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ANALYSIS OF TRENDS IN LIVESTOCK PRODUCTION IN NIGERIA: 1970-2005

IFEANYI A. OJIAKO AND G.O. OLAYODE

ABSTRACT

The livestock industry as an important component of general agriculture is expected to be a key contributor to national development. This study analyzes the livestock production trends in Nigeria with a view to ascertaining the influence of policy changes on real output of livestock over time, and investigates the existence of acceleration, stagnation or deceleration in growth of livestock production at different periods. Secondary data on real production for the 1970-2005 periods were obtained from the publications of the Central Bank of Nigeria. Annual compound growth indices were calculated from the estimated trend equations while existence of acceleration, stagnation or deceleration in growth was investigated using quadratic equations in the time trend variables of the livestock production data. Results reveal that the growth rate, which was less than 1% per annum during the 1970-1985 pre-SAP period increased to 6.44% and 8.92% per annum respectively during the 1986-1998 SAP and 1999-2005 post-SAP eras. The compound growth rate was computed as 4.83% per annum during the entire period under study. Presence of statistical significant acceleration ($p<0.01$) was found during the entire 1970-2005 period. However, whereas the 1986-1998 period recorded statistical significant deceleration ($p<0.01$), the periods 1970-1985 and 1999-2005 had confirmed cases of stagnation. The study suggests that for deregulation policy to result to desired accelerated growth in livestock production it should be accompanied by relevant farm support policies, like provision of accessible credit and subsidization of agricultural inputs, to produce the desired multiplier effects on agriculture and food production.

Keywords: livestock, production trends, policy changes, growth, Nigeria

INTRODUCTION

The livestock industry as an important component of general agriculture is a key contributor to economic growth and development of any nation. In addition to having the capacity for earning revenue for the governments, it provides employment, food, farm energy, manure, fuel and transport (Nuru 1986). As Fakoya (2007) has succinctly argued, livestock, especially ruminant production, is the most efficient user of uncultivated land and contribute evidently to crop production. Efficient crop-livestock integration systems have the tendency of allowing nutrients to be recycled more effectively on the farm thereby enhancing crops' yield. Under such a system livestock can be fed on crop residues, like straw, damaged fruits and grains, as well as other products that would have posed a major waste disposal problem (Fakoya, 2007).

In Nigeria, notwithstanding its acclaimed relevance the livestock sub-sector tends to be playing a decreasing role in national development in view of its contribution to the country's agricultural Gross Domestic Product (GDP). As shown in Figure 1 livestock as a percentage of agricultural GDP was as high as 19% in 1983 and 1984. However, the share has dropped persistently over time to 10% in 1998 and further to all time low 6% in 2004 and 2005. Similar trends were recorded in the sub-sector's percentage contribution to the country's non-oil GDP and total GDP where the recorded shares were 4% and 2% respectively as at 2005.

