

Empirical Investigations of Agricultural Export Trade in Nigeria (1975 - 2008): A Case Study of Cocoa and Palm Kernel

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The study examined the export performance of two major agricultural commodities (cocoa and palm kernel in Nigeria). It covered the periods 1975 to 2008 and it adopted cointegration and error correction modeling (ECM) methodology. The time series data were obtained from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Food and Agricultural Organisation (FAO) for the empirical work. Unit root and cointegration tests were conducted which revealed the existence of short and long term equilibrium relationships between the dependent and independent variables in the model. The parsimonious error correction result shows that, virtually all the variables were rightly signed and significant. The result showed that, a 1% increase in producer price, commercial loan to Agriculture and exchange rate will reduce export quantities of cocoa by 0.11, 0.23 and 0.8 per cent respectively, while the result of palm kernel are almost similar to that of cocoa. The empirical findings show that, there is the need to promote expanded production in both cocoa and palm kernel, while at the same time giving greater attention to the packaging and the design of export product to command better prices and patronage at the international market.

Key words: Agricultural Export, Economic Reform, Cointegration, ECM

JEL Classification: C12, C32, C50, F14, F40, O40, Q10.

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I. Introduction

In spite of the current dominance of the petroleum sector in Nigeria's economy, agriculture remains a major source of economic survival and sustenance. Agriculture's contribution to the nation's food supply, raw materials export, savings and investment and general price stability have been critical for economic growth since independence. In many developing countries, including Nigeria, agriculture accounts for the largest proportion of total labour employment and, where it is export-oriented it is also a vital source of foreign exchange.

However, the agricultural sector in Nigeria, both in terms of its contribution to import

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For a discussion of the Nigerian experience see Orubu, (2002)

and export earnings, has recorded persistent declines, occasioned largely by policy neglect and the lack of access to international market. On the other hand, the petroleum sector recorded decline in term of its contribution to GDP since the early 1980s, while agriculture and the informal sector activities have sustained the economy's productive capacity.

Agricultural export trade in Nigeria was expected to be a major beneficiary of the economic policy and structural reforms adopted from 1986 (SAP era). Ten years of implementation of these reforms would seem to indicate that while government has continued to impact on the economy, its overall performance is still below expectation. Nigeria agricultural export trade before has improved noticeably, but research shows that the results were not adequate. Improving Nigeria's agricultural export trade to an acceptable and sustainable level is therefore the challenge to policy makers in government and operators in the private sector.

The study will concentrate on the following objectives: (i) to evaluate the contributions of agricultural exports to the foreign earnings in Nigeria; (ii) to examining the trend of agricultural commodities output and export quantities during the period of the study; and (iii) to make recommendations on how the agricultural sector can be a major source of revenue to the government so as to avoid the over dependence of the Nigeria economy on the oil sector.

For ease of analysis, the study focuses on examining the agricultural export trade from 1975 to 2008 and the effect of regulation and deregulation policy of Government on agricultural export trade on export quantities, producer prices and world prices of cocoa and palm kernel during the period.

The rest of the paper is organized as follow: section 2 reviews the literature, while section 3 presents the methodology. The estimation results are discussed in section 4 and section 5 draws policy recommendations and concludes the paper.

II. Literature Review

The Nigerian agricultural export trade has its foundation in the Neo- Classical factor

endowment theory of international trade postulated by two German economist Heckscher and Ohlin (1919). According to the theory, countries have different and unrelated natural endowment or resources and thus, different production factors/agents in different proportion. In view of this, Nigeria with good climatic condition concentrates on production of agricultural commodities like cocoa, palm kernel commodities and trade with other countries for her input (Adegeye, 1985).

The first theoretical explanation of the relationship/role of agricultural in development and its impact on export is provided by Krugman (1989). This approach argues that agricultural export expansion leads to an increase in the demand for a country's output, which in turn increases real output. Various researches have been undertaken on the impact of commodities export on the speed of development.

Sodersten (1953) in a discussion of the inter-relationship between economic growth and export trade indicated that two schools of thought have emerged. The first, according to him, is the structural school led by Harrod, Spitze, and Allen-Smith (1994) which examined possibilities of changing the structure of production through re-allocation of resources and the opportunities that would emanate thereof. They further examined how a higher rate of export in a country could lead to corresponding increase in the trade of economic development.

The second explanation is the marginal school led by Hick (1979). It implicitly assumes that any change taking place during growth process is marginal in nature, that is, the change occurs because market forces are allowed to operate fully in the system. A more negative concept of the interrelationship between growth and the export trade is adopted. Hence, there is hardly any clear cut conclusion as to how growth leads to a worsened export trade position. While Johnson (1955) regards growth as leading to a worsened export trade situation under a stage of complete specialization, Hicks (1979) considers economic growth as disadvantageous to trade, if the later is concentrated in the export commodities.

