The Impact of Capital Accumulation on Livestock Production Output in Nigeria.

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ABSTRACT

This study was aimed at investigating the impact of capital accumulation on livestock production output in Nigeria. The study covered a period of 1980-2013. The objective is; to examine the effect of capital accumulation (Net National Savings(NNS), Gross Capital Formation(GCF), Human Capital Formation(HCF)) on livestock production output in Nigeria, The study employed the Ordinary Least Squares (OLS) and the Co-integration/Error Correction method (ECM) as the main analytical tools. Livestock production output model was developed. The Livestock Production Output model results showed that the coefficient of ECM appeared with the right sign but statistically not significant at the 5% level. Durbin Watson value of 2.0 suggests less level of autocorrelation. The overall fit was satisfactory with an R-squared of 0.45 and F-statistic of 2.8 was significant at the 5% level. The result showed that all the variables used in the model had positive impact on livestock production output but the impacts were not significant hence, the null hypotheses were accepted which states that capital accumulation (NNS, GCF, HCF) does not significantly affect livestock production output in Nigeria. The results showed that capital accumulation has positive implications for livestock production output in Nigeria. Government policies on capital Investment in the livestock sector should be increased and monitored to ensure that the target groups use the funds for the development of the livestock sector. Policies on National savings should be reviewed and strengthened. This is because net national savings is abysmally low in Nigeria hence it is not impacting significantly on growths especially growth in the livestock sector.

Keywords: *Livestock, Capital, Accumulation, Production, Savings, Investment*

Introduction

Improving the production capacity of agriculture in developing countries through productivity increases is an important policy goal where agriculture represents an important sector in the economy. Agriculture comprises the main fields of human activity concerning the primary production of food and cash crops, livestock, fishing, forestry and marketing of the products. The Nigerian economy during the first decade after independence could be described as an agrarian economy because agriculture served as the engine of growth of the overall economy (Ogen, 2003). From the stand point of occupational distribution and contribution to GDP, agriculture was the leading sector. In the early 60's, contribution from this sector accounted for about 70% of the Gross Domestic Product (GDP). This was a period when we were not only virtually self-sufficient in production of food crops to feed ourselves but also provided raw materials for industries and major crops for export (Ekerete, 2000). Indeed, agriculture provided the main stimulus to our national economic growth despite the small farm holdings and primitive productive systems. The

role of agriculture in any economy is very well articulated in the relevant literature. Therefore, agriculture contributes greatly to government revenue, employment and the general economic performance – the higher the agricultural output, the higher will be the overall expenditure, savings and, ultimately, investment in the economy. Consequently, any activity that will boost agriculture will be expected to result in increased savings and investment. This will, in the long run, stimulate economic growth and reduce poverty. Unfortunately, Nigeria's agricultural sector suffers from extremely low productivity, largely due to its peasant nature. The sector has also suffered from unstable and often inappropriate economic policies (of pricing, trade and exchange rate), the relative neglect of the sector, the negative impact of oil boom era (NBS, 2014), a land tenure system that does not encourage long-term investment in technology or modern production methods and a severe shortage of rural credit (FAO, 2006). Given the central role of agriculture in Nigeria's economy, this situation does not augur well for savings and investment. So, the need for agricultural growth–driven government policy is inevitable for sustained economic growth in Nigeria. There is growing concern among researchers and policy makers over the declining trend in saving rates and its substantial divergence among countries. This is due to the critical importance of savings for the maintenance of strong and sustainable growth in the world economy.

The crucial role of capital in economic growth and development process has been recognized since the pre Keynesian era when the classical ideology monopolized economic thinking and policy formulation. Without doubt every nation in the world today still lays tremendous emphasis on capital accumulation by stressing the need for raising the level of investment in relation to output. This emphasis is traceable to the short term fiscal policies and national development plans of both the developed and the developing economies over the Past four decades. One important trend in development process which has remained consistent since civilization is that all developed nations are industrialized. Industrialization is associated with heavy investment financed through capital accumulation.

Capital accumulation as a component of economic growth and development in any society is the process of acquiring additional capital stock which is used in productive process. The foundation of capital accumulation is savings and it results when some portion of present income is saved and invested in order to augment future output and incomes. The extent to which the level of savings can affect capital accumulation and growth largely depends on the capacity of the economy to channel the savings into productive use. Higher savings then implies higher capital accumulation and hence, growth in the agricultural sector of the economy and in indeed the general economy. Many attempts are being made on a regular basis to study the relationship between capital accumulation and economic growth in less developing countries like Nigeria. It is believed that the people of LDCs are incapable of high level of individual savings for reasons like; low level of per capital income, indulgence in luxurious and conspicuous consumption by the few who could afford to save. According to Sims (2004), it may seem that given higher level of savings and investment, the capital stock will grow faster and a higher growth of income will result.

Statement of the Problem

Inadequate funding of the agricultural sector has been re-echoed by several experts as an obstacle to increased agricultural output (CBN 2007). However, from a nominal point of view, it is evident that in Nigeria, government spending on agriculture continues to increase over the years while empirical evidence have revealed that the performance of the agricultural sector has been inadequate (CBN, 2000). Two decades ago, Nigeria policy makers pursued a structural adjustment programme which shifted emphasis from the public sectors to the private sector. The goal was to encourage private domestic savings, private domestic investment and capital formation in order to enhance economic growth. In an attempt to achieve this goal, resources were diverted from current consumption and were invested in capital formation through privatization and commercialization of state enterprises. Unfortunately, the

initial optimism expressed about public sector reforms has not been met. The growing demand for food in both rural and urban areas requires that agricultural productivity must increase. However, population growth and pressure in Nigeria have affected the supply of productive land negatively in the country (Nwagbo and Achoja, 2001).

