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TREND ANALYSES AND MACROECONOMIC VARIABLE DETERMINANTS OF OIL PALM FRUIT AND ITS DERIVATIVES PRODUCTION IN NIGERIA

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Abstract

The production of oil palm fruit and its derivatives was once the prime mover of the Nigeria's economy a few decades ago, but currently, the country is a net importer of these commodities. The sub-unit holds great potential in terms of job creation, poverty reduction, raw materials for agro-based industries and overall growth of the country's economy. In recent times, the governmenthas articulated and implemented numerous policies, programs and institutions to re-brand the sub-unit but to no avail. Beckoned on these evidences, the study was developed to examine the production trends in this sub-unit and investigate its link with some selected macroeconomic variables as alternative ways of examining the problems of the sub-unit. The research utilized secondary data from the years 1981 to 2023. The data were gathered from the United State Department of Agriculture (USDA), Food and Agricultural Organization (FAO), World Bank, and Central Bank of Nigeria (CBN). The properties of the series were tested to confirm their stability. The co-integration of the series was establish by autoregressive distributed lag (ARDL) bound F-test. The trends analyses revealed a 1.68%, 3.50%, 4.63%, 4.83%, and 2.19% annual exponential growth in oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil respectively. The study found significant relationship between the outputs of oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil and the domestic credit injected in the economy, per capita income, nominal exchange rate, and inflation rate in the short and long run periods. To upsurge the sub-unit production, it is strongly recommended among others that adequate credit facilities should be provided for the production of the primary product (oil palm fruit) and the expanding value chain.

Key words: *Palm oil, Palm kernel oil, palm fruit, Macroeconomics, Trend, Nigeria*

INTRODUCTION

The *Elaeis guineensis* popularly known as oil palm tree is among the prominent cash crops grown in the southern region of Nigeria [32], [29], [24], [8]. The crop has been integrated in the cultural fabric of the inhabitants of the south eastern and south-south regions of Nigeria [10]. The history of the crop is well rooted in the country and dates back to the 1950s when Nigeria control almost half of the global export. In the mid-1960s, Nigeria owned a global market share of 43% [32]. Though the dominant position of Nigeria in palm oil production and export was relinquished to Malaysia and Indonesia following the diversification of the revenue source due to the commencement of the commercial drilling of crude oil in the early 1970s in the country [26], [12]. Both countries currently controlled about 80% of the global palm oil production and exports. Currently, Nigeria is ranked 5th in the global palm oil production, with an annual production of about 1.40 million metric tons which is below 2.0% of the global output in 2022 [16].

Despite the abysmal performance of Nigeria in oil palm fruit and its derivatives production, the relevance of the sub-unit has continued to upsurge given its importance in job creation, industrialization drive and its multiple chains of income generation and livelihood sustenance [10], [38]. The crop is rich and has a long chain of derivatives namely: palm oil, palm kernel oil, palm kernel cake, palm kernel, palm kernel meal and sludge among others. Palm oil is the most widely used oil palm fruit processing

derivative. It is a major component in the daily dietary intake of the majority of Nigerians. According to Gonzalez-Diaz and García-Núñez [18], palm oil is a rich source of carotenoids, vitamins, tocopherols, fatty acids, vitamin E, and emulsifiers among other chemicals.

Nigeria's demand for oil palm fruit and its derivatives have increased progressively over the years. For example, palm oil domestic demand (i.e. used as food) was at 1.65 million metric tons in 2020 and rose to 1.71 million metric tons in 2021 [39]. The domestic production stood at 1.275 million metric ton in 2020 and 1.400 million metric tons in 2021 creating supply deficits of 0.375 million metric tons and 0.310 million metric tons in 2020 and 2021 respectively [39]. The supply deficit generated import demand with a huge financial implication for the country's economy. If this trend continues without appropriate interventions, other sectors might suffer gross neglect and this can further worsen Nigeria's poverty situation [35]. Currently, with an estimated population (demand capacity) of over 200 million, the demand capacity is expected to expand with expanding deficiency in supply. According to the report from the USDA [39], Nigeria is the biggest consumer of palm oil in Africa with an annual consumption of 1.79 million metric tons followed by Egypt with a yearly consumption of 1.225 million metric tons in 2022. In 2020, the Sub-Saharan Africa production level stood at 6 million metric tons of oils and fats while domestic consumption was 11.2 million metric tons, thereby creating an import demand of 7.4 million metric tons. In 2018, it was reported that Nigeria's total fats and oil consumption rose to about 3 million metric tons, with 44.7% share derived from palm oil consumption [33].

The government of Nigeria has put forward several attempts to revive the dwindling fortune in the oil palm fruit production and agricultural sector in general that is predominated by the small-scale farmers [38], [1]. The interventions manifested in import policies, financial assistance to stakeholders, infrastructural development among others [9]. For instance, the Federal Government (FG) in 2015 added palm kernel and palm oil products to the list of items it prohibits from accessing foreign exchange for importation [13]. In 2019, the FG closed its land borders to guarantee the enforcement of bans on the imported palm oil derivatives. In addition, the FG released about N30 billion loan to oil palm farmers to enhance their productivity. In 2015, the CBN launched the anchored borrower programme to provide indirect funds to small scale oil palm farmers in the country to boost aggregate production. The CBN in 2020 disbursed ₦34.3 billion to major palm oil enterprises in the country with an intention to expand cultivated area to 100,000ha in 2025 from 20,000ha in 2020, increase productivity and generate jobs for the teeming youth population. However, these interventions have not yielded the expected outcomes as the country's commanding position in the global oil palm fruit and its derivatives production is still a mirage. The yearly output growth rate is still at the marginal level [16]. In 2019, the major palm oil producing firms quoted in the Nigerian stock exchange (NSE) market recorded a revenue decline. In addition, the global activities played down on the objective of the FG to boost oil palm fruit and its derivatives production. For example, the mean crude palm oil price in 2017 stood at US$751/metric ton compared to US$601/metric ton in 2019; a 19.97% decline [40].