According to Chenery (1961), the ratio of export trade to national income rises as an economy grows; the divergence can be removed or narrowed considerably by import substitution. Thus, Kindle (1977) states that export lead to growth, but they need not if they are to do so, there must be capital, technical and re-allocation of resources. The larger the gains from export trade given these processes, the faster and more certainly will growth proceeds.

Moreover, Newmark (1974) claims that in all African territories, export demand had been the underlying basis for economic development. But he fails to specify whether or not a basis can be depended upon for future needs of stimulating further economic growth. There has been some recent work on the role of export in economic development among which Olayide (1969) maintained that export has made positive contributions to the Nigeria economy. These contributions include the systematic provision of foreign exchange for the purchase of capital goods, the orderly importation of capital, the steady and satisfactory supply of the durable and semi-durable consumer goods and the stimulation of expansion in local primary production both for export and internal consumption.

Lipsey (1981) stressed the importance of exports, when he observed that while exports raise national income, imports on the other, hand lowers it and that though exports are injections to an economy, which add to the value of output, they do not add to the value of domestic consumption. If a country achieves surplus in exports over its imports, it will be accumulate claims to foreign exchange, add to foreign exchange reserves and engage in investment abroad.

Douglas (1957) identifies exports as the main drivers of Nigeria's economic growth and hence the principal source of profound changes, which have occurred in the economic structure of the country, including the growth concentration of resources in the hand of government. According to him, exports enhanced capitalization, acceleration of a country's industrialization, as well as ensure increased short run stability in Nigeria. Bello (1994) revealed that trade serves as an engine for growth by facilitating the economic development of the trading

partner. In his view, trade is a veritable and indispensable tool for the acceleration of Nigeria's economic advancement since the wealth of any country is a function of the foreign demand of its products.

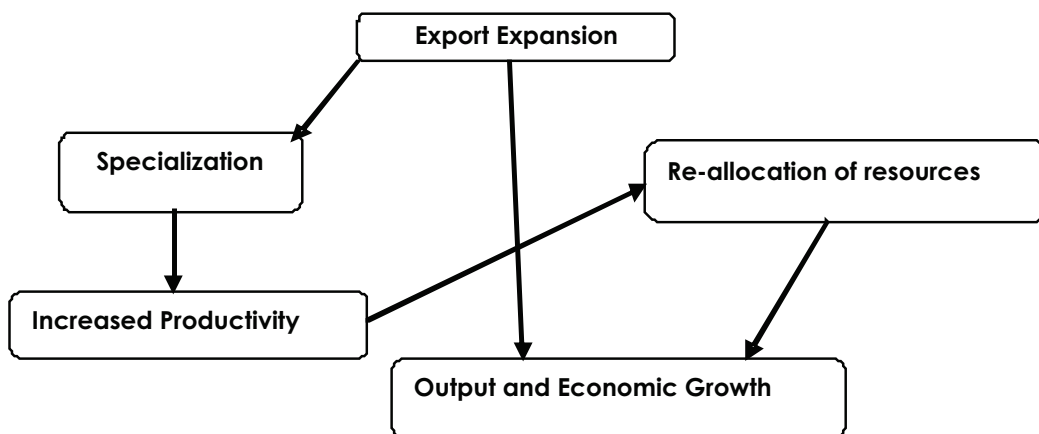
Similarly, Emma (1994), in a lecture delivered on export drive, he narrated that export is a course of economic stability and prosperity. He believed that this can be attained by the encouragement and development of export market. Indeed, experience from most developed countries show that international trade is a major catalyst of economic growth. Olayide and Essang (1976) also believed that tropical agricultural exports have played a pivotal role in multilateral trade system development by the western world and developing countries. Oladele (1987), citing Krugman (1984) in a paper delivered on the role of department of customs and export promotion explained that exports contributed immensely to foreign exchange earnings of a country. Moreover, it gives access to new technologies and new management practices that are essential for economic development.

Yusuf (2000) and Mesike (2006) attributed the decline in Nigeria's agricultural earnings to the discovery of crude oil and rural-urban migration. With the situation in the oil market, it has become apparent the country needed to reconsider its policies towards agricultural commodity export. The study aimed to examine the current position of agricultural exports product in Nigeria, with a view of identifying the factors associated with its growth and discovering the role of some important external variables in determining the nation's competitiveness in the world market for agricultural product.

