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Effect of Changes in Some Macro-Economic Policies on Sorghum Economy in Nigeria between 1961 And 2005

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ABSTRACT The effect of changes in the marketing system and oil economy in Nigeria on sorghum output, acreage and yield between 1961 and 2005 was investigated. The result shows that there are signs of both growth and retardation during the periods under study. The average rates of growth were 1.58% for output, 1.42% for acreage and -0.16% for yield translating to doubling time of 25 years for output, five years for acreage and 13 years for yield. Acceleration, stagnation and deceleration were also observed at different sub-periods for the variables. It was indicated that sorghum technology must grow at a rate that will ensure food security for Nigeria not later than 2015.

INTRODUCTION

Much has been said about the effect of various macro changes on agricultural production in Nigeria since independence but not many researchers have measured empirically the actual effect (Omuruyi 1987). Efforts at measuring the actual effect has been made by Onyenweaku (1993, 2004) and Onyenweaku and Okoye (2005). The introduction of the Structural Adjustment Programme (SAP) in 1986 marked a turning point in Nigerian economy as it was meant to boost agricultural production and other non-oil products (Ojo et al. 1993). According to Onyenweaku (2004) in the study of 23 food and cash crop in Nigeria, there has been acceleration in most of the crops studied over the entire trend of 1970 to 2000 however, he did not show whether it is the same for various sub-periods. The objective of this study is to investigate the effect of changes in marketing system and oil economy of Nigeria on the growth of sorghum yield, acreage and output between 1961 and 2005. The basic assumption here is that the changes did not affect the sorghum economy significantly.

METHODS

The data used in this study were sourced from FAO (1970-1995), FOS (1960-1995) and CBN (1986-1997). The data were analysed using the exponential function and quadratic function in trend variable. The exponential function is given as:

$$S_V = ae^{bt} \quad (1)$$

Eq. (1) is linearised by taking its natural logarithm to make it amenable to OLS to obtain:

$$\ln S_V = a + bt + u \quad (2)$$

Where S_V = Sorghum variable: yield in kg/ha, acreage in '000 hectares or output in '000 tonnes

t = trend variable 1961 – 2005

u = noise term *nid* $(0, F^2)$

After the estimation of eq. (2), the compound rate of growth was computed for each variable as follows:

$$r = (e^b - 1) \times 100 \quad (3)$$

Where r = compound rate of growth

b = estimated coefficient from eq. (2)

The time it will take to double the rate of growth was then estimated as given below:

$$D_T = 69/r \quad (4)$$

(Anonymous, 2002, Wikipedia 2005)

Where D_T = doubling time

r = compound rate of growth computed in eq. (3)

In order to determine the effect of the changes in the marketing system and the oil economy on sorghum production, a quadratic function in the trend variable was estimated as follows:

$$\ln S_V = a + bt + ct^2 + u \quad (5)$$

All variables as previously defined.

The quadratic trend term in eq. (5) allows for the possibility of determining deceleration, acceleration or stagnation in sorghum economy in Nigeria during the period under study. Significant positive value indicates acceleration in growth; significant negative value indicates deceleration in growth while non-significant value

implies stagnation in the growth process (Sawant 1981; Onyenweaku 1993).Eq. (2) and (5) were applied to the entire period for each variable and the sub-periods for changes in marketing system and oil economy as indicated below.

Marketing System

Transitional, multinational marketing agencies: 1961 - 1967

Regional marketing boards: 1968 - 1976

Federal marketing boards: 1977 - 1986

End of state control, free-market economy: 1986 - 2005

Oil Economy

Agricultural boom era: 1961 - 1971

Oil boom era: 1972 - 1981

End of oil boom as oil prices fell: 1982 - 2005

RESULTS AND DISCUSSION

The estimated exponential growth equations are presented in Tables 1, 2 and 3, compound growth rates are presented in Table 4, doubling time for the various compound rates of growth are presented in Table 5 while estimated coefficients of the quadratic functions are presented in Tables 6, 7 and 8.