Though many economists have attributed the weakening production capacity of the palm oil fruit and it derivatives to the over reliance of the country's economy on petroleum production, poor processing techniques and poor policy implementation, but the volatility in the macroeconomic fundamentals also played a major role [29], [1], [27], [28], [41], [11], [25]. Oil palm fruit production is an economic activity likely to be influence by the uncertainties in the macroeconomic policy environment in areas such as: production, research capability, marketing, export and import drives among others [3], [1], [27], [28], [25], [5]. The macroeconomic policies is an embodiment of the exchange rate regulations, fiscal, monetary and trade policies tended to control the economic

(production) activities in the economy. Sound and sustainable macroeconomic policies are prerequisites for sustainable agricultural development [15], [7], [1], [27], [22], [2], [4], [5]. A stable macroeconomic environment has a severe economic and development implications for the attainment of smart and sustainable agricultural production and expansion of export [7], [37]. For instance, import restrictions, exchange rate regulation and trade barriers can be used as tools to boost domestic production [15]. Moreover, high rate of inflation can trigger cost of production and dampened the domestic supply. As note by Ziaei and Issa [41] a surge in palm oil production would possibly lead to an increase in farmers' income, private capital stock or assets, government revenue, improved human capacity, an stimulate other economic activities. Hence, with these assertions, there is a need to critically examine the roles macroeconomic fundamentals had played in the production of oil palm fruit and its derivatives over the years as an alternative strategy to boost production and extend the borderline of value addition system of the sub-unit in the country.

Surprisingly very scanty literature have explored the association between the oil palm fruit and its derivative production versus macroeconomic variables. However, Akpan and Patrick [3] in Nigeria found a significant impact of selected macroeconomic variables on the outputs of palm oil and palm kernel in the short and long run periods. Among the macroeconomic variables identified were, the per capita income and lending interest rate. Also, [26] identified the exchange rate (N/$) and the price of palm oil among the determinants of oil palm production in both short and long run periods. In a similar vein, Akpan [1] found the price of oil palm fruit, value addition and consumers' income as long and short runs determinants of oil palm fruit production in Nigeria. Moreover, Hasibuan and Nurdelila [20] identified the negative influence of inflation rate on oil palm fruit production in both short and long run periods in Indonesia. Recently, Busari et al., [12] found the nominal exchange rate, the interest rate on the agricultural loan, export tax, and the inflation rate as significant negative determinants of the Nigeria's market share of palm oil in the global market.

From the few literature available, it is palpable that most of the studies focused specifically on palm oil neglecting other palm oil fruit derivatives. The appropriate intervention in the sub-unit needs to be holistic by considering a wide range of important derivatives. Again, information on this issue need to be updated following the high volatility of macroeconomic environment in the country.

Hence, this study was designed to fill this identified research gaps and generate alternative variables to tackle the problem of low output/supply deficit in oil palm fruit and its derivatives production in Nigeria.

To achieve this major objective; the study specifically: (i) examined the trends in the annual outputs of the oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil in Nigeria and, (ii) identify the macroeconomic variables that influence the outputs of oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil in both short and long run periods in Nigeria.

MATERIALS AND METHODS

Study area and data Source

The study was conducted in Nigeria. The country is located in the Sub-Saharan region of West Africa. Nigeria is the most populous country in Africa. It is rich in agricultural resources.

The country is a major player in the global oil palm fruit production. About 60% of the country's population are engaged in agricultural production [17].

The land mass is 923,769km^2 and more than 70% of the land mass constitute arable crop land. The population of the country is over two hundred (200) million [36].

Secondary information or data were gathered from official sources including; United State Department of Agriculture (USDA), World Bank publications; Food and Agricultural Organization (FAO) and Central Bank of Nigeria (CBN). The time frame stretches from the year 1981 to 2023.

Theoretical Framework

The study used the concept of a classical production theory framework which assumed that a firm output is determined by the use of certain factors of production suh as labour and capital. Basically, the classical production theory describes a unilateral production function depicting the relationsip between output of a firm and factors of production. Implicitly, in a typical factor- factor relationship, a firm output is determined as thus:

$$Q = f(W, B) \dots\dots\dots\dots\dots (1)$$

where: Q represent a firm or farm output, and W and B connotes capital and labour factors respectively. The amount of Q produced at any point is a function of the various combinations of W and B while other inputs are held constant. Production being an economic activity is affected by other economic variables. The quantities of W and B inputs available is equally affected by the market prices, wages, and interest paid among others. Hence, economic production is is a function of a multilateral factors such as; macroeconomic factors, climatic factors, price factors etc. The production relationship in a holistic form connotes that, a firm output at any point in time depends on the physical inputs and non-physical factors alike. Implicitly, this assertion can be illustrated and examplified as thus:

$$Q = f(W, B, E, C) \dots\dots\dots\dots\dots\dots (2)$$

where: E an C are economic and climatic factors. Therefore, equation 2 forms the structural framework in which we derive our behvioural function employ in this study.

Model Specification

The analyses of trends in oil palm fruit and its derivative

The study estimated the exponential trend equation to analyze the trends in annual oil palm fruit and its derivatives outputs. The trend equation is explicitly showed in equation 3.

$$log_e Output_t = \delta_0 + \delta_1 t + U_t \dots (3)$$

where "t" represents the time variable measured in years. According to Akpan et al., (2022), the compound growth rate or exponential (r) growth rate is given as:

$$(r) = (e^{b1} - 1)\ x\ 100 \dots\dots\dots\dots\dots (4)$$

Note, euler's number (e ≈ 2.71828). The quadratic trend equation as shown in equation 5 was also estimated to test the acceleration, deceleration and stagnation of oil palm fruit and it derivatives outputs over doubling of time [6], [5].

$$log_e Output_t = \vartheta_o + \vartheta_1 T_1 + \vartheta_2 T_2^2 + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

If $\vartheta_2 > 0$; the oil palm fruit production for instance is increasing at a decreasing rate or is increasing at increasing rate depending on its sign. When $\vartheta_2 < 0$, it means the growth rate in palm oil fruit is not significant, hence stagnated over a doubling period. Note the trend equation was also estimated for the oil palm fruit derivatives (namely; the palm kernel, palm kernel oil, palm kernel meal and palm oil).

The macroeconomics factors influencing oil palm fruit and it derivatives production

An oil palm fruit equation is modeled using variables at their level to identify its determinants. The general production relationship used is explicitly demonstrated in a double –log form in equation 6.

$$LnY_t = \alpha_0 + \alpha_1 LnINF_t + \beta_2 LnEXC_t + \beta_3 LnPER_t + \beta_4 LnCRE_t + \mu_t \dots\dots\dots\dots\dots (6)$$

where:

Y_t represents group of dependent variables defined as:

PFU_t = Oil palm fruit in tons

PKE_t = Palm kernel in tons

PKO_t = Palm kernel oil in tons

PKM_t =Palm kernel meal in tons

PAO_t = Palm oil in tons

Where:

INF_t = annual inflation rate (that proxy factor price fluctuation)

EXC_t = annual nominal exchange rate(₦/$) (proxy influence of external World)

PER_t = Gross Domestic Product per capita (naira/person) (represents demand capacity of the population)

CRE_t = domestic credit disbursed to the private sector in the economy used as a proxy to credit injected in the agricultural sector (% of GDP)

U_t = error term; U_t~ IID (0, δ^2_U).

