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Research Paper

Determinants of Cashew Supply and Prospects for Diversification Into Agroindustry In Nigeria.

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ABSTRACT
Supply of cashew is lagging behind demand for it both in the domestic and foreign markets. While the agro-industry face serious problems in procuring the kinds and quantities of the commodity they want, producers of the commodity have remained poorly linked to agro-industrial sector and availability of the commodity as raw material to agro-industry remained inadequate and irregular. In this connection, the key determinants of domestic supply and the prospects for diversification of increased supply of cashew to domestic agro-industry for manufacturing high value products of the commodity was examined. Time series secondary mainly collected from National Bureau of Statistics were used. Data were analysed using simultaneous equation regression model. The key determinants of cashew supply in Nigeria. were price of cashew, price of complementary crop, rural wage rate, government investment in agriculture and interest rate charged on agricultural loans. Among the significant variables, rural wage rate has significant effect on cashew supply with coefficient of -0.38 at $p<0.05$. Government investment on agriculture with coefficient of 0.06, has significant effect on cashew supply at $p<0.05$. Interest rate on agricultural loans, with coefficient of -0.44, has significant effect on cashew supply at $p < 0.05$. Policy strategies to expand supply of cashew and enhance diversification to agro-industry include improved infrastructure that will ensure effective market linkages and maintaining stable macroeconomic policy environment.

Keywords: *Cashew supply, Determinants, Agro-industry, Diversification, Simultaneous equation model.*
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I. Introduction

Production of cashew has contributed immensely to the Nigerian economy in terms of exports and also domestically as a source of raw materials to agro-based industries. Over the period 1980 to 2017, Nigeria's annual production of cashew averages 255.28thousand tonnes. This is only 10 per cent of the world's average production. Exports recorded an annual average of US$31.19million while contribution to gross domestic product increased more than fifteen folds (FAO database accessed 2019). It is an important industrial raw material with rising demand in the confectioneries, food, and beverage industries. It is also important in the conservation of environment. Industrial demand for the commodity is also increasing in the international markets. In 2007, about 50 per cent of Nigeria's production of cashew representing about 30,510 metric tones was exported at a value of US$22.27 million. Nigerian producers currently supply US and UK with cashew kernels. The commodity started generating revenue for the country as far back as 197,0 but it appeared substantially in the export basket in1986 at the implementation of structural adjustment programme in the country(CBN,2017).

In recognition of the economic importance of cashew and other agricultural commodities, various efforts were directed at promoting processing into high value products and export diversification through increased production. The Nigerian government had expended enormous efforts in policy design and implementation, which were directed toward provision of incentives for stakeholders in the agricultural sector to expand the supply of agricultural raw materials including cashew to meet an increasing demand of an expanding industrial sector. The efforts were also intended to enhance non-oil export earnings. Among these policies was reduction or elimination of export restrictions or taxes, and exchange rate devaluation, which was oriented to reduce overvaluation of the real exchange rate. Commodity marketing boards were dissolved to create price

incentives to farmers. Apart from the dramatic structural adjustment programmes implemented during the second half of the eighties, the government at various times had implemented some programmes and initiatives on agricultural commodities in order to increase production and processing of agricultural export commodities, increase their foreign exchange earning capacity and further diversify the country's export base and sources of foreign exchange earnings. In the initiatives, cashew was given considerable attention so as to profitably tap its potentials. To complement the efforts of the government international agencies such as USAID, Non-Governmental Organizations and professional groupings have implemented additional programs to develop the production and the export of cashew nuts from Nigeria

The efforts included National Accelerated Industrial Crops Production Program (NAICPP). The government commenced this programme in 1994, in an effort to arrest the declining productivity of industrial crops and to restore the previous position of Nigeria in commodity export trade. The aim was to increase the production of ten industrial crops including cashew. The main thrust of the project was to sensitize farmers to increase the productivity of the crop by using improved planting materials, through an application of improved agronomic practices, use of appropriate agro-chemicals etc. Improved seedlings were produced by Tree Crop Units and the Small Holder Management Unit (SMU) of the States Ministries of Agriculture and other implementing agencies. The improved seedlings were distributed to farmers for new planting and for rehabilitation purposes at 50 per cent subsidy. Since the implementation of the program, a total of 1.1 million cashew seedlings, with a value of about US $50,000, have been distributed to farmers and about 8.881 hectares of cashew holdings have been achieved.

Another programme called Rural Transformation Programme was intended to develop the rural economy through economic empowerment of the rural population. Development of cash and food crops, including cashew, as well as n industries were central to this program. Also, another programme called massive Plants/Nurseries was implemented by the Federal Government by setting aside substantial amount of money for massive multiplication programme for plant materials like nurseries, seeds and seedlings of major tree, cash and food crops, as well as for their acquisition and distribution to farmers at subsidized prices (CBN 2017)

More importantly, Cashew Development Program under Tree Crop Development Programme was aimed at rehabilitating and resuscitating moribund plantations. Other objectives of the programme included training of extension staff and farmers; provision and distribution of inputs such as seedlings, agro-chemical etc; quality control at primary (farm) level; and strengthening the management information system in the cashew sector. The programmeswas implemented over a period of four years from 2001 to 2004. It was based on establishment of 2,321 hectares of cashew plantation; strengthening capacity of Cocoa Research Institute of Nigeria (CRIN) to allow development and production of high yielding, disease resistant, cashew varieties for distribution to farmers, with a view to double the total annual output.