A trend analysis of the ratio of total savings to GDP in Nigeria showed that the saving rate has been fluctuating over time. The savings/GDP ratio was 2% in 1960. It increased to 7.8% and 11.6% in 1970 and 1980, respectively. In 1990 and 2000, it declined to 11.1% and 8.4% respectively. In 2011, the savings/GDP ratio in Nigeria stood at17.4% (CBN, 2011). Clearly, the relatively poor rates at which domestic savings in Nigeria is growing is a source of worry to agricultural growth and production in Nigeria. Investment is also of a special interest as a limiting factor to agricultural production capacity and production because an alarming trend is being observed: public and private investment in agriculture has been declining (FAO 2006). Meanwhile, Agricultural sector contribution to GDP fell from 48 per cent in 1970 to 20.6 per cent in 1980 and was only 23.3 per cent of GDP in 2005. With much focus on oil sector, the average contribution of agricultural sector output to GDP is about 13 percent (CBN, 2007; Obayori, 2014). Also, when agricultural production continued to be denied of the requisite manpower and the expected gross public and private investment, its productive capacity has continued to fall short of domestic consumption and as a major source of export earnings for the country. Therefore, growth in the various sectors of the economy like the agricultural sector and indeed the general economy is slowed down and economic activities neglected. The decline in public investment is of particular concern because public investment in basic infrastructure, human capital formation and research and development (R&D) are also necessary conditions for private investment in the agricultural sector. It is based on the above that answers would be provided to the following research questions. What are the impacts of gross domestic investments on livestock production in Nigeria? What are the impacts of gross national savings on livestock production in Nigeria? and does human capital formation have effects on livestock production output in Nigeria?

Literature Review

Livestock production

Recently, the performance of the livestock industry in Nigeria has fallen below expectation due to high feed cost arising from; fluctuations in feed supplies, rising prices of ingredients, poor feed quality (adulterated feed) and inefficiency in production. These farmers experience high risk and uncertainty during periods of inflation whose effect is non - neutral impacting on price variability (Ukoha, 2007). Livestock production is a major component of the agricultural economy of developing countries and goes well beyond direct food production. The roles livestock play in these economies are manifold though their contribution to agricultural and overall development has not been adequately evaluated and is likely to be under estimated Livestock products are important contributors to total food production. Protein and micronutrient deficiencies are mainly wide spread in developing countries because people subsist on diets that are almost entirely made up of starchy staples. The addition of milk and meat provides protein, calcium, vitamins, and other nutrients that go lacking in diets that are exclusively made up of staples such as cereals. Besides providing food, the driving force behind increased livestock production; livestock remain an important form of non-human power available to poor farmers in much of the developing world. The poor, in particular use organic fertilizer from livestock operations, especially when rising petroleum prices make chemical fertilizers unaffordable. Livestock also store value and provide insurance for people who have no other financial markets available to them. Livestock production is a major economic activity in the economy complementing crop production. The predominant type of livestock kept includes cattle, sheep, goats, poultry, donkeys and dairy cattle. It has been estimated by the World

Bank that around 10 percent of the population of Sub – Saharan Africa are primarily dependent on their animals, while another 58 percent depend on varying degrees of their livestock.

Capital Accumulation

According to Lawanson (2009) Capital accumulation or formation refers to the process of amassing or stocking of assets of value, the increase in wealth or the creation of further wealth. Capital formation can be differentiated from savings because accumulation deals with the increase in stock of needed real investments and not all savings are necessarily invested. Recent literature has confused investment with capital formation. Investment can be in financial assets, human (capital) development, real assets that can be productive or unproductive. The increase in investment through non-financial assets has been held to increase value to the economy and the increase in the gross domestic product through further increase in employment (Adekunle and Aderemi, 2012). The Central Bank of Nigeria (2007), defines capital formation as the total change in the value of fixed assets in the economy in addition to fixed assets either for replacing or adding to the stocks, it refers to the increase in the fixed capital stocks of the capital formed. Governments by their autonomous investment influence the direction of other investment by crowding in other investment as desired.

National Savings

National Savings thus represents resources available to government and businesses for investment in infrastructure, purchase of capital goods, human capital growth among other uses. Higher savings and investment in a nation's capital stock contribute to increased productivity and stronger economic growth and sectoral growth like livestock over long term. That is, savings today increases a nation's capacity to produce goods and services in the future. Production often brings about an increase in income either of individuals (businesses) or government and invariably a corresponding propensity to save from the additional income. Gollin (2002) defined savings as the residue of income of a government, a firm or a household after all their expenditures have been incurred. In national accounts terminology, savings is the net surplus of income over consumption or, stated differently, the amount of resources or income produced in the economy in a given period that is not consumed immediately but put to use in a way that will provide returns to the economy in future (Bakare, 2009). Saving, therefore, means forgoing consumption today so as to enjoy a better standard of living in the future while national saving, on the other hand, is the sum of saving by households, businesses, and all levels of government.

Concept of Human Capital and Human Capital Formation

According to Ajie (2008) Human Capital is the skill, knowledge or abilities acquired by labour or a stock of assets in a country which allows an individual to receive a flow of income, which could be likened to interest earned in physical capital (Ajao and Gabriel, 2011). Income of individuals is a function of human capital possessed by the workforce (Yesufu, 2000). From the view point of job performance, there may be substitution or complementary relationship between experience and training or education (Ogbuagu and Ewubare, 2014). Human Capital is a widely used concept with varying definitions which is sometimes taken to include only schooling (i.e. acquired formal education). In other circumstances, it is defined as wide set of investment that influences well-being and productivity of people, firms and nations like investments in health and nutrition, as well as vocational training (Akpokoje, 1998). Human Capital Formation on the other hand, is the process of acquiring and increasing the number of persons who have the skills, education and experience which are critical for the economic and political development of a country (Yesufu, 2000). Human Capital Formation is associated with investment in man and his development as a creative and productive person. There are different ways of acquiring and developing human capital. These various ways called human capital investment include investment in education,

training, health promotion, as well as "investment in all social services that could influence man's productive capacities especially transport and housing (Okojie, 1995). Education is identified in most human capital studies as the most important component of human capital.

