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Growth Trends and Sources of Output Growth for Oil Palm and Groundnut Production in Nigeria (1961-2007)

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ABSTRACT

This research was conducted to study growth trends and sources of output growth in Nigeria with a focus on oil palm and groundnut production from 1961-2007. The period was delineated into the following sub periods, to take into account various policy regimes: 1961-1969, 1970- 1985, 1986-1993 and 1994-2007. Objectives of the study were to estimate growth rates of oil palm and groundnut output, yield, harvested area and determine their sources of output growth. Data used for the study was obtained from FAOSTAT and covered area (hectare), yield (hg ha⁻¹), output (tonnes), the Log-linear regression model and Decomposition analysis were employed to determine the growth rates and sources of output growth, respectively. The findings showed that growth rate for groundnut output, yield and harvested area were increasing overtime except for the 1970-1985 period, where harvested area and output decreased and the 1961-1969 periods in which yield and output also decreased. The growth rate for oil palm harvested area and output for the 1961-1969 decreased while the other sub periods had positive growth rates, there was no growth in yield for the 1961-1969, 1986-1993 and 1994-2007 periods. The main source of output growth was through expansion of area under cultivation for both crops. Policy implications focused on increasing productivity of land, labour and capital while encouraging the processing of groundnut and oil palm into a variety of products to improve their value and also enhance their industrial application so that farmers get a better return on their efforts to encourage further cultivation.

Key words: Agricultural development, structural adjustment programme, output growth, growth trends, policy formulation

INTRODUCTION

This study is about agricultural policy in Nigeria and its relation to economic development, dealing with the experience of the federation of Nigeria from 1961-2007. Trends in production of two cash crops; oil palm and groundnut are analysed in detail to see the impact of various policy regimes that have come to dominate the Nigerian state.

According to Philip (1996), Nigerian agriculture is faced with the tasks of providing sufficient and balanced food supply for her teeming population, alongside raw materials for cottage industries and the generation of needed foreign exchange earnings. In the same vein, Meijerink and Roza (2007) asserted that agriculture provides sustainable means of livelihood and employment while enhancing rapid rural integration and development.

Udechukwu (2003) noted that in developing countries, subsistence agriculture dominates the economy and this provides income for farmers as output expands and yields increase. Johnston and

Mellor (1961) opine that “An increase in agricultural productivity (yields) implies some combination of reduced inputs, reduced agricultural prices or increased farm receipts”. Rising incomes significantly increases the demand for food consumption along with rising demand for inputs like tractors, fertilizers etc. Modern transport and communication expands with expansion in agriculture (Barrett *et al.*, 2003; Tiffin and Irz, 2006). Besides, food demand rises with an expanding population moving to cities and industrial locations, consideration should therefore be placed to ensure that agricultural output rises faster than food demand.

Hart (1998) pointed out that a surplus agricultural output ensures that capital is created and expands goods and services. Domestic expansion brings about more use of these goods and services and therefore exports declines. By so doing, these goods act as import substitutes and increasing expansion contributes to the expansion of the economy as a whole. Rural welfare is enhanced due to increasing agricultural output as well as sustainable community development, sustainable livelihood and poverty reduction as Eneh (2011a) recommends. Thirtle *et al.* (2003) adopted a higher standard of living and benefit from better social amenities such as transport, community banking and health care etc. (Imahe and Alabi, 2005).

How effective has agricultural policy been in Nigeria with respect to oil palm and groundnut from 1961-2007? This fairly straightforward question constitutes a central theme around which the study is organized. Attempting to answer the question requires consideration on the formulation and appraisal of agricultural policy in a programme of economic development, as Eneh (2011b) has noted that Institutional/Structural policy inconsistencies have plagued Nigerian developments. There are a few concerns about the growth and development of agriculture in Nigeria. As any high growth rate in agriculture especially the crop sub-sector is brought about by expanding area under cultivation. This approach is not sustainable as land is a limiting resource; Chandra *et al.* (2011) have observed similar impacts on land management in central Himalaya. Also, environmental concerns associated with increasingly expanding agricultural land are enormous. With this in mind, agricultural policy should focus on improving land productivity rather than continuous expansion. Likewise, improved inputs in technology such as high yielding variety of seeds, disease resistant stocks, fertilizers, dry season irrigation etc. has not led to an appreciable increase in yields.

A period of 47 years is covered for the study. Neither agricultural policies, nor selection of projects which will contribute most to these policies, are possible without such a relatively long time frame. In this study, it is argued that sound agricultural policies are a key driver of growth and development of agriculture with a focus on oil palm and groundnut.