Similarly, assistance was obtained through Food and Agriculture (FAO) Technical Co-operation Program (TCP) for Tree Crops. FAO supported the agricultural development of Nigeria through sponsorship of a TCP on major tree crops, including cashew. Areas of assistance included seed multiplication, germplasm conservation, and capacity building. United States Agency for international Development (USAID) also implemented Tree Crop Program. USAID has chosen 5 agricultural products with export potential in order to assist in the agricultural development in the country. The criteria used for the selection of these products comprised their demand and export market trends, their supply constraints and potential, their competitiveness situation, the environmental impact of their cultivation and the employment generation, and foreign exchange earning capacity. USAID assisted in activities related to product and market development and the improvement of quality. The five products selected are the Gum Arabic, Sesame seed, Ginger Cashew nut and Leather products.

Another step taken by the Federal Government was the Establishment of Three Commodity Development and Marketing Companies in 2004 in order to revitalize the agriculture and to bring it back to its past performance, by addressing the present near collapse of the commodity marketing system, especially in terms of its effect on welfare of the farmers. Consequently, the following three multi-commodity and marketing companies have been established: Arable Crops Development and Marketing Company, which comprises five groups of products, including cashew citrus, mangoes and breadfruits that are grouped together, Tree Crops Development and Marketing Company, as well as Livestock and Fisheries Development and Marketing Company. The companies were owned and managed by farmers, with equity shares of USD500,000 to be divided into 60 per cent and 40 per cent equity shares between farmers and the Federal government, respectively. However, the Federal government share is expected to be divested within 5 years. The functions of the companies included: Promoting the production of tree crops through the production and distribution of inputs, including seeds/seedlings, fertilizer, and other agro-chemicals and farm machinery; Promoting and funding agricultural research and extension services; Promoting the development of rural infrastructure; Providing market information services; Undertaking buying and selling of agricultural produce; Promote processing, preservation, storage and distributing agricultural produce etc.

In recent time, efforts of government at improving export earnings included implementation of project made in Nigeria for export(MINE). This was aimed at unlocking the potential of special economic zones based on comparative advantage of each free trade zone that were set up across the country to increase export earnings. Many other efforts included strengthening the bank of agriculture, Bank of Industry and the Small and Medium Enterprises Development Agency of Nigeria(SMEDAN), as well as Anchors' Borrowers Scheme of the Central Bank of Nigeria, to provide easy access to loans to micro, small and medium enterprises at moderate interest rate, rehabilitation of roads and provision of power in key economic clusters and markets in Nigeria (CBN 2017).

However, the efforts have not yielded appreciable dividend. Supply of cashew is lagging behind rising demand for it both in the domestic and foreign markets. While the agro-industry face serious problems in procuring the kinds and quantities of the commodity they want, producers of the commodity have remained poorly linked to agro-industrial sector and availability of the commodities as raw material to agro-industry remained inadequate and irregular. Growth potentials of the commodity are far from being fully exploited in Nigeria while many existing cashew trees in the country have reached the end of their productive cycles. Majority of export from Nigeria is still in form of raw nut without processing, thereby losing substantial income.

In this regard some questions may be asked, are the factors, which historically helped to increase crop production in the past still present or operative? How responsive are farmers supply of the commodity to price increases? What are the effects of changes in real exchange rate, interest rate, wage rate, and government capital investment in agriculture on the supply of cashew? What are the constraints to expanded supply of the commodity? How can the constraints be removed? Thus, the major focus of this paper is to provide answers to these issues. The remaining sections of the paper are organized as follows. Section two presented theoretical framework Section three discussed methodology. Section four presented empirical results, while section five presented policy implications and conclusions

II. Theoretical Framework

Changes in patterns of supply and demand operate through price mechanism. Relative price changes reflect changes either on the supply side or on the demand side. Increase in the demand will be reflected in an increase in price, necessitating changes in supply and vice-versa (Mamingi, 1996, 19997). It is known from theory and practice that such a response may be due to employment of resources depending on price rise or decrease, modification of scale or farm size, through technological advance, access to credit, market information and price certainty (Olayide and Heady, 1982). According to Mamingi, (2019) and Olayide and Heady (1982), important factors that will influence supply are price of commodity, prices of all other commodities, the price of factors of production, and the state of technology.

More importantly, macroeconomic policy climate dictates the environment in which agricultural activities are carried out. The macroeconomic policies comprise fiscal, monetary, trade and budgetary policies that govern macro-prices. These policies usually have major impact on profitability of the agricultural system and the welfare of farmers as they affect the flow of funds to the sector in terms of budgetary allocation, credit subsidies and taxes. Some elements of macroeconomic policy constraints, such as high exchange rate, high interest rate, poor trade policy, and policy inconsistencies have been perceived as causing high cost of production in the Nigerian agriculture (Manyong et al., 2003). This effect manifest in two forms. One is the high cost of investment and the other is the high cost of acquiring all necessary inputs required in the agricultural sector of the economy. High exchange rate and inflation may have adverse effect on the prices of domestic inputs such as transports, electricity, and infrastructure maintenance and, to some extent, labour. This will lead to high cost of production. The high cost of production may limit commercialization and investment in production of cashew, which ultimately may reduce the level of output. Macroeconomic policy can affect farm profitability through control over output and input prices. Also, it exerts control on wages and interest rates, institutional arrangements such as access to credit, inputs, information and actions that affect profitability and productivity (Jaeger, 2018).

Construction of transport infrastructure will lower transport costs, reduce input prices and raise output prices at the farm-gate. Extension services can be seen as reducing the costs of information. Rural credit institutions make credit available at lower costs to farmers and research attempts to raise profits by way of technological changes. Nominal exchange rates set an upper bound on the prices paid to farmers for exported commodities. In the same way, exchange rates togetherwith import taxes and other restrictions set prices of inputs and agricultural imports, which compete with domestic production. (Yiheyis, 2014; Kamin, 2006) Price stability and equilibrium exchange rates are essential macroeconomic conditions for strong international competitiveness (Kannapiran and Fleming, 2021). Also, high levels of real wages and rigidity in the labour market as well a high real exchange rate are important macroeconomic factors influencing competitiveness of major agricultural commodities.