The Autoregressive Distributed Lag (ARDL) bound test

To avoid spurious regression following the result of the unit root test of series; it is strongly recommended that the series should be tested for cointegration. The ARDL bound test was used to validate the cointegration relationships among variables in the specified equations [30], [31]. The ARDL bound test is designed to solve issues with variables having mixture of stationary. The ARDL test generates relatively more efficient estimates compared to other techniques (such as cointegration and Engle-Granger two step method) especially when dealing with small sample size. Besides, the test produced unbiased, best and stable estimates of the long-run model as noted by Harris and Sollis, [19]. The ARDL bound test modelled for equation (6) is expressed explicitly as thus:

$$\Delta LnY_t = \theta_0 + \theta_1 \sum_{i=1}^{n_1} \Delta LnY_{t-1} + \theta_2 \sum_{i=1}^{n_2} \Delta LnINF_{t-i} + \theta_3 \sum_{i=1}^{n_3} \Delta LnEXC_{t-i} + \theta_4 \sum_{i=1}^{n_4} \Delta LnPER_{t-i} + \theta_5 \sum_{i=1}^{n_5} \Delta LnCRE_{t-i} + \delta_1 LnY_{t-i} + \delta_2 LnINF_{t-i} + \delta_3 LnEXC_{t-i} + \delta_4 LnPER_{t-i} + \delta_5 LnCRE_{t-i} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The ARDL bound test model assumes endogeneity of the specified variables. In equation 7, the short run elasticities coefficients are symbolized by θ_1 to θ_5 while δ_1 to δ_5 are the long-run coefficient elasticities. The θ_0 represents the drift factor; "n" is the maximum lag length determined by the decision criteria; U_t is the regression error term. The bounded F-values were generated with restricted constant and no trend for K = 4. The decision rule is that, if the ARDL F-value exceed the upper bound critical value; then co-integration exist, hence the null hypothesis is rejected. Besides, when the estimated F-value is found to be below the lower bound critical value, the null hypothesis of no cointegration cannot be rejected, indicating the absence of no co-integration. Otherwise, if the F-value lies between the lower and upper critical bound values; then the results is inconclusive [31]. When the ARDL bound test upheld the presence of cointegration, then the long and the short runs equations are explicitly specified as thus:

The long run model:

$$LnY_t = \delta_0 + \delta_1 \sum_{i=1}^{q_1} LnY_{t-i} + \delta_2 \sum_{i=1}^{q_2} LnINF_{t-i} + + \delta_3 \sum_{i=1}^{q_3} LnEXC_{t-i} + \delta_4 \sum_{i=1}^{q_4} LnPER_{t-i} + + \delta_5 \sum_{i=1}^{q_5} LnCRE_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

The short run model (ECM model):

$$\Delta LnY_t = \beta_0 + \beta_1 \sum_{i=1}^{n_1} \Delta LnY_{t-1} + \beta_2 \sum_{i=1}^{n_2} \Delta LnINF_{t-i} + \beta_3 \sum_{i=1}^{n_3} \Delta LnEXC_{t-i} + \beta_4 \sum_{i=1}^{n_4} \Delta LnPER_{t-i} + \beta_5 \sum_{i=1}^{n_5} \Delta LnCRE_{t-i} + \forall ECM_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

From the ECM, "∀" is the error correction term that depicts the speed of adjustment towards the long-run equilibrium.

RESULTS AND DISCUSSIONS

The Summaries of variables

The series' summary tests are shown in Table 1. The data indicated that the GDP per capita and exchange rate skewness and coefficient of variability indices are larger than one. This

indicates that during the specified period, the variables under consideration exhibited significant annual volatility and continued annual increases. A marginally positive skewness and the lowest coefficient of variability were observed in the annual production of oil palm fruit. The sub-unit witnessed about 23.00% variability while the skewness index suggests that the output grew at a marginal positive rate. In addition, the volatility index of annual palm kernel, palm oil, palm meal, palm oil production and domestic credit was 45 per cent, 53 per cent, 53 per cent, 30 per cent, and 38 per cent respectively. This means that the annual variations in these variables were moderate; but with persistent positive annual growths. However, the variations in inflation rate revolved around unity but with consistent positive annual growth.

Table 1. The major summaries of data

Variable	Min.	Max.	Average	Std. deviation	CV	Skewness
Oil palm fruit (tons/10,000)	475.00	1,271.80	793.67	183.37	0.23	0.71
Palm kernel (tons/10,000)	20.00	90.00	51.18	23.19	0.45	0.25
Palm kernel oil (tons/10,000)	6.80	39.30	21.59	11.38	0.53	0.14
Palm oil (tons/10,000)	50.00	140.00	81.17	24.62	0.30	0.97
Palm kernel meal (tons/10,000)	7.60	47.20	26.23	13.81	0.53	0.06
Inflation rate (%)	5.39	72.84	19.07	16.28	0.85	1.87
Exchange rate (%)	0.62	638.70	127.82	142.23	1.11	1.53
GDP/capita	1,853.10	1,026,900	244,440	295,060	1.21	1.08
Domestic credit/GDP	4.96	19.63	9.62	3.63	0.38	0.86

Source: This is computed by the authors, data are derived from FAO, CBN, USDA and World Bank, 2024.

This means that these variables witnessed high level of fluctuations marked with consistent increase in the growth rates within the specified period. An average of 7.93 million metric tons, 0.51 million metric tons, 0.21 million metric tons, 0.81 million metric tons and 0.26 million metric tons of oil palm fruit, palm kernel, palm kernel oil, palm oil and palm kernel meal respectively was produced from 1981 to 2023 period.

Trends in the oil palm fruit output and its derivatives

The estimated exponential trend equation for oil palm fruit and its derivatives is shown in Table 2 an 3. The results show that annual production of oil palm fruit and its derivatives in Nigeria is positively related to time. In other words, the annual production of palm oil fruit and its derivatives (palm kernel, palm kernel oil, palm kernel meal and palm oil) increases with the increase in the time factor.

The results show that in Nigeria, the average positive exponential growth rate is 1.68 per cent, 4.63 per cent, 3.50 per cent, 4.83 per cent, and 2.19 per cent for oil palm fruit, palm kernel oil, palm kernel, palm kernel meal and palm oil respectively.The findings revealed that the oil palm fruit and its drivatves on average wtnessed persisitent annual positve increment from 1981 to 2023.