Mesike and Abolagba (2006), postulated that agricultural sector is vital for any economy that must grow and develop. The export trade sub-sector is even more important to generating foreign exchange to make possible the importation of farm machineries and other capital goods required for industrialization and general development. Similarly, Von Joachim, (2003), also argued that the stunted growth of the less developed countries was a consequence of export instability. In

Nigeria, agricultural exports have played a prominent role in economic development by providing the needed foreign exchange for other capital projects before the 1970s. The main arguments of scholars in favour of export-led economic growth and development are summarized in the diagram below:

Fig1: A Schematic Description of the Agricultural Export Led Growth Hypothesis



It is clear from the above that agricultural export trade promotes specialization, which in turn boosts productivity since the country will have access to new technologies and better management practices. The increase in productivity will cause reallocation of the country's scarce resources from relatively inefficient sectors towards more efficient ones and thereby cause growth in an economy.

II.1 Theoretical Framework

Theories are framework or understanding research work and help to give credence to studies of this nature. The issue addressed in this section is the essential of agricultural export as an agent of development. Non-oil export trade is a development tool identified with economics of abundance which is also associated with the function of guiding production purposefully toward the general wellbeing of the society and the economy. The vital role of optimizing economic growth process can therefore, be credited to export trade. This is

because export trade was instrumental in laying the foundation necessary for rapid development of most developed nations.

Kilpatrick and Miller (1978), relevantly remarked that determinants of export success from Israel, had to do with wages per employee which are strongly associated (positively) with capital per employee, and the study concluded that higher wages per employee, higher value added per production workers, and higher economies of scale, are the main characteristics distinguishing between net exporting and net importing industries in the United States. It has also been argued that most of the benefits derived from exporting, may not be realized if the firms in developing countries do not first meet the home needs of its products or services. Oyanda (1988) observed that it would be misplaced priority to plan to export when domestic demand has not been satisfied. He noted, however that for firms to grow at home, they definitely need to sell their products/services abroad. The conception that a country should only export when it has surplus over domestic demand, undermines the policy of export-oriented development, which the Nigerian government tends to be pursuing.

Similarly, the economic theory of comparative advantage also provides the rationale for economic activity, or another useful reason to be involved in the selling of a country's goods and services across its national boundaries, the theory of comparative advantage states that each country need to specialize in the production of goods and services in which it is comparatively most efficient, and then export the products/services to countries that are comparatively least efficient. The exporting country will in turn import from such other countries' products/services for which it is least efficient comparatively. The theory goes further to postulate that through the re-allocation of resources, with a view to increasing production of goods and services which the country has a comparative advantage, trade will attract for that country a greater total volume of goods/services than could have been obtained directly, provided the current exchange rate between both countries favours the producer of the

goods/services.

II.2 Stylised Facts on Cocoa and Palm Kernel Exports in Nigeria

Agricultural export trade is structurally small and comprise mainly of small scale peasant production that account for over 80 per cent of the total agricultural output while at least over 60 per cent of the country's population earn their living directly or indirectly from agricultural proceeds.

Nigeria's agricultural export has been influenced by varying trade policies ranging from regulatory to deregulatory trade policies. During the regulatory era, the government through her agencies dominated the agricultural export trade. This period started from the late 1940s, precisely, 1947 when marketing boards were established to handle the agricultural export trade.

In 1977, three(3) commodity boards were set up to take over the activities of the marketing boards, which were earlier considered to be inefficient, inadequate in their set up and unorganised in their objective pursuit. The three commodity boards set up were: the Nigeria cotton board, the Nigeria palm produce board and Nigeria cocoa board. These boards were saddled with the following duties/functions.

- Provision of easy access to collection of duties and taxes by the government and serving as a source of capital formation for financing various government undertakings;
- Promoting the development and rehabilitation of producing areas generally and in particular to ensure adequate supplier of sprayer, fertilizer, chemical, improved seedlings e.t.c. and ensuring productivities and efficiency of farmers and earning capacity;
- The provision and availability of security to act as a safety guide for the purchase and sales of such commodities; and
- Stabilisation of producers' prices through the accumulation of buffers

Agricultural export trade was expected to be one of the sources of foreign exchange earnings for the nation and Nigeria being a country with good climatic condition and several export commodities was also supposed to feed its teeming population as well as export the excess produce. But research shows that these objectives are far from being achieved as hunger and poverty had been on the increase while export earnings from agricultural had dwindled continuously over the decades. Though agricultural export trade in Nigeria was expected to be a major beneficiary of the economic policy and structural reforms adopted from 1986 (SAP), ten years of implementation of these reforms seem to indicate that its overall performance is still below expectation. Improving Nigeria's agricultural export trade to an acceptable and sustainable level is, therefore, the challenge to policy-makers in government and operators in the private sector.

In Nigeria, the agricultural sector remained the mainstay of the economy in spite of the oil sector. The sector provides the much needed capital formation for economic growth, employs a greater proportion of the labour force, raises the living standard by reducing poverty and serves as the principal source of human and livestock sustenance. It is also a major source of our foreign exchange earnings and provides market for industrial goods. For example, cocoa is processed into food beverages, while agricultural profit taxes are used to finance other sectors of the economy.