Effects of government expenditure on agriculture can be traced from two perspectives. First, is the direct effect on agricultural output. This output effect refers to the possibility of having increases in agricultural output as farmers begin to have access to improved technology and requisite infrastructure, which are financed by public funds (Olomola, 1998). Second, is the effect on farm input demand. Government investment in agriculture could stimulate the demand for agricultural inputs directly or indirectly. The direct effect on input demand manifests in farmers' use of inputs whose procurement internally or from external sources, forms a component of expenditure on agriculture. The effect is indirect when the demand for such inputs is affected by projects or programmes financed by the public funds. There is a link between government expenditure on agriculture and some critical inputs associated with farming in Nigeria. Expenditures on some of them are direct components of government expenditure on agriculture. For instance, expenditures on fertilizer, improved seeds and irrigation represent a considerable proportion of government expenditure on agriculture. Agriculture and land use can be enhanced with the availability of fertilizer, improved seeds and irrigation water. Thus, government expenditure on agriculture can affect not only the supply of farm products but also the quality and quantity demanded of farm inputs. By and large, these policy measures are aimed at reducing costs of production in order to raise profits and output.

III. Methodology

3.1 Analytical Framework and Model

On the basis of supply theory, the empirical model for analysing the supply of cashew is expressed as:

(3.1) $Q^{AX} = f(P^{AX}, P^{AN}, P^{AM}, w, k, h, Zt, t)$

Where Q^{AX} is the supply of agricultural exportables, P^{AX} is the price of agricultural exportable, P^{AN} is the price of agricultural non-tradables, P^{AM} is the price of agricultural importable, w, is the wage rate, k is capital stock in agriculture, h is an index of weather (average rainfall) and t is an index of technical change.

The supply function in (3.1) can be normalized by any one of the four prices to express the others in real form. Here, if it is chosen to normalise all prices and wages by P^{AM}, the supply function becomes

(3.2) $Q^{AX} = f(P^{AX}, P^{AN}, w, k, h, t)$

Where $P^{AX} = P^{AX} / P^{AM}$, $P^{AN} = P^{AN} / P^{AM}$, and $w = w / P^{AM}$

Policy variable is incorporated into the supply function as shifter variable (Fankel, 1996, Kwanashie et al., 1998). Government expenditure on agriculture is incorporated into the farmers' output supply as a shifter variable. On the basis of profit maximization theory, output supply is a function of output and input prices. Thus, the supply function in (3.2) becomes

(3.3) $Q^{AX} = f(P^{AX}, P^{AN}, w, k, h, Zt, t)$

WhereZt represents policy variables, which included interest rate (the cost of credit), real exchange rate, and government capital investment in agriculture. An increase in the rate of interest would induce a reduction in credit demand, as cost of credit becomes more expensive, and this would reduce level of output and vice versa. Thus, interest rate on agricultural loans can be a constraining factor. The price of imported input such as fertilizer can also be incorporated into the supply function as a constraining factor.

The supply function in (3.3) becomes:

(3.4) $QAX = f(P^{AX}, P^{AN}, w, k, h, Zt, P^{f} t)$

Where P^{f} is the price of imported input (fertilizer). The supply function in (3.4) contains price of agricultural non-tradable and wage rate as endogenous variables. Each of these is explicitly derived as follows. With the assumption of market equilibrium, supply and demand theory suggests that the market prices of agricultural non-tradeables adjust to clear the domestic market.

That is:

(3.5) $Q^{AN} = f(P^{AN}, P^{AX}, w, k, h, Zt, t) = D^{AN} = f(P^{AN}, P^{AX}, P^{N}, E)$

Where Q^{AN} is the supply function of agricultural non-tradeable, D^{AN} is the domestic demand function for agricultural non-tradeables; P^{N} is the price of non-agricultural goods and E is total domestic expenditure. Both P^{N} and E can also be normalized by P^{AM}

From (3.5) price function for the agricultural non-tradeables is derived as:

(3.6) $P^{AN} = f(P^{AX}, P^{N}, w, E, k, h, t)$

$P^{N}$is the price of non-agricultural output (which can be expressed as other services' component of Consumer Price Index (CPI). This price is largely endogenously determined by their prevailing supply and demand conditions. On the basis of market equilibrium, the market for the non-agricultural good can be represented by:

(3.7) $Q^{N} = f(P^{N}, w, t) = D^{N} = f(P^{N}, P^{AN}, P^{AX}, E)$

Where the left-hand in (3.7) represents the domestic supply of non- agricultural goods and the right-hand their demand. Agricultural sector competes with the rest of the economy for allocation of labour. On the basis of an assumption that all factors of production in agriculture, with the exception of labour, are sector-specific, the

prices of agricultural goods do not directly affect the supply of non-agricultural goods. The effect of agricultural good prices on Q^N is indirect through their effect on the wage rate, W.
From (3.7) it follows that, .
(3.8) $P^N = f(P^{AN}, P^{AX}, w, E, t)$
Wage rate (the price of labour) is endogenous, reflecting the fact that there is competition for labour between agriculture and the non-agricultural sector of the economy. Wage rate is a function of the price level. The wage function is specified as:
(3.9) $W = f(P^{AN}, P^{AX}, P^N, W_M, t)$
Where Wis the wage rate in the agricultural sector W_M is the minimum urban wage (also normalised by P^{AM}). Production of agricultural exportable could compete with agricultural importable and agricultural non-tradables for sector-specific resources. In the labour market, there could be competition for labour, which may be reflected in the wage rate. A major interaction between agricultural sub-sector and the non- agricultural sub-sector of the economy take place through the level of real wage (Enwere, 1998). An expansion of non-agricultural sector could cause greater demand for labour and for agricultural non-tradable goods and vice versa. This could lead to higher wages and higher prices of agricultural non- tradable, which in turn may cause a fall in the production of agricultural exportables and vice versa. Higher wages could reduce competitiveness of agricultural exportables. Higher prices for agricultural non-tradables could induce a shifting of sector specific agricultural resources from production of exportables to the production of agricultural non-tradables, and vice versa.