The results in Tables 1, 2 and 3 show that the variables exhibited significant growth during the entire period as found by Onyenweaku (1993, 2004) and Onyenweaku and Okoye (2005) but behaved somewhat differently during the sub-periods. There was significant reduction in growth for output during the period of transitional, multinational marketing agencies; and for yield during transitional, multinational marketing agencies and agricultural boom era. This is a confirmation of an earlier assertion by Nmadu (2002) indicating that changes in marketing system and the oil economy might be the sole causes of retardation in growth. It appears that enough investment has not been put in agricultural research and technology improvement.

The results in Tables 6, 7 and 8 show that there has been some acceleration of output, acreage and yield over the entire trend (Onyenweaku 1993, 2004; Onyenweaku and Okoye 2005) but the situation is mixed for the various sub-periods. While stagnation was observed for output during all the sub-periods, there was acceleration of acreage after the oil boom period of 1982 – 2005. In addition, there was deceleration (Sawanti 1981) of acreage during the periods of transitional, multinational marketing agencies and Federal marketing boards. The situation with regards to yield is quite different. While stagnation was observed for most of the sub-periods, acceleration was observed at the end of state control of markets while deceleration was observed at the end of the oil boom. The acceleration in acreage was not translated to increased output either due to stagnation or deceleration in yield. This is a confirmation of what was highlighted by Nmadu (2002) that the growth in sorghum technology has been very slow in Nigeria. This situation is also evident in Tables 4 and 5 which shows that even though sorghum

Table 1: Exponential growth equations of sorghum output in Nigeria

	a	*B*	R^2	*F*
Entire Trend	-43.3591***	0.026161***	0.73	119.42***
	(4.747278)	(0.002394)		
Marketing System				
Transitional, multinational marketing agencies	88.42302***	-0.04081***	0.36	4.30***
	(38.63668)	(0.019672)		
Regional marketing boards	-2.25004	0.005274	-0.13	0.088
	(35.14457)	(0.017822)		
Federal marketing boards	-87.7304***	0.048454***	0.59	13.98***
	(25.67115)	(0.012955)		
End of state control, free-market economy	-83.3904***	0.046242***	0.84	95.91***
	(9.424213)	(0.004722)		
Oil Economy				
Agricultural boom era	54.64163***	-0.02361	0.17	3.08***
	(26.40751)	(0.013432)		
Oil boom era	-20.3867	0.014446	0.11	2.16***
	(19.39723)	(0.009814)		
End of oil boom as oil prices fell	-82.3628***	0.045729	0.88	176.28***
	(6.866055)	(0.003444)		

Values in parenthesis are standard errors ***Significant at 1%

Table 2: Exponential growth equations of sorghum acreage in Nigeria

	a	*B*	R^2	*F*
Entire Trend				
	-4.28766	0.006519***	0.17	10.32***
	(4.023282)	(0.002029)		
Marketing System				
Transitional, multinational marketing agencies	-4.33229	0.006552	-0.17	0.12
	(37.00539)	(0.018842)		
Regional marketing boards	-5.57528	0.007204	0.04	1.32***
	(12.33792)	(0.006257)		
Federal marketing boards	11.88049	-0.00163	-0.12	0.024
	(20.46492)	(0.010328)		
End of state control, free-market economy	-81.0754***	0.044965***	0.80	73.01***
	(10.50369)	(0.005262)		
Oil Economy				
Agricultural boom era	-18.1683	0.013599	0.16	2.96***
	(15.53597)	(0.007902)		
Oil boom era	-14.3308	0.011626	0.18	2.96***
	(13.33709)	(0.006748)		
End of oil boom as oil prices fell	-36.869***	0.022844***	0.38	15.32***
	(11.63416)	(0.005836)		