Further analyses of the quadratic trends revealed that the time squared coefficients related to the palm kernel, palm kernel oil and palm kernel meal equations are negative and significant at the conventonal levels. This suggests that the production of these outputs over doubling time assumed a deceleration pattern. Alternatively, over a doubling time, the annual production of palm kernel, palm kernel oil and palm kernel meal increase at a decreasing rate in Nigeria. The result for the palm oil fruit production revealed stagnation over doubling of time, while the production of oil palm showed acceleration in output over doubling of time. The behaviours observed in these variables has a lot of policy implications. From the analyses, it is obvious that the oil palm fruit production and its rich value chain in Nigeria cannot be describe as being efficient but just struggling to stay afloat within the period of analysis. This is an indication of long neglect of the oil palm sub–unit and perhaps the agricultural sector at large in the country. The neglect and non-

prioritizing of the agricultural sector and the conscious violation of the Afrıcan Union, Maputo 2003 Declaration on agricultural investment in Africa has contributed to the result obtained [7], [22].

The pictorial representation of the estimated trend lines for the oil palm fruit and its derivatives are shown in Figure 1 to 5. The trends in palm kernel oil, palm kernel meal and palm kernel production are somehow similar while trends in oil palm fruit and palm oil production displayed similar pattern with minor variations. However, from 1981 to 1985, the output trends in all the five commodities assumed undulated patterns following the policies of the then pre-structural Adjustment Programme (PSAP). The structure of the trend could partly be attributed to the instability in the macroeconomic environment that prompted the enunciation of economic stabilization acts in 1985 [7], [2].

Table 2. Thetrend analyses of oil palm friuts and its derivatives

	Oil palm fruit		**Palm kernel oil**		**Palm kernel**	
Variable	Coeff	t-value	Coeff	t-value	Coeff	t-value
Constant	6.284	214.1***	1.916	35.19***	3.071	49.52***
Time	0.017	14.33***	0.045	21.02***	0.034	14.02***
Fcal. (1,41)	205.3*		441.8*		196.5*	
Exp. growth (%)	**1.68**		**4.63**		**3.50**	
	Quadratic trend analysis					
Constant	6.229	140.1***	1.799	22.03***	3.222	35.08***
Time	0.024	5.16***	0.061	7.11***	0.014	1.49
Time Squared	-0.0002	-1.63	-0.0004	-1.87*	0.0005	2.15**
Fcal.(2, 40)	108.1***		236.1***		109.3***	

Note: asterisks *** represent a 1% significance level. Exp is exponential growth rate.

Table 3. Thetrend analyses of oil palm friuts derivatives

	Palm kernel meal			**Palm oil**		
Variable	Coeff.	Std error	t-value	Coeff.	Std error	t-value
Constant	2.062	0.055	37.75***	3.879	0.026	148.0***
Time	0.047	0.002	21.2***	0.022	0.001	20.86***
Fcal. (1,41)	475.9*			435.12*		
Exp. growth (%)	**4.83**			**2.19**		
	Quadratic trend analysis					
Constant	1.846	0.073	25.37***	3.999	0.033	123.1***
Time	0.076	0.008	9.96***	0.006	0.003	1.64
Time Squared	-0.0007	0.0002	-3.89***	0.0004	0.00008	4.87***
Fcal.(2, 38)	327.8***			349.7***		

Note: asterisks *** represent a 1% significance level. Exp is exponential growth rate.

In 1986, the Structural Adjustment Programme was enunciated being engulfed by several policies that decline the roles of government in agricultural production and accelerating privatization programmes [5]. During this period, importation of oil palm fruit derivatives was discouraged in order to boost domestic production. Also, the marketing board of palm oil was abolished to enhanced farmers earnings and reduced government participation and subsidy in the oil palm production among other policies [34].This period which spanned from 1986 to 1993 witnessed an improvement in outputs of oil palm fruit and its derivatives. The trends in oil palm fruit and its derivatives production in this period was majorly influenced by the policies and programmes embedded in the structural adjustment programme (SAP) era. [7], [35]. From 1994 to 1999, privatization and commercialization policies was emphasized in the agricultural sector through public-private partnership agenda (PPP). This period was characterized by the emergence of mega agro enterprises in oil palm production. This period also witnessed a tremendous increase in the production of oil palm fruit and its derivatives in Nigeria. This period is

considered as the boom period in the post Sap era in oil palm fruit and its derivatives production in Nigeria. The notable feature of this period was the privatization and commercialization of state-owned palm oil companies. During this period, private investment in oil palm fruit production and processing increased significantly, but subsequent improvements in the sub-sector was significantly hampered by increasing macroeconomic fundamental volatility in the country. Between 1999 and 2007, series of President Initiatives were enunciated and targeted on specific agricultural commodities to upsurge food production in line with Vision 2020 agenda. From 2007 to 2010, the agricultural policies of the "seven point agenda" attempted to create a conducive macroeconomic environment to stimulate greater agricultural production [23].

From 2010 to 2015, the agricultural transformation agenda was birthed to strengthen private investment in the oil palm production. Following the implementation of these policies, the oil palm fruit and its derivative outputs continued to upsurge till 2009. From 2010 to 2015, the sub-units witnessed a general decline in outputs. As a response in 2015, the Central Bank of Nigeria (CBN) launched the Anchor Borrowers Programme (ABP), among other intervention schemes, to provide loans to majors, small and medium scale oil palm enterprises in the country. The overall policy objective of the programme was to meet the local demand for palm oil and its derivatives and at the same time improve local processing quality and standards. In addition, the (ABP) was aimed at protecting the foreign exchange reserves; create more jobs and enhance the entrepreneurial skills of Nigerians along the oil palm value chain. Also, in 2015, the CBN intentionally excluded palm kernel and palm oil products from being procured with foreign exchange from the Nigerian foreign exchange markets or platforms with the aim of boosting domestic production.

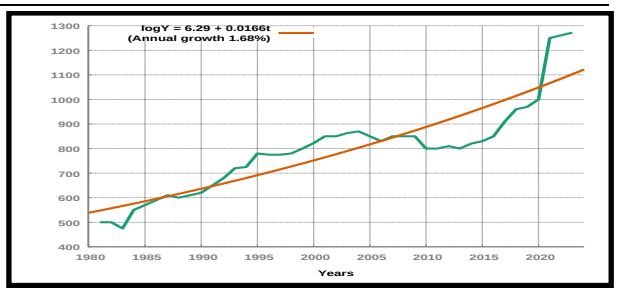

Fig. 1. Trends in Oil Palm Fruit in Nigeria (1981 - 2023)
Source: Own results.