Minimum urban wage could affect the wage rate in the agricultural sector on which it is binding and enforced. It has been shown in Nigeria, Malawi, Tanzania and South Africa that adjustments of the minimum wage convey important information for wage setting in all sectors of the economy (Enwere, 1998; Lopez, 1997). The aggregate real expenditure is also affected by both policy and external variable. An increase of fiscal expenditure could cause a rise in total domestic expenditures, which in turn may lead to higher prices of non-tradeables and to wage increase. This could reduce supply of tradable crops. On the other hand, capital expenditure in the form of publicinvestment contributes to output growth by making available the basic infrastructures that are crucial for direct productive activity. This category of publicspending complements private investment and thus produces a positive effect on output growth (Lopez et al., 1997). A significant proportion of government recurrent expenditure goes to various categories of income earners in form of subsidies and transfers. Therefore, transfers that aid the development and maintenance of public goods such as infrastructures are fundamental to productive activity. In contrast, transfers and subsidies that lead to distortion of prices in the economy will tend to have a negative effect of direct productive activity. In consistent with this, the function for domestic expenditure is expressed as follows:
(3.10) $E = g(P^{AX}, q, W_M, E^g, t)$
Where q is the external term of trade of the country, and$E^g$is government expenditure on agriculture normalised byP^M. From the foregoing, the system of simultaneous equation model for the empirical analysis of supply of cashew is articulated and consists of six behavioural equations. These can be explicitly expressed as follows:
(i)
$Q^{AX} = \alpha 1 + \alpha 2P^{AX} + \alpha 3P^{AN} + \alpha 4P^M + \alpha 5Zt + \alpha 6D^d + \alpha 7Lt + \alpha 8w + \alpha 9k + \alpha 10h + \alpha 11t$
(ii) $P^{AX} = \mu 1 + \mu 2Zt + \mu 3w + \mu 4Q^{AX} - 1$
(iii) $P^{AN} = \infty 1 + \infty 2P^{AX} + \infty 3P^N + \infty 4W + \infty 5E + \infty 6K + \infty 7h + \infty 8t$
(iv) $P^N = \lambda 1 + \lambda 2P^{AN} + \lambda 3P^{AX} + \lambda 4W + \lambda 5E + \lambda 6t$
(v) $W = \delta 1 + \delta 2P^{AN} + \delta 3P^{AX} + \delta 4P^N + \delta 5WM + \delta 6t$
(vi) $E = \theta 1 + \theta 2P^{AX} + \theta 3q + \theta 4WM + \theta 5E^g + \theta 6t$
Where all variables in the model are as earlier defined.

3.2 Nature and sources of data

Largely, the study was based on secondary data. In terms of scope, time series data extended from 1970 to 2021. The sources of data included various issues of Central Banks of Nigeria's (CBN) Annual Report and Statement of Accounts, Statistical Bulletin as well as National Bureau of statistics' (NBS) Annual Abstracts of Statistics. Other sources of data were International Financial Statistics, the United Nations Trade Year Book, relevant studies such as ENWERE DIKE (1998): Investment and Labour Flows in Nigerian Agriculture Under Structural Adjustment, CBN(2017): Impact of the Structural Adjustment Programme on Nigerian Agriculture and Rural Life. The data included output quantity (QAX) and price of cashew (PAX). Price of agricultural non-tradable (PAN) was proxied by the price of yam because yam is mostly produced and consumed domestically. Data on indicators of macroeconomic policies included macro-prices such as real exchange rate (RER), interest rate (IRA), and rural wage rate (W) as well as government expenditure in agriculture (Eg). Price of non-

agricultural good was represented by other services component of the consumer price index while total domestic expenditure was estimated as the sum of private and public consumption and investment expenditures

3.3 Method of analysis

The initial step in the estimation procedure involved identification of each equation of the specified model. Tracing identification of each equation of the model indicated that the model was over-identified. This prompted the choice of two stage least squares estimation technique among simultaneous equations techniques. The estimation procedure also consists of an approach designed to capture the long run relationship between the dependent and the independent variables, while avoiding spurious inferences. This is the co-integration and error correction technique, which has received prominent attention in the literatures (Adams, 1992; Engle and Granger, 1987; Tambi, 1999). Working throughout in logarithms, the first attempt involved determination of the order of integration of the time series data. The augmented Dickey Fuller unit root test was used in testing for stationarity of variables. The next procedure was a test for cointegration between the explained and the explanatory variables. The Johansen cointegration test was applied. The final step was the estimation of the error correction representation for the regression. The estimation of error correction model was based on existence of cointegration between the dependent variable and the independent variables. For the error correction model, an over-parameterised regression was first run for the system of equations of the model before the parsimonious one was gotten. The parsimonious regression was based on the t-value and theoretical expectations of the variables. The determinants of supply cashew were determined by the sizes and signs of elasticity coefficients with respect to each variable since a double logarithm form of the model was estimated.

