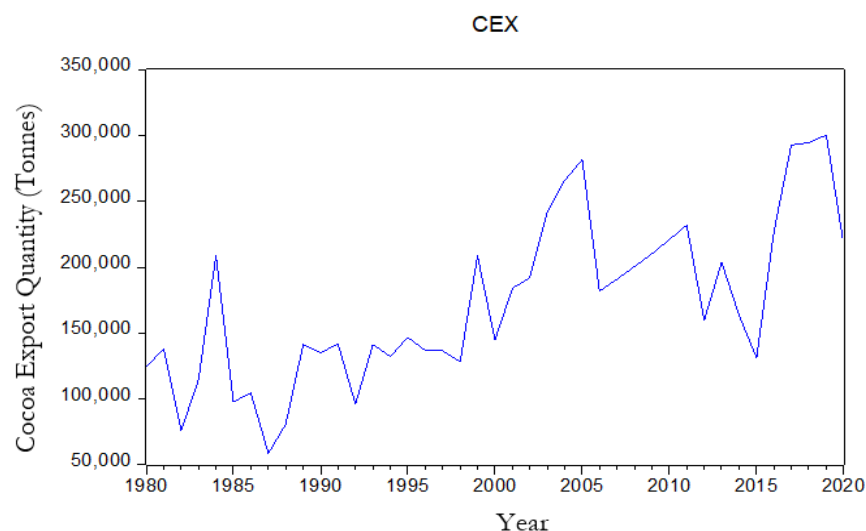


Fig. 6. Graph showing the trend in cocoa export quantity in Nigeria (1980-2020).

7 | Discussions

As shown in Fig. 1, from the year 1980 to 1987, the yield oscillated between 2000 and 2500kg/ha, increased sharply from 1988-1994 and continued irregularly until 2007 when there was a sharp drop from the yield of the previous year. Thereafter, it continues to fluctuate steadily till the year 2020. The low yield from 1980-1987 may be a result of the oil discovery in the country in the 1970s and 80s with the effort of the government

to concentrate more on oil than agriculture as well as the adverse effect of the Cocoa Marketing Board [31] while the rise from 1988-1994 could be as a result of the success of the SAP, introduced by then-government, on cocoa production [4], [15], [16].

It was shown in *Fig. 2* that 1988-1994 witnessed a steady rise in annual production, then a sharp decline in 1995, another sharp increase in 1996-1998, followed by another decline in 1999. Then, 2000-2006 showed a continuous rise in annual production, which may be attributable to the National Cocoa Rehabilitation Programme established in 1999 [32]. Another sharp decline from 2007-2009 indicated the poor performance of the Cocoa Rebirth Programme launched in 2005 by the federal government. A slight rise in 2010, followed by a decline from 2011-2016 and finally, a gradual rise from 2017-2020.

As shown in *Table 2* and *Fig. 6* a period of relative stability from 1980 to 1985, where the exchange rate was maintained at less than one Naira per US dollar due to a fixed exchange rate regime. However, this fixed regime led to an overvaluation of the Naira and significant economic distortions, including high imports of finished goods. This situation negatively impacted domestic production, the balance of payments, and the nation's external reserves, prompting the adoption of the SAP in 1986. Under SAP, the Central Bank of Nigeria (CBN) introduced the Second-tier Foreign Exchange Market (SFEM) to implement a more flexible exchange rate regime. Despite this flexibility, the Naira depreciated sharply, with the annual average exchange rate increasing from 2.02 Naira to the US dollar in 1986 to 17.30 Naira in 1992 and 22.05 Naira in 1993. It was stable between 1994 and 1998 (21.89 Naira to a US dollar) as a result of the introduction of the Dutch Auction System by the CBN to curb excessive demand (with its characteristic pegging). Again, in 1999, signalling the new era of democratic dispensation, there was a meteoric rise in the level of depreciation from 21.89 Naira in 1998 to 92.69 Naira in 1999 and 133.5 Naira in 2004. The Naira managed to appreciate against the US dollar from 132.15 Naira in 2005 to 118.57 Naira in 2008 but depreciated again in 2009 to 148.88 Naira and did not appreciate again till year 2020. The global financial crisis that peaked in the year 2009 and episodes of oil price volatility in the international oil market, among other factors, are responsible for the continued depreciation of the exchange rate from 2009 till 2020.

As shown in *Fig. 3*, the official and parallel exchange rates have evolved over the decades as a result of different policies adopted in different regimes. As evidenced in *Fig. 4*, the variation, however, became very pronounced from 2015. Despite narrowing initially after the introduction of the Investors and Exporters (I&E) Foreign Exchange Window in 2017, the gap subsequently widened again [14]. While the official rate was 192.44 Naira to a US dollar in 2015, the corresponding parallel rate was 222.79 Naira, a 15.77% margin. In 2016, the margin became wider at 47.01% and dropped to 29.31% in 2017 as a result of the introduction of I&E windows.

As shown in *Fig. 5*, the data hovered between 1,000,000 and 1,400,000 hectares from 2002 to 2020, with a volume of 1,002,000 hectares as the minimum within the period in the year 2003 and 1,359,550 hectares as the maximum in the year 2007. Trade liberalization policy was found to be an essential driver of competitiveness, encouraging the production and export of cocoa and, subsequently, an expansion in the area of land cultivated/harvested. This may be a reasonable justification for the steady rise in area harvested from 1989 to 1999. The sudden increase in the area harvested in the year 2000, sustained in 2001, may be the positive response of cocoa farmers to the National Cocoa Rehabilitation Programme of the Nigerian government established in 1999 [10], which also caused the rise in cocoa production from the year 2000-2006. Ondo, Osun, Oyo, Cross River, and Ekiti are traditionally known for cocoa production in Nigeria. These states accounted for a larger percentage of the total area harvested, with Cross River taking the lead, followed closely by Ondo [16]. The latter entry of some other states into the cocoa production business in the country may also contribute to the increase in the area harvested over the years.

8 | Conclusion

The study examined the spatio-temporal analysis of cocoa production and exports in Nigeria. The variables reviewed are key aspects of cocoa production, such as CO, YE, and exports (CEX). Secondary data spanning from 1980 to 2020 were sourced from reputable national and international sources such as the FAO,

publications from the CBN including Statistical Bulletin, Economic and Financial Reviews, Annual Reports, and Quarterly Bulletin of Cocoa Statistics. Analytical tools employed in the study included descriptive statistics (graph).

The result showed that cocoa export is significantly determined by COs, which in turn add value to the exchange rate. Based on the findings, the following recommendations were suggested:

- I. Cocoa farmers should step up their game to achieve increased production and export more cocoa produce.
- II. The government should support the cocoa farmers by providing improved seedlings, fertilizers for the farmers.
- III. The government should educate the farmers on how to grow cocoa in line with the current global standard.

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The author declares that there is no conflict of interest.

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