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Research Article

Insights on Oil Palm Production Variation and Trade Growths Rates in Nigeria

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ABSTRACT

This research was conducted to study various policy regimes in Nigeria with a focus on Oil palm production variations and trade growth rates from 1961-2007. Objectives of the study were; To determine the variations in oil palm production (yield, output and harvested area) overtime.; to test for differences in the variation of oil palm output and to estimate growth rates of palm oil trade (import/export) quantities. Data used for the study was obtained from FAOSTAT and covered area (hectare), yield (hg/ha), output (tonnes), import and export quantities (tonnes). The Coefficient of Variation (CV) was used to estimate the variations for each period. The Kruskal- Wallis test was employed to test for differences in the variation of oil palm output. While the Log-Linear regression model was used to estimate the growth rates. Findings show periods of general instability in oil palm output which accompanied decreasing export and increasing imports growth rates. The study recommends a sustained medium to long term agrifood policy that emphasizes productivity of all factors of production while also encouraging the industrial utilization of oil palm products to ensure rapid and sustained production.

INTRODUCTION

Agriculture is a major supplier of agro based resources in Nigeria and Agricultural trade plays a leading role in furthering economic growth by providing the foreign exchange required to import capital goods and other manufactured goods needed to expand the farm and non-farm sectors.

Nigeria as a developing country is constrained by a relatively small agricultural export market, and is often been described as a food import dependent nation, little wonder Nigeria is ranked 11th in the world in arable land availability yet ranked 116th out of 138 farming countries (Olaoye, 2012), thus serving as a deterrent for investment along with low per capita income for the domestic market.

According to Xinshen *et al* (2007), trade broadens the market and induces investment while lifting people out of poverty. However, growth rates of Nigerian agricultural exports have been marginal, in India, annual growth rates of 3% for a sustained period of time between 1997-2009 has been reported despite wide spread resource constraints (Alka and Suresh, 2010).

(Elumalai and Sundaram, 2011) consider technological and institutional support in the crops sub-sector as accounting for significant changes in area and output. Also, (Antia-Obong and Bhattarai 2012) found out that there was a decline in area and output growth rates of Oil palm for a period between 1960-1969 in Nigeria, while yields for Oil palm remained stagnant in the periods 1960-1969, 1986-1993 and 1994-2007 and these periods coincides with indirect Government involvement in agricultural production, the expansion of export crops/processing facilities and the application of more modern technology and expansion of rural infrastructure respectively.

This study therefore looks at the export-import growth rates of palm oil, the most important product obtained from oil palm.

The oil palm *(Elaeis guineensis jacqu)* is of West African origin. Its major product, palm oil is used for both domestic and industrial applications, as many processed foods contain palm oil (BBC panorama, 22 february 2010). Biodiesel can also be made from palm oil, just like other vegetable oils (Corley, 2009).

This study is an attempt to have an historical overview of oil palm production in order to see under which policy regime, oil palm production and trade did achieve some level of stability and growth.

This study therefore has the following specific objectives:

a. To determine the variations in oil palm production (yield, output and harvested area) overtime.
b. To test for differences in the variation of oil palm output.
c. To estimate growth rates of palm oil trade (import/export) quantities.

MATERIALS AND METHODS

Data Collection And Sampling Technique

Time series secondary data used to study the variations and growth rates were obtained from (Faostat, 2010), the data covered harvested area, yield and output of Oil palm as well as import and export quantities of palm oil from 1961-2007 a total of 47years. Palm oil was purposively selected due to its importance as a cash crop and based on the availability of data.

Variations In Yield, Area And Output

The coefficient of variation was used to measure the variability in this study. The CV gives an indication of the average percentage variation from the mean of each period under study. The higher the value of CV is from zero is an indication of higher instability.

Market and policy failures are factors that do contribute to these instabilities (Manyong *et al* 2003). The CV allows for comparison of means that differ widely from each period, as such it serves as a better measurement of relative variability. (Ghosh, 2010).