IV. Empirical Results

4.1 Key Determinants of Domestic Supply of Cashew

A summary of the regression results for cashew is displayed in Table 4.1. The Table indicates that five variables are significant determinants of cashew supply. These are price of cashew, price of agricultural non-tradeable (yam price), wage rate, government capital expenditure in agriculture, and interest rate on agricultural loans. Estimated coefficient of the price of cashew was positive and significant at 5 percent.

The magnitude, 0.25, showed that a 10 percent increase in price of cashew will bring about an increase of 2.5 percent in supply of cashew. An attractive price would induce profit and investment in production of the crops, which would result in increased supply. The estimated coefficient of yam price is positive and the magnitude of the coefficient is 0.97. The magnitude implies that a 10percent increase in yam price will result in 9.7 per cent increase in cashew supply indicating that cashew and yam are complements. It reflects a mixed cropping pattern commonly practiced by the smallholder farmers.

Table 4.1: Regression Results for Cashew (Variables in Natural Logarithms)

Dependent Variable	Constant	PCSWR t-1	PCASR t-1	PRBR t-1	PAN t-1	VCSWEXR t-1	W	CEAR	IRA	RER	DU	QCSWA $_t$ t-1	VQCSWR
VQCSWR	0.004 (0.09)	0.25* (2.34)	-0.37 (-0.94)	-0.25 (-0.74)	0.97* (2.00)	0.04 (0.40)	-0.38* (-2.16)	0.06* (2.11)	-0.44* (-2.01)		0.37 (0.61)		
PCSWR	-0.02 (-0.09)				0.24 (0.98)			0.21* (2.86)				-0.13 (-0.83)	0.60 (1.53)
VCSWEXR	-0.09 (-0.073)						-1.19** (-3.40)	0.46** (2.65)	-0.30 (-0.59)	1.37* (4.58)			2.0** (4.36)
PAN	0.04 (0.41)	0.30 (1.01)	0.78* (2.11)	0.34 (1.48)			0.28 (0.80)			-0.07 (-0.64)			
PN	0.009 (0.07)	-0.01 (-0.03)			0.17 (0.51)		0.03 (0.09)						
W	0.04 (0.34)	-0.24 (-0.47)			-0.10 (-0.41)								
ER	0.004 (0.08)	-0.22** (-2.61)		0.06 (0.66)									

Note: The variables in parentheses are t-statistics. **means significant at 1 per cent * means significant at 5 per cent.

Source: Computer Print-out (Author's Estimate).

Table 4.1 Continued: Regression Results for Cashew (Variables in Natural Logarithms)

Dependent Variable	Q	H	YTRADI	PN_{t-1}	$PPKNR_{t-1}$	WMR	PSCR	EGR	PCTONR	ECM_{t-1}	Adj R^2	DW
VQCSWR										0.73* (1.87)	0.71	1.81
PCSWR		-1.02* (-2.64)								-1.15* (-1.79)	0.58	1.76
VCSWEXR	0.22 (1.13)		0.75 (1.19)							-0.70* (-4.58)	0.77	1.63
PAN				0.71 (1.07)	0.26 (1.14)					-1.43* (-1.89)	0.67	1.62

PN	0.13 (0.55)				0.29 (1.20)		0.71 (1.23)			0.91* (1.91)	0.46	1.67
W				-0.71 (-1.14)	-0.11 (-0.71)	0.51* (2.59)				-0.76* (-2.17)	0.47	1.81
ER						0.06 (0.57)		0.13* (2.26)	0.06 (1.32)	-1.29* (-3.20)	0.49	2.15

Note: The variables in parentheses are t-statistics. **means significant at 1 per cent * means significant at 5 per cent. DW = Durbin-Watson statistics. Adj. R^2 = Adjusted R^2
Source: Computer Print-out (Author's Estimate).

The coefficient of wage rate was negative and significant at 5 percent level. The magnitude of -0.38 implies that a 10 percent increase in rural wage rate will lead 3.8 percent decrease in supply of cashew and vice versa. The negative sign indicates that higher wages would lead to higher cost of production which ultimately could lead to a fall in the supply of cashew. The coefficient of government expenditure in agriculture was positive and significant at 5 percent level. The magnitude, which was 0.06, implies that a 10 percent increase in capital expenditure in agriculture would lead to 0.6 percent increase in supply of cashew. This response is very negligible. The coefficient of interest rate on agricultural loans was negative as expected. It was significant at 5 percent. The magnitude, 0.44, implies a 10 per cent increase in interest rate would lead to 4.4 per cent decline in cashew supply and vice versa. The negative sign is indicative of the fact that high interest rates would restrict access to credit to farmers and thereby would add to the harmful effects on investments in cashew cultivation. R^2 figure of 0.71 indicates that the independent variables explain 71 per cent of variations in cashew supply.

4.2 Effects of Significant Determinants of Cashew Supply.

The estimated elasticities of supply of cashew with respect to policy instruments are shown by the results in Table 4.2. The Table reveals that the elasticity coefficients are generally low. Nevertheless, one can gain some insight into the effect of the policy instruments on supply of the cashew, and draw important inferences. The elasticity of supply of cashew with respect to changes in capital expenditure on agriculture (CEAR) is significant and has positive sign. The positive sign implies that government capital investment in agriculture would induce positive effect but the effect is very weak. Weaknesses in government expenditure policy as reflected by the observed instability in the policy instruments as demonstrated in Table 4.3 would seriously constrain supply of commodities by the farmers. For instance, it can be observed in Table 4.3 that only a small proportion of public sector investment spending goes to agriculture. The relatively small share has the potential to create serious bias against agriculture in the provision of basic social and economic infrastructures that are required in the rural areas. This could constrain direct productive activities, reduce profit and discourage investment. When direct productive activities are constrained and new investment are discouraged it could result into low response of commodity supply to the policy instrument.