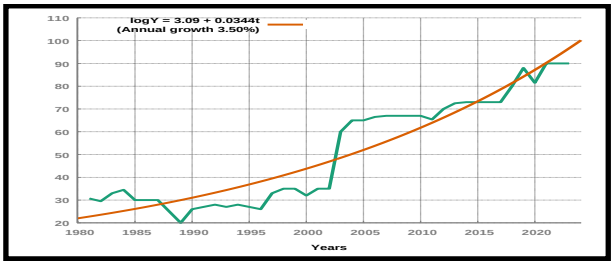

Fig. 2. Trends in Palm Kernel nut in Nigeria (1981 - 2023)
Source: Own results.

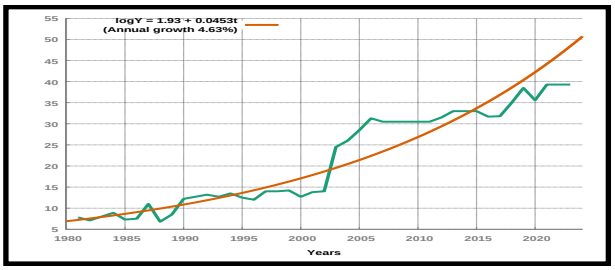

Fig. 3. Trends in Palm Kernel Oil in Nigeria (1981 - 2023)
Source: Own results.

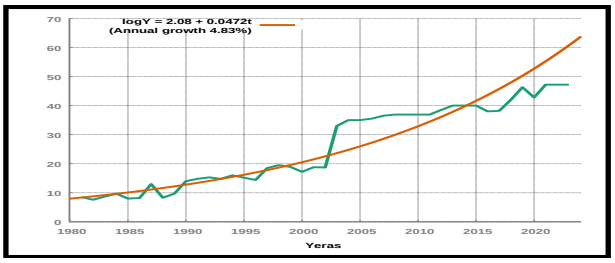

Fig. 4. Trends in Palm Kernel Meal in Nigeria (1981 - 2023)
Source: Own results.

Fig. 5. Trends in Palm Oil in Nigeria (1981 -2023)
Source: Own results.

These interventions yielded positive impact with insurgence of positive growth in outputs of oil palm fruit and its derivatives from 2017 to 2019 though inconsistent. In 2019, the CBN enunciated partnership agreement with the oil palm producing States to nurture the long term investments in oil palm production and its value chains. The partnership aimed at expanding the oil palm plantation by 100,000 hectares. Though the implementation of some of these policies are on-going, the global lock-down caused by the emergence of COVID-19 pandemic in 2020 and persistent increase in inflation rate slow down the activities in the sub-units from 2019 to 2021. In summary, the trend in oil palm fruit and its derivatives production has shown undulating behaviours from 1981 to 2023, which mostly were predicated by the implementation of programmes and policies targeted at increasing the capacity utilization in the sub-sector. However, the overall growth patterns have been uninspiring considering the domestic deficit imposed by production shortages.

Unit root test

The study used the Augmented Dickey Fuller [14] unit root test to verify the stationarity of series. The results as presented in Table 4 showed that inflation rate is stationary at level 1(0); while other series are shown to be stationary at the first difference 1(1) level. Given the unit root test results, some methods of testing the presence of the cointegration among series is inappropriate. For example, the Engle-Granger two step method and Johansen cointegration method required that all series must be stationary at the same level. Therefore, following the mixed level of stationarity of variables, it infers that the ARDL bound test technique is the most suitable to test for the presence of cointegration in the specified models compared to other methods. The justification of using ARDL bound test warrant the determination of the appropriate lag length for the specified series. This was conducted by using the information criteria. The next step was the estimation of the F-values of the ARDL models. The calculated ARDL F-values and the tabulated F-values representing the critical bound are presented in Table 5.

Table 4. ADF unit root tests for variables

Variable	ADF (constant)				ADF (constant and Trend)			
	Lag	**Level**	**1st Diff.**	**Decision**	**Lag**	**Level**	**1st Diff.**	**Decision**
Oil palm fruit (tons)	0	-0.2373	-6.1731	1(1)	0	-1.3403	-6.0980	1(1)
Palm kernel oil (tons)	0	-0.988673	-8.1273	1(1)	0	-3.0523	-8.0500	1(1)
Palm kernel (tons)	0	-0.39667	-6.3634	1(1)	0	-2.3567	-6.3159	1(1)
Palm oil (tons)	0	0.11179	-6.0389	1(1)	0	-2.3491	-6.0487	1(1)
Palm kernel meal (ton)	0	-1.12547	-8.2573	1(1)	0	-3.0497	-8.2299	1(1)
Inflation rate (%)	0	-3.5251**	-	1(0)	0	-3.4907*	-	1(0)
Exchange rate (%)	0	-1.94252	-5.5056	1(1)	0	-1.62125	-5.7462	1(1)
GDP/capita	0	-1.51375	-3.5098**	1(1)	0	0.139674	-3.7539**	1(1)
Domestic credit/GDP	0	-1.49744	-5.8990	1(1)	0	-3.05837	-5.8277	1(1)
Critical values								
1%	0	-3.5966	-3.6009		0	-4.1923	-4.1985	
5%	0	-2.9332	-2.9350		0	-3.5208	-3.5236	
10%	0	-2.6049	-2.6058		0	-3.1913	-3.1929	

Note: Asterisks*, ** and *** indicate 10%, 5% and 1% probability levels respectively. Variables in in natural logarithm. Table prepared by authors.

The results of the ARDL F-values with respect to oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and oil palm equations connote presence of cointegration. The estimated F-value for each of the estimated equation exceed the tabulate upper critical value bound at 5% probability level. The finding implies the presence of co-integration.

Following the establishment of co-integration among series, the long run and the ECM models were generated.