Gross Fixed Capital Formation

According to Ajie and Ewubare (2013) Gross Fixed Capital Formation can be classified into gross private domestic investment and gross public domestic investment. The gross public investment includes investment by government and public enterprises. Gross domestic investment is equivalent to gross fixed capital formation plus net changes in the level of inventories. Economic theories have shown that capital formation plays a crucial role in the models of sectoral growth in particular and economic growth in general. It is clear that even mildly robust growth rates can be sustained over long periods only when countries are able to maintain capital formation at a sizeable proportion of GDP

Gross Fixed Capital Formation and Agricultural Production Output in Nigeria

Several studies have been conducted to show the significance of public financing and investments in the agricultural sector in Nigeria. (Lawal, 2011) employed trend analysis and simple linear regression to examine the level of government spending in the agricultural sector and the consequential effect on GDP. The result of the study showed that public spending does not follow a regular pattern and the contribution of agricultural sector to GDP is in direct consonance with government funding to the sector. Bakare (2009) Studies applied the Cobb-Douglas production function to establish the relationship between credit and agricultural output. In general, there is consensus that credit influences agricultural output and its coefficient is positive. The other variables included in the agricultural production function are land, rainfall and capital.

Ajao and Gabriel (2011) in his study concludes that long-term capital formation in Nigeria were not majorly sourced from the capital market as the above result shows the marginal contribution of Market Capitalization and New Issues to Gross Fixed Capital Formation. Though, it is unarguable that when investors take position for profit, it can affect the level of wealth which can then be used to build private capital. This result is in line with the findings of Gollin (2002) where he concludes that there exist no meaningful relationship between stock market capitalization and gross fixed capital formation. Orji and Mba (2010) in their study looked at relationship between FPI, Capital Formation and Growth, in Nigeria using the two-stage least squares (2SLS) method of estimation. The study finds that the long run impact of capital formation and foreign private investment on economic growth is larger than their short-run impact. There is thus, a long-run equilibrium relationship among the variables as the error correction term is significant, but the speed of adjustment is small in both models. In their result, the two stage least squares estimates are very close to the OLS estimates suggesting that OLS estimates are consistent and unbiased. Hence, endogeneity was not a problem in the estimated models. There is therefore no simultaneity between GDP growth and capital formation model.

Adekunle and Aderemi (2012) examined the relationship between Domestic Investment, Capital Formation and Growth in Nigeria. He used Secondary data from the Central Bank of Nigerian, for capacity utilization, capital expenditure, bank credit and capital formation while growth and investment rates from World Economic Information database were also used. His result shows that the rate of investment does not assist the rate of growth of per capital GDP in Nigeria. The study tests on the curve estimation regression models confirm that growth is in existence but is found to be insignificant. The linear result indicates the importance of government expenditure, capacity utilization and bank credit in increasing the income of Nigerians.

With the curve estimation method results, investment rate can engender growth in the economy though slowly, on a linear path. With the accumulation of foreign capital inflows, the domestic resources of any

economy are augmented thereby enhancing economic development. For capital-scarce developing countries like Nigeria, offshore capital inflows are desirable as they help to stimulate investment, employment and growth. A high inflow of foreign private investment would lead to rise in gross domestic investment, which will in turn lead to growth (Akramov, 2009). This makes FDI to be one of the major adoptions to bolster funds, investment, and development into an economy especially the agricultural sector.

Bankole and Basiru (2013) employed econometric model to examine financial system regulation, deregulation and savings mobilization in Nigeria by adopting an ex-post analysis of the Nigerian banking system. The results indicate that ex-post real interest rate is a significant determinant of both savings and real stock of money demand in Nigeria and that the higher the rate of savings the greater the output of agro based production.

Nwachukwu and Odigie (2011) studied the determinants of private saving in Nigeria by comparing the estimation results of the ECM model with those of partial-adjustment, growth rate and static models. They found that real interest rate on bank deposits has a significant negative impact while external terms of trade, inflation rate and external debt service ratio have positive impact on private savings. They also found that savings rate rises with the level of disposable income; and that the ECM performed better than the other models and that agro production can only increase through increased private and public savings. Igbatayo and Agbada (2012) investigated the relationship between inflation, savings and output in Nigeria, employing Vector Auto regression (VAR) approach. The results indicate that inflation tends to reduce Output while savings actually stimulates output in Nigeria. Temidayo and Taiwo (2011) adopted descriptive statistics in carrying out a qualitative analysis of the relationship between domestic savings and agricultural production in Nigeria, using annual secondary data obtained from World Data Indicator (WDI), World Bank publication and Statistical Bulletin of the Central Bank of Nigeria for the period of 1970 to 2006. The study concluded that the problem with agricultural production is not that of mobilizing domestic savings but that of intermediation; and thus recommended that government should adopt policy enhancing intermediation between savings and investment in the economy by providing regulating and coordinating role to ensure effective intermediation between savings and growth in the economy. Eregha and Irughe (2009) examined the impact of foreign aid inflow on domestic savings in Nigeria using an OLS methodology. The results indicate that both the short run and steady state foreign aid inflow to Nigeria have positive effect on domestic savings and invariably affect agricultural production. Ogwumike and Ofoegbu (2012) used an ARDL estimation technique to examine the impact of financial liberalization on Nigeria's domestic savings on 1970-2009. The study concluded that interest on deposit induced by liberalization was not the major determinant of savings.

Sarkar (2006) studied the relationship between domestic savings and agricultural growth for various economies with different income levels using the Granger causality test. He adopted the time series annual data from 1960 to 2001. His empirical results indicated unidirectional and bi-directional Granger causality from economic growth rate to growth rate of savings in thirteen countries and five countries respectively.

Human Capital Formation and Agricultural Production Output in Nigeria.

In attempting to show the long run relationship between education and growth in Nigeria, (Babatunde and Adefabi, 2005) applied the Johansen co-integration technique and the vector error correction model on data between 1970 and 2003. The results of the co-integrating technique established a long run relationship between enrolments in primary and tertiary level as well as the average years of schooling and output per worker. It also found that high quality labour force and education expenditure significantly influence growth both as a factor in the production function and through total factor productivity.