Public sector investment in agriculture could also be rendered ineffective by long action lags and long delay in release of funds. Similarly, leakages of agricultural funds, arising from diversion to unintended targets could render capital expenditure on agriculture ineffective, and thus would not translate to agricultural capital good within the budget year. A substantial amount of financial resources had been on agriculture ineffective, and thus would not translate to agricultural capital good earmarked for agriculture on paper in Nigeria within the last decades. The important issue is the extent to which these actually go for what they are meant. The leakages in the sector could be very high. This may contribute to low response of farmer's supply of cashew and other agricultural products to capital expenditure in agriculture by the government. Supply response of cashew to interest rate (IRA) is significant and the coefficient has negative sign. The negative sign implies negative effect of interest rate. The negative effect could be attributed to the fact that high rate of interest rates makes cost of borrowing very high and unattractive to farmers. The supply response of the commodity to wage rate is significant and the coefficient has negative sign meaning that the higher the wage rate the higher would be the cost of production which would induce a fall in supply of the commodity. Regarding dummy variable that represented structural adjustment policy, the estimated coefficient had expected positive sign but it is insignificant.

Table 4.2 Elasticities of Cashew Supply with respect to Policy Variables and its Own price

Crop	CEAR	IRA	W	DU	Own Price
Cashew	0.06*	0.44*	-0.38*	0.37	0.25*

*means significant at 5percent

Supply elasticity of cashew with respect to changes in its own price as depicted by Table 4.2 is less than unity. The magnitude 0.25 shows that a unit change in price of cashew will result into less than a proportionate change in supply of cashew. Thus, for cashew it can be inferred that an attractive price would induce increased production and supply of the commodity, but would result in negligible increase in supply of

the commodity. The instability in policies, high and rising prices of inputs and the near collapse of infrastructure in the rural areas creates the environment that tend to confound responses of the commodity to favourable prices. This is illustrated further the results presented in Table 4.3.

4.3 Trends of Major Macroeconomic Policy Indicators and Prices of Major Farm Inputs in Nigeria

The results in table 4.3 revealed a widening differential between urban and rural wage rate over time. This could result into influx of labour from rural to urban areas which could reduce the amount of labour available in the agricultural sector. This way, rural wage rate would rise, which would ultimately cause a reduction in production of cashew. The reduction in the production of the commodity will eventually lead to reduction in availability and diversification of the commodity as raw materials to agro-industry.

Evidently, unstable pattern and high level of interest rates on loans had emerged from liberalization of financial market as demonstratedby Table 4.3. This would tend to discourage investment in the primary sector of the economy while encouraging tertiary sector activities. It should be noted that distributive operators who deal mainly in imported finished goods dominate the tertiary sector. They have a short turnaround time, which often does not exceed three months. For primary sector operator, which is dominated by farmers, average turnaround time could be much higher if the other constraints to primary sector operations were taken into account. The implication is that the effective lending rate will be more affordable by traders inthe tertiary sector compared to the smallholder farmers and processors who dominate the primary agricultural sector. Moreover, a rising lending rate as observed in the Table would make locally produced cashew less competitive in the market. Bearing in mind that the Nigerian primary sector is dominated by agriculture, which is basically the small scale subsistent type and given the low literacy rate in the rural areas as well as bureaucratic lending procedure of banks, smallholder cashew farmers and processors would face formidable problem in patronizing the formal financial institutions for loans. The high interest rate charges has almost permanently shut the door against farm loans as the returns to farm enterprises could hardly cover the cost of such loans. The farmers also have to contend with a longer gestation period.

Table 4.3: Trends of Major Macroeconomic Policy Indicators and Prices of Major Farm Inputs in Nigeria, 1970-2021.

Macro-Economic Policy Indicators	1981-85		1986-90		1991-95		1996-2000		2001-2007		2008-2012		2013-2017	2018-2021
	Mean	CV%	Mean	CV%	Mean	CV%	Mean	CV%	Mean	CV%	Mean		Mean	Mean
Interest rate: lending (%)	11.60	9.22	20.22	30.35	22.42	22.43	22.85	11.37	24.58	19.01	22.01		27.01	28.87
Exchange rate(₦ to $)	0.73	14.46	5.20	47.87	30.70	95.40	96.70	27.17	116	3.45	145.8		213.7	342.9
Monthly Urban Wage	155	10.0	226.65	28.86	1165.25	39.62	4524.63	65.62	7500	10.0				
Monthly Rural Wage	121.44	45.10	177.04	31.13	874.83	26.55	3000.63	43.78	3960	50.10				
Expenditure in Agriculture (billion naira)	616.26	48.65	1082.36	67.40	2605.84	43.88	9837.16	31.57	41930.97	58.61	38.112		40.79	68.28
Share of Agriculture in Total Expenditure	4.70	62.69	3.03	30.32	1.77	18.01	1.90	21.65	4.03	63.42	0.0136		0.0102	0.0091
Share of Agriculture in Total Capital Expenditure (%)	12.55	-	10.83	-	7.67	-	5.05	-	8.93	-	1.36		1.03	0.91
Nature of Primary Roads in Nigeria														
	1994			1995				1996		2004				
Paved Primary Roads as % of Total Roads	21.3			18.8				18.8		30.9				
Unpaved Primary Roads as % of Total Roads	78.8			81.2				81.2		69.1				
Average Prices of Major Farm Inputs														
	1980		1985		1990		1995		1999	2007	2012	2017	2021	
Tractor Hire (Naira per hectare)	25		55		250		850		2000	2500				
Fuel (Naira per litre - DIESEL)			0.20		0.44		7.39		17.80	39	125	2215.33	248.95	
Fertilizer (Naira per 25kg)	2		15		50		500		1250	1500				
Agrochemicals (Naira per litre)			65		280		850		1500	2026				
Sprayer (Naira per unit)	75		150		850		2200		4500	8000				

