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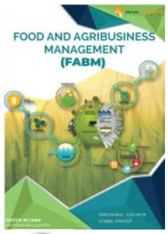

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RESEARCH ARTICLE

DYNAMIC GROUNDNUT SUPPLY RESPONSE IN NIGERIA: A PARTIAL ADJUSTMENT APPROACH

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ABSTRACT

This paper investigated dynamic supply response of groundnut in Nigeria using a partial adjustment approach. Secondary data were used. Data was collected from various publications of the central bank of Nigeria (CBN) statistical bulletin and Food and Agriculture Organization (FAO) over the period 1975-2015. Unit root test, descriptive statistics, partial adjustment model and error correction model were used for data analysis. The result for unit root by using the Augmented Dickey-Fuller Test revealed that most of the variables were stationary with a constant trend and at first difference. The average groundnut output for the study period 1975-2015 was 7.81. The value of the standard deviation is 1.64 which explains stability and indicates that groundnut output was relatively stable for the period under study. The result of the Partial adjustment model indicates that supply response of groundnut is dependent on price of groundnut, rainfall and land area of which the price of groundnut is significant. The ECM which is the error correction term is significant at 5 percent and has the expected negative sign. Its coefficient of -0.641 indicates that there is 64.1% deviation of groundnut output. This adjustment can be attributed to the fact that famers are constrained by technical factors which limits their ability to adjust immediately to change in price. The production of groundnut in Nigeria could actually be increased such that Nigeria becomes the largest producers of groundnut in the world if proper resources is provided to the farmer to increase their production.

KEYWORDS

Groundnut, Supply response, Price, Rainfall, land area, Output, Nigeria

1. INTRODUCTION

Before the discovery of crude oil exploration in Nigeria, oilseed agricultural products, including palm oil, groundnut, and soybeans were among the leading agricultural produce and export products in Nigeria. Surprisingly, these agricultural products have taken a back seat in the global export competitiveness. Groundnut is regarded as the 13th most important food crop and 4th oil seed crop (FAO, 2017). Although, groundnut production has not increased as expected in Nigeria and the era of peanut pyramids has disappeared or remain redundancy. It might be partly because peanut farmers in Nigeria faced with limited farm inputs, finance, solely rely on natural rainfall with either recurrent drought or excess rains. For instance, studies by Awoke (2003); Ani, Umeh and Weye (2013); Alabi *et al.* (2013) indicate that yield per hectare and farm inputs have positive effects on groundnut production in Nigeria. On the other hand, lack of improved capital inputs, access to finance due to lack of collaterals, pests and diseases, roads, marketing, non-availability of fertilizer and high-interest rate are the major problems hindering peanut production in the region. Consequently, most farmers engaged communal labour, employed traditional farm inputs and their little personal savings for production in the area.

Dynamic agricultural supply response in terms of yield, acreage or output has been regarded as a fundamental issue which continues to attract many attentions due to the uncertainty in nearest future food supply including crisis experienced in the past events. These major concerns are being held mostly due to volatile nature of the prices for various agricultural commodities that is on the world markets and also to climatic influences on various crop production. Various supply response studies that have been carried out so far in literature have been on either estimating response across a group of crops or for a particular crop of interest to a country under study and groundnut as regarding this particular study. Either case, the supply decision of a farmer is expected to be in line with economic theory; subsequently being influenced by the price and some non-price factors. It should be stated that among the mostly common non-price factors that were suggested in literature were status of the groundnut farmers, capital access, land area cultivated, agro-climatic conditions, access to extension services, availability of agricultural labor and fertilizer use (Basorun and Fasakin, 2012; Bingxin and Shenggen, 2009; Mythili, 2008).

The real producer's price of groundnut, world price of groundnut and price of the relevant agro-chemicals such as fertilizer (Molua, 2010; Mulwanyi, Hutagaol and Sinaga, 2011). were among the identified price-related drivers of supply response identified in the literature.