Values in parenthesis are standard errors ***Significant at 1%

Table 3: Exponential growth equations of sorghum yield in Nigeria

	a	*B*	R^2	*F*
Entire Trend				
	-29.1727***	0.01811***	0.44	36.15***
	(5.972533)	(0.003012)		
Marketing System				
Transitional, multinational marketing agencies	99.40363***	-0.04723***	0.65	12.14***
	(26.61882)	(0.013553)		
Regional marketing boards	10.08459	-0.00185	-0.14	0.024
	(23.72015)	(0.012028)		
Federal marketing boards	-20.5629	0.013615	-0.10	0.19
	(61.09948)	(0.030835)		
End of state control, free-market economy	-1.67335	0.004391	-0.02	0.61***
	(11.1985)	(0.00561)		
Oil Economy				
Agricultural boom era	79.60719***	-0.03715***	0.59	15.10***
	(18.79093)	(0.009558)		
Oil boom era	0.811762	0.00284	-0.07	0.38
	(9.057385)	(0.004583)		
End of oil boom as oil prices fell	-57.1286***	0.032142***	0.39	15.63***
	(16.20769)	(0.00813)		

Values in parenthesis are standard errors ***Significant at 1%

Table 4: Compound growth rates of sorghum computed from the growth equations

	Output	*Acreage*	*Yield*
Entire Trend			
	2.650622	0.654057	1.827461
Marketing System			
Transitional, multinational marketing agencies	-3.99888	0.657304	-4.61319
Regional marketing boards	0.528807	0.722956	-0.18525
Federal marketing boards	4.964715	-0.16259	1.370782
End of state control, free-market economy	4.732747	4.59914	0.440071
Oil Economy			
Agricultural boom era	-2.33309	1.369188	-3.64687
Oil boom era	1.455041	1.169356	0.284425
End of oil boom as oil prices fell	4.679057	2.310682	3.266422
Mean	1.584877	1.415011	-0.15702

Table 5: Doubling time for the compound growth rate in years

	Output	*Acreage*	*Yield*
Entire Trend			
	26	105	38
Marketing System			
Transitional, multinational marketing agencies	-17	105	-15
Regional marketing boards	130	95	-372
Federal marketing boards	14	-424	50
End of state control, free-market economy	15	15	157
Oil Economy			
Agricultural boom era	-30	50	-19
Oil boom era	47	59	243
End of oil boom as oil prices fell	15	30	21
Mean	25	5	13

Table 6: Estimated coefficients of the quadratic equation of sorghum output in trend variable

	a	*B*	*c*	R^2	*F*	*Remark*
Entire Trend						
	4270.906***	-4.32528***	0.001097***	0.91	211.05***	A
	(479.7563)	(0.483884)	(0.000122)			
Marketing System						
Transitional, multinational	-60837.6	62.00207	-0.0158	0.51	4.065***	S
marketing agencies	(38376.04)	(39.0795)	(0.009949)			
Regional marketing boards	-1297.62	1.319038	-0.00033	-0.32	0.038***	S
	(33038.45)	(33.50759)	(0.008496)			
Federal marketing boards	21298.95	-21.538	0.005447	0.60	7.7039***	S
	(19918.8)	(20.1048)	(0.005073)			
End of state control,	4313.724	-4.35972	0.001104	0.84	49.54***	S
free-market economy	(3819.396)	(3.827071)	(0.000959)			
Oil Economy						
Agricultural boom era	9621.85	-9.7563	0.002475	0.096	1.54***	S
	(19424.64)	(19.76061)	(0.005026)			
Oil boom era	5685.579	-5.75937	0.001461	0.0062	1.028***	S
	(16056.21)	(16.24714)	(0.00411)			
End of oil boom as	722.4423	-0.76171	0.000203	0.88	84.70***	S
oil prices fell	(2261.839)	(2.269233)	(0.000569)			

Values in parenthesis are standard errors A = Acceleration S = Stagnation D = Deceleration ***Significant at 1%