Olajide and Olatunbosun (1976) enthused that, prior to the oil boom, export trade of Nigeria was largely dominated by agricultural products such as groundnut, palm produce, cocoa, rubber, cotton, coffee and others. Bond (1987) in a study of primary commodity exports from developing countries indicated that the speed of new technology in the rural sector tends to raise agricultural capacity and raw materials necessary to begin expansion in manufacturing sector. To them, export trade offer great potentials to third world countries against the marginal school of thought which hold the view that export trade has led to international inequality whereby the rich countries have become richer at the expense of the poor countries. Thus, despite the arguments that export trade operated as a

mechanism of international inequality and has related the development of underdeveloped countries, export trade has opened up new opportunities of specialization and development for countries engaged in it, as hypothesised by the structuralist school.

It is no doubt that Nigeria is endowed with abundant arable land, favourable climatic conditions and different vegetation zones which enhance its position as an agricultural economy. These endowments favour the cultivation of various tropical crops including cocoa and palm kernel. Before the oil boom of the 1970s, agricultural products dominated the export of the country, providing employment to about 70 per cent of its labour force and generating about 55 per cent of revenue for government (Malton, 1981). Since the oil boom of the early 1970's, however, crude oil has dominated both total export and government revenue. The fortunes of the traditional exports declined, owing apparently to the neglect of the traditional export sector and development in international commodity markets, especially decline in commodity prices.

Meanwhile, in the agricultural sector, it is clear that the edible crude materials made up of cocoa and palm kernel was increased systematically between 1976 and 1985 when it peaked at 5.4 per cent. This development was attributed to the initial positive impact of the exchange rate depreciation that accompanied liberalization as well as the abrogation of the marketing board system. However, the performance of palm kernel exports since 1989 declined due to the negative effects of the exchange rate depreciation on the cost of agrochemical, high lending rate and partial removal of subsidies, especially on agricultural input such as fertilizer. Akanji and Ukeje (1995) confirms that agricultural export growth has recently been hampered by increased cost arising from the vacuum created by the exit of the marketing boards and the reduction in the activities of those who seized the opportunity of liberalized agricultural export to effect capital flight.

Thus, palm kernel output grew at an average annual rate of 1.9 percent between 1960 and 1965. It reached a peak of 4.2 percent during 1976-1980. For the period

1976 -1985, production showed a relative decline of 0.6 percent while its export fluctuated throughout the period. Like palm kernel, the trend of cocoa export and output has been below expectation. Available information reveals that cocoa production declined with the record low output to 100,000 tonnes in 1987. But it assumed an upward trend from 1986 with an output of 253,000 tonnes which reached a peak of 345,000 tonnes in 1998 before it started declining thereafter. This development was due to the scraping of the commodity boards which signalled the move towards the deregulation of the economy. Despite this high output, the increase in export quantity was minimal, due to low international commodity prices and increase in domestic consumption resulting from the activities of cocoa processors. Moreover, the continuous depreciation of the naira, poor and deteriorating infrastructure facilities along with the dwindling international community aid contributed to the depressing growth of output and exports.

II.2.1 SAP and Post-SAP Era (1986 2008)

Policies formulated and implemented during this era were aimed at reversing the low trend in agricultural production in order to increase farm incomes and the supply of industrial raw materials (Ojo and Ukeje, 1995). Policies during this period were designed to consolidate existing achievements, and the period witnessed some structural changes such as shifts from an outright deregulation to that of guided deregulation. Various agencies were also created among which were the Directorate of Food, Roads and Rural Infrastructure (DFRRI) and the National Directorate of Employment (NDE). The government adopted a comprehensive package to boost the economic reform programmes. This could have resulted from the absence of an alternative to well-articulated and well-designed agricultural policies as instruments for promoting agricultural growth and productivity. According to Orubu (2002), one effect of depreciation in the SAP package and liberalization argument is an expected increase in non-oil exports, which would be cheaper in terms of foreign currency, and a concurrent increase in the Naira value of exports that should serve as an impetus for producers to produce more for exports.

III. Methodology

The estimation technique adopted in this study is the Engle-Granger co-integration analysis. The stationarity property of the variables was determined using the Augmented Dickey Fuller (ADF) and Phillips-perron (PP) tests. This becomes necessary in order to avoid the incidence of spurious regression estimates. Economically speaking, cointegration of two or more variables implies a long-term or equilibrium relationship among them, given by their stationary linear combination (called the cointegrating equation).

III.1 Model Specification

The model specified quantity exported (the dependent variable) as being explained by producer price, world price, commercial loans to agriculture, average annual rainfall and exchange rate (independent variables).