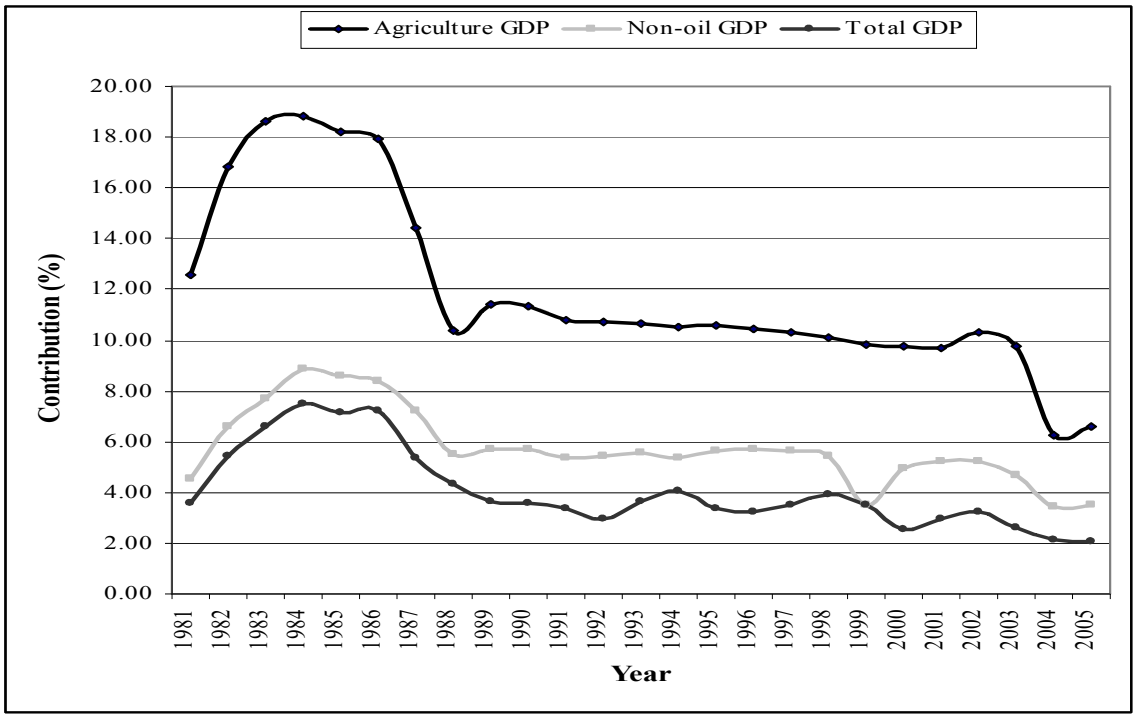

Figure 1: Percentage contribution of livestock to agriculture, non-oil and total GDP in Nigeria, 1981-2005

This study seeks to make further investigate on this. The objective therefore is to analyze the production trends in the livestock sub-sector with a view to ascertaining the influence of policy changes on the output of livestock over time. The hypotheses to be tested are that there is acceleration in growth, or there is deceleration in growth, or there is stagnation in growth of livestock during the period under investigation. These hypotheses are explained further in following subsection.

MATERIALS AND METHOD

Data source

Secondary data on annual livestock production was used for the study. The data were obtained from the various issues of Statistical Bulletin published by the Central Bank of Nigeria (CBN, 2007). The data series, which covered the 1970-2005 periods, was expressed in real terms (1990=100). The analysis of data was done to cover four different time periods to enable for comparison: the pre-SAP era (1970-1985), the SAP era (1986-1998), the post-SAP era of democratic governance (1999-2005) and the aggregate data (1970-2005). The Standard E-views Statistical software was used for the analysis.

Modeling the trends for analysis of growth rates

The annual exponential or compound growth rates (or what is sometimes referred to as the left-side semi-log) analysis was used to estimate the growth rates in livestock production in Nigeria. The method has been variously applied in past trend studies in Nigerian agriculture (Sawant, 1983; Onyenweaku and Okoye, 2005; Udom, 2006; Ojiako et al., 2007).

The exponential trend equation is given as:

$$lk_i = \exp(\beta_0 + \beta_1 t_i + e_i) \qquad (1)$$

where lk is the livestock production output, expressed in real terms (1990=100), t is the time trend measured in years, β_0 and β_1 are parameters to be estimated. If linearized, equation (1) becomes

$$\log lk_i = \beta_0 + \beta_1 t_i + e_i \quad (2)$$

where log *lk* is the natural logarithm of the real livestock production and other variables are as previously defined.

The annual exponential or compound growth rate (g) in livestock production is given as

$$g = (e^{\beta_1} - 1) * 100\% \quad (3)$$

where *e* is the Euler's exponential constant (2.71828).

To ascertain the existence of acceleration, stagnation or deceleration in growth of livestock production, the quadratic equations in the time trend variables were fitted to the data for the four periods covered in the analysis. The quadratic equation is as follows:

$$\log lk_i = \beta_0 + \beta_1 t_i + \beta_2 t_i^2 + e_i \quad (4)$$

where the variables *lk* and *t* variables are as previously defined and β_0, β_1 and β_2 are parameters to be estimated.