The coefficients of variation of these parameters were calculated as;

$$Cv(\%) = \frac{S\tan dard\ Deviation}{Mean(\overline{x})} * 100 \text{ ---------- Eqn (1)}$$

Test For Differences In The Variation Of Oil Palm Output

Crop production tends to vary overtime, and also across the periods. The Kruskal-Wallis test Anderson *et al* (2008) is used to test for difference in CV of oil palm for the periods under study.

The hypothesis is stated as follows:

H_0: Sub-period CVs with respect to area, yield and output of oil palm are identical.

H_1: Sub-period CVs with respect to area, yield and production are not identical.

From the hypothesis, the null hypothesis reflects stability while the alternative hypothesis is a reflection of Instability across the periods.

The Kruskal-Wallis test uses the sum of ranks for CVs of the five sub-periods for oil palm, and is calculated as follows:

Kruskal-Wallis test:

$$W = [\frac{12}{n(n+1)} \sum_{i}^{k} = 1 \frac{R_i^{\ 2}}{n_i}] - 3(n+1) \text{---------- eqn (2)}$$

Where:
k= The number of population (here sub-periods)
n_i = The number of observation in the sample i
R_i = Dummy of ranks for sample i

ESTIMATION OF GROWTH RATES OF PALM OIL TRADE (IMPORT/EXPORT) QUANTITIES

Growth rates of import and export quantities were estimated for palm oil using the log-linear function as was employed by Shadmehri (2008).

The log-linear equation is usually of the form:

$LnY_t = b_o + b_1T + e$ ---------- Eqn (3)

Where, LnY_t = natural logarithm time series data for imports and exports quantities in tonnes of palm oil for year *t*.

b_o = Constant term
T = time trends for years of interest
e = error term
b_1 = Slope coefficient for the period under consideration (i.e. growth rate).

By Multiplying b_1 by 100 the percentage growth rate is obtained.

CGR = [antilog b -1]*100 ---------- Eqn (4)

RESULTS AND DISCUSSION

Variation In Area, Yield And Output Of Oil Palm

Table I: Coefficient of Variation in area, yield and output of oil palm (%)

Periods	Harvested Area	Yield	output
1961-1969	10.20	0	10.20
1970-1985	5.47	0.91	5.74
1986-1993	7.21	0.68	0.68
1994-2007	5.62	1.56	5.32
1961-2007	17.30	3.15	19.31

Source: Authors own estimation

Table 1 presents the variation in oil palm harvested area, yield and output, the highest variability (instability) captures the entire study period 1961-2007 for each variable. Besides, the 1961-1969, 1994-2007 and 1961-1969 with respect to harvested area, yield and output were the most unstable periods. The results reflect widening instabilities across the variables as figures I, II and III indicates.