Sources: Underlying data obtained from CENTRAL BANK OF NIGERIA AND NATIONAL BUREAU OF STATISTICS, Abuja; ENWERE DIKE (1998); CBN/NISER (1991); CBN'S STATISTICAL BULLETIN (various issues)

Furthermore, the exchange rate had fluctuated and depreciated over time. This had raised the cost of production which like high bank lending rate had made locally produced products less competitive in the market, compared to imports from other producing countries. Depreciating exchange rate may crowd out marginal investment proposals on account of high investment costs in a high bank lending rate regime. High exchange rate combined with a high bank lending rate may create enabling environment for importation and distribution of finished products of cashew while creating a disabling environment for existing domestic producers and processors and thus could discourage investors in the production, processing, and export of cashew and its products.

Moreover, poor network of rural feeder roads as depicted by Table 4.3 has resulted into large farm-gate-retail price spreads, inflated farm-gate prices of farm inputs. This would greatly distort the structure, conduct, and performance of rural markets. The network of rural feeder roads to service and feed the national road remains in a primitive state, with only about 30.9 per cent being paved in 2007 and only 10 percent of total rural feeder roads remained all-season roads. As a result, transportation costs and input prices remain high on account of high time costs, and road user charges, especially vehicle operating cost. The consequence would be ineffective evacuation of cashew from the farm to the agro-industry located in the urban centres resulting into heavy post-harvest losses. This would eventually lead to inadequate supply of raw materials to agro-industry and hence low value addition. Also, poor rural transportation facilities would encourage spatial production inefficiencies, as they would hamper the emergence of specialized cashew production patterns. Similarly, the poor nature of primary roads would lead to ineffective market linkages. This would render the implied elasticities of supply of cashew with respect to policy variables low. Marketable surpluses would be bought up by middlemen at a discount because of poor rural roads with the consequence that the benefits of increased prices would flow to the middlemen who tend to exploit the farmers by offering low farm gate prices while taking advantage of scarcity of commodities in the urban market place. Therefore, the response of farmers to favourable price would be low because they are being shielded from receiving appropriate signals.

One inference that can be drawn from the results presented in Table 4.3 is that policy instability results in undesirable effects. It is clear from the low responses of crops that policy effectiveness in Nigeria had been hampered by inconsistencies, instability and lack of will to follow through in a determined manner to propel growth and development in production of agricultural commodities including cashew. Uncertainties associated with implementation of policies tend to dampen supply response of cashew thus limiting investment, production and availability of commodities for optimal use by domestic agroindustry.

4.4 Potentials of Cashew for Ago-industrial Development in Nigeria

Changes in consumption patterns for cashew nuts have been propelled by such drivers as health concerns. High valued products of cashew have opened the door to cashew producers, processors, financiers, and exporters who have the financial capability to exploit opportunities afforded by cashew market that is growing steadily at 5 per cent per annum (Chemonics International, 2019). Nigerian stakeholders in cashew industry can share in a long-term potential investment in exportation of cashew based products that can generate higher export earnings for the country. More importantly, diversification of cashew to cashew-based processing industry in Nigeria can generate almost threefold increase in employment level in the industry. This was estimated for the period between 2003 and 2019 as displayed in Table 4.4.

A large and growing domestic and regional market exists for cashew kernels, as well as other cashew by-products. West Africa is now the major supplier of cashew as raw materials to the Indian processing factories. Therefore, cooperation between major exporting countries in West Africa will create the potential to improve cashew prices. In addition, several United State Agency for International Development projects in Nigeria. Mozambique, Kenya, Tanzania, and Ghana, are potential opportunities for market linkages for African Cashew. Nigerian Cashew, therefore, has high potential for penetrating global cashew market to generate increased foreign exchange earnings and employment if the identified critical factors that determine domestic supply are effectively managed to create improved market linkages for expanded supply.

Table 4.4: Estimated Earnings and Employment Figure from Processing and Export of Cashew from Nigeria Between 2003 and 2019.

Cashew Type	Base year (2003)	12 years (2015)	2 years (2017)	2 years (2019)
Traditional Kernel Export	$60.0 million	$8.0 million	$19.0 million	$38.0 million
Organic Kernel Export	$0 million	$3.0 million	$6.0 million	$15.0 million
Raw Nuts Exports	$17.0 million	$17.0 million	$19.0 million	$21.0 million
Total	$23.0 million	$28.0 million	$44.0 million	$74.0 million
Projected Number of Jobs that will be generated through Cashew Processing	122,000	153,000	246,000	375,000

Source: Chemonics International, 2019.

Furthermore, in terms of industrial exploitation, cashew can effectively be expanded and developed in Nigeria through diversification of primary products to emerging cashew based industries to enhance manufacturing of high valued cashew products if the enabling infrastructure conditions can be improved and sustained. For instance, from historical record, in 2001 alone, about 30 per cent of Nigerian raw cashew nuts are exported to the major processing countries, such as India and Brazil for further value-added processing. Recently export market has expanded to cover Vietnam. Moreover, about 10 per cent or more were smuggled unrecorded through Lagos port to Cotonou, and Benin Republic, where they received 20per cent premium. Similarly, in Nigeria only 30 to 40 per cent of raw nuts were processed into kernels

With the present emphasis on developing crops that are highly resistant to vagaries of climate change such as drought as well as the emphasis of Nigerian government on diversification of sources of export earnings away from petroleum products, cashew can be used as a springboard to bring about a major turnaround in the non-oil export sector. Therefore, if the economic potentials of cashew are fully exploited in Nigeria it can contribute immensely to export trade expansion though increased exports of high valued cashew products. This will depend on maintaining a conducive and sustainable policy environment in the country. Similarly, increased income can be generated from cashewby smallholder farmers, small, medium, and large scale processors as well as exporters of cashew and its products if the variables influencing cashew supply are favourable.