Lawanson (2009) using a macro data investigated the role of investment in health and education on economic development in Nigeria between 1983 and 2007. The study adopted Error Correction Mechanism (ECM) and found a positive relationship between human capital and economic growth in Nigeria, although the link was weak. Only tertiary enrolment and education expenditure positively spurred growth and increase in production.
For most of the countries, a one per cent increase in literacy increased growth by 120 to 470 per cent. Using the Ordinary Least Squares (OLS) method, the author found that labour force, primary, and tertiary school enrolments were not significant in influencing economic growth in Nigeria. Secondary enrolment was however significant, but negatively affects gross domestic product. Health expenditure was positive and significant. A one per cent increase in expenditure on health would increase sectoral growth (Agriculture) of GDP by 3.1%.

Adawo (2011) used an econometric model to examine the contributions of primary education, secondary education and tertiary education to sectoral growth especially the agricultural sector of Nigeria economy. These variables were proxies by school enrolments at various levels. Other variables included were physical capital formation, health measured through total expenditure on health. In all, primary school input, physical capital formation and health were found to contribute to growth. Secondary school input and tertiary institutions were found to dampen growth. Amassoma and Nwosa (2011) studies the causal nexus between human capital Investment and increased production in Nigeria for sustainable development in Africa at large between 1970 and 2009 using a Vector Error Correction (VEC) and Pairwise granger causality methodologies. The findings of the VAR model and pairwise estimate reveal no causality between human capital developments and increased in production. Johnson (2011) evaluates human capital development and economic growth in Nigeria by adopting conceptual analytical framework that employs the theoretical and ordinary least square (OLS) to analyze the relationship using the GDP as proxy for economic growth especially sectoral growth like agriculture; total government expenditure on education and health, and the enrolment pattern of tertiary, secondary and primary schools as proxy for human capital. The analysis confirms that there is strong positive relationship between human capital development and agricultural growth. It is seen as an important tool for sectoral growth and economic growth in Nigeria.

Human capital directly influences agricultural productivity by affecting the way in which inputs are used and combined by farmers. Improvements in human capital affect acquisition, assimilation and implementation of information and technology. Nkamleu (2007) used a stochastic frontier production (Maximum Likelihood Estimation, MLE) methodology to estimate the food production in Oyo State, Nigeria. The estimated mean level food production was 70 percent, ranging between 18 percent and 93 percent, indicating that with the present technology there is still room for a 30 percent increase in food production. Based on the result, age of farmers affects food production positively and significantly whereas farming experience and level of education have negative and significant influence on the level of food production.
Human capital also affects one's ability to adapt technology to a particular situation or to changing needs. Schultz (1963) attributed between 21 to 23 percent of the growth in U.S. income, between 1929 and 1957, to education of the labour force. Contemporaneously, Schutz (1963) focused on minimizing the unexplained portion of growth in U.S. agriculture by adjusting labour for quality, using education. When he included research and extension expenditure as an input to production, he found that virtually all the "unexplained" growth could be explained by economies of scale, R&D and labour quality changes. Farrell (1957) explored the role of farmer education and extension on farm efficiency. They found that farmer education and extension were not only important to enhancing production on Thai, Korean and Malaysian farms, but that there was an interaction effect between education and extension. In contrast, they found physical capital had an insignificant impact on production and profits.

On the other hand, some researchers are finding evidence that returns to education are low, especially for those who stay in agriculture. In their summary of the findings on the determinants of rural poverty for six country studies based on econometrically estimated income equations, Lopez and Valdes (2000) conclude that the return to education in farming is surprisingly small in most cases. An increase in one year in the average level of schooling raises per capita annual income of the family by less than US$ 20 per person in most cases. The main contribution of education in rural areas appears to be to prepare young people to migrate to urban areas and towns. Using an econometric approach, Okojie, (1995) examined sources of TFP growth in 83 industrial and developing countries for the period 1960-1990. They found that human capital formation was three to four times more important than raw labour in explaining output growth. Using human capital as a separate variable, they found that the countries with the fastest growing economies have based their growth on factor accumulation (human capital, labour and physical capital), not growth in efficiency or technology.

This study is unique in its form. This is because no study from empirical studies disaggregated capital accumulation into Net National Savings, Gross Fixed Capital Formation and Human Capital Formation as explanatory variables to determine variations in livestock productivity as a component of total economic growth in Nigeria. Also, this study seeks to determine both the short and long run impact of capital accumulation on livestock production in Nigeria using OLS and cointegration/ECM methods. Also, the time frame of the current work is extended to 2013 to capture the resent reality in the Nigerian economy. These are the gaps the study identified to be filled.

Methodology

Research Design

The research design employed for this study is quasi-experimental and explanatory in nature. The ordinary least squares regression analysis (OLS) and the co-integration/error correction mechanism were employed as the main analytical tools. The Ordinary Least Squares was adopted because of its desirable properties of best, linear, unbiased estimates (BLUE). The co-integration technique was employed to determine the long run equilibrium relationship between the variables in the models developed as well as establish the speed of adjustment of short run dynamics to long run equilibrium.

Model Specification

Both linear and non linear specifications were tried on the argument on equations

The specifications are as follows:

Livestock Production Output Model

$$LVP = f(NNS, GCF, HCF) \quad (1)$$

$$LVP_t = b_0 + b_1NNS_t + b_2GCF_t + b_3HCF + U_t \quad \text{(Linear)} \quad (2)$$

$$LogCRP_t = Logb_0 + Logb_1NNS_t + Logb_2GCF_t + Logb_3HCF + U_t \quad \text{(Non linear)} \quad (3)$$

Where:

b_0 = Intercept Parameter

b_1-b_3 = slopes Parameter

LVP = Livestock Production Output

NNS = Net national savings

GCF= Gross capital formation

HCF= Human capital formation

All at time t.

***A priori* expectations**

On the apriori; $b_1 > 0$, $b_2 > 0$ and $b_3 > 0$

Variables in the Model

Dependent Variables: The dependent variables is livestock production output.

Independent Variables: The independent variables include Net National Savings, Gross Fixed Capital Formation and Human Capital Formation.