Though, defined as variation of the agricultural outputs due to variation in price and some key inputs factors, supply response according to Molua (2008) can be explained by factors such as bio-physical, policy and socio-

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economic factors. For more than three decades now, many theories have so far been developed which are being applied by various economists to explain the various dynamics of the supply response in agriculture and also its key sub sectors. In line with the economic theory, the supply functions have been particularly estimated based on assumptions that primary drivers of the market supply of a given commodity were inputs, state of technology and output (Bingxin and Shenggen, 2009). Ahmed and Siddiqui (1994) in their study, estimated supply response as a function of input prices, output together with some quasi-fixed inputs and also supply shifters such as technical change with policy intervention.

Molua (2010) advised in his study that positive signals that were observed from the acreage response model will only translate into output based on employment of some other vital and important complementary factors of agricultural production like fertilizer, pesticides, other farm chemicals, high yielding varieties, improved cropping system and also good farm management techniques. Although, studies (Daramola, 2005; Basorun and Fasakin, 2012) on supply response has been conducted in Nigeria especially on crops like rice, maize, millet, sorghum etc. None of these studies so far had empirically examined the dynamic supply response of groundnut in Nigeria, hence this study. Specifically, this study evaluated the trend of groundnut supply in Nigeria; estimated and compare the short run and long run elasticities of groundnut production and examine the acreage and output response of groundnut production in Nigeria.

2. Methodology

This study pertains to Nigeria which is located in West Africa on the Gulf of Guinea and has a total area of 923,768 km^2 making it the world's 32nd largest county. It shares a 4,047 km border with Benin(77km), Niger(1497km), chad (87km), Cameroon (1690km) and has a coastline of a least 853km. Nigeria lies between latitude 4^o and 14^o north and longitude 2^o and 15^o east. The far south is defined by its tropical rain forest climate where annual rainfall is 60 to 80 inches (1524mm to 2032mm) per year. The coastal plain are found in both the southwest and the southeast, this forest zones most southerly portion is defined as salt water swamp also known as the mangrove swamp.

The tropical climate in the area favors the growth of some varieties of annual crops such as groundnut, yam, cassava, maize, rice, cowpea, plantain and banana and the tree crops include cocoa, kola nut and palm produce. Nigeria is ranked 31st in the world in terms of GDP (PPP) as of 2011. There are two distinct seasons in the state, namely the rainy season which last from March to October and the dry season which comes up with harmattan and last from November to February. Nigeria is the most populous country in Africa and account for about 18% of the continent total population. Secondary data were used for the study. Data was collected from various publications of the central bank of Nigeria (CBN) statistical bulletin and Food and Agriculture Organization (FAO) over the period 1975-2015. Data covered information on groundnut production, trends of groundnut supply and acreage and output response of groundnut production. The analytical techniques employed in this study include the unit root test which was used to test for Stationarity, descriptive statistics, partial adjustment model and error correction model. The descriptive analysis was used to analyze the first objective which is to evaluate the trend of groundnut supply, the error correction model was used to analyze the short run and long run elasticities of the acreage and output response of groundnut production and partial adjustment model was used to analyze the supply response of groundnut to price.

2.1 Test for Stationarity

Data series can be said to be stationary when the data has a constant mean and variances. In other words, the data is seen fluctuating around its mean value within a definite finite range and does not necessarily show any viable or distinct trends over time. Although, in a stationary series displacement over time does not necessarily alter the characteristics of a series such that the probability distribution remains constant over time. Stationary series therefore, is a series where the mean, covariance and variance remain constant over time. In other words, it does not change nor fluctuate over time. The conditions of Stationarity are illustrated by the following:

$$Y_t = \theta Y_{t-1} + \mu_t \quad t=1 \tag{1}$$

Where μ_t is the random walk with mean zero and constant variance.

If $\theta < 1$, the series Y_t is stationary
If $\theta = 1$, the series Y_t is said to be non-stationary which is known as random walk.

In other words, the mean, covariance and variance of the series Y_t changes with time or have an infinite range. Although, Y_t by differencing can be made stationary.