In the general form, the econometric model is specified as

$$QE = f(PD, WP, CLA, ARF, EXR, U_t)$$

The linear equation is specified as follow:

$$\ln QE = \alpha_0 - \alpha_1 \ln PD + \alpha_2 \ln WP - \alpha_3 \ln CLA + \alpha_4 \ln ARF - \alpha_5 \ln EXR + \mu_t \quad (1)$$

where,

$\ln QE$ = Natural log of export quantity measured in tons

$\ln PD$ = Natural log of producer price

$\ln WP$ = Natural log of world price

$\ln CLA$ = Natural log of commercial loan to agriculture

$\ln ARF$ = Natural log of average annual rainfall in millimetres

$\ln EXR$ = Natural log of exchange rate

U_t = stochastic error term

$\alpha_0 - \alpha_5$ = parameters

The producer price (PD), commercial loans to Agriculture (CLA) and exchange rate (EXR) are expected to have a negative effect on the quantity of cocoa exports and palm kernel produced, while world price (WP) and average rainfall are expected to have a positive sign.

III.2 Tests for Stationarity (Unit Root Tests)

In conducting the stationary / unit root tests on the variables, we used the

Augmented Dickey Fuller (ADF) and Phillips-perron (PP) unit root tests on all the variables. The Augmented Dickey fuller approach accounts for the autocorrelation in a series in a parametric fashion by estimating additional nuisance parameters through the addition of the first differences of the series as explanatory variables in the equation.

$$\Delta G_t = \alpha_1 + \alpha_2 + \delta G_{t-1} + \sum_{i=1}^m \alpha_i \Delta G_{t-i} + \varepsilon_t \quad (2)$$

The ADF test entails estimating the following equation:

where: G_t is the variable of interest; ε_t is a pure white noise error term; t is time trend; Δ is difference operator; $\alpha_1, \alpha_2, \delta$ and α_i are various parameters.

The unit root test is the first step and the most important in determining the stationarity of time series data. A series X_t is said to be stationary if it has the following characteristics; constant mean, finite variance, tendency to return to mean value equilibrium when there is a disequilibrium and zero order of integration $I(0)$. It is usually expressed as $X_t \sim I(0)$. This means that the series (X_t) does not need to be differenced, it is stationary at levels. If the series is not stationary, then it means that it is time dependent and its variance is infinite, therefore, the series (X_t) has to be first differenced in order to achieve stationarity $I(1)$, it said to be integrated of order one, that is $X_t \sim I(1)$ if it needs to be differenced once to achieve stationarity.

In general term, if the series (X_t) need to be differenced (d) times in order to achieve $I(0)$, then it is said to be integrated of order (d) that is $X_t \sim I(d)$. The null hypothesis of the existence of the unit root is stated as $H_0: X_t \sim I(1)$. If the MacKinnon critical value is less than the ADF test statistics we reject the null hypothesis that X_t contains a unit root and the alternative hypothesis is accepted that X_t is stationary. In contrast to the ADF, the Phillips-perron (PP) test does not require that the ARIMA process be specified and would, thus, be less subject to misspecification than the ADF test. The PP test corrects for autocorrelation in a non-parametric fashion.

III.3 Tests for Co-integration.

Co-integration is said to exist between non-stationary variables if their linear combination, namely the residuals of the co-integrating regression are stationary

(Granger, 1986). Thus, spuriousness can only be avoided if a stationary cointegration relationship is established between the variables. The particular relevance of the error correction form is the modelling of cointegrated series. According to Engle and Granger (1987), when variables are cointegrated there exist a valid error correction model describing their relationship, with the implication that cointegration between variables involved is a precondition for the error correction model. In testing for cointegration, we apply the ADF test to the residuals of the co-integrating regression rather than the levels of the series. If the residuals of the bivariate or multivariate co-integrating regressions are found to be stationary, implying co-integration, we will then specify an error correction model, which is the second step of the Engle-Granger two-step algorithm method.

Following Engle and Granger (1987), the cointegration regression between Y_t and Z_t can be specified thus:

$$Y_t = \alpha_0 + \alpha_1 Z_t + \varepsilon_t \quad (3)$$

The residuals of the co-integration equation (3),

$\varepsilon_t = (Y_t - \alpha_0 - \alpha_1 Z_t)$ is simply a linear difference of the non-stationary series (i.e., $Y_t Z - t$).