Data Collection Methods and Sources

The data for this study was time series data at the macro level spanning from 1980 to 2013. The data were largely sourced from National Bureau of Statistics Bulletin, Federal Ministry of Agriculture annual issues and Central Bank of Nigeria (CBN) statistical bulletin. The data include livestock production output as dependent Variable and Capital Accumulation as disaggregated into Net National Savings, Gross Fixed Capital Formation and Human Capital Formation as independent variable.

Techniques of Data Analysis

The statistical tool to be employed in analyzing the data of this study are; Ordinary Least Square method (OLS), the Error Correction Method of Co-integration based on Engle-Granger (1987) co-integration theorem and the Granger Causality test. The choice of these econometric approaches is premised on the fact that time series data are sometimes pronged to fluctuation that may cumulate into spurious regression result.

Ordinary Least Squares Regression Analysis

This test is employed to investigate the relationship that exists between the dependent and independent variables. The OLS method is chosen because of the considerable advantages associated with it (Wallace and Silver, 1988). These advantages include; Best Linear Unbiasedness (BLU), minimum variable, efficiency, least mean square (MSE) and sufficiency.

Unit Root Tests

The first stage of co-integrated technique is the unit root test, otherwise called test of stationarity.

A test of stationarity which has become widely popular over the past several years is the unit root test (Gujarati, 2007). The assumption of stationarity of regressors and regressands is crucial for the properties of the OLS estimators. In this case, the usual statistical results for the linear regression model and consistency of estimators hold. But when variables are non-stationary, then the usual statistical results may not hold. Also Granger (1986) opined that most time series variables are non-stationary and using non-stationary variable in model might lead to spurious regression. Therefore a preliminary investigation into the analysis commenced with confirmation of the order of integration of the series, where the series is confirmed to be order 1, then, co-integration can then be performed. Time series analysis involving stochastic trends, Augmented Dickey-Fuller unit root tests was calculated for individual series to provide evidence as to whether the variables are integrated. This was followed by a co-integration analysis. Augmented Dickey-Fuller (ADF) test involved the estimation of one of the following equations respectively: The unit root model is presented thus:

$$\Delta Y_1 = \alpha Y_{t-1} + \sum_{i=1}^{m} \beta \Delta Y_{t-1} + \delta + Y_1 + \varepsilon_1 \quad (3.4) \quad \text{for levels}$$

$$\Delta\Delta Y_1 = \alpha \Delta Y_{t-1} + \sum_{i=1}^{m} \beta \Delta\Delta Y_{t-1} + \delta + Y_1 + \varepsilon_1 \quad (3.5) \quad \text{for first difference}$$

The Co-integration Technique

The study adopted the co-integration estimation technique in analyzing our data. Co-integration is an econometric technique used for testing the correlation between non-stationary time series data. Usually time series data are non-stationary due to fluctuations that do characterize such information. Two variables are said to be co-integrated if they have a long run or equilibrium relationship between them or share a common stochastic drift (Gujarati, 2007). Hence co-integration technique has been developed to address the problem of spurious correlation often associated with some time series data.

According to Charemza and Headman (1992), a stochastic process is said to be stationary if the joint and conditional probability distributions of the processes are unchanged if displaced in time. If the series are co-integrated of the same order, a linear relationship between these variables can be estimated, and examining the order of this linear relationship can test for co-integration. The grim fact is that economists look for the presence of stationary co-integrated relationships, since only these can be used to describe long-run stable equilibrium. The Granger representation theorem states that if set variables are co-integrated (1, 1); implying that the residual is co-integrated of 1(0), then there exists an error correction model describing the relationship. However, an extension of this in the co-integration technique is the error correction mechanism (ECM) (Engle and Granger, 1987). These authors have established that co-integration is a sufficient condition for an error correction model formulation.

Johansen's Test for Co-Integration: The basic argument of Johansen's procedure is that the rank of matrix of variables can be used to determine whether or not the two variables are co-integrated.

Suppose two variables X (human capital formation) and Y(net national savings), used in our analysis are integrated of order 1 and we are interested in finding out the equilibrium relationship between the two variables, then this method suggests a straight forward test whether two variables are co-integrated of order l(I) or not.

The Error Correction Model (ECM)

According to Iyoha and Ekanem (2011), error correction model (ECM) involves using lagged residual to correct for deviations of actual values from the long-run equilibrium. The error correction model (ECMs) parameter λ, which shall be negative, in general measured the speed of adjustment towards the long run equilibrium relationship between the variables.). The Error Correction Method is used to correct the inconsistencies in time series data for this study as well as provide short-run and long-run relationship amongst the variables.

Other Tests

Also tested in this research work are the following:

- Test for the co-efficient of determination (R^2) as test to know the explanatory power of the variables in the models (goodness of fit of the variables).
- Test of significance (T-test) of each of the parameter estimates.
- Overall significance (F-test) of the explanatory variables in the model.
- Durbin Watson test for serial autocorrelation.

RESULTS AND DISCUSSION

Table 1 Livestock Output, Net National Savings, Gross Fixed Capital Formation and Human Capital Formation, 1980-2013 (in million naira)

YEAR	LVP	NNS	GCF	HCF
1980	47.80000	5769.900	10841.20	1852.300
1981	56.27000	6562.600	12215.00	1232.800
1982	61.17000	7514.400	10922.00	1421.100
1983	58.50000	9443.900	8135.000	1247.000
1984	63.65000	10988.10	5417.000	1051.400
1985	66.39000	12521.80	5573.000	1073.700
1986	68.81000	13934.10	7323.000	1455.200
1987	85.66000	18676.30	10661.10	889.9000
1988	83.44000	23249.00	12383.70	1527.300
1989	97.09000	23801.30	18414.10	2394.400
1990	100.0000	29651.20	30626.80	2952.400
1991	132.3700	37738.20	35423.90	2311.700
1992	131.3700	55116.80	58640.30	10683.60
1993	133.2100	85027.90	80948.10	13311.60
1994	135.2800	108460.5	85021.90	17580.20
1995	140.9500	108490.3	114476.3	20412.70
1996	145.0900	134503.2	172105.7	21747.00
1997	148.7000	177648.7	205553.2	38705.60
1998	149.4600	200065.1	192984.4	47743.80
1999	152.9900	277667.5	175735.8	85749.90
2000	157.2100	385190.9	268894.5	104396.1
2001	199.5000	488045.4	371897.9	172626.4
2002	208.9000	592094.0	438114.9	119121.6
2003	225.5000	655739.7	429230.0	153555.3
2004	238.0000	797517.2	456970.0	191720.9
2005	250.0000	1316957.	472140.4	270803.7
2006	264.7200	1739637.	479243.6	308171.8
2007	263.4500	2693554.	492421.2	256898.8
2008	259.3900	4118173.	512438.4	278624.7
2009	262.5200	5763511.	494701.1	281231.8
2010	261.7900	5954261.	499853.5	272251.7