The intent of this study is not to provide a comprehensive or detailed review of agricultural policy in Nigeria, it is rather to try and see which sub-period under study performed better and why, using two important cash crops cultivated in Nigeria. Another aim is to see what lessons this findings provide in the study of Nigeria’s government efforts to promote agricultural growth.

MATERIALS AND METHODS

Time series secondary data used for the present study were obtained from Faostat 2010 (<http://faostat.fao.org/site/567/default.aspx#ancor>) database, covering Harvested area, yield (productivity), production quantity of groundnut and oil palm for each sub-period covering the years 1961-1969, 1970-1985, 1986-1993, 1994-2007 and 1961-2007 covering a total of 47 years and captures periods of agricultural policy plans and measures in Nigeria (Alabi and Alabi, 2009; Abolagba *et al.*, 2010; Ojo and Akanji, 1996). Selection of crops for the study was dictated by the availability of data. The data were processed and analyzed by using semi-log regression model to estimate the growth rates and decomposition analysis for an estimate of the sources of output growth.

MODEL SPECIFICATIONS

The growth in agricultural development of any region can be determined by measuring growth rate in area, production and yield of crops in that region.

Growth trend: The contribution of growth factors provides a leeway in assessing the policies and programmes of agricultural development in Nigeria with the purpose of achieving higher growth. Prominent amongst the factors affecting agricultural output growth are area and yield (Deosthali and Chandrahekhar, 2004). The need arises to investigate why the various sources of output growth differ. By so doing, obstacles are removed and the process of agricultural development is rapidly achieved.

Compound growth rates of area, production quantity and yield (productivity) were estimated for the two crops using log-linear function. According to Dankedar, (1980) compound growth rates provide a more reliable means of comparing growth rates among periods and between crops. OLS equation fitted to analyze the growth rate trend was of the semi-log equation form as was employed by Ghosh (2010) and Shadmehri (2008). The semi-log equation is usually of the form:

$$\text{Ln}Y_t = b_0 + b_1T + e$$

where, $\text{Ln}Y_t$ is the natural logarithm time series data for area, yield, production quantity, of oil palm and groundnut for year t , b_0 is the constant term, T is the time trends for years of interest, e is the error term and b_1 is Growth rate for the period under consideration (i.e., slope coefficient). b_1 measures the relative change in Y_t for a given absolute change in the value of the explanatory variable (t). Multiplying b_1 by 100 gives the percentage growth rate in Y_t for an absolute change in variable (T):

$$\text{CGR} = (\text{antilog } b_1 - 1) \times 100$$

Growth rates of harvested area+Yield = Growth rate of production quantity for each period

Analysis on the decomposition of agricultural output growth: Several researches have been carried out to measure the contribution of yield and area to changes in output as has been utilized by Singh and Asokan (2000) and Siju and Kombairaju (2001).

According to Thanh and Singh (2006) "the theory of decomposition analysis is shown as follows: The observed increase in production of a crop could be decomposed into different components i.e. (1) Change in area, (2) Change in yield and (3) the interaction between area and yield."

The equation for the model is as shown below:

Change in production = Area effect+yield effect+Interaction effect between area and yield

$$\Delta P = A'\Delta Y + Y'\Delta A + A\Delta Y$$

Where:

ΔP = Difference in production from base year to last year (periods)

ΔY = Difference in yield from the base year to last year (periods)

ΔA = Difference in area from the base year to last year (periods)

A' = Area in the base year (of each period)

Y' = Yield of crop during base year (of each period)

Three sources of changes in output (ΔP) emerges; $Y'\Delta A$ is called 'area effect', $A'\Delta Y$ is called 'yield effect' and $\Delta A\Delta Y$ is an 'interaction effect' and is the combination effect of both changes in yield and area.

The use of this model permits estimation of the separate effects of changes in area, yield and a combination of both area and yield effect. The fundamental causes of changes in area, yield and the combination of both are not analyzed in the model and are beyond the scope of this study. Decomposition of growth in agricultural output among its constituent forces is of great importance. An analysis of the behaviour of agricultural production in the past and an estimation of its growth rates can provide a basis for future projections of agricultural output (Lakshmi and Pal, 1988). Therefore, an attempt is made in this study to analyze agricultural growth and the contribution of various components to overall output growth for the period 1961-2007.