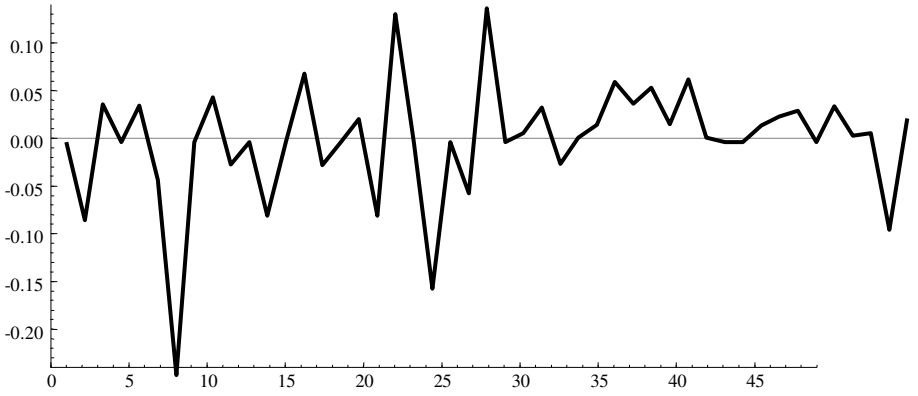

Figure I: Annual Variability in oil palm harvested area

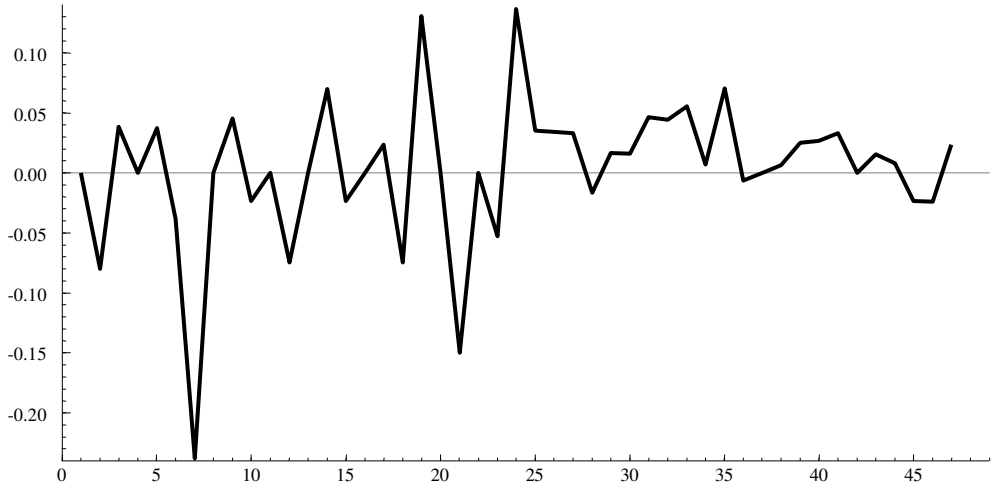

Figure II: Annual Variability in oil palm output

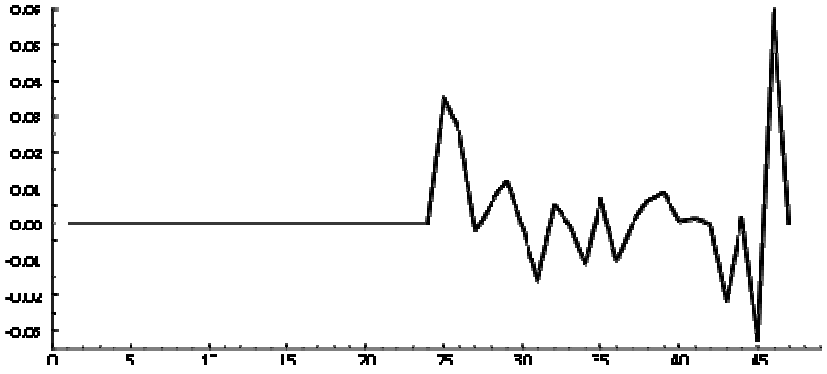

Figure III: Annual Variability in oil palm yield

Figures I,II and III present annual variability in harvested area, output, and yield of oil palm. Annual fluctuations are observed over time. The reasons for such instability could be as a result of risk and uncertainty surrounding agricultural production. As agricultural production is both biological and seasonal in nature, we do not know

clearly the nature of agricultural decisions and their possible outcomes. Farmers are generally concerned with decisions on crops to be planted, seed rates, fertilizer application and other crucial inputs. If there are fewer time lags between production and marketing activity, we could expect less price risk for oil palm. But this is not the case as there is enough time for prices to fluctuate as the crops move from production to market.