In the specification in expression (4), the linear and quadratic time terms indicate the circular path in the dependent variable (lk_i) while the quadratic term (t^2) allows for the possibility of acceleration, or deceleration or stagnation in growth during the period under study (Sawant, 1983; Onyenweaku and Okoye, 2005). Our major interest is on the coefficient of t^2, which is β_2. If β_2 is positive and statistically significant there is acceleration in growth, if β_2 is negative and statistically significant there is deceleration in growth, if β_2 is not statistically significant there is stagnation in the growth process (Onyenweaku and Okoye, 2005; Anyaegbunam et al., 2006).

RESULTS AND DISCUSSION

Livestock production by time period

The statistics of livestock production index in Nigeria by time periods are presented in Tables 1 and 2. As shown in the Tables the mean of real output of livestock was highest for the 1999-2005 post-SAP periods and lowest during the 1970-1985 pre-SAP periods. The mean output for the entire period (1970-2005) is 4.37% higher that the 1990 level. During the SAP era (1986-1998) the mean of real output was higher the 1990 base year by 19.36% but slightly lower than the real output during the post-SAP era of democratic rule in Nigeria (1999-2005). The higher index recorded during the 1986-1998 period was mainly accounted for by the post-1990 real output level. The average real output of livestock for the 1986-1998 periods was 16.25% lower than the 1990 base year level while the 1991-1998 showed an average 8.71% increase over the 1990 base year index.

Table 1: Test of significance of mean livestock production between different periods and entire period

Period	Mean (1990=100)	Std Dev.	Mean Difference	t-value
1970-1985	55.89	13.02	48.48***	4.89
1970-2005	104.37	56.13		
1986-1998	119.36	28.16	14.99NS	1.23
1970-2005	104.37	56.13		
1999-2005	187.34	39.78	82.97***	3.71
1970-2005	104.37			

***=significant at 1%; **=significant at 5%; *=significant at 10%; NS=not significant.

Table 2: Test of significance of mean livestock production between different periods

Period	Mean (1990=100)	Std Dev.	Mean Difference	t-value
1970-1985	55.89	13.03	63.47***	7.50
1986-1998	119.36	28.16		
1970-1985	55.89	13.03	131.46***	8.55
1999-2005	187.34	39.78		
1986-1998	119.36	28.16	67.98***	4.46
1999-2005	187.34	39.78		

***=significant at 1%; **=significant at 5%; *=significant at 10%.

Table 1 also presents the results of statistical tests of significance between the real production in the respective periods and the aggregate data. It reveals that the difference between the mean of the aggregate output and that of the pre-SAP is significant ($p<0.01$) in favour of the aggregate output while the difference between the aggregate and the post-SAP era are statistically significant ($p<0.01$) in favour of the post-SAP era.

The results of tests of significance between the real productions for the different time periods are presented in Table 2. Significant differences were found for each pair of periods considered. The results tend to suggest that there has been progressively increasing trend in livestock production.

Estimated trend equations

The estimated trend equations for livestock are presented in Table 3 for the periods under study. The coefficient of the time trend is positive for all four periods. However, whereas the coefficient is highly significant for the 1986-1998, 1999-2005 and the 1970-2005 (aggregated) periods, indicating significant increases (or growth), it is statistically non-significant for the 1970-1985 pre-regulation period, indicating sameness in output. The Table reveals further that the coefficient of determination is high ($r^2>0.85$) and significant ($p<0.01$) during the three periods of significant growth in output.

Table 3: Estimated trend equations for livestock production in Nigeria, 1970-2005

Period	Estimated parameters		r^2	F	Sig.
	β_0	β_1			
1970-1985 (n=16)	3.9332*** (37.9808)	0.0083NS (0.7713)	0.0408	0.59	0.453
1986-1998 (n=13)	4.3160*** (73.7806)	0.0624*** (8.4661)	0.8669	71.67	0.000
1999-2005 (n=7)	4.8734*** (89.0217)	0.0854*** (5.4107)	0.8541	29.27	0.003
1970-2005 (n=36)	3.6364*** (54.1699)	0.0472*** (14.9195)	0.8675	222.59	0.000