The model is primarily a descriptive technique useful for quantifying changes; it is not an analytical technique for explaining the sources of these changes. For instance, the effect of a yield increase can be quantified, but the model cannot attribute it specifically to improved varieties, increased use of fertilizer, irrigation, favourable climatic conditions or other changes which have occurred. Implicitly, it is assumed that additional land coming into production is of same quality as existing land. If the land which is brought into production is of lower quality than existing land, then the true yield effect may be underestimated by the model.

RESULTS AND DISCUSSION

Table 1 reveals a mixed trend with respect to harvested area, yield and production quantity. The 1970-1985 period recorded negative growth rates in harvested area and production quantity. The 1961-1969 periods also recorded negative growth rates in yield and output. The rest of the periods had positive (increase) in harvested area and this is traceable to government policy of increasing production through expansion of area under cultivation and increases in input use Ogen (2007). Yusuf and Shehu (2007) equally reported high growth rates of 3.4 and 4.0% for citrus and mango respectively for the same period. Giving reasons such as the rehabilitation and maintenance of existing farm holds and encouragement of export which fell in line with the policies of government for the period. Technical efficiency:

Table 1: Percentage growth rates in area, output and productivity (yield) of groundnut

Period	Harvested area	Yield	Output
1961-1969	3.29±0.018 ^{NS}	-3.42±0.023 ^{NS}	-0.13±0.013 ^{NS}
1970-1985	-10.24±0.015*	2.96±0.016 ^{***}	-7.28±0.020*
1986-1993	7.74±0.024**	0.50±0.021 ^{NS}	8.24±0.019**
1994-2007	1.04±0.009 ^{NS}	5.27±0.007*	6.30±0.008**
1961-2007	0.29±0.006 ^{NS}	1.56±0.003*	1.85±0.006**

NS: Not Significant, ***,***Signifcant at1, 5 and 10% level, respectively

$$\text{Yield} = \frac{\text{Output}}{\text{Area}}$$

of 5.96% was observed during the 1970-1985 period. The cultivation of high yielding varieties, use of dry season irrigation, government subsidies on fertilizer and movement of labour to agriculture associated with the Schultz (1964) high-pay off input model can account for this efficiency. Babatunde (2008) has asserted that the scope of poverty is further reduced significantly through agricultural growth as a result of these favourable policies.

Table 2 presents the output, area and yield of oil palm. A look at the table shows that there was no growth in yield for the periods 1961-1969, 1986-1993 and 1994-2007. An explanation for the stagnant growth is related to the wild varieties of oil palm grown in Nigeria and the long gestation period required for the crop to mature. The 1961-1969 recorded significant decrease in harvested area due mainly to the Nigerian civil war that ravaged southern Nigeria, the traditional base of oil palm cultivation in Nigeria. A careful look at the entire period (1961-2007) reveals some degree of technical efficiency of 1.74% with respect to yield. Even though yield growth rate was stagnant, there was some level of technical efficiency as growth rate only measures the pace of agricultural development and not necessary its performance (Kalamkar, 2007).

Decomposition of individual crop outputs: The relative contribution of area, yield and their interaction to change in output for groundnut is presented in Table 3. The decomposition analysis revealed that growth in production of groundnut was mainly due to expansion in area for the periods 1970-1985, 1986-1993 and 1961-2007 with percentage contribution of 74.19, 157.75 and 195.29%, respectively (Ghosh, 2011), while studying crop diversification in west Bengal also reported a mix of crop growths amongst different crop mixes. From the results, the scope for any further increase in production lies in increasing yields. Interaction effect contributed to groundnut output in periods 1961-1969 and 1994-2007, clearly showing that total production for the periods was brought about by contribution of both yield and area. The expansion in yield was largest in the 1986-1993 periods with percentage contribution of 84.96%. As such agricultural policies

Table 2: Percentage growth rates in area, output and productivity (yield) of oil palm

Period	Harvested area	Yield	Output
1961-1969	-2.95±0.009**	0.00±0.000)	-2.95±0.0014*
1970-1985	0.03±0.003 ^{NS}	0.08±0.000 ^{NS}	0.11±0.003 ^{NS}
1986-1993	2.57±0.005*	0.00±0.001)	2.61±0.004*
1994-2007	1.10±0.002*	0.00±0.001	1.12±0.002*
1961-2007	0.81±0.001*	1.56±0.003*	0.99±0.0014*

NS: Not significant, *****Significant at 1, 5 and 10% level, respectively

Table 3: Contribution of area and yield in production of groundnut

Periods	Area effect (YΔA) (ha)	Yield effect (AΔY) (Hg ha ⁻¹)	Interaction (ΔAΔY) (ton)
1961-1969	57.74	-20.99	63.24
1970-1985	74.19	3.09	22.73
1986-1993	157.75	84.96	-142.71
1994-2007	-34.38	-59.99	194.37
1961-2007	195.29	-17.99	-23.99

Table 4: Contribution of area and yield in production of oil palm

Periods	Area effect ($Y\Delta A$) (ha)	Yield effect ($A\Delta Y$) (Hg ha ⁻¹)	Interaction ($\Delta A\Delta Y$) (ton)
1961-1969	100.00	0.00	0.00
1970-1985	178.13	-60.43	-17.71
1986-1993	99.34	3.46	-2.81
1994-2007	169.01	-229.49	160.47
1961-2007	195.29	-17.99	-77.30

targeted at boosting yields such as effective irrigation, fertilizer usage, use of pesticides, available credit facilities and extension services was somewhat effective during this period.

Table 4 shows the relative contribution of area, yield and the interaction of both to changes in production of oil palm. The relative importance of the various growth components varied between the periods. During the 1961-1969 period area effect accounted for 100% of output growth, as observed, emphasis was on rapid increase in area with no corresponding yield effect. Area continued to expand all through the periods while yield contributed negatively (declined) except for the 1986-1993 period for which yield contributed positively to output at 3.46%, this again shows that the period of structural adjustment in Nigeria brought about increased productivity of land as a result of agricultural policies that encouraged rapid agricultural development such policy programmes like the river basin development programmes that boosted water and irrigation, national accelerated food production programme which provided agricultural inputs to farmers and agricultural development programmes that provided extension services to rural farmer. These programmes combined various price and non-price incentives in an attempt to increase efficiency and raise production (Fasinmirin and Braga, 2009). The interaction effect increased during the 1994-2007 as against the other periods due primarily to further expansion in area.

CONCLUSION AND RECOMMENDATIONS

The success of agricultural policy and its implementation is dependent on sustainable macroeconomic policies needed for the rapid growth of the agricultural sector in relation with other sectors of the Nigerian Economy. Sound agricultural policy ensures the profitability of agricultural businesses and promotes farmers welfare through the provision of credit, investment, budgetary provisions, taxes etc.

The study has implications for the growth in agricultural productivity in Nigeria in general and specifically on the productivity growth of oil palm and groundnut. The following policy implications are based on the findings of the study:

The period under study for the two crops for which increasing yield growth rate was accompanied by decreasing growth rate in harvested area was the most effective at increasing production. From the study, the period between 1970-1985 with reference to groundnut observed a significant decrease in harvested area and a significant increase in yields. Policy measures adopted during the period were: provision of agricultural subsidies, expansion and improvement in extension services, accessibility of farm inputs, provision of accessible road networks, provision of affordable storage facilities, domestic and export market access and provision of reliable credit facilities, according to Damisa *et al.* (2008) agricultural credit system should be given special attention so as to boost farmers satisfaction and production potentials. These policies should be vigorously pursued to ensure agricultural productivity growth.

The source of output growth was mainly due to area effect and this situation is not sustainable as land is a limiting resource, because as population increases, land competes for needed housing

and recreation. Efforts should be geared towards increasing the productivity of land, to achieve this, focus should be on policy implementation through continuous research into the agro-climatic conditions of different agricultural producing zones of Nigeria in order to discover their peculiar needs and develop crop varieties suitable for such regions.

There is need for a workable agricultural price stabilization policy as a watch against unnecessary price fluctuations that may lead to uncertainties and instability in agricultural production, as with the case of Indonesia, Rifin (2010) opined that the increasing export competitiveness of palm oil, due mainly to favourable government policies is the reason for Indonesia's export increase. To encourage, domestic production, protection of farmers by way of high tariff should be encouraged, but should be based on sound judgement and timing. Also, the health of farmers deserves special attention considering the fact that a large proportion of Nigerian farmers operate at the subsistence level and poor health contributes to inefficiency at the farm level (Ajani and Ugwu, 2008). Efforts should be put in place to encourage the processing of groundnut and oil palm into a variety of products to improve their value and also encourage its industrial application, so that farmers get a better return on their efforts to encourage further cultivation. Indeed, Baharuddin *et al.* (2009) asserted that the by-products from oil palm are a suitable compost material that can be used as fertilizer in the oil palm plantation for soil improvement.

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