The ADF test equation based on the residuals is given as:

$$\Delta \varepsilon_t = \phi + \beta \varepsilon_{t-1} + \sum \lambda \Delta \varepsilon_{t-j} + v_t \quad (4)$$

The test statistic, as indicated earlier, is a t-ratio

For $\beta = 0$. If this null hypothesis cannot be rejected against the alternative that $\beta < 0$, then the variables are not cointegrated, on the other hand if the null hypothesis is rejected then the conclusion would be that the estimated ε_t is stationary (that is, does not have a unit root). In our estimations, multivariate co-integrating regressions were carried out between the export supply of cocoa and the price variables and income to establish the existence of long-run co-integrating relationship. Finally, in stage two, the residuals of the valid multivariate co-integrating regressions were included in the model as an explanatory variable, before it was estimated with the use of ordinary least squares regression.

From equation (3), the error correction mechanism (ECM) can be specified as:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta Z - \alpha_2 (Y_t - Z_t)_{t-1} + \varepsilon_t \quad (5)$$

where,

Z = the vector of explanatory variables

Y_t and Z_t = the co-integrating variables

α_2 = the coefficient of the error correction mechanism (ECM)

α_1 = the vector of parameters.

III.4 Data Source

The data for this research are annual and were obtained from several sources. These included the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Food and Agriculture Organisation (FAO) of the United Nations and International Financial Statistics (IFS) of the International Monetary Fund. Precisely, data on producer price, the export price and average rainfall from 1976 to 2008 were collected from the Statistical Bulletin of the CBN. Statistics of export quantities of commodities were sourced from the FAO.

IV. Estimation Results and Discussion

IV.1 Unit Root Tests (Cocoa and Palm Kernel)

The results of the Augmented Dickey-Fuller (ADF) and Phillips - Perron (PP) tests are presented in tables 1 and 2 below.

Table 1 shows that in the case of cocoa exports except for LNQE that was stationary at level $I(0)$, all other variables, (LNPD, LNWP, LNCLA, LNARF and LNEXR) were stationary at the first differences $I(1)$ and at 1 per cent statistical significance.

Table 1: Unit Root tests (Cocoa)

Variable		ADF Stat	Critical Values		Order of Integration	PP Stat	Critical Values		Order of Integration
			1%	5%			1%	5%	
LNQE	Level	-5.8406	-3.6463	-2.9540	I(0)	-5.8407	-3.6463	-2.9540	I(0)
LNPD	Level	-1.6070	-3.6463	-2.9540	I(1)	-1.5431	-3.6463	-2.9540	I(1)
	First Diff	-6.1059	-3.6537	-2.9571	I(0)	-6.2725	-3.6537	-2.9571	I(0)
LNWP	Level	-3.3128	-3.6537	-2.9571	I(1)	-2.5847	-3.6463	-2.9540	I(1)
	First Diff	-4.4075	-3.6537	-2.9571	I(0)	-4.4251	-3.6537	-2.9571	I(0)
LNCLA	Level	-2.1456	-3.6463	-2.9540	I(1)	-2.3577	-3.6463	-2.9540	I(1)
	First Diff	-6.8068	-3.6537	-2.9571	I(0)	-6.7583	-3.6537	-2.9571	I(0)
LNARF	Level	-1.5903	-3.6463	-2.9540	I(1)	-1.4942	-3.6463	-2.9540	I(1)
	First Diff	-6.7121	-3.6537	-2.9571	I(0)	-6.7121	-3.6537	-2.9571	I(0)
LNEXR	Level	-0.4781	-3.6463	-2.9540	I(1)	-0.5166	-3.6463	-2.9540	I(1)
	First Diff	-4.7075	-3.6537	-2.9571	I(0)	-4.7075	-3.6537	-2.9571	I(0)

Table 2: Unit Root tests (Palm Kernel)

Variable		ADF Stat	Critical Values		Order of Integration	PP Stat	Critical Values		Order of Integration
			1%	5%			1%	5%	
LNQE	Level	-0.7258	-3.6463	-2.9540	I(1)	-0.7258	-3.6463	-2.9540	I(1)
	First Diff	-6.2979	-3.6537	-2.9571	I(0)	-6.3674	-3.6537	-2.9571	I(0)
LNPD	Level	-0.8797	-3.6463	-2.9540	I(1)	-0.8544	-3.6463	-2.9540	I(1)
	First Diff	-4.5933	-3.6537	-2.9571	I(0)	-4.7706	-3.6537	-2.9571	I(0)
LNWP	Level	-2.0517	-3.6537	-2.9571	I(1)	-2.2041	-3.6463	-2.9540	I(1)
	First Diff	-5.5720	-3.6537	-2.9571	I(0)	-5.5720	-3.6537	-2.9571	I(0)
LNCLA	Level	-2.1457	-3.6463	-2.9540	I(1)	-2.3577	-3.6463	-2.9540	I(1)
	First Diff	-6.8068	-3.6537	-2.9571	I(0)	-6.7583	-3.6537	-2.9571	I(0)
LNARF	Level	-1.5902	-3.6463	-2.9540	I(1)	-1.4942	-3.6463	-2.9540	I(1)
	First Diff	-6.7121	-3.6537	-2.9571	I(0)	-6.7121	-3.6537	-2.9571	I(0)
LNEXR	Level	-0.4781	-3.6463	-2.9540	I(1)	-0.5166	-3.6463	-2.9540	I(1)
	First Diff	-4.7075	-3.6537	-2.9571	I(0)	-4.7075	-3.6537	-2.9571	I(0)

In the case of palm kernel, table 2 shows that all the variables are non-stationary at level I(1) and that stationarity is only established after first differencing.