2.2 Unit Root Test

Unit roots test of each of the time series of chosen variables used were undertaken to ascertain order of integration. In this case, the order of integration for all the chosen variables must be known before analysis, in other to ensure that the variables are not integrated of order greater than one Abbott *et al.,* (2000). In testing for unit root, Dickey Fuller statistic was used. The first equation tested can be generalized and secondly the Dickey Fuller statistics can also be adjusted. In general, most appropriate and commonly used is the Augmented Dickey-Fuller test. The evaluation can be carried out by adding lagged values of the dependent variable to the equations being tested, thus:

$$\Delta Y_t = (\theta_1 - 1)\, Y_{t-1} + I Y_{t-I} + \mu_t \tag{2}$$

$$\Delta Y_t = \alpha_2 + (\theta_2 - 1)\, Y_{t-1} + I\, \Delta Y_{t-I} + \mu_t \tag{3}$$

$$\Delta Y_t = \alpha_3 + \beta_3 t(\theta_3 - 1) Y_{t-1} + I\, \Delta Y_{t-I} + \mu_t \tag{4}$$

Although, ADF test uses the same critical values as with DF. Yt = series under investigation,

t = time trend, α_3 = constant term and μ_t = white noise residuals.

2.3 Descriptive Statistics

Descriptive statistics simply provides summaries of the sample and that of the observation that have been made. Such summaries may either be quantitative, that is, the summaries may either form the basis of initial description of data as a part of more extensive statistical analysis or they might be sufficient for a particular investigation. However, descriptive statistic is method of summarizing large sets of quantitative or numerical information. Descriptive statistics such as means both minimum and maximum, standard derivation was used to analyse this data on groundnut output, price of groundnut, areas of land and rainfall from 1975-2015.

2.4 Partial adjustment model

The partial adjustment model technique was used to analyze the supply response of groundnut production for the study period 1975-2015. The general form of the supply function, in the simplest version is:

$$X_t = a + bP^e_{xt} \tag{5}$$

Where
X_t is the desired or equilibrium level of output at time t, and

P^e_{xt} is the expected value of P_x at time t, available at t-1.
Supposed that the dynamics of the supply is driven only by price expectations; then $X^*_t = X_t$ (i.e., there are no restrictions to the instantaneous adjustment). In this model, price expectations are generally assumed to follow the adaptive scheme:

$$Pe_{xt} - Pe_{x,t-1} = \gamma\,(P_{x,t-1} - P^e_{x,t-1}).$$

Introducing dynamics into the model, using an adaptive mechanism for the formation of expectations, assumes that the expected "normal" prices are revised each period, and adjusted proportionally to the difference ($P_{x,t-1}$ - $P^e_{x,t-1}$) between the actual price in the previous period and the expected price available for that period.

2.5 Error Correction Model

Error correction model are category of multiple time series model that directly estimate the speed at which a dependent variable returns to equilibrium after a change in the independent variable. It is a useful model when dealing with integrated data as well as stationary data but in this study, it is used to determine the estimate and compare the long run and short run elasticities of the acreage and output response of groundnut production in Nigeria for the study period 1975-2015.

The equation below shows the error correction model of supply response of variable Y and X in its simplest form;

$$Y_t = \alpha + \theta X_{it} + \mu_t \tag{6}$$

Where;
Y_t = yield of crop (groundnut) in country I at time t

Y_{t-1} = yield of crop at previous year in country i
X_{it} = explanatory variable which the yield of crop is dependent on the time t of country i
μ_t = disturbance or error term
α = short run effect of changes in independent variables
θ = long run effect of changes in the explanatory variable

$$\Delta Y_t = \alpha \Delta X_{it} - \theta(Y_{t-1} - \gamma X_{t-1}) + \mu_t \quad (7)$$

Where:
U_t= disturbance term with zero mean, constant variance and zero covariance.
α= takes into account the short run effect on Y of the changes in X,
γ= measures the long-run equilibrium relationship between Y and X in equation 6

The idea behind the mechanism of the error correction model is that the proportion disequilibrium from one period is corrected in next period in an economic system (Engle and Granger, 1987). The validity of Error Correction Models (ECMs) largely depends on the existence of long-run or equilibrium relationship among the chosen variables. The Error Correction Model (ECM) thus has various advantages like ensuring that no information on levels of the variables is been lost or been ignored by inclusion of the disequilibrium terms. Also, ECMs solves the problems of spurious correlation observed because ECMs were formulated in terms of first differences which normally eliminates trends from the chosen variables (Ganger and Newbold, 1974). It also avoids unrealistic assumption of the fixed supply based on a stationary expectation in the partial adjustment model.