V. Policy Implications and Conclusions

To achieve expansion in cashew supply, findings of the study have revealed essential factors that should be targeted for effective policy implementation and management so as to create incentives to smallholder farmers, small, medium, and large scale processors as well as exporters of cashew and its products. In this connection, price of cashew is one of the important incentive factors. To achieve better prices it will be necessary to ensure higher quality cashews. Therefore, it is imperative to maintain a high standard for well dried cashew. This has implication for an effective educational programme which will be directed towards cashew growers. This could be achieved through training of local buying agents who will in turn train the farmers. High level kernel breakages that is often associated with processing often results in a different end use suitable only for the culinary market as opposed to important markets such as confectionery and food industry. Improved quality through drastic reduction in breakages will create incentive for industrial processors to pay higher prices for well-dried cashew. In this way, absorption of cashew by agro-industry would be encouraged and this would lead to increased processing capacity and transformation of cashew to semi-final and final products for penetrating new markets instead of raw nuts.

Furthermore, findings of the study have shown a low proportion of annual budget going to agriculture. So far, resources deployed to agriculture has not received the minimum share as specified under international declarations. For instance, in 2003, Maputo Declaration required member countries including Nigeria to allocate at least 10 percent of their national budget to agricultural sector. The share of national budget expenditure deployed to agriculture has remained far below the global benchmark. Capital investment is the most important aspect of expenditure share in terms of generating productive activities and growth. This component still remained below the global benchmark with negative implication on infrastructure investment in the rural sector. In this way, possibility of having access to improved technology and requisite infrastructure which are financed by government funds would be constrained. Low government investment in agriculture could constrain demand for agricultural inputs given the fact that poor rural infrastructure such as poor road network would stimulate high cost of inputs.

Infrastructural bottlenecks and high cost of operations are implicated by observed poor infrastructural capacity in the rural areas. Relieving these constraints should bea priority for government expenditure that will propel development. Agriculture sectors including cashew sub-sector has higher costs because of deficiencies in transport systems. A lack of rural roads leads to large wastage in fruit and vegetable production including cashew after harvesting, and this is true of many other agricultural crops. This deprives agro-industries of cost-effective inputs. Poorly functioning transport systems make distribution costly and inefficient, and retard the agricultural productivity. Deficient infrastructure such as electricity and water supplies in the rural sector will raise costs and thereby discourage investment. Intermittent power cuts will cause heavy damage to industrial machines, and the cost of recoiling engines constitutes a major expenditure. Better power supplies and effective rural roads network and effective linkages to the urban centres would encourage regular supply of cashew to cashew based industry for investment in manufacturing final and semi-final products of cashew thereby enhancing the prospects of exploiting growth potentials of cashew in Nigeria. Use of local raw materials and product diversification and improvements in marketing logistics will help cashew processing firms survive competitive pressures. Agro-industrial growth and competitiveness will be greatly impeded by poor infrastructural capacity.

Main element of instability in policy included high variability in interest rate, exchange rate and widening urban-rural wage rate differential. This has contributed to the high cost of operations. Inadequate

access to credit by farmers has been implicated by high and rising interest rate. This would constrain demand for credit by farmers and processors. In the light of these challenges, the following policy strategies should be given priority attention to enhance increased cashew supply and regular flow into agroindustry in Nigeria.

5.1 Quality and productivity is an important issue to be addressed:

The main constraint to quality and productivity are the poor infrastructure services and related skills thus preventing farmers' access to inputs, limiting processing enterprises access to raw materials, global markets and making it difficult to be integrated into international production and supply chains. The government will therefore need to take necessary step to invest heavily on infrastructural rebuildingto be able to offer competitive, safe, reliable and cost-effective products. Increased budget share for agriculture must be focused effectively on adequate provision infrastructure so as to improve market opportunities, enhance competitiveness the market and rate of returns on investment.

5.2 Training Assistance:

To increase productivity and increase diversification to agro-industry, training assistance to local buying agents and farmers on how to improve on quality of cashew is crucial to eliminate unnecessary technical barrier to trade caused mainly by disparities in standards, and related practices. Thus, mutually developed and recognized systems of standardization, testing and quality control are urgently needed to enhance market transparency for manufacturers and purchasers.

5.3 Primary commodity markets and input markets should be strengthenedby the government:

Supply of farm inputs should target smallholder farmers at affordable prices in order to provide opportunities to expand their farms. They should be assisted through provision of adequate market information and effective market linkages so as to prevent exploitation by middlemen.

5.4 Increased Access to Credit through reduction of the High Rate of Interest on Agricultural Loans:

Farmers, Small and Medium Scale Processors should be assisted by granting them access to increased credit at single digit interest rate. The Nigerian Agricultural Bank and Bank of Industry should be strengthened to provide scope for offering agricultural loans to farmers and processors at reduced interest rate and to enhance fast delivery of such loans to meet necessary farm operations.

5.5 Stable Macroeconomic policies

The drive to achieve a stable macroeconomic policy environment which will manifests largely in price stability should be achieved and sustained to encourage investors and potential investors in cashew industry as well as other sub-sectors of agriculture.

5.6 Conclusion

In conclusion, findings have revealed that effective management of the major determinants of cashew supply to the advantages of smallholder farmers, small, medium, and large scale processors as well as exporters of cashew and its products are fundamentals to induce expanded supply of cashew and its uptake for transformation into high valued cashew products by agro-industry in Nigeria.

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