Table 7: Estimated coefficients of the quadratic equation of sorghum acreage in trend variable

	a	*B*	*c*	R^2	*F*	*Remark*
Entire Trend						
	1856.606***	-1.87041***	0.000473***	0.30	10.39***	A
	(633.3817)	(0.638831)	(0.000161)			
Marketing System						
Transitional, multinational	-77683.2***	79.10935***	-0.02014***	0.54	4.498***	D
marketing agencies	(26345.15)	(26.82808)	(0.00683)			
Regional marketing boards	6541.316	-6.63266	0.001684	-0.061	0.768	S
	(11287.97)	(11.44825)	(0.002903)			
Federal marketing boards	-37110.1***	37.46698***	-0.00945***	0.58	7.148***	D
	(9840.018)	(3.081946)	(0.002506)			
End of state control,	-4237.71	4.209962	-0.00104	0.80	36.83***	S
free-market economy	(4306.076)	(4.314728)	(0.001081)			
Oil Economy						
Agricultural boom era	-4133.72	4.200337	-0.00106	0.074	1.40***	S
	(11508.18)	(11.70723)	(0.002977)			
Oil boom era	2922.612	-2.96024	0.000752	0.072	1.35***	S
	(11083.58)	(11.21538)	(0.002837)			
End of oil boom as	10553.19***	-10.6019***	0.002665***	0.59	17.39***	A
oil prices fell	(3071.903)	(3.081946)	(0.000773)			

Values in parenthesis are standard errors A = Acceleration S = Stagnation D = Deceleration ***Significant at 1%

Table 8: Estimated coefficients of the quadratic equation of sorghum yield in trend variable

	a	*B*	*c*	R^2	*F*	*Remark*
Entire Trend						
	3301.044***	-3.3408***	0.000847***	0.57	30.39***	A
	(895.3829)	(0.903086)	(0.000228)			
Marketing System						
Transitional, multinational	16513.85	-16.7626	0.004255	0.59	5.28***	S
marketing agencies	(32741.2)	(33.34137)	(0.008488)			
Regional marketing boards	-7901.56	8.022136	-0.00203	-0.30	0.0746***	S
	(22066.42)	(22.37977)	(0.005674)			
Federal marketing boards	69054.72	-69.7067	0.017593	0.072	1.347***	S
	(44001.19)	(44.41207)	(0.011207)			
End of state control,	12452.59***	-12.4749***	0.003126***	0.39	6.66***	A
free-market economy	(3550.994)	(3.558129)	(0.000891)			
Oil Economy						
Agricultural boom era	13732.04	-13.9257	0.003532	0.59	8.15***	S
	(13173.65)	(13.4015)	(0.003408)			
Oil boom era	2757.529	-2.78666	0.000706	-0.20	0.239***	S
	(7492.552)	(7.581647)	(0.001918)			
End of oil boom as	-11387.2***	11.39932***	-0.00285***	0.50	12.32***	D
oil prices fell	(4750.356)	(4.765885)	(0.001195)			

Values in parenthesis are standard errors A = Acceleration S = Stagnation D = Deceleration ***Significant at 1%

yield grew at the rate of 1.82% over the entire period, the average for all the sub-periods shows retardation. In addition, while it will take only five years to double the rate of growth of acreage based on the current trend, it will take 13 years to double the rate of yield. And this forces the rate of doubling output to 25 years. It therefore means that research must be intensified in order to improve sorghum technology significantly in a way that the rate of growth will achieve the needed self-sufficiency and food security not later than 2015.

CONCLUSION

This study investigated the effect of changes in the marketing system and changes in the oil economy of Nigeria on sorghum output, acreage and yield for the period 1961 – 2005 using exponential growth equation and quadratic equation. The compound rate of growth and the time needed to double rate of growth were also determined. The results show that there was acceleration, deceleration or stagnation in growth during the period under investigation depending on the variable and the changes in the economy. The average rate of growth was found to be 1.58% for output, 1.42% for acreage and -0.16% for yield translating to doubling time of 25 years for output, five years for acreage and 13 years for yield. Therefore the assumption that changes did not affect sorghum economy in Nigeria can not be substantiated based on the current trend and findings. It is recommended that investment in agricultural research must be such that the rate of growth will make it possible to achieve self-sufficiency and food security by 2015.

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