Table 1: Model Specification

	Objective	Variable	Analytical Techniques
1.	Evaluate the trend of groundnut supply in Nigeria	Groundnut output (000' tons), price of groundnut (000' Naira), land area(000'hectares), rainfall (mm).	Descriptive analysis: mean, standard deviation, minimum and maximum
2.	Analyze the supply response of groundnut in Nigeria to prices.	Price of groundnut (000' Naira), land area (000'hectares), rainfall (mm).	Partial adjustment model
3.	Estimate and compare the long run and short of the acreage and output response of groundnut production in Nigeria	Price of groundnut (000' Naira), land area (000'hectares), rainfall (mm).	Error correction model

3. Results and Discussion

3.1 The unit root test result for Stationarity for the study variables

In order to do any meaningful analysis, it is important to distinguish between the correlation that arises from the trend and the one that arises from a causal relationship. As such, the data was tested for unit root by utilizing the Augmented Dickey-Fuller Test (ADF) (Dickey and Fuller, 1981). The result (Table 2.) revealed that most of the variables were stationary with a constant trend and at first difference. Hence, the results shows that the variables are integrated of order one I (1) expect for price of groundnut.

Table 2: Unit root test for Stationarity for the study period 1975-2015

Variable	Level	First difference	Critical value	
			5%	1%
Groundnut output	-0.339887	-4.514244	-2.938987	-3.610453
Land area	-1.333270	-7.473745	-2-938987	-3.610453
Priceof groundnut	-1.454775	-1.823043	-2.938987	-3.610453
Rainfall	-5.506683	-6.832389	-2.954021	-3.646342

3.2 Descriptive Statistics of the study variable

The descriptive statistic of the study variables is shown (Table 3). The average groundnut output for the study period 1975-2015 was 7.81with a minimum of 4.65 and maximum of 10.97. The value of the standard deviation is 1.64 which explains stability and indicates that groundnut output was relatively stable for the period under study.

The average price of groundnut is 7.96 with a minimum of 4.91 and a maximum of 10.22. The standard deviation for groundnut is 2.13. The standard deviation is a tool that is used to denote stability of the production thus the standard deviation denotes that groundnut is less relatively stable. This could be as a result of fluctuations in the market price of groundnut due to various smuggling activities in the country thereby creating uncertainty in the price of the crop. There are other factors that causes fluctuation in prices such as high cost of land preparation, use of unimproved seed varieties which exhibit low productivity, scarcity of hired labor, high transportation costs, an expensive credit, marketing problems which results in middlemen not paying maximum prices that are attractive enough to keep the farmers producing at a certain price and also importation of cheaper groundnut from other countries.

The average land area is 13.76 with a minimum land area of 12.05 and a maximum of 14.8. the difference between the maximum and minimum land area is relative low which might be attributed to the fact that an increase in land cultivated without a necessary increase in the resources of the farmer will have an adverse effect on minimal resources available to the farmer hence resulting in marginal increase in output indicating that the productivity of the farmer reduces with increase in the farm size. The standard deviation is 0.86. The average rainfall is 6.02 with a minimum of 4.80 and a maximum of 7.22. The standard deviation is 0.60 indicating that rainfall is relatively stable

Table 3: Result for Evaluation of trend of groundnut supply in Nigeria

Variable	Observation	Mean output	Standard deviation	Minimum output	Maximum output
Groundnut output	30	7.187600	1.646306	4.65396	10.97428
Price of groundnut	30	7.965311	2.304658	4.912655	11.22708
Land area	30	13.76178	0.867417	12.05552	14.81798
Rainfall	30	6.022786	0.600873	4.807703	7.22788

3.3 Results for the Study Variable Using Partial Adjustment Model

Partial adjustment model is use to analyze the supply response of groundnut production for the study period 1975-2015. It indicates that supply response of groundnut is dependent on price of groundnut, rainfall and land area of which the price of groundnut is significant (Table 4).