2011	261.2300	6531913.	502331.0	277369.4
2012	261.8500	6083228.	498961.9	276951.0
2013	261.6200	6189801.	500382.1	

Source: *CBN Statistical Bulletin (Various Issues)*

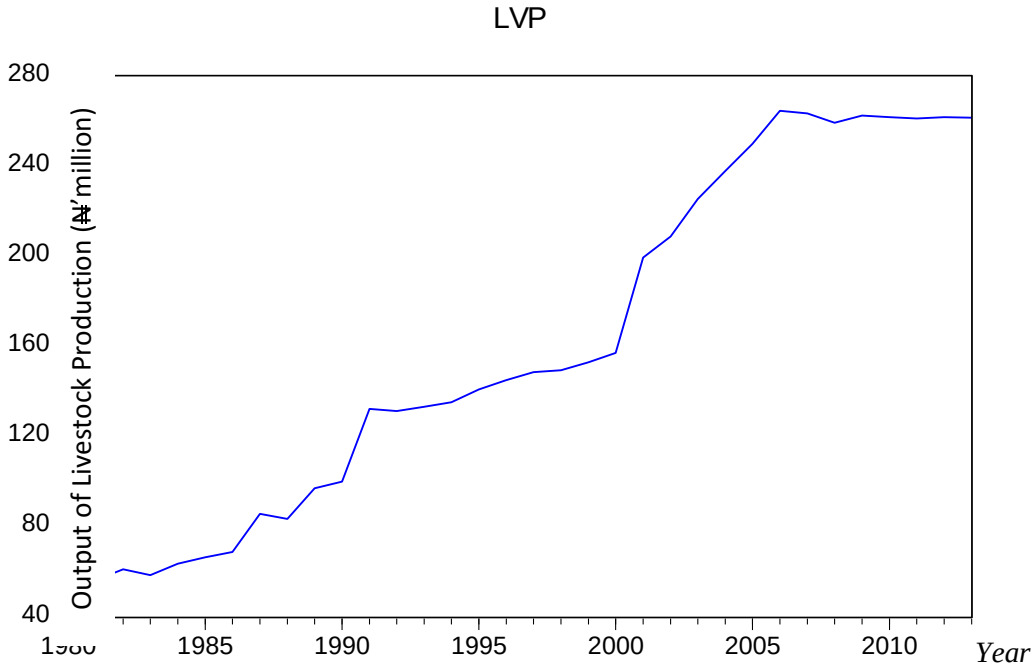

Figure 1 Trend of Output of Livestock Production

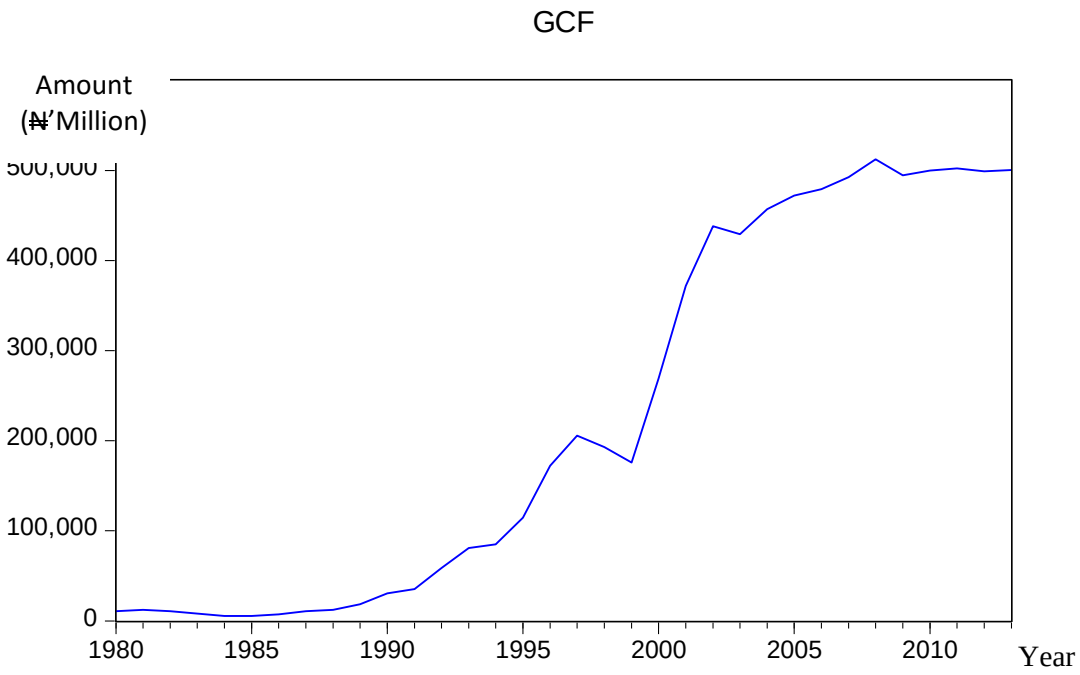

Figure 2 Trend of Gross Capital Formation

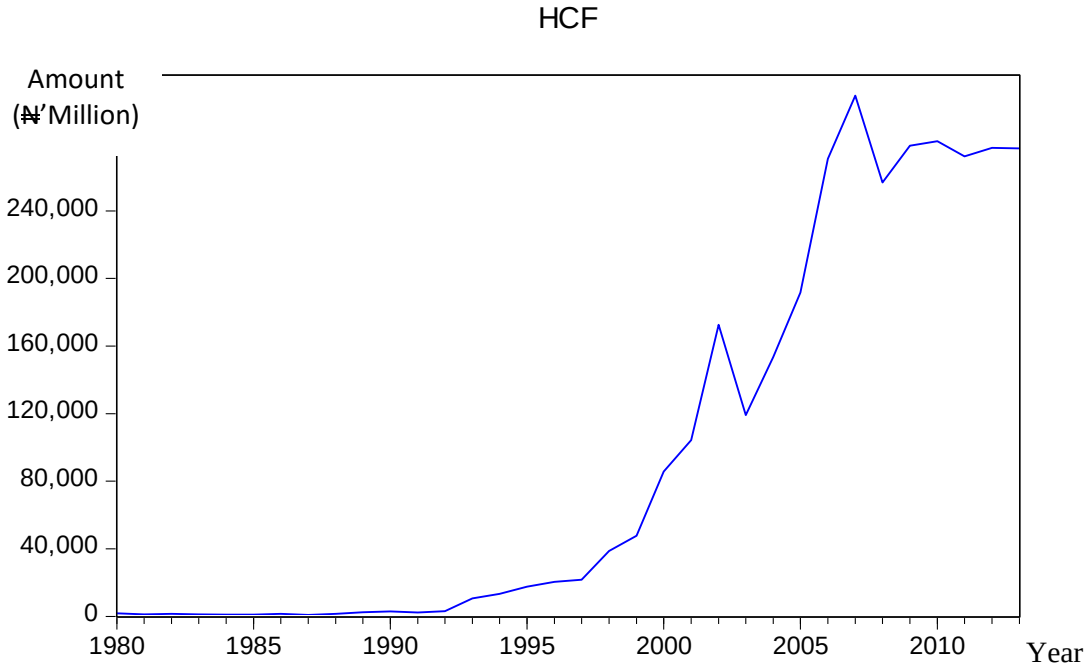

Figure 3 Trend of Human Capital Formation

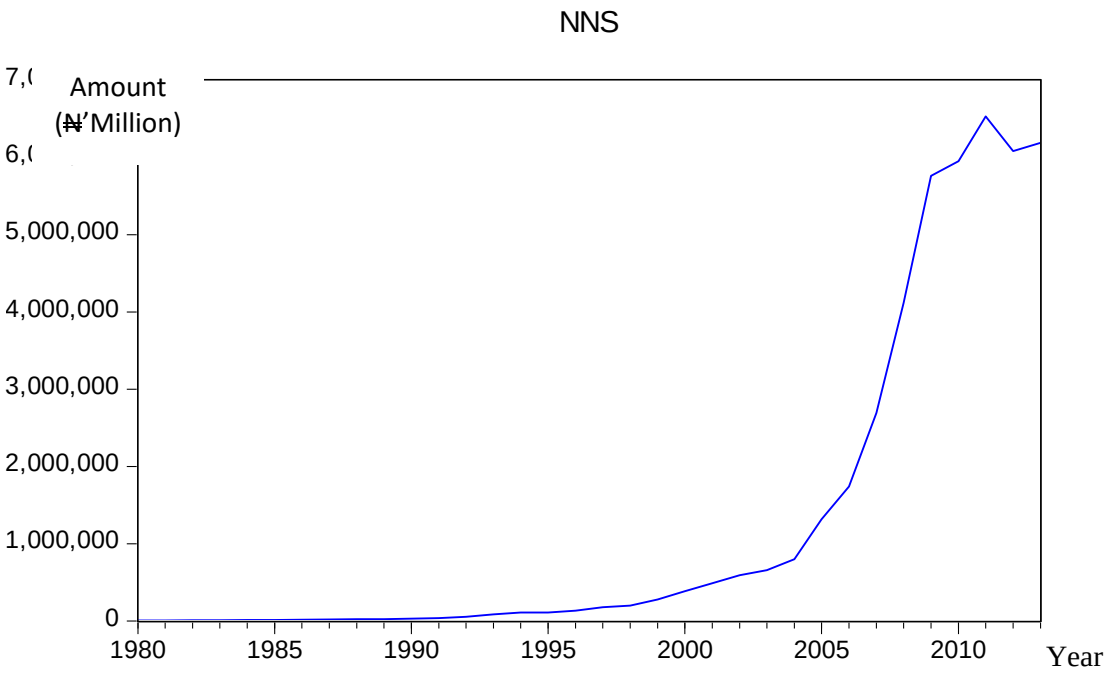

Figure 4 Trend of Net National Savings

Regression Analysis at Levels

Regression Analysis for Livestock Production Output Model

The results below showed the log-linear specifications of the livestock production the model.

Table 2 Analysis of Regression Result for Livestock Production Output Model

Dependent Variable: LOG(LVP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.055762	0.220566	4.786610	0.0000
LOG(NNS)	0.181658	0.030006	6.054086	0.0000
LOG(GCF)	0.279350	0.045992	6.073897	0.0000
LOG(HCF)	-0.152377	0.047712	-3.193655	0.0033
R-squared	0.970149	Mean dependent var		4.938223
Adjusted R-squared	0.967164	S.D. dependent var		0.555629
S.E. of regression	0.100684	Akaike info criterion		-1.643525
Sum squared resid	0.304119	Schwarz criterion		-1.463953
Log likelihood	31.93993	Hannan-Quinn criter.		-1.582286
F-statistic	324.9965	Durbin-Watson stat		0.645093
Prob(F-statistic)	0.000000			

Source: *Computed Result from (E-View 7.1)*

The result of the table revealed that R^2 of 0.97, indicating that the variation in Livestock Production Output explained by Net National Savings, Gross Capital Formation and Human Capital Formation is 97 percent. The Durbin-Watson value of 0.65 depicts the presence of serial auto correlation. From the result, the regression result is spurious. Therefore, there is need to conduct stationarity test and long run analysis.

Johansen Test for Co-integration

Co-integration is conducted based on the test proposed by Johansen. According to Iyoha and Ekanem, (2002) co-integration deals with the methodology of modeling non-stationary time series variables. For detail result of the Johansen co-integration

Table 3: Result of Unit Root (Stationarity) Test on Variables (1980-2013)

Variables	ADF Test	Critical Value 1% critical value value	5% Critical value	10% critical	Order of integration
LVP	-5.357118	-3.653730	-2.957110	-2.617434	I(1)= 1st Diff.
FOP	-5.538989	-3.653730	-2.957110	-2.617434	I(1)= 1st Diff.
NNS	4.790816	-3.711457	-2.981038	-2.629906	I(0)=At Level.
GCF	-4.068590	-3.661661	-2.960411	-2.619160	I(1)= 1st Diff.
HCF	-5.765974	-3.653730	-2.957110	-2.617434	I(1)= 1st Diff.

Source: *Computed Result (E-view 7.1)*

Table 4: Johansen Co-integration Test Result for LVP Model

Eigen value	Max-Eigen Statistic	5% critical value	Prob. **	Hypothesized N0 of CE(s)
0.809340	51.37514	27.58434	0.0000	None *
0.575123	26.53460	21.13162	0.0079	At most 1 *
0.143555	4.803920	14.26460	0.7664	At most 2
0.029517	0.928795	3.841466	0.3352	At most 3

Source: *Computed Result (E-view 7.1) from Appendix IV*

Note: * denote rejection of the hypothesis at the 0.05 level. **Mackinnon-Haug-Michelis (1999) p-values. Max-eigenvalue test indicate 2 co-integrating eqn(s) at 0.05 level

Error Correction Model (ECM)

Error correction model (ECM) is a means of integrating the short-run behaviour of an economic variable with its long-run behaviour (Gujarati and Sangeetha, 2008). One implication of Granger representation

theorem is that if two variables are co-integrated, an Error Correction Term (ECT) is required to be included (Granger, 1988). The table below shows an inference error correction test conducted:

Table 5: Over Parameterized Error Correction Mechanism for LVP Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.474790	4.069839	1.836630	0.0892
D(LVP(-1))	-0.089199	0.266894	-0.334212	0.7436
D(LVP(-2))	0.154594	0.292446	0.528624	0.6060
D(LVP(-3))	-0.128656	0.279528	-0.460262	0.6529
D(NNS)	-3.64E-05	1.65E-05	-2.198872	0.0466
D(NNS(-1))	1.60E-05	1.02E-05	1.564248	0.1418
D(NNS(-2))	1.40E-05	1.17E-05	1.197371	0.2525
D(NNS(-3))	-2.00E-05	1.04E-05	-1.917522	0.0774
D(GCF)	-0.000188	0.000143	-1.313929	0.2116
D(GCF(-1))	0.000380	0.000142	2.671524	0.0192
D(GCF(-2))	-0.000439	0.000203	-2.156738	0.0503
D(GCF(-3))	0.000195	0.000139	1.400589	0.1848
D(HCF)	0.000149	9.64E-05	1.545380	0.1462
D(HCF(-1))	2.43E-05	9.21E-05	0.264493	0.7955
D(HCF(-2))	0.000359	0.000202	1.779872	0.0985
D(HCF(-3))	9.68E-05	0.000138	0.703380	0.4942
ECM(-1)	5.642377	17.32785	0.325625	0.7499
R-squared	0.575434	Mean dependent var		6.770667
Adjusted R-squared	0.052891	S.D. dependent var		10.16484
S.E. of regression	9.892376	Akaike info criterion		7.718491
Sum squared resid	1272.168	Schwarz criterion		8.512503
Log likelihood	-98.77737	Hannan-Quinn criter.		7.972502
F-statistic	1.101218	Durbin-Watson stat		2.171654
Prob(F-statistic)	0.436148			

Source: *Computed Result (E-view 7.1)*

Table 4.5b above shows the results of the over-parameterized error correction model LVP model. The reason for the over-parameterized specification is to show the main dynamic processes in the model and as well sets the lag length such that the dynamic processes would not be constrained by too long a lag length.

Table 6 Parsimonious Error Correction Model for LVP Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.225798	3.900603	1.083370	0.2958
D(LVP(-1))	-0.162419	0.276631	-0.587134	0.5658
D(LVP(-2))	0.212709	0.301279	0.706019	0.4910
D(LVP(-3))	-0.034878	0.290036	-0.120253	0.9059

D(NNS)	-1.19E-05	9.82E-06	-1.211148	0.2446
D(NNS(-1))	5.96E-06	7.98E-06	0.746532	0.4669
D(NNS(-2))	-2.36E-06	7.06E-06	-0.334407	0.7427
D(GCF)	-3.90E-05	0.000126	-0.308677	0.7618
D(GCF(-1))	0.000265	0.000133	1.994262	0.0646
D(GCF(-2))	0.000193	0.000167	-1.159586	0.2643
D(GCF(-3))	0.000112	0.000129	0.866909	0.3996
D(HCF)	0.000112	9.26E-05	1.206910	0.2462
D(HCF(-1))	1.16E-05	9.23E-05	-0.125863	0.9015
D(HCF(-2))	8.73E-05	0.000136	0.641686	0.5308
ECM(-1)	-9.543775	18.03494	0.529183	0.6044
R-squared	0.455339	Mean dependent var		6.770667
Adjusted R-squared	-0.053010	S.D. dependent var		10.16484
S.E. of regression	10.43078	Akaike info criterion		7.834252
Sum squared resid	1632.018	Schwarz criterion		8.534851
Log likelihood	-102.5138	Hannan-Quinn criter.		8.058380
F-statistic	2.895721	Durbin-Watson stat		2.017704
Prob(F-statistic)	0.009139			

Source: *Computed Result (E-view 7.1)*

CONCLUSIONS AND RECOMMENDATIONS

Inadequate funding of the livestock sector has been identified by several experts as an obstacle to increased livestock output in Nigeria. However, from a nominal point of view, it is evident that in Nigeria, government spending on livestock continued to increase over the years while empirical evidence have revealed that the performance of the livestock sector has been inadequate. Table 6 of the model showed that the coefficient of ECM appeared with the right sign and statistically significant at the 5% level. Moreover, the current and lