



ASSESSMENT OF THE GROWTH OF SWEET POTATO OUTPUT AND YIELD IN NIGERIA (1970 - 2020) AND ITS IMPLICATIONS ON FOOD PRODUCTION

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ABSTRACT

The study assessed the growth of sweet potato output and yield in Nigeria (1970 - 2020) and its implications on food production. The study basically relied on the use of time series data spanning from 1970 to 2020. Data on the variables for the study were collected from the archives of Food and Agriculture Organization (FAO) and World bank database. Data for this study were analyzed using both descriptive such as mean, maximum and minimum with trend graphs and inferential statistics such as Johansen co-integration, Augmented Dickey Fuller (ADF) test, Vector Error Correction Model (VECM) and Autoregressive Integrated Moving Average (ARIMA) model. The result of the trend model revealed that the coefficient for estimating the growth of sweet potato output was positive (0.103) and significant at 1% with an accelerated pattern of growth; the coefficient for estimating the growth of sweet potato yield was negative (-0.033) and significant at 1% with a decelerated pattern of growth while the coefficient for estimating the growth of sweet potato yield was positive (0.0369) and significant at 1% with an accelerated growth pattern. The compound growth rates of sweet potato output, yield and food production was 10.88%, -3.31% and 3.76% respectively. The result of the Augmented Dickey Fuller (ADF) test indicated that all the variables were found to be stationary on first differencing and Johansen co-integration mechanism indicated that there was co-integration among the variables. The results of the ARIMA forecast showed that in the next decade, sweet potato output will be 4697194.87 tones; sweet potato yield will be 0.78 tones/hectare and the index of food production will be 117.71. The study concluded that sweet potato output significantly contributes to food production in Nigeria both in the short and long run. Therefore, the study recommended that Governments at all levels and policy makers should promote sweet potato production as the crops has enormous potentials to increase food production in Nigeria.

Keywords: Augmented Dickey Fuller (ADF) test, Vector Error Correction Model (VECM), Autoregressive Integrated Moving Average (ARIMA) model, Sweet potato.

INTRODUCTION

Sweet potato (*Ipomoea batatas* L.) is a tropical root crop believed to have originated from Central America and was introduced to Africa probably at the end of 19th Century (Purseglove, 1968). It is the only economically important plant of the family Convolvulaceae of about 50 genera and 1000 species (Scott and Ewell, 2012). Sweet potato seems to be the most widely dispersed root crop as it is adaptable and can grow under many different ecological conditions (Purseglove, 1968).

Sweet potato ranked seventh most important food crop of the world after wheat, rice, maize, potato, barely and cassava (Jan *et al.*, 2015; Centre International Potato [CIP], 2017). Sweet potato is cultivated in 117 countries in an area of 8.62 million ha producing 105.19 million tons with a yield of 12.20 t ha⁻¹ (FAO, 2016). In Nigeria, it is cultivated in almost all the states. Nigeria is the number one producer of sweet potato in Africa with annual output of



3.46 million metric tons and globally the second largest producer after China (Adewumi *et al.*, 2018).

Sweet potato is traditionally considered to be hardy crops and it is a rich source of carbohydrates, vitamins and minerals for the poor farmers in many developing countries and also it can produce more edible energy per ha per day than wheat, rice or cassava (Jan *et al.*, 2015; CIP, 2017). In present times it is becoming the focus for research due to its versatility and adaptability to variation in climatic conditions. Sweet potato is one of the main crops as majority of farmers consider it as major source of food mainly for human consumption and having substantial role by ensuring food security and increasing the income of farmers (Prakash *et al.*, 2016; Prakash *et al.*, 2017).

However, it is the only crop among the root and tuber crops that has a positive per capita annual rate of increase in production in sub-Saharan Africa (Horton and Fano, 2013). Crop productivity in Nigeria is still at declining stage in spite of the various incentives by the government to boost massive production. The poor output by the farmers may be an indication that the resources needed for production are not being utilized at the optimal levels. There is a need to document sweet potato production, particularly at a time when a variety of approaches to poverty alleviation are being considered by the Nigerian government and their development partners. The crop is cheap, inexpensive and is easily cultivated, yet it is facing a lot of production and post-harvest challenges (Adewumi *et al.*, 2018).

The specific objectives of the study were to:

- i. describe the trend of sweet potato output, yield and food production in Nigeria;
- ii. determine the growth rate and direction of sweet potato output, yield and food production in Nigeria; and
- iii. forecast the trend of sweet potato output, yield and food production in the next decade.

MATERIALS AND METHODS

The Study Area

The study was carried out in Nigeria (Figure 1). Nigeria has a total geographical area of 923, 768 square kilometers constituting a land area of 910768 square kilometers and water area of 13000 square kilometers, respectively. It has coaster lines of 853 square kilometers and is located on the Gulf of the Guinea in West Africa. It is one of the eight most populous countries in the world with a population of about 140 million (NPC, 2006). With a population growth rate of 2.6%, Nigeria has a projected population of about 210.87 million in 2021 (www.statista.com). Nigeria lies wholly within the tropics along the Gulf of Guinea on the western coast of Africa. The topography ranges from mangrove swampland along the coast to tropical rain forest and savannah to the north. Nigeria is located between latitude 4°16 and 13°53 north and longitude 2°40 and 14°41 east (CIA Fact Book, 2009).

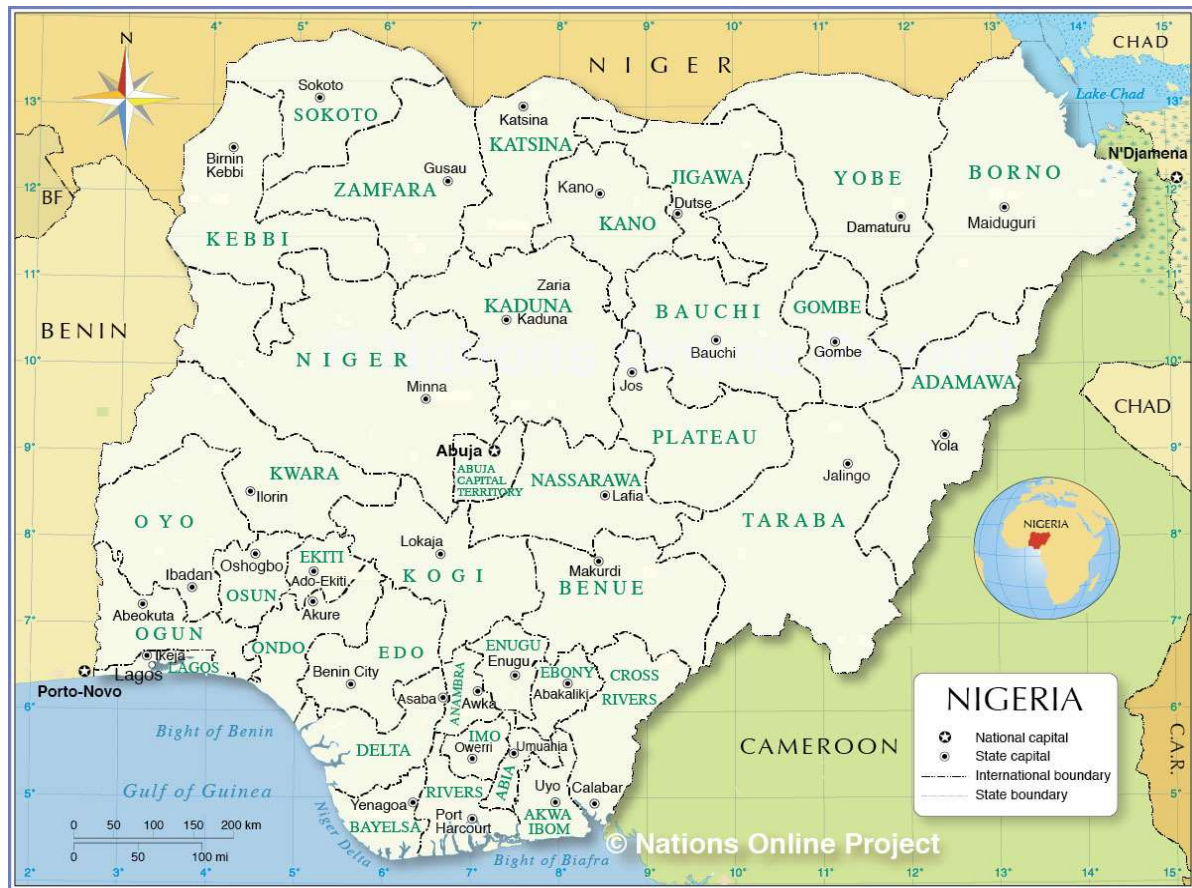


Fig. 1. Map of Nigeria Showing the Study Area

Source: www.nationsonline.org

Methods of Data Collection

The study basically relied on the use of time series data spanning from 1970 to 2020. Data on the variables for the study were collected from the archives of Food and Agriculture Organization (FAO) and World bank database. Specifically, data on sweet potato output and yield of sweet potatoes were collected from FAO while data on food production index were collected from World bank.

Method of Data Analysis

Data for this study were analyzed using both descriptive and inferential statistics. Specifically, descriptive statistics such as mean, maximum and minimum with trend graphs was used to achieve objective 1, growth model was used to achieve objective 2, objective 3 was achieved using the Johansen co-integration test after testing for unit root, Vector Error Correction Model (VECM) was used to achieve objective 4 and objective 5 was achieved using the Autoregressive Integrated Moving Average (ARIMA) model, while t-test was used to test the hypotheses of the study. The variable of the study was measured as: output was measured in tones; yield was measured in tones/hectares and food production was measured using the food production index. The models used are specified as follows:

1. Growth model

The trend equation is given as:

$$Y_t = Y_0(1+r)^t \quad \dots(1)$$

where;

Y_t = Sweet potato output or yield in year t

Y_0 = Sweet potato output or yield in the base year.

r = Compound rate of growth of Y ,

t = time trend variable

By taking the natural logarithm of both sides, the linear form of the equation was obtained making it amenable to OLS as:

$$\ln Y_t = \ln Y_0 + t \ln(1+r) \quad \dots(2)$$

Substituting in $\ln Y_0$ with α and $\ln(1+r)$ with β , equation 2 is rewritten as:

$$\ln Y_t = \alpha + \beta_t \quad \dots(3)$$

Adding the disturbance or error term to equation 3, we obtain:

$$\ln Y_t = \alpha + \beta_t + U_t \quad \dots(4)$$

Equation 4 is the growth rate model developed for this study. Growth model used to ascertain direction and growth rates of variables of interest was specifically stated for the variables of interest as follow:

$$\ln Y_t = \alpha + \beta_{sout}t + \mu_t \quad \dots(5)$$

$$\ln Y_t = \alpha + \beta_{syd}t + \mu_t \quad \dots(6)$$

where;

α = intercept;

β = vector of the trend variable and μ is the econometric error term.

B_{sout} , β_{syd} , = coefficients of the trend variable for sweet potato output and yield respectively.

The parameter of utmost interest in equations (5-6) is coefficient of β , the slope coefficient which measures the constant proportional/relative change in Y for a given absolute change in the value of the regressor t . Firstly, multiplying b by 100, gives the instantaneous growth rate (IGR) at a point in time.

$$IGR = \beta \times 100 \quad \dots(7)$$

where;

IGR = Instantaneous growth rate and

β = is the least-square estimate of the slope coefficient

Secondly, the compound growth rate (CGR) in percentage in each of the five cases can be recovered from the equations 5-6 in the following manner:

$$CGR = (e^{\beta_i} - 1) \times 100 \quad \dots(8)$$

where;

β_i = the coefficient of the trend variable in the respective cases

e = Euler's exponential constant (= 2.71828)

In order to estimate the direction or pattern of growth so as to determine whether there is acceleration, deceleration or stagnation, quadratic equation in time trend variable was fitted as follows:

$$\ln Y_t = \beta_0 + \beta_1 t + \beta_2 t^2 + U_t \quad \dots(9)$$

All variables as previously defined, β_0 , β_1 and β_2 are parameters to be estimated. In the specification of equation 9, the linear and quadratic time terms indicate the circular path in the dependent variable (Y_t). The quadratic time variable (t^2) allows for the possibility of determining whether there was acceleration, deceleration or stagnation in the study (Maikasuwa and Ala, 2013).

Finally, in equations 9, if β_2 is positive and statistically significant there is acceleration in growth, if β is negative and statistically significant there is deceleration in growth, if β is not statistically significant there is stagnation in the growth process.

2. Vector Error Correction Model (VECM)

The vector error correction model was used to model causal influence between non stationary I (1) variables with evidence of long run relationship. The vector error correction

model is useful for the evaluation of a short-term adjustment which adjusts towards the long run equilibrium in each time period. If the variables are found to be co-integrated, a VECM is estimated because a co integrating relationship deals only with long-run relationship without considering the short-run dynamics. The advantage of this procedure lies in the fact that both long run and short run influences of the endogenous variables in the model can be determined with the mechanism that keeps the variable in equilibrium evaluated.

$$\Delta \ln FP_t = \varphi_1 + \sum_{i=1}^p \alpha_{1i} \Delta \ln FP_{t-i} + \sum_{i=1}^p \beta_{1i} \Delta \ln SWP_{t-i} + \sigma_1 ECT_{t-i} + \xi_{1t} \quad \dots (10)$$

$$\Delta \ln FP_t = \varphi_2 + \sum_{i=1}^p \alpha_{2i} \Delta \ln FP_{t-i} + \sum_{i=1}^p \beta_{2i} \Delta \ln SWP_{t-i} + \sigma_2 ECT_{t-i} + \xi_{2t} \quad \dots (11)$$

where; φ and σ are $m \times 1$ vector of parameters; $\alpha, \beta, \theta, \mu$ are $m \times 1$ and $m \times p$ vectors of parameters respectively; p is the optimal lag order that minimizes Information criteria; m is the number of endogenous variables under investigation (food production and sweet potato output); ξ_{jt} is an $m \times 1$ vector of random variables assumed to be normally distributed white noise process.

RESULTS AND DISCUSSION

Trend of Sweet Potato Output in Nigeria

The trend of sweet potato output is presented in Figure 3 with the descriptive statistics presented in Table 1 and Figure 2. The result showed that sweet potato output ranged between 80000 tones and 4145488 tones with a mean of 1616758 tones during the period under study. Specifically, sweet potato output was fairly constant from 1970 to 1994. However, sweet potato output increased drastically between 1994 and 1996. From 1997 to 2005 sweet potato output experienced an increasing trend but declined between 2006 and 2007. From 2007 to 2019 sweet potato output further had an increasing trend, however, the trend declined slightly between 2019 and 2020. This is in line with the findings of Kenyon *et al.* (2006) who reported that the area of root and tuber crops annually planted in SSA (Nigeria inclusive) has gradually increased over the years.

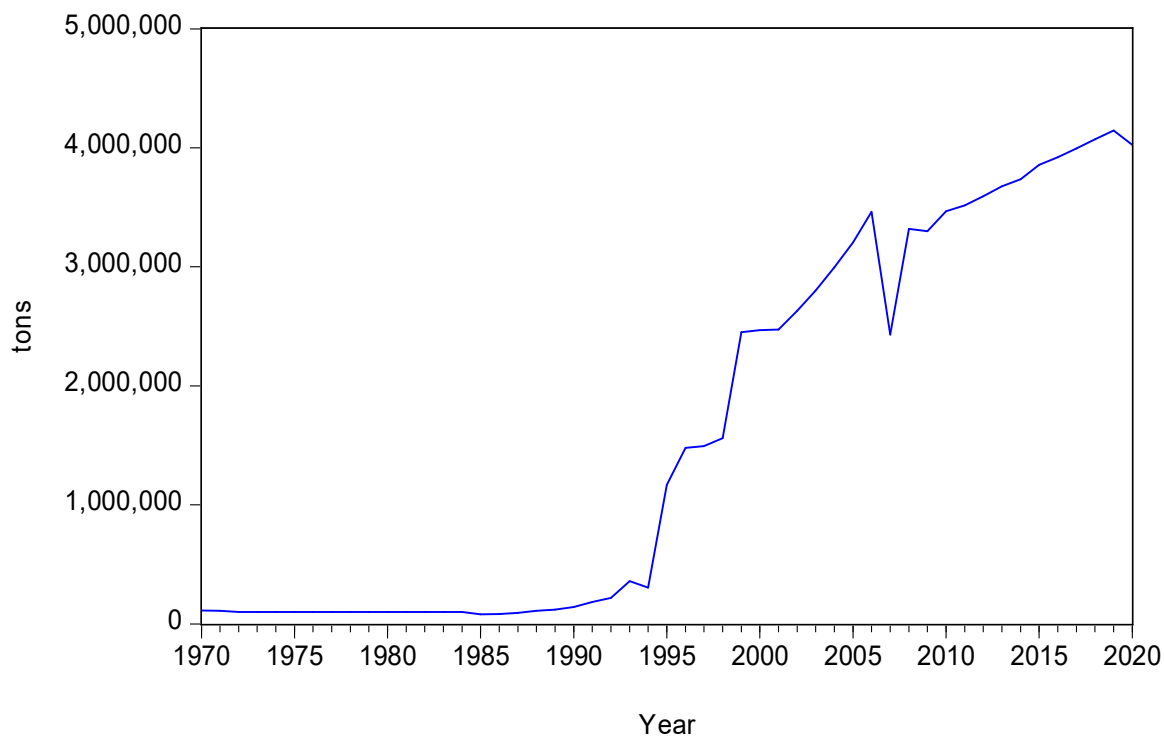


Figure 2: *Trend of sweet potato output in Nigeria (1970-2020)*

Source: Data analysis, 2021.

Trend of Sweet Potato Yield in Nigeria

The trend of sweet potato yield is presented in figure 3 with the descriptive statistics presented in Table 1 and Figure 3. The result showed that sweet potato yield ranged between 2.15 tones/hectares and 9.42 tones/hectares with a mean of 5.78 tones/hectares during the period under study. This is consistent with the findings of Omoare *et al.* (2016) who reported that Nigeria recorded one of the world's lowest average potato yields of less than 3.1 tons per hectare. This performance is abysmal when compared with sweet potato yield in the United States of America and Japan where yields of 22.8 and 21.7 tons per hectare were recorded respectively. This could be attributed to to inefficiency in resource use by farmers in Nigeria. Specifically, sweet potato yield was fairly constant from 1970 to 1975. However, sweet potato yield fluctuated tremendously at a declining rate between 1975 and 1985. Furthermore, sweet potato yield experienced a downward trend and continued to decrease till 2005 where the yield was lowest. A slight noticeable increase was however experienced between 2005 and 2006. However, sweet potato yield experienced a continuous decline slightly till 2020.

Table 1: Summary Statistics of the Variables

	SWTOUT	SWTYLD	FPI
Mean	1616758.	5.183743	56.66667
Median	1168000.	4.483500	55.38000
Maximum	4145488.	9.416700	103.2900
Minimum	80000.00	2.150300	21.86000
Std. Dev.	1602361.	2.508345	28.86160
Skewness	0.322594	0.380104	0.192846
Kurtosis	1.365471	1.596770	1.550191
Jarque-Bera	6.561899	5.412315	4.782745
Probability	0.037593	0.066793	0.091504
Sum	82454663	264.3709	2890.000
Sum Sq. Dev.	1.28E+14	314.5899	41649.60
Observations	51	51	51

Source: Data Analysis, 2021

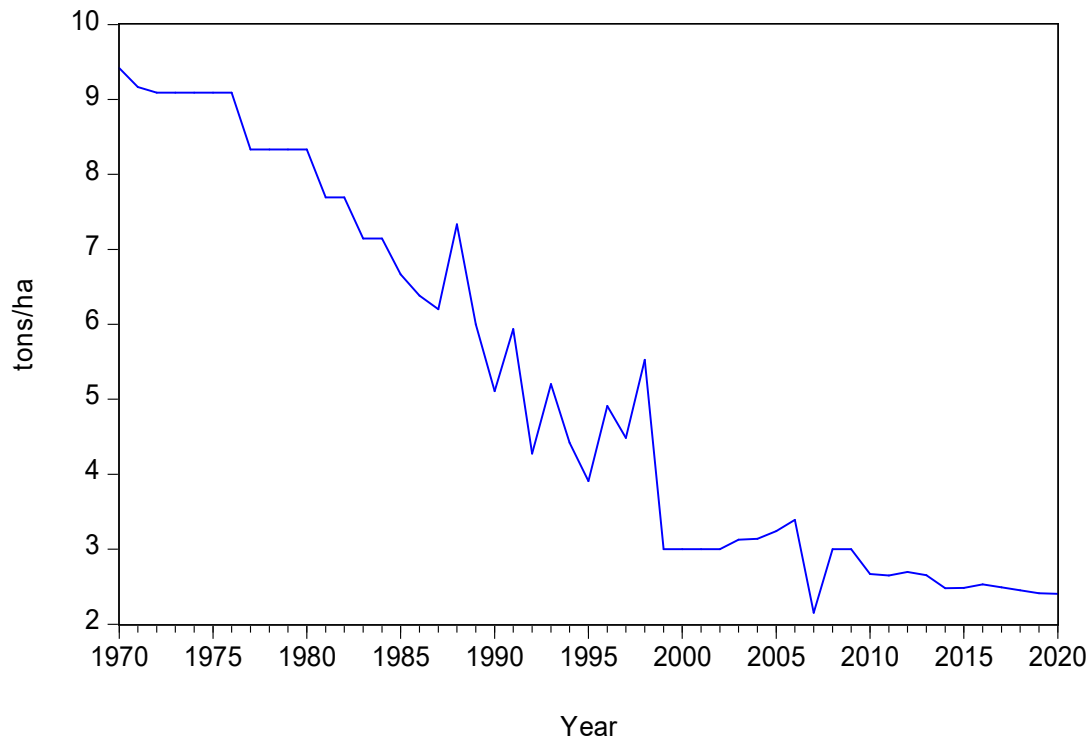


Figure 3: Trend of sweet potato yield in Nigeria (1970-2020)

Source: Data analysis, 2021

Trend of Food Production in Nigeria

The trend of food production in Nigeria is presented in Figure 4. The result showed that food production in ranged between 21.86 and 103.29 with a mean of 56.67 during the period of the study. Specifically, food production was fairly constant from 1970 to 1983. Furthermore, food production increased drastically between 1991 and 2005. However, food production in Nigeria fluctuated tremendously from 2006 to 2019 from whence it declined slightly in 2020. This is consistent with findings by Shettima *et al.* (2019) who posited that food production in Nigeria has increased over the years.

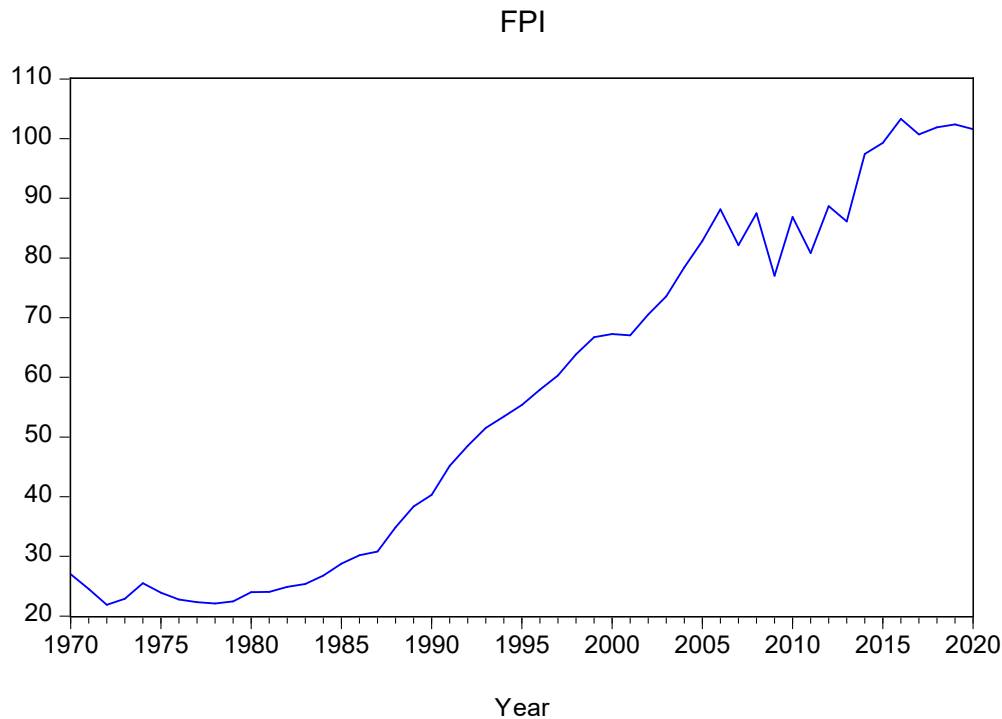


Figure 4: Trend of food production in Nigeria (1970-2020)

Source: Data analysis, 2021.

Growth rate and direction of sweet potato output in Nigeria

The result of the growth trend analysis of sweet potato output is presented in Table 2. The exponential growth model was chosen from different functional forms as a good fit based on the low value of Akaike information criterion (AIC) and coefficient of determination (R^2). The results of the growth trend of sweet potato output shown in Table 2 revealed that the coefficient for estimating the growth of sweet potato output was positive (0.103) and significant at 1%. The instantaneous growth rate (growth at a point) was 10.33% suggesting that there has been a 10.33% (Table 3) per annum increase in sweet potato output for the period 1981-2020. The compound growth rate of sweet potato output was 10.88%. This implies a relatively moderate process of growth in sweet potato output particularly during the period 1970-2020. The coefficient of determination (R^2) value of 0.860 implies that 86% of the variations in the trend of sweet potato output was explained over time by the trend model.

The quadratic term (t^2) in equation (9) allows for the possibility of acceleration, deceleration or stagnation in the growth processes. Results in Table 2 showed that the value of the coefficient of t^2 for sweet potato output (1716.035) was positive and significant implying an accelerated growth process in sweet potato output over time.

In terms of growth rate and direction of sweet potato yield in Nigeria, the exponential growth model was chosen from different functional forms as a good fit based on the low value of Akaike information criterion (AIC) and coefficient of determination (R^2). The growth trend results for sweet potato yield as shown in Table 2 revealed that the coefficient for estimating the growth of sweet potato yield was negative (-0.033) and significant at 1%. The instantaneous growth rate (growth at a point) was -3.26% suggesting that there has been an -3.26% per annum decrease in sweet potato yield for the period 1970-2020. The compound growth rate of sweet potato yield was -3.31%. This implies a relatively slow process of growth in sweet potato yield particularly during the period 1970-2020. The coefficient of determination (R^2) value of 0.935

implies that 93.5% of the variations in sweet potato yield was explained over time by the trend model.

The direction or pattern of the growth process from the quadratic term (t^2) as shown in Table 2 revealed that the value of the coefficient of t^2 for sweet potato yield (-0.024) was negative and significant implying a decelerated growth process in sweet potato yield. This implies that the growth of sweet potato yield has been declining over the years.

Table 2: Growth Trend Model

Variables	Model	Determinant	Coefficient	t-stat	Prob.	R ²	F-stat	AIC
Sweet potato output	Linear	Trend	-907397.9***	-5.802	0.000	0.877	350.84	29.37
	Exponential	Constant	100966.2***	18.730	0.000	0.860	(0.000)	1.94
		Trend	0.1032.66***	17.38	0.000		301.97	
	Quadratic	Constant	10.72773***	62.22	0.000	0.921	(0.000)	28.97
		Trend	15164.50	0.88	0.380		281.09	
		Trend ²	1716.035***	5.17	0.000	(0.000)		
Sweet potato yield	Linear	Constant	-206683.7	-1.11	0.270	0.920	564.314	6.81
	Trend	-1.618***	-23.755	0.000				
	Exponential	Constant	92.299***	46.696	0.000	0.935	(0.000)	-1.23
		Trend	-0.032***	-26.622	0.000		708.741	
	Quadratic	Constant	4.641***	130.829	0.000	0.955	(0.000)	6.26
		Trend	-2.832***	-14.099	0.000		520.718	
	Trend ²	-0.024***	-6.248	0.000	(0.000)			
Food production	Linear	Constant	102.211***	47.065	0.000	0.953	996.394	6.561
	Trend	1.895***	31.565	0.000				
	Exponential	Constant	9.282***	5.328	0.000	0.942	(0.000)	-1.104
		Trend	0.036***	28.416	0.000		807.481	
	Quadratic	Constant	2.697***	78.664	0.000	0.964	(0.000)	6.315
		Trend	1.100***	5.322	0.000		656.637	
	Trend ²	0.0015***	3.975	0.002	(0.000)			
	Constant	15.774***	7.056	0.000				

Note: ***Significance at 1% probability level. Figures in parenthesis are p values of the F-statistics

Source: Data Analysis, 2021.

For the growth rate and direction of food production in Nigeria, the exponential growth model was chosen from different functional forms as a good fit based on the low value of Akaike information criterion (AIC) and coefficient of determination (R^2). The growth trend results for food production as shown in Table 2 revealed that the coefficient for estimating the growth of sweet potato yield was positive (0.0369) and significant at 1%. The instantaneous growth rate (growth at a point) was 3.69% suggesting that there has been an 3.69% per annum increase in food production during the period 1970-2020. The compound growth rate of food production was 3.76%. This implies a relatively slow process of growth in food production particularly during the period 1970-2020. The coefficient of determination (R^2) value of 0.942 (Table 2) implies that 94.2% of the variations in food production was explained over time by the trend model. The direction or pattern of the growth process from the quadratic term (t^2) as shown in Table 2 revealed that the value of the coefficient of t^2 for food production (0.0158) was positive and significant implying an accelerated growth process in food production over time.

Table 3: Growth Rates and Direction of the Variables

Variables	IGR (%)	CGR (%)	Direction of growth
Sweet potato output	10.33	10.88	Acceleration
Sweet potato yield	-3.26	-3.31	Deceleration
Food production	3.69	3.76	Acceleration

Note: IGR = Instantaneous growth rate; CGR = Compound growth rate

Source: Data Analysis, 2021.

Unit root test

The Augmented Dickey Fuller (ADF) test for unit root was employed to test whether or not a variable is stationary and also determine the order of integration of the variable (Table 4). The result indicated that all the variables (sweet potato output, yield and food production) were found to be integrated of order one and became stationary on first differencing. This indicates that the variables exhibit random walk (unit roots) or the future values of these variables do not converge from their past values.

Table 4: Augmented Dickey-Fuller Unit Root Test

Variables	Level		First difference		Inference
	t-statistics	Probability	t-statistic	Probability	
Swtpotato yield	-1.273765	0.6345	-11.93083***	0.0000	1(1)
Swtpotato output	0.393679	0.9807	-9.225220***	0.0000	1(1)
FPI	-0.366709	0.9065	-3.588054**	0.0116	1(1)

*** and ** indicate stationary at 1% and 5% level of significance, respectively

Co-integration Rank Test for the Long Run Relationship among the Variables

According to Engle and Granger (1987), regressing a non-stationary series on another non-stationary series yields spurious regression, but if the linear combination of the series is stationary, we could say the variables are cointegrated and the regression is no longer spurious. Variables are said to be cointegrated if they have long run association. Since the variables are non-stationary, it becomes imperative to test whether or not the variables are cointegrated. The result (Table 5) shows that the computed trace statistic (51.36828) is greater than the critical value (47.85613) at 0.05 level therefore, co-integration exists among the variables. This implies that a long run relationship exists sweet potato output, yield and food production.

Table 5: Johansen Co-integration Test for unrestricted co-integration Rank Test (Trace)

Hypothesized No. of CE (S)	Eigenvalue	Trace Statistics	0.05 Critical value	Prob**
None *	0.354564	31.75838	29.79707	0.0293
At most 1	0.185069	10.30477	15.49471	0.2580
At most 2	0.005634	0.276862	3.841466	0.5988

Trace test indicates 1 cointegrating eqn (s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

Source: Data analysis, 2021.

Lag Length Selection Criteria

The result of the lag length selection criteria is presented in Table 6. The lag length was selected from six different selection criteria. Akaike information criterion (AIC) was chosen

because of its lowest value -4.063088 at lag 2. Therefore, lag 2 is the appropriate lag to be used for the model.

Table 6: Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	101.8268	NA	3.87e-06	-3.950076	-3.595792*	-3.816757*
2	113.4826	20.33560*	3.47e-06*	-4.063088*	-3.354520	-3.796449
3	120.9392	12.05757	3.74e-06	-3.997413	-2.934563	-3.597456
4	124.7133	5.620996	4.77e-06	-3.775035	-2.357900	-3.241757

*Indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criteria.

Forecast of the Trend of Sweet Potato Output, Yield and Food Production in Nigeria

The results of the ARIMA forecast of the trend of sweet potato output, yield and food production is presented in Table 7. Figure 5 showed that sweet potato output will continue to have an upward trend during the next decade *ceteris paribus*. Specifically, in the next decade, sweet potato output will be 4697194.87 tones. More so, Figure 5 showed that the trend of sweet potato yield will experience a decreasing trend for these forecasted time period *ceteris paribus*. Specifically, in the next decade, sweet potato yield will be 0.78 tones/hectare. Furthermore, Figure 5 showed that food production will continue to increase for these forecasted time period *ceteris paribus*. Specifically, in the next decade, the index of food production will be 117.71.

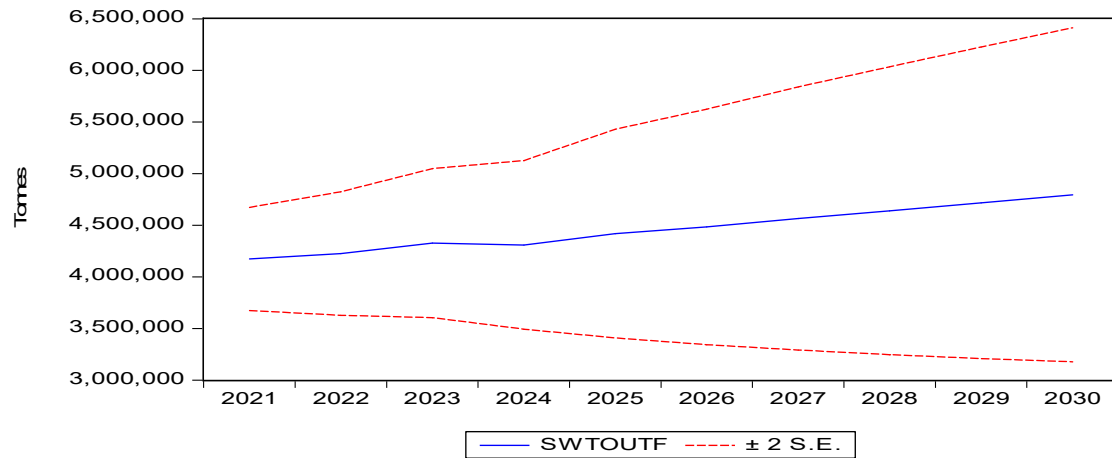


Figure 5: Forecast Plot of Sweet Potato Output from 2021-2030

Source: Data Analysis, 2021.

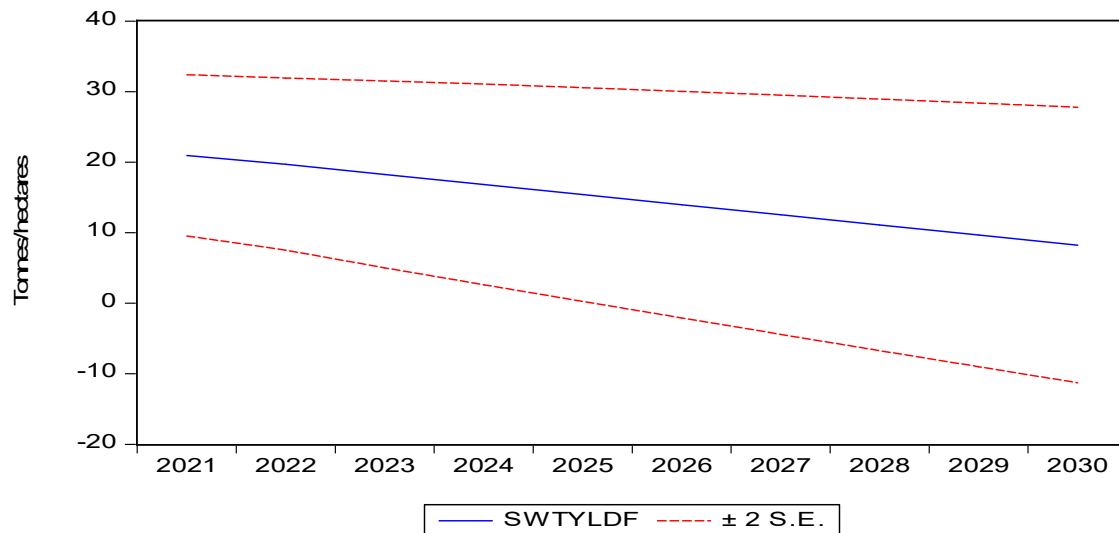


Figure 6: Forecast Plot of Sweet Potato Yield from 2021-2030

Source: Data Analysis, 2021.

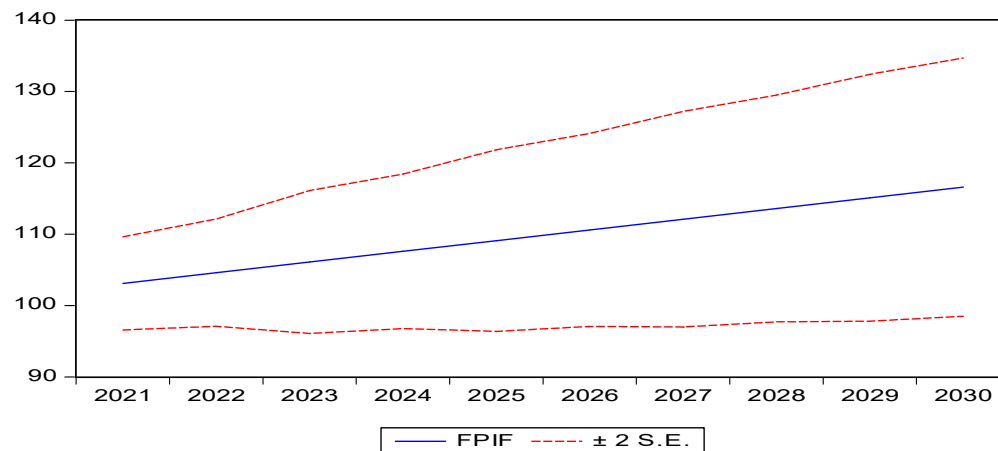


Figure 7: Forecast Plot of Food Production from 2021-2030

Source: Data Analysis, 2021

Table 7: Ten Years Forecast of Sweet Potato Output, Yield and Food Production

Year	Output	Yield	FPI
2021	4155586.79	2.078	101.72
2022	4213828.94	1.934	103.04
2023	4253830.65	1.789	104.59
2024	4297525.15	1.645	105.86
2025	4350651.78	1.501	107.33
2026	4412347.02	1.357	109.17
2027	4479950.19	1.213	111.23
2028	4550989.22	1.068	113.28
2029	4623740.94	0.924	115.43
2030	4697194.87	0.78	117.71

Source: Data Analysis, 2021.

Stability Diagnostics

Figure 8 presents the result for structural break of the model using the CUSUM of squares test. The CUSUM of square test lies between the gridlines, this implies that it lies between two standard deviation or 95% confidence interval. The graph shows that the fitted model is stable and therefore relevant for policy direction.

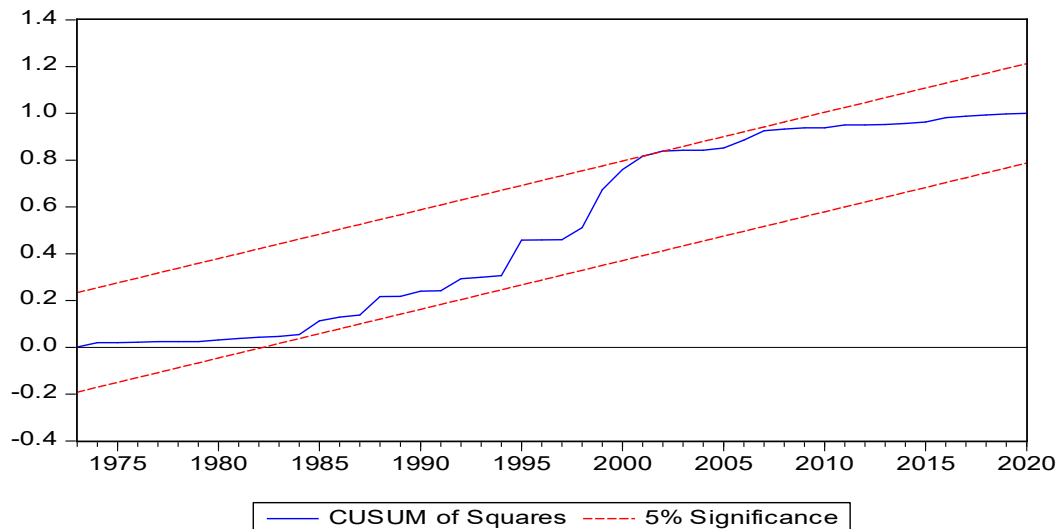


Figure 8: *CUSUM of Square Test for Structural Break*

Source: Data analysis, 2021.

CONCLUSION AND RECOMMENDATIONS

The study was carried out to assess the growth of sweet potato yield and output and their implication on food production in Nigeria from 1970-2020. The study revealed that sweet potato output and food production had positive growth rates with an accelerated pattern of growth. However, sweet potato yield had a negative growth rate with a decelerated growth pattern. The study also revealed that sweet potato output significantly contributes to food production in Nigeria both in the short and long run. Many of the major crops cannot meet the rise in food demand due to population growth, increased income per capita, biofuel production and low food prices. Therefore, there is need to promote crops that can provide food and energy without detrimental impacts on soil or water resources, as well as provide local development benefits to smallholder farmers. Sweet potato has the potential to address these global problems and promote food security.

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