***=significant at 1%; **=significant at 5%; *=significant at 10%; NS=not significant; t-values are in parentheses.

Compound growth rate in livestock output

The calculated annual compound growth rates are presented in Table 4 for the four periods. It shows that the compound growth rate in livestock output was less than 1%, which is not significant, during the 1970-1985 pre-SAP eras. The rate increased to 6.44% per annum during the 1986-1998 SAP periods and increased further to 8.92% during the post-SAP period. The compound growth rate for livestock was computed to be 4.83% per annum during the entire period under study. Similar studies on crops production have revealed compound growth rates of 4.17% and 4.36 % respectively for cassava and yam during the 1961-2005 periods (Ojiako et al. 2007). Also, Onyenweaku and Okoye 2005 found a compound growth rate of 4.17% for cassava output during the 1960/61-2003/04 periods.

Table 4: Exponential growth rates in livestock output in Nigeria, 1970-2005

Period	Parameter (β_1)	Exponential Growth
1970-1985 (n=16)	0.0083NS	0.833454
1986-1998 (n=13)	0.0624***	6.438801
1999-2005 (n=7)	0.0854***	8.915264
1970-2005 (n=36)	0.0472***	4.833165

***=significant at 1%; **=significant at 5%; *=significant at 10%; NS=not significant

Investigating acceleration, deceleration or stagnation in livestock output

To confirm existence of acceleration, deceleration or stagnation in livestock output quadratic equations in time variable were estimated and reported in Table 5. The result shows that the coefficient of t^2 is positive and highly significant ($p<0.01$) during the entire period (1970-2005) confirming statistical significant acceleration in growth of real livestock output. Contrarily, the coefficient is negative and highly significant ($p<0.01$) for the 1986-1998 SAP period reflecting a case of statistical significant deceleration.

Table 5: Estimated quadratic equations in time variables for livestock production, 1970-2005

Period	Estimated parameters			r^2	F	Sig.
	β_0	β_1	β_2			
1970-1985 (n=16)	4.1772*** (27.3502)	-0.0731 (-1.7672)	0.0048* (2.0234)	0.270495	2.41	0.129
1986-1998 (n=13)	4.1039*** (70.6747)	0.1473*** (7.7192)	-0.0061*** (-4.5714)	0.956939	111.11	0.000
1999-2005 (n=7)	5.0660*** (56.4699)	-0.0429 (-0.8360)	0.0161* (2.5555)	0.944589	34.09	0.003
1970-2005 (n=36)	3.8578*** (41.4004)	0.0122 (1.0540)	0.00095*** (3.1039)	0.897437	144.37	0.000

***=significant at 1%; **=significant at 5%; *=significant at 10%; t-values are in parentheses.

For the 1970-1985 and 1999-2005 periods, however, the coefficients of t^2 are positive but only significant at 10%, which is not an acceptable high level of significance to qualify for confirmation of acceleration. In other words, the non-acceptable significance of the coefficients of t^2 is a confirmation of stagnation or lack of acceleration or deceleration in the growth of livestock output during these periods.

CONCLUSION

The study has shown that positive growth and significant acceleration was realized in the real production of livestock during the 1970-2005 periods. The growth was significantly achieved during the SAP and post-SAP eras of deregulation and subsequent enthronement of democratic rule in Nigeria. The liberation policy that came with deregulation provided good incentive to livestock farmers to improve on their production levels. The drop in the relative contribution of the sub-sector to general agriculture and total GDP observed in available data may have resulted from the increasing importance of the oil sector as a major income earner for the government. Investigation of acceleration, deceleration or stagnation, however reveal that there was significant deceleration during the SAP period and stagnation during the pre- and post-SAP eras, showing that some improvement was recorded during the post-SAP era of deregulation and democratic rule. In all, the findings reveal that although deregulation policy was good and favourable for livestock production, the policy when applied in isolation could not lead to attainment of the desired accelerated growth in the sector in particular and agriculture generally. We recommend that deregulation should be accompanied by relevant farm support policies, like provision of accessible credit and subsidization of agricultural inputs to produce the desired multiplier effects on agriculture and food production.

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