Table 5. Cointegration test (ARDL Bound Test; unrestricted intercept and no trend)

Equations	**Lag**	**F-Statistic**	**Decision**
F_{PFU}(PFU | INF_t, EXC_t, PER_t, CRE_t)	ARDL(1, 2, 0, 3, 2)	3.5153	Co-integration
F_{PKE} (PKE | X INF_t, EXC_t, PER_t, CRE_t)	ARDL(1, 4, 4, 1, 1)	5.5479	Co-integration
F_{PKO}(PKO | INF_t, EXC_t, PER_t, CRE_t)	ARDL(1, 4, 4, 0, 4)	4.0959	Co-integration
F_{PKM}(PKM | INF_t, EXC_t, PER_t, CRE_t)	ARDL(1, 4, 4, 0, 4)	5.5123	Co-integration
F_{PAO}(PAO | INF_t, EXC_t, PER_t, CRE_t)	ARDL(1, 3, 1, 3, 0)	3.6274	Co-integration
Critical Values (at K = 4 and Asymptotic: n=1,000)			
	Lower	Upper	
10%	2.20	3.09	
5%	2.56	3.49	
2.5%	2.88	3.87	
1%	3.29	4.37	

Note: Table arranged by authors and generated from data analysis from Eview 12.

The long run determinants of the ARDL model for oil palm fruit and its derivatives

The results in Table 6, 7 and 8 present the estimates of the long run ARDL bound test generated for oil palm fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil equations.

(a) Oil Palm Fruit

The long- run results for oil palm fruit equation revealed that inflation rate has a significant negative inelastic correlation with output of oil palm fruit in Nigeria. This connotes that as the inflation rate increases, the output of oil palm fruit shrinks. The possible reason for the result could be the fact that increase in inflation will trigger increase in the cost of factors of production and subsequently increase in the production cost. Farmers will intentionally cut down production following increase in production cost. The finding corroborate Hasibuan and Nurdelila [20] and Busari et al., [12].

The coefficient of the nominal exchange rate and per capita GDP exhibited a positive significant association with the oil palm fruit production in Nigeria. This implies that as these variables increase, the oil palm fruit production increases too. A unit increase in the nominal exchange rate and per capita income will result in a 0.089 unit and 0.011 unit increase in oil palm fruit production respectively.

Table 6. The ARDL long- run Coefficients for palm fruit and its derivatives

Variable	**Oil palm fruit**				**Palm kernel nut**			
	Coeff.	Std error	t-value	p-value	Coeff.	Std error	t-value	p-value
Constant	5.777	0.721	8.01***	0.000	5.320	1.668	3.190***	0.004
Inflation rate	-0.476	0.276	-1.73*	0.096	-0.315	0.121	-2.600**	0.016
Exchange rate	0.068	0.017	3.95***	0.004	0.262	0.209	1.250	0.224
GDP/capita	0.102	0.035	2.94***	0.007	-0.036	0.006	-5.737***	0.000
Domestic credit/GDP	0.563	0.113	4.98***	0.001	0.377	0.193	1.955*	0.056

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Variables are expressed in natural logarithm.

An increase in the nominal exchange rate (₦/$) means the devaluation of the Naira with respect to US dollars thereby constraining importation of oil palm products or derivatives. This policy has a tendency of boosting domestic production. Similarly increase in the per capita income will likely increases the citizen demand capacity. This in turn would stimulate domestic demand for oil palm fruit. The increase in demand would incentivize farmers to produce more. The result is in agreement with the submission of [26].

Similarly, the domestic credit has a significant stimulating impact on the production of the oil palm fruit in the country. This means that, as the domestic credit increases by a unit, the quantity of palm fruit produce increases proportionally by 0.624 unit. Nevertheless, credit is known to stimulate production at the farm level considering the fact that most farmers in the developing countries are resource-poor.

(b) Palm kernel

The long run relationship showed that inflation rate and per capita income have a significant negative relationships with the palm kernel production in the country. This means that as these variables increase, the quantity of palm kernel produce decreases. The relationship with respect to the per capita GDP could be attributed to the fact that, the palm kernel is not directly consumed by people but are demanded for by firms who use it as a raw material. On the other hand, the domestic credit has a significant positive relationship with the production of palm kernel in the country. This implies that increase in the domestic credit would upsurge palm kernel output in the country.

Table 7. The ARDL long- run Coefficients for palm fruit and its derivatives

	Palm Kernel Oil				**Palm kernel meal**			
Variable	Coeff.	Std error	t-value	p-value	Coeff.	Std error	t-value	p-value
Constant	3.563	1.582	2.252**	0.035	3.016	0.903	3.341***	0.003
Inflation rate	-0.143	0.044	-3.224***	0.005	-0.101	0.043	-2.353**	0.039
Exchange rate	0.474	0.251	1.885*	0.073	0.388	0.550	0.705	0.762
GDP/capita	-0.284	0.080	-3.552***	0.003	0.173	0.185	0.945	0.862
Domestic credit/GDP	-0.624	0.276	-2.260**	0.036	0.471	0.348	3.183***	0.007

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Variables are expressed in natural logarithm.

(c) Palm Kernel Oil

The long run coefficient of inflation, per capita income and the domestic credit showed negative significant relationships with the palm kernel oil production in Nigeria. For instance, a unit increase in inflation rate, the per capita GDP and domestic credit will cause about 0.143, 0.284 unit and 0.625 unit decrease in the palm kernel oil production respectively in the country. The conceivable reasons for the result is the fact that palm kernel oil is not a household consumable (neither a normal good) among Nigerians. It is mostly used by industries for secondary production and sometimes by the households for medicinal purposes as such increase in the household per capita income will not directly influence its production. Moreover, palm kernel oil is one of the secondary derivatives of oil palm fruit and so credit is mostly tight to the production of the primary product which is palm fruit instead. Another reason for the result could be the fact that the volume of credit in the economy that actually goes into agricultural sector is small and palm oil production being a tree crop is rarely considered by donors' banks for credit disbursement. This is due to its peculiar nature such as long gestation period, slow rate of returns and risks involved in its production among others. Also, increase in the rate of inflation would impose a higher cost during value addition and would likely restrain production volume. On the contrary, the slope coefficient of the exchange rate has a significant positive inelastic relationship with the palm kernel oil in the country.

Table 8. The ARDL long- run Coefficients for Palm oil

Variable	Coefficient	Standard error	t-value	p-value
Constant	3.6233	0.9472	3.8253	0.0007
Inflation rate	-0.5061	0.2765	-1.8307	0.0782
Exchange rate	0.2691	0.1166	2.3076	0.0318
GDP/capita	0.1739	0.0713	2.4382	0.0287
Domestic credit/GDP	0.4613	0.2010	2.2947	0.0426

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Variables are expressed in natural logarithm

Increase in the nominal exchange rate will impose constraints to importation and rather encourage domestic supply of palm kernel oil. The finding agrees with [26].