A fluctuating change in the price of groundnut causes a reduction in the groundnut production in the short run and even greater harm in the long run when the two magnitudes are compared i.e. for the short run, price of groundnut is significant at 5 percent with a negative coefficient of -0.19 which implies that a unit decrease in the price of groundnut leads to 0.19 reduction in production of groundnut while in the long run, price of groundnut is significant with a negative sign of -0.47 which also implies that a unit decrease in the price of groundnut leads to 0.47 reduction in groundnut production, there is a linear relationship between the price of groundnut and the groundnut production in Nigeria which is expected.

Land area cultivated has a positive coefficient of 0.23 in the short run which implies that an increase in area cultivated of groundnut will lead to 0.23 increases in production in the short run. This is rather on the low side. This can be attributed to the fact that an increase in the land cultivated without a necessary increase in the resources of the farmer will have an adverse effect on the minimal resources available to the farmer hence resulting in the reduced output. In the long run, the land area cultivated has a positives coefficient of 0.54 which implies that an increase in area cultivated for groundnut will lead to 0.54 increases in production. In the long run, the elasticity is 0.54 which is higher than the 0.23 for the short run which indicates that in the long run, farmers adjust their farm sizes than in the short run. That is, increase in area cultivated will lead to increase in output in the long run. Rainfall has a positive coefficient of 0.05 in the short run; this implies that increase in rainfall will result in a 0.05 rise in production. In the long run rainfall has a positive coefficient of 0.12 which implies that increase in rainfall will result in 0.12 rises in production. This shows that rainfall has an important effect on groundnut production.

Table 4: Result for the estimation the supply response of groundnut production in Nigeria

Variable	Short run	Long run
Price of groundnut	- 0.199432**	- 0.473716**
Land area	0.230364	0.547189
Rainfall	0.052671	0.125111

Significant ** 5%

3.4 Estimate of the short run and long run elasticities of supply of groundnut

Error correction model was used to estimate and compare the short run and long run elasticities of the acreage and output response of groundnut production in Nigeria for the study period 1975-2015. The result indicates that the acreage and output response of groundnut production is dependent on price of groundnut, land area and rainfall of which price of groundnut and rainfall were significant. (Table5). An R^2 of 0.463 is obtained which indicates that 46% of the variation in the dependent variable might be accounted for by the variation in the independent variable. F-statistics has a coefficient of 5.68 which testifies for goodness of the model and the D.W test estimate of 2.22 reveals that there is no serial correlation. The results indicate that price of groundnut has a positive coefficient of 0.017942 and is significant at 5 percent which implies that a unit rise in the price of groundnut will lead to 0.02 increases in the output in the subsequent year. The increase in groundnut price percentage suggest that farmers respond to price by increasing their output in subsequent years and if they experience a decrease in price, they tend to lower their output in subsequent year as a result of the drop in price. Rainfall is significant at 5 percent with a negative coefficient of -0.121669 this implies that a percentage increase in rainfall leads to 0.1 decrease in groundnut production. The low and inverse response to rain can be attributed to the fact that the improved groundnut varieties under consideration depends on relatively normal to low amount of rainfall for optimum production efficiency that too high amount of rainfall has an adverse effect on its production. The result on the area of land cultivated indicate that a negative coefficient of -0.008342 implies that area of land cultivated and the output are inversely related i.e. when there is an increase in land area it will lead to 0.008% decrease in its production, this can be attributed to the fact that an increase in the area of land cultivated without necessary resource availability for the farmer will have an adverse effect on the minimal resources available.

The ECM which is the error correction term is significant at 5 percent and has the expected negative sign. It measures the adjustment to equilibrium. Its coefficient of -0.641370 indicates that there is 64.1% deviation of groundnut output. This adjustment can be attributed to the fact that famers are constrained by technical factors which limits their ability to adjust immediately to change in price.

Table 5: The result to compare the short run and long run elasticities of the acreage and output response of groundnut production in Nigeria.