Test For Differences In The Variation Of Oil Palm Output: Kruskal-Wallis Test

Table II: Estimated Kruskal-Wallis tests for variations between periods of area, output and yield of oil palm

Crop	R_1	R_2	R_3	R_4	R_5	$X^2 0.05$	H
Oil palm	25	22	16	21	33	9.49	10.00**

Source: Authors own calculation based on Faostat data. R1 = Sum of ranks in the period 1961-1969; R2 = Sum of ranks in the period 1970-1985; R3 = Sum of ranks in the period 1986-1993; R4 = sum of the ranks in period 1994-2007 and R5 = sum of the ranks in period 1961-2007.
** = significance at 5% level
Chi-square at 0.05 with *4* degrees of freedom.

The results of the kruskal-Wallis test is displayed on table 2, the results vary significantly as indicated by H $> X^2 0.05$ at *k*-1 degrees of freedom, where k =5 sub-periods. As such, we fail to reject the alternative hypothesis at the 5 % level of significance, thereby signifying general instability in oil palm production for the periods under study.

% GROWTH RATES OF IMPORT AND EXPORT QUANTITIES FOR PALM OIL

Table III. Percentage Growth rates of palm oil import quantity

Period	**Palm oil**
1961-1969	0(0.000)
1970-1985	105.82*(0.124)
1986-1993	-45.37^{NS}(0.825)
1994-2007	2.43^{NS}(0.118)
1961-2007	29.49*(0.040)

Source: Growth rate based on authors' estimation
Figures in parentheses are standard errors
NS = Not significant *= significance at 1% level

The results of the growth rates of palm oil output (tonnes) have been presented in table III, taking into account the five periods of the study. Palm oil recorded a stagnant growth rate for the 1961-1969 period, invariably there was no import of Oil palm, several analogies can be drawn; it could be that domestic production was commensurate with population growth during the period and the crude oil industry was still at its infancy so Oil palm production was stable. The 1970-1985 period witnessed a significant growth rate of 105.82% at the 1% level; there was a decline in import for the proceeding period of -45.37%. Colman and Okorie (1998) are of the opinion that the oil boom came with a distortion in the labour market and had an adverse effect on production levels. Government had paid farmers low prices over the years in order to satisfy the domestic market and encourage demand for affordable food. This approach made agricultural work less attractive and encouraged rural-urban migration. On the whole, these developments led to low productivity on land and person, coupled with other factors such as inadequate technology, drought, poor transportation and infrastructure, and trade restrictions.

Table IV. Percentage Growth rates for palm oil export quantity

Period	palm oil
1961-1969	-44.68**(0.122)
1970-1985	-47.70**(0.197)
1986-1993	-39.88^{NS}(0.380)
1994-2007	48.62**(0.180)
1961-2007	-8.40***(0.044)

Source: Growth rate based on own estimation
Figures in parentheses are standard errors
NS = Not significant **= significance at 5% level
***= significance at 10% level

Table IV, palm oil witnessed declining export except for the 1994-2007 period for which export significantly increased at a rate of 48.62% at a 5% significant level. For the entire period, palm oil export significantly declined at a rate of -8.40% at a 10% significant level. One explanation for declining export would be that emphasis was geared towards meeting domestic consumption taking into account rising population.

CONCLUSIONS

From the findings of the study, the following conclusions can be drawn; instability in output of Oil palm is accompanied with decreasing export and increasing import growth rates of palm oil for the entire period. Generally, the trend shows that instability in output was accompanied with declining export. Government policy inconsistencies and the general uncertainties and risk associated with agricultural production may be responsible for these general instabilities, these instabilities distort the terms of trade as the export-import ratio of the crop declines considerably. Likewise, expansion of cultivated area of Oil palm without a corresponding increase in yields invariably leads to an increase in production cost which also distorts production output.

Policy recommendation focuses on sustained agrifood policy, that encourages the productivity of land, labour, capital alongside affordable and accessible farm inputs. There is the need to encourage the utilization of Oil palm products into a variety of industrial uses. By so doing, farmers can derive more benefit from Oil palm production, thereby boosting yields and encouraging sustained crop production.

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