(d) Palm Kernel meal

The long run coefficients of inflation and domestic credit showed negative significant correlation with the palm kernel meal production in Nigeria. By implication, a 10% increase in the inflation rate and domestic credit will result to 1.01% and 4.71% decline in palm kernel meal production respectively. Similar reasons discussed above also are applied in this case. Palm kernel meal is a derivative and would not be a preferred area of credit investment among the value chains. Also, a rise in inflation rate is known to negatively impact on all stages of production. The finding agrees with [26].

(e) Palm oil

In the long run, the inflation rate has a significant negative relationship with the palm oil production in Nigeria. A unit increase in the inflation rate will decrease palm oil production by 0.506%. Increase in inflation rate causes increase in the general price level including the cost of production. This has a deteriorating effect on palm oil production in the long run. On the contrary, an increase in the nominal exchange rate relates positively to the palm oil production in the country. Besides, the per capita income and domestic credit impacted positively on palm oil production in the long run in Nigeria. Palm oil is consumed by almost all households in Nigeria. It is a normal good whose consumption or demand increases with an increase in household income. Also, palm oil production is a primary derivative from palm fruit processing with a good potential to attract credit sources due to its high demand and ability to yield persistent revenue. The finding is similar to the reports of [26], [20], [12].

The short run coefficients of ARDL model for oil palm fruit and its derivatives

The estimates presented in Table 9, 10 and 11 represent the short – run dynamics of the ARDL model for the specified equations. The ECM coefficients in each of the equation possessed the required sign and are statistically significant at the conventional level of probability. For instance, the oil palm fruit equation has the ECM coefficient of 0.163 which shows that about 16.30% of the short-run disequilibrium in the oil palm fruit production is adjusted towards the long-run equilibrium annually.

The interpretation is also applicable to other equations (i.e. palm kernel, palm kernel oil, palm kernel meal and oil palm production). The diagnostic tests for all the ECM equations indicated structural rigidity following the non-rejection of the null hypothesis concerning the RESET tests.

The Breusch-Pagan and the normality test of residuals upheld the null hypotheses of no presence of heteroscedasticity and the normality of residuals. This justifies the used of the Ordinary Least Squares estimation method. The Durbin-Watson values for all the equations revolved around 2.00 unit mark showing minimal autocorrelation of the error terms. However, as noted by Laurenceson and Chai [21], the ECM model is shown to be robust against residual serial autocorrelation. Hence, the presence of serial autocorrelation does not affect the stability of the short run estimates. This means that, the estimated ECM models have structural rigidity, absent of heteroscedasticity, normally distributed error terms and is stable over time. The estimated cumulative sum (CUSUM) statistics derived from the recursive estimation of the ARDL ECM models denote stability in the coefficients of the ARDL ECM within the time frame. The empirical results are discussed below:

(a) Oil palm fruit

The results for the short run model for the oil palm fruit equation revealed a statistically significant negative connection between inflation rate and the production of oil palm fruit in the short run in Nigeria.

This means that in the short run, as the rate of inflation keep on rising, the production of oil palm fruit shrinks correspondingly.

The result satisfies a *priori* expectation since increase in inflation will likely snowball to increase in production cost.

Table 9. The ARDL short - run coefficients for oil palm fruit and palm kernel outputs

Variable	Oil palm fruit				Palm kernel				
	Coeff.	Std error	t-value	p-value	Variable	Coeff.	Std error	t-value	p-value
D(INF)	-0.028	0.014	-1.998*	0.056	D(INF)	-0.053	0.033	-1.615	0.120
D(INF(-1))	-0.023	0.013	-1.703*	0.100	D(INF(-1))	-0.123	0.041	-2.996***	0.007
D(PER)	-0.063	0.088	-0.716	0.479	D(INF(-2))	-0.143	0.034	-4.191***	0.000
D(PER(-1))	-0.199	0.085	-2.329**	0.027	D(INF(-3))	-0.093	0.031	-2.978***	0.007
D(PER(-2))	-0.199	0.087	-2.286**	0.030	D(EXC)	0.039	0.051	0.751	0.460
D(CRE)	0.043	0.042	1.027	0.313	D(EXC(-1))	-0.167	0.062	-2.699**	0.013
D(CRE(-1))	0.104	0.043	2.404**	0.023	D(EXC(-2))	-0.317	0.071	-4.457***	0.000
ECM(-1)	-0.163	0.033	-4.999***	0.000	D(EXC(-3))	-0.147	0.065	-2.250**	0.034
					D(PER)	-0.410	0.135	-3.036***	0.006
					D(CRE)	0.008	0.091	0.084	0.934
					ECM(-1)	-0.425	0.067	-6.366***	0.000
R-Squared	0.400983				R-Squared	0.685624			
RESET test	1.496470(0.2322)				RESET test	1.055255(0.3028)			
Breusch-Pagan test	0.391673(0.9547)				Breusch-Pagan test	0.796596(0.6703)			
Normality of residual	2.945066(0.0710)				Normality of residual	1.641720(0.2175)			
CUSUM test	-1.0929 (0.2828)				CUSUM test	-0.813185(0.4223)			
Durbin-Watson	2.160306				Durbin-Watson	2.504841			
Selected Model	ARDL(1, 2, 0, 3, 2)				Selected Model	(1, 4, 4, 1, 1)			

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Note, variables are expressed in log. Difference. ARDL lag (1, 2, 0, 3, 2) for oil palm fruit and ARDL lag (1, 4, 4, 1, 1) for palm kernel.

Since most of the oil palm fruit producers are small-scale farmers and are resource poor, an increase in inflation in the short run might induce diversification and or alternative allocation of farm resources. The result also showed that the per capita income at lag 1 and lag 2 correlate negatively with the production of oil palm fruit in the short run. The finding also revealed a significant positive relationship between domestic credit and oil palm fruit production in the short run. Busari et al., [12] has reported similar result.

(b) Palm kernel

The short run result indicates that the lags of inflation rate and exchange rate (i.e. lags 1, 2, and 3) impacted negatively on the palm kernel production. Also, the per capita GDP at level also showed a negative correlation with the palm kernel production in the short run.

(c) Palm kernel oil

The short run coefficients of the palm kernel oil equation revealed that the lags of inflation rate (i.e. lag 1, 2 and 3) relate negatively with the palm kernel oil production. This means that the rise in the previous first, second and third year inflation rate decreased the output of palm kernel oil in the current year.

Similarly, the rise in the previous first, second and third year exchange rate decline the output of the palm kernel oil in the current year. However, the relationship between the current year exchange rate and palm kernel oil was found to be positive. In the same vein, the lag 2 and lag 3 of the domestic credit exhibited a positive influence on the palm kernel oil production.