Variable	coefficient	t-value
Price of groundnut	-0.017942**	-2.474623**
Rainfall	-0.121669**	-2.760343**
Land	-0.013315	-0.116122
Constant	0.008342	0.355413
ECM (-1)	-0.641370**	-4.198644**
R^2 (0.463)	F-Statistic(5.68)	Prob.(F-Stat)0.01
Durbin-Watson stat (2.23)		

Significant ** 5%

4.Conclusion

The present review has highlighted that a wealth of information already exists. The results show that groundnut supply is influenced by land area under cultivation, real prices of groundnut, climatic conditions (rainfall). Furthermore, fluctuation in price of groundnut has an effect on farmer enthusiasm to increase and cultivate groundnut as a decrease in price of groundnut thus lower the output in subsequent years. This then has an important implication on how Nigerian groundnut supplies can be promoted in the future. In other to facilitate this response and improve groundnut production the government should prioritize the neglected agricultural sector; firstly, the government should look into groundnut production. The production of groundnut in Nigeria could actually be increased such that Nigeria becomes the largest producers of groundnut in the world if proper resources is provided to the farmer so as to increase their production. Furthermore, there should be promotion of modern technology and crop diversification should be tailored to local production. Poor road and market conditions prevent local producers from benefiting from its production and as such, these factors should also be looked into. There should be reinforcement of the groundnut sector in order to encourage use of improve varieties to increase yield, promote improve cultural practices, ensure better storage facilitates so as to enable improve regularity of supply. Future studies can be conducted on climate change impact on supply response of groundnut in Nigeria.

References

Abbott, A., A.C. Darnell, L. Evans. 2000. The Influence of Exchange Rate Variability on UK Exports. Applied Economic Letters 8, 47-59.

Ahmed, A.M., R. Siddiqui. 1994. Supply response in Pakistan with “Endogenous” Technology. The Pakistan Development Review 33:4 Part II (Winter 1994),871-888.

Alabi, O.F., B. Owonibi, S.O. Olafemi, S. Olagunju. 2013. Production Analysis of Groundnut in Birnin Gwari Local Government Area of Kaduna State. PAT, 9(2), 102–113.

Ani, D.P., J.C. Umeh, E.A. Weye. 2013. Profitability and Economic Efficiency of Groundnut Production in Benue State, Nigeria. African Journal of Food, Agriculture, Nutrition and Development, 13(4), 8091–8105.

Awoke, M.U. 2003. Production Analysis of Groundnut, (arachis hypogaea) in Ezeagu Local Government Area of Enugu State, Nigeria. Global Journal of Agricultural Sciences, 2(2), 138–142.

Basorun, J.O., J.O. Fasakin. 2012. Factors Influencing Rice Production in Igbemo-Ekiti Region of Nigeria. Journal of Agriculture, Food and Environmental Science, 5(1), 1-9.

Bingxin, Y., F. Shenggen. 2009. Rice Production Response in Cambodia. Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China. August 16-22, 2009.

Daramola, B. 2005. Government Policies and Competitiveness of Nigerian Rice Economy. Paper presented at the ‘Workshop on Rice Policy & Food Security in Sub-Saharan Africa’ Organized by WARDA, Cotonou, Republic of Benin, November 07-09, 2005.

Dickey, D.A., W.A. Fuller. 1981. Likelihood ratio statistics for auto-regressive time series with a unit root. Econometrical, 49, 1057-1072.

Engle, R.F., C.W.J. Granger. 1987. Co-integration and error correction: Representation, estimation and testing. Econometrica, 55, 251-276.

FAO. 2017. FAOSTAT database [Online]. Available at: http://bit.ly/2iBrcUH. [Accessed 2017, January 5].

Granger, C.W.J., P. Newbold. 1974. Spurious regressions in econometrics, Journal of Econometrics, 2, 41-58.

Molua, E.L. 2008. Turning up the heat on African Agriculture: Economic impact of climate change on agriculture in Cameroon. African J. Agricultural and Resource Economics, 2(1),45-64.

Molua, E.L. 2010. Response of Rice Yields in Cameroon: Some implications for agricultural price policy. Libyan Agriculture Research Center Journal Internation,1(3), 182-194.

Mulwanyi, A., P. Hutagaol, B.M. Sinaga. 2011. Impact of rice purchasing policy on welfare of both producers and consumers in Indonesia. J. ISSAAS, 17(2), 48-57.

Mythili, G. 2008. Acreage and yield response for major crops in the pre- and post-reform periods in India: A dynamic panel data approach. Report prepared for IGIDR-ERS/USDA Project: Agricultural Markets and Policy. Indira Gandhi Institute of Development Research, Mumbai.