IV.2 Parsimonious Error Correction Model (Cocoa and Palm Kernel)

The parsimonious error correction model (ECM) was obtained by regressing the variables including the one period lag of the error correction term. To estimate an (ECM), two period lags of the first differenced variable of all the variables were included, while the parsimonious equation was obtained through the sequential elimination of insignificant variables guided by theory. The result is presented in Tables 3 and 4 below.

Table 3: Parsimonious short run error correction model (cocoa)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.052654	0.075163	0.700550	0.0906
D(LNQE(-1))	0.502640	0.164900	3.048150	0.0057
D(LNPD(-2))	-0.108179	0.082003	-1.319213	0.0081
D(LNWP)	0.489458	0.248642	1.968528	0.0612
D(LNARF(-2))	-0.234289	0.193850	-1.208612	0.0390
D(LNCLA)	-0.234403	0.146894	-1.595735	0.1041
D(LNEXR)	-0.079920	0.283780	-2.395943	0.0251
ECM(-1)	-0.098008	0.214692	-0.456506	0.0023
R-squared	0.746055	Mean dependent var		0.006359
Adjusted R-squared	0.702422	S.D. dependent var		0.397534
S.E. of regression	0.332376	Akaike info criterion		0.852539
Sum squared resid	2.540905	Schwarz criterion		1.222600
Log likelihood	-5.214355	F-statistic		8.844987
Durbin-Watson stat	2.097447	Prob(F-statistic)		0.002199

Table 4: Parsimonious short run error correction model (Palm kernel)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.068257	0.073130	0.933416	0.0697
D(LNQE(-2))	0.266947	0.186092	1.434489	0.1649
D(LNPD(-2))	-0.304829	0.243667	-2.482188	0.0079
D(LNWP(-2))	0.157138	0.191093	0.822436	0.0542
D(LNCLA)	-0.080900	0.112187	-0.721119	0.0781
D(LNARF)	0.329061	0.191864	1.715075	0.0998
D(LNEXR)	-0.177958	0.192935	-0.922375	0.0029
ECM(-1)	-0.515965	0.186920	-2.760354	0.0111
R-squared	0.599464	Mean dependent var		0.065092
Adjusted R-squared	0.558130	S.D. dependent var		0.288940
S.E. of regression	0.252201	Akaike info criterion		0.300457
Sum squared resid	1.462925	Schwarz criterion		0.670518
Log likelihood	3.342916	F-statistic		9.339540
Durbin-Watson stat	2.034207	Prob(F-statistic)		0.000425

IV.3 Analysis of Result

Table 3 shows the parsimonious result for cocoa, the result indicates that the adjusted R-squared (R^2) of the model was approximately 70 per cent, implying that the dependent variables was largely explained by the independent or exogenous variables. Almost all the explanatory variables, except commercial loans to agriculture, are statistically significant. Similarly, all the variables including (ECM) are rightly signed, except average rainfall (ARF). The Durbin-Watson statistic of 2.09 is within the acceptable band, indicating the absence of serial correlation among the variables in the model, even as the probability of the F- statistic shows that the model was well-fitted. The coefficient of the lag of producer price of cocoa is rightly signed and significant, showing that a 1% increase in producer price of cocoa, all things being equal, will reduce export quantities by approximately 0.11 per cent. This is in line with evidence that has shown that cocoa output hence export supply has been trending down for many years due to higher cost of producing cocoa in Nigeria.

Onyenweaku and madu (1991) in their study of the supply of Nigeria's cocoa confirmed the evidence of negative output in the face of rising cocoa producer prices. They argue that the price factor has been almost swamped by non-price factors, which are non-agricultural, such as over-reliance on the oil sector. Another probable reason for the negative short-run price elasticity include failure of farmers to replace their old and low-yielding cocoa trees with young high yielding ones. Beyond these, rising production costs especially labour costs are known to partially offset output price increases.

The estimated result also shows that a positive relationship exists between world price and export quantities of cocoa. The result indicates that a 1.0 per cent increase in world price of cocoa increases export of cocoa by as much as 0.49 per cent. This is a clear indication of world price of cocoa being a major incentive for farmers to produce more for the export market.

Similarly, the coefficient of the lag value of average rainfall is negatively signed and significant but is not in line with a priori expectation and adequate rainfall is required for increased cocoa export supply in the country. The coefficients of

commercial loans to agriculture and exchange rate show an inverse relationship with export of cocoa. The result indicates that a 1 per cent depreciation of the exchange rate will reduce cocoa exports by 0.08 per cent. It is observed from the results that the coefficient of the error correction term (ECM (-1)) carries the expected negative sign, less than 1 and it is highly significant at the 5 per cent level. The significance of the error correction term supports cointegration and suggests the existence of a long-run steady-state equilibrium between cocoa export supply and producer price, world price, average rainfall, commercial loans to agriculture and exchange rate. The ECM indicates that should there be disequilibrium in the system, about 10 per cent will be corrected within a year. In other words, the model has an adjustment speed of 10 per cent.

On the other hand, the parsimonious result for palm kernel presented in table 4 shows that the model has a good fit having an adjusted R-squared (R^2) of 56 per cent, which shows the relative contribution of the independent variable to the dependent variable. All the explanatory variables including the ECM, except export quantity are statistically significant and rightly signed. Durbin-Watson statistic of 2.03 also is an indication of the absence of serial correlation among the variables in the model while the F-statistic shows that the model was well-fitted and reliable. The coefficient of lag of export quantities is positively signed and the parameter estimate for producer price of palm kernel was negatively signed, in line with the a priori expectation. This means that a 1.0 per cent increase in producer price of palm kernel, all things being equal, will reduce export quantities by 0.30 per cent.

More so, the lag values of world price and coefficient of average rainfall are positive and significant, pointing to the positive relationships that exist between these variables and export of palm kernel in Nigeria. These indicate that a 1.0 per cent increase in world price and average rainfall will increase export quantities of palm kernel by 0.16 and 0.32 per cent, respectively. Similarly, commercial loan to agriculture and exchange rate show an inverse relationship with the export quantities of palm kernel. This means that a 1.0 per cent depreciation of exchange rate will increase export of palm kernel by 0.18 per cent, as the lower exchange

rate will make the product cheaper at international market.

The error correction mechanism (ECM) supports cointegration and suggests the existence of a long-run steady-state equilibrium relationship between palm kernel export supply and producer price, world price, average rainfall, commercial loan to agriculture and exchange rate. The ECM indicates that should there be disequilibrium in the system, about 52 per cent will be corrected within a year. In other words, the model has an adjustment speed of 52.0 per cent.

V. Policy Recommendation

In view of the findings from this study, the following are antidotes for Nigeria's dependency on petroleum that policy makers and Nigerian leaders can work on to revitalize agricultural export trade.

- i). The performance of agriculture has not been too impressive even with liberalization measures. Though the exchange rate policy is probably the most likely instrument to induce increased competitiveness of agricultural export commodities in a developing country like Nigeria, parallel market exchange rate premium significantly affects the export performance of palm-kernel, cocoa and other major agricultural products. Thus, critical attention should be paid to such incentives as export promotion because it is believed that export promotion has the potential to stimulate productivity, thrift and entrepreneurship.
- ii). Since the main manifestation of the "Dutch Disease" is the crowding out or depression of the non-oil export sector, it follows that the "disease" can be cured by effective implementation of prices aimed at promoting and revitalizing the non-oil export sector. These policies should address not only agricultural exports like cocoa and palm kernel, but also exports of other (non-oil) minerals, manufactured goods and services where Nigeria has comparative advantage.
- iii). Conservation and rehabilitation programmes for palm kernel should be organized in areas where degradative processes are about to set in. Also, uncontrolled felling of palm kernel trees should be checked and farmers encouraged through appropriate pricing mechanisms, to replant the cleared and

rehabilitate the old palm kernel trees. The federal government should ensure that there is a margin between the producer price and world price of agricultural product, so that cocoa and palm kernel farmers can benefit substantially from international trade.

VI. Conclusion

The study examined cocoa and palm kernel export trade in Nigeria from 1975 to 2008 using co-integration and error correction approach. The objectives of the study were to estimate short and long-run effects of price change, foreign income and government policy on cocoa and palm kernel production. The result of the study showed that producer price, world price, commercial loans to agriculture, and exchange rate have key roles to play in the export of cocoa and palm kernel in Nigeria. These results showed that cocoa and palm kernel exports have been responding negatively to producer prices on both short and long-run, and also the result showed that there may be an increased in cocoa and palm kernel in long-run, when it would have been possible for harvested hectares to be expanded and the replace low-yielding and aged trees. From the data collected and analysis of the result, it is pertinent to note that a holistic review of agricultural export trade policy is necessary. In summary, an increase in production of both cocoa and palm kernel will stimulate an increase in exportation of the product and more revenue from exportation of these products can be used to finance agricultural sector.

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