(d) Palm kernel meal

The short run coefficients of the palm kernel meal equation showed that the lags of inflation and exchange rates (i.e. lag 1, 2 and 3) has a negative correlation with the palm kernel meal production. This means that the rise in the previous first, second and third year inflation and exchange rates decrease the output of palm kernel meal in the current year. On the contrary, the level value of the exchange rate has a positive significant impact on the current value of the palm kernel meal output. In the same vein, the lag 2 and lag 3 of the domestic credit exhibited a positive influence on the palm kernel meal production.

Table 10.The ARDL short - run coefficients for oil palm kernel oil and palm kernel meal

Variable	**Palm Kernel Oil**				**Palm kernel meal**				
	Coeff.	Std error	t-value	p-value	Variable	Coeff.	Std error	t-value	p-value
D(INF)	-0.011	0.047	-0.230	0.821	D(INF)	-0.024	0.045	-0.532	0.601
D(INF(-1))	-0.107	0.049	-2.182**	0.041	D(INF(-1))	-0.079	0.046	-1.739*	0.097
D(INF(-2))	-0.159	0.050	-3.166***	0.005	D(INF(-2))	-0.128	0.046	-2.757**	0.012
D(INF(-3))	-0.121	0.045	-2.695**	0.014	D(INF(-3))	-0.101	0.042	-2.419**	0.025
D(EXC)	0.220	0.075	2.936***	0.008	D(EXC)	0.176	0.071	2.485**	0.022
D(EXC(-1))	-0.231	0.087	-2.667**	0.014	D(EXC(-1))	-0.256	0.084	-3.031***	0.006
D(EXC(-2))	-0.313	0.097	-3.228***	0.004	D(EXC(-2))	-0.352	0.093	-3.799***	0.001
D(EXC(-3))	-0.253	0.092	-2.752**	0.012	D(EXC(-3))	-0.289	0.088	-3.296***	0.003
D(CRE)	0.108	0.137	0.786	0.441	D(CRE)	0.085	0.129	0.659	0.517
D(CRE(-1))	0.113	0.131	0.857	0.401	D(CRE(-1))	0.136	0.125	1.084	0.291
D(CRE(-2))	0.346	0.135	2.566**	0.018	D(CRE(-2))	0.355	0.126	2.826***	0.010
D(CRE(-3))	0.310	0.133	2.327**	0.030	D(CRE(-3))	0.295	0.126	2.340**	0.029
ECM(-1)	-0.556	0.101	-5.516***	0.000	ECM(-1)	-0.807	0.126	-6.399***	0.000
R-Squared	0.650000				R-Squared				
RESET test	0.917913 (0.3696)				RESET test	1.046187 (0.3080)			
Breusch-Pagan test	1.426479 (0.2180)				Breusch-Pagan test	1.961986 (0.0720)			
Normality of residual	10.339(0.0056)				Normality of residual	10.3555 (0.0056)			
CUSUM test	-1.01489 (0.3053)				CUSUM test	-1.028919 (0.2839)			
Durbin-Watson	2.607100				Durbin-Watson	2.512477			
Selected Model	ARDL(1, 4, 4, 0, 4)				Selected Model	ARDL(1, 4, 4, 0, 4)			

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Note, variables are expressed in log. difference. ARDL lag (1, 4, 4, 0, 4) for palm kernel oil and ARDL lag (1, 4, 4, 0, 4) for palm kernel meal.

(e) **Oil palm**

The short run results for oil palm equation revealed that the previous years of inflation rate (i.e. lag 1 and 2) has a significant negative connection with the current year production of palm oil. On the opposing side, the per capita GDP at lag 1 and 2 and the domestic credit at level has a significant positive relationship with the output of palm oil in the short run. The finding corroborates Busari et al.,[12], Akpan and Patrick [3].

Table 11. The ARDL short - run coefficients for oil palm oil output

Variable	Coeff.	Std error	t-value	p-value
D(INF)	-0.0270	0.0164	-1.6477	0.1110
D(INF(-1))	-0.0965	0.0166	-5.8153***	0.0000
D(INF(-2))	-0.0383	0.0160	-2.3941**	0.0239
D(EXC)	0.0298	0.0287	1.0373	0.3088
D(PER)	0.0809	0.1058	0.7647	0.4511
D(PER(-1))	0.3682	0.1085	3.3935***	0.0021
D(PER(-2))	0.3405	0.1199	2.8406***	0.0085
D(CRE)	0.0631	0.0192	3.2830***	0.0092
ECM(-1)	-0.1995	0.0414	-4.8252***	0.0000
R-Squared	0.572865			
RESET test	1.083053 (0.2887)			
Breusch-Pagan test	0.588831 (0.83120)			
Normality of residual	1.6975(0.42795)			
CUSUM test	-0.9829 (0.3333)			
Durbin-Watson	2.452571			

Note: The asterisks: ***, **, and * indicate 1%, 5% and 1% probability level respectively. Note, variables are expressed in natural logarithm. ARDL lag (1, 2, 0, 3, 2) selected based on decision criteria.

CONCLUSIONS

The study has shown that the oil palm fruit and its major derivatives growth rates are insufficient to restore the leading position Nigeria had previously in the global

production map. Considering the commodities production over a long time, the study has also revealed that their productions shrinks implying increasing supply deficit in the future. Given the rich value chain and the magnitude of jobs oil palm fruit and its derivative production is capable to generate; the country needs an urgent policy direction to boost production to the required level that will help to reduce poverty and unemployment. Focusing on the roles of macroeconomic variables as an alternative strategy to upsurge production in the sub-unit, the study found a significant relationship between some key macroeconomic fundamentals and the annual production of palm oil fruit, palm kernel, palm kernel oil, palm kernel meal and palm oil in both short and long run periods in Nigeria. The study confirmed the impact of inflation rate, nominal exchange rate, per capita income and domestic credit on the production of oil palm fruits and their derivatives in both short and long run periods. Based on this study, by improving the per capita income of Nigerians, an increase in the production of palm oil fruits, palm kernel oil, palm kernels, palm kernel meal and palm oil in the country can be achieved. Providing adequate credit facilities for the production of the primary product (oil palm fruit) and growing value chain are critical to increasing production in the sub sector. Furthermore, a reduced and stable inflation rate in the country is necessary and highly recommended for the survival of the sub-unit. Maintaining an appropriate exchange rate policy is also an important prerequisite for improving the production of palm oil fruits, palm kernel oil, palm kernels, palm kernel meal and palm oil in the country

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