FORECASTING AND GROWTH TRENDS OF SUGAR CANE PRODUCTION: MEETING THE GOALS OF COMMERCIAL AGRICULTURE IN NIGERIA.

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ABSTRACT

The study was undertaken to estimate the growth trend in sugarcane production. The exponential model was applied to estimate the trend in production. Secondary data was obtained for the period of production on sugarcane from 1980-2007. The results revealed that sugarcane production had an instantaneous growth rate of 2.08% and a compound growth rate of 2.10%. The growth rate reveals is further confirmed by the signs of acceleration in growth from the results computed. However the results revealed a doubling time of 32 years for sugarcane production to double its current trend. The study therefore suggests the implementation and strong revolve of the of the Federal Government's agricultural commercialization efforts to focus on availability and timely supplies of resources, to boost optimum production and also the establishment of small scale sugar processing plants which serves as outlets for the produced sugarcanes used as raw materials for sugar production.

CITATION

INTRODUCTION

Agriculture plays an important role in the economy as it contributes 40 percent to the gross domestic product against 13 percent from oil. Crop production accounts for about 85% of this total and livestock accounts for 10% with the remaining 5% from fisheries and forestry. Agricultural commercialization entails the production of crops and livestock for sale, for widespread distribution to wholesalers and retail outlets, storage, processing, market and enterprise development. These crops include commercial production of wheat, maize, tea, coffee, sugar cane, and cotton, a number of tropical fruits such as cashew, mangoes, citrus, bananas etc, livestock such as poultry, piggery, dairy and fisheries.

Agricultural commercialization places new emphasis on capital formation, scientific progress and technological development. As a result of the contribution of agriculture to the nations G.D.P. the Federal Government of Nigeria through its agencies resolve to fully exploit these contribution came up with the move to commercialize agriculture. The main objective of agricultural commercialization is to improve the efficiency of agricultural production systems and improve access to markets for targeted value chains among small and medium scale commercial farms. This was to be actualized through the developmental role of the central bank of Nigeria in collaboration with the Federal Government of Nigeria represented by the Federal Ministry of Agriculture and water resources, through the establishment of the commercial agricultural credit scheme (CACS). The scheme focused on crops as cotton, oil palm, wheat, rubber, sugar cane, *Jatropha carcus*, fruits and vegetables and livestock such as dairy, poultry, piggery and fisheries and forestry.

Sugar cane is the major raw material used for sugar manufacturing in Nigeria. It accounts for about 61% of the total world sugar production (Lafiagi, 1984 in Wayagari et, al. 2003). Two types of sugarcane are grown in Nigeria industrial and soft cane (chewing cane). The industrial cane is the hard or tough type generally processed into sugar while the soft cane or chewing cane is mainly chewed raw for it's sweet juice, some of it is also processed into different crude sugar products.(Wayagari,et,al.2003). The production of raw sugar (the main product of sugarcane) in Nigeria slumped to zero in the early part of this decade. An overall sugar consumption is put at 1.5 million tons in the country. Nigeria has also been reported to be the largest consumers of sugar in Africa apart from South Africa. The sugar industry in Nigeria which is highly dependent on sugarcane as its raw material is still dependent on raw sugar imports of which 90% of this is imported annually. Conclusively there is a dearth in sugarcane production particularly in meeting the demands of sugar industries and consequently the Nigerian consumers.

The privatization process of sugar producing companies with the attendant drive for commercialization of sugarcane production were put in to place to proffer possible solution for this sugar decline in the country. Arising from the assumed importance of sugarcane production in meeting the demands of consumption of sugar and other bye-products of sugarcane, it becomes imperative to estimate the growth in

production/output of sugarcane. Also to assess it's contribution to boosting it's commercialization.

Agricultural economic development is a process whereby agricultural productivity increases over a sustained period of time to take account importantly of human population growth, an important parameter of interest is the growth rate. Generally the essence of estimating growth trends or forecasting is to improve the quality of decision making. Since there are future events which are unknown at present but are crucial to making decisions. It becomes necessary to estimate growth trends and make predictions for the future. (Yusuf and Salau; 2007).

METHODOLOGY

Secondary data were obtained from the central bank of Nigeria statistical bulletin (vol16). Time series data from 1980 through 2007 on production time trend in years was used. Analysis was performed using simple descriptive analysis of graphs and regression time trend models. In modelling trend for this study the exponential trend or log-linear as employed by (Ahmad *et. al.*, 2005; Onyeaweaku and Okoye, 2005; Udom, 2006; Diebold, 2007; Ojiako et,al. 2007; Ojiako *et, al.* 2008 and Nmadu 2009) was employed. This functional form is also often phrased as "left –side semi-log by many econometricians according to Studenmund (2001). The exponential trend equation for sugarcane production is specified as follows;

$$Y_t = e \beta_0 + \beta_1 t_i + ut \qquad (1)$$

By taking the natural logarithm of both sides the linear form of the equation will be obtained making it amenable to OLS as ;

$$Log Y_t = \beta_0 + \beta_1 t_i + ut - \qquad (2)$$

Where
Ln= natural log of sugarcane production
Y_t =production measured in tonnes
β_0 =constant term or intercept of the trend equation
t = time trend measured in years
β_1 = slope or trend coefficient
ut= error term/disturbance term.

From equation (2) the compound growth rate r was computed as follows,

$$r = (e^{\beta} - 1) \times 100 \qquad (3)$$

Where
r = compound rate of growth
β =estimated coefficient from equation (2)
e = 2.71828 is the Euler's exponential constant (Sawant 1983).

The time it would take to double the rate of growth was then estimated as follows.

$$D_T = 69/r \qquad (4) \qquad (Anonymous, 2002, Wikipedia, 2005, Nmadu, 2009)$$

Where
D_T = Doubling time
r = compound rate of growth computed in equation (3)

In order to estimate the growth patterns of sugarcane production and consequently determine areas of acceleration, deceleration and stagnation, the quadratic equation in the trend variable was estimated as follows.

$$Ln\, Y_t = \beta_0 + \beta_1 t_i + \beta_2 t_i^2 + ut \qquad (5)$$

All variables as previously defined, β_0, β_1 and β_2 are parameters to be estimated. In the specification in equation (5), the linear and quadratic time variables indicate the circular path in the dependent variable (Y_t) while the quadratic term (t^2) allows for the possibility of determining whether there was acceleration, deceleration or stagnation in growth during the period under study (Sawant, 1983; Oyeaweanku and Okoye, 2005; Ifeanyi and Idowu, 2009.). In determining these areas of growth our major concern is on the β_2 (i.e coefficient of t^2), which reveals a measure of the growth pattern.

If $\beta_2 > 0$; and statistically significant there is acceleration in growth.

If $\beta_2 < 0$; and statistically significant there is deceleration in growth.

If β_2 is positive or negative; and is not statistically significant there is stagnation in growth.(Onyenweaku and Okoye,2005; Anyaegbunam et,al;2006).

RESULTS AND DISCUSSION

Growth trends of sugarcane of production: The trend equations for sugarcane production is presented in Table 1. The coefficient of the time trend was positive in the specified model, this reveals that time was relevant in explaining variations in the production of sugarcane. The coefficient was statistically significant at ($p<0.05$) implying production increases over the period considered. The R^2 of the trend equation revealed a good fit with R^2 of 0.17, this signifies that 17% of the production from sugarcane is explained by the trend (number of years). It can be inferred from the positive slope coefficient realised that increases or growth was recorded in sugarcane production during the period under study. In this model β_2, the slope of the coefficient measures the relative change in Y for a given change in the value of the regressor (in this case the variable "t"). That is:

$$\beta_1 = \frac{Relative\ change\ in\ regressand\ (Y_t)}{Absolute\ change\ in\ regressor\ (t)} \qquad (6)$$

Table 1: Estimated exponential trend equation for sugarcane production

Period	β_0	β_1	β_2	r^2	F-value	Significance
Exponential trend	-34.7578	0.0208		0.171	5.349	0.0289
	(-1.933)***	(2.3128)**				
Quadratic trend	17811.302	-17.884	0.00449	0.582	17.389	1.85E-05
	(4.948)*	(-4.952)*	(4.957)*			

Figures in parenthesis are the respective t-ratios. Levels of significance = * at 1%; ** at 5% and *** at 10%.

If we multiply the relative change in Yt (production) by 100, we will get percentage change or growth rate in Y for an absolute change in t, (the regressor). The slope coefficient β_1 measures the instantaneous rate of growth.

This relative change is as follows:
$\beta 1 = 0.0208$
Growth rate = $\beta_1 . 100$
Growth rate = 0.0208 x 100
Growth rate = 2.08%
This implies that over the period 1980-2007, the output of sugarcane production grew at 2.08% per year. This growth rate is an instantaneous (at a point in time) rate of growth and not the compound (over period of time) rate of growth. The compound growth rate (r) can be estimated from equation (2) as follows:
$r = (e \beta -1) \times 100$
Compound rate of growth = $r = 2.71828^{0.0208} -1) \times 100$
$r = (1.0210 - 1) \times 100$
$r = 2.10\%$

The period under study, 1980-2007, revealed that the compound rate of growth of production of sugarcane was about 2.10%. This growth rate does not reveal much significant difference from the instantaneous growth rate which is at 2.08%. This implies a relatively slow growth process in the production of sugarcane particularly during the period 1983-2003.

Doubling Time: The doubling time for the compound growth rate in years computed from equation (4) revealed 32 years. This implies that it would take about 32 years to double the rate of output / production on the current trend. It therefore means that adoption and full implementation of commercial agriculture by placing more significant emphasis on its intensification cannot be over-emphasised. This is needed in order to achieve the needed demand in the sugar industries and consumer demand thereby translating to a viable food industry.

Acceleration, Deceleration and Stagnation in Sugarcane production: To investigate for existence of acceleration or deceleration or stagnation in growth of sugar cane production, the

quadratic equation in the time trend variable were fitted according to equation (5). The results are also reflected in Table 1 and revealed that the equation has a good fit giving the R^2 value of 0.58, and the associated F-statistics at 17.39 which is statistically significant at (P<0.01). The slope coefficient of t_2 that is β_2 is positive and statistically significant at (P<0.001) level of significance. The significant positive value is a confirmation of acceleration in growth of sugarcane production.

Forecast of Sugarcane Production in Nigeria 1980-2007: Figure 1 reveals the trend in sugarcane production. The production of sugarcane increased steadily with a yield of 870.0 tonnes in 1980 to 905.0 tonnes in 1993 with minimal fluctuations experienced in between these years. A sharp decline in sugarcane production was experienced in 1994 with an output of about 633.0 tonnes up on till 2002 revealing an output of 757.0 tonnes. In 2003, production picked to 804.0 tonnes, sharp increases occurred from 2004 with an output of 2,167.0 tonnes and continued with steady increase to 2,550.6 tonnes realized in 2007.
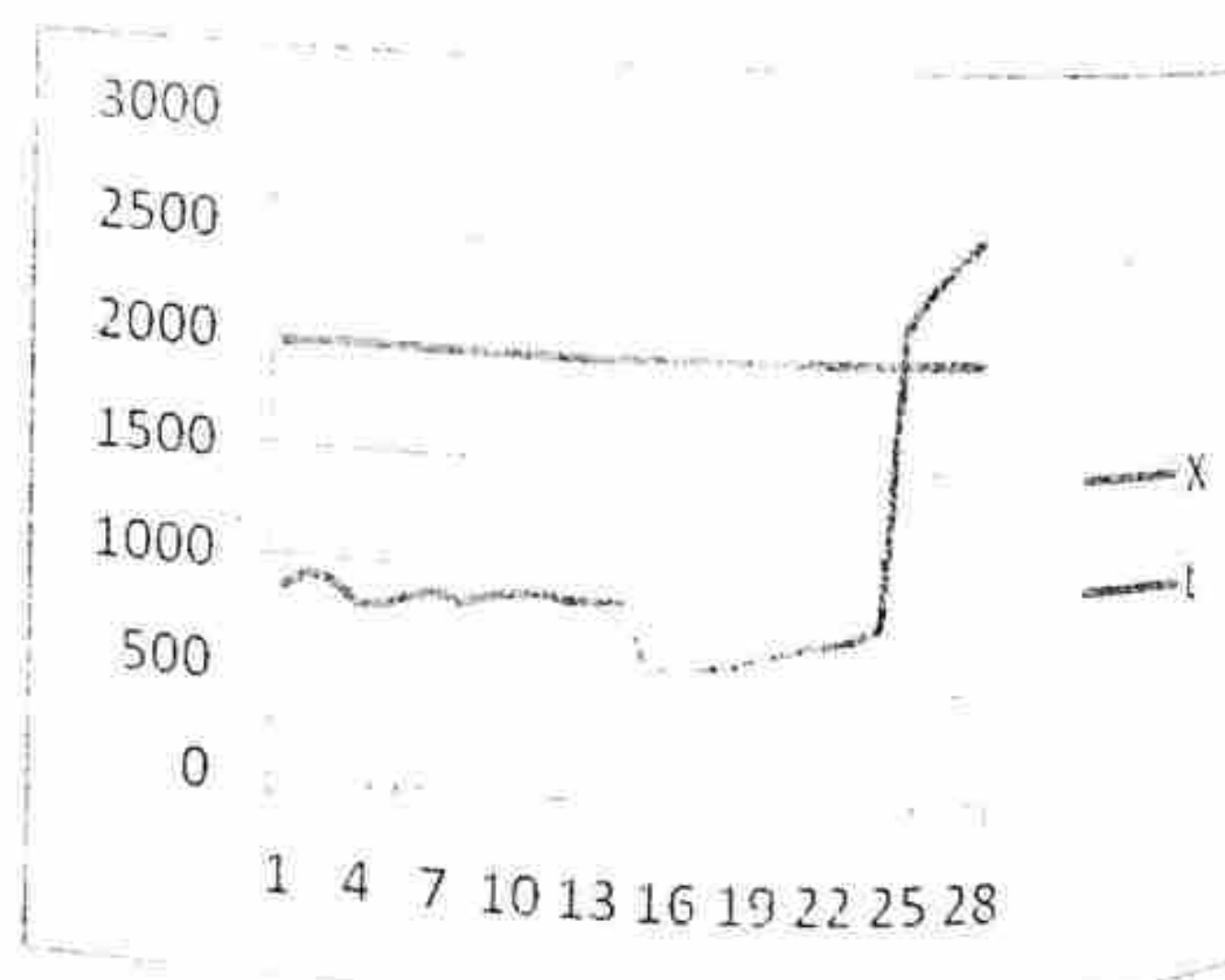

FIG 1: Trend In the Production Of Sugarcane in Nigeria (1980-2007)

The awareness and inclusion of sugarcane as one of the target crops for commercialization could be adduced for the sharp increase of sugarcane produced in the years 2004-2007. The privatisation of formerly owned Government sugar companies is also a likely reason for this increase; this is because as a result of bringing back to life the somewhat

42

comatose Government owned sugar companies through privatization farmers were now more encouraged to produce. Through the activities of the National sugar development company inputs were now made readily available to farmers, such as new improved varieties as against the previously used varieties which had lost their vigour and suffered declining productivity especially the case of the Bacita sugar company.

Also the sharp increase reported in this period could be adduced to the availability of small sugar plants scattered all over the nation such as the Sara sugar plant in Jigawa state, Corner Mada sugar plant in the FCT, revitalized and privatized Government owned sugar plants etc. Through the efforts of commercialization which focused on production, marketing, distribution, storage processing etc, these small scale sugar plants have availed themselves as points for marketing the sugarcane produced to be used as raw materials in their companies thus enhancing and creating a drive for optimum production by farmers.

CONCLUSION

This study has revealed that there existed a positive growth in sugarcane production over the years studied. The study further revealed that in the years 2004-2007 there resulted significant growth increases in production. It is pertinent to note that the onset of agric commercialization came on board around this period. It could therefore be inferred that the commencement of commercialization of agriculture has greatly impacted positively on the sugarcane industry. It is therefore recommended that Government needs to continue it's support of this industry vis-a-vis being involved in the quick and timely supply of inputs to farmers. Enhancing the establishment of small scale sugar factories which will serve as processing outlets/marketing outlets for the produced sugarcanes is a policy option that needs to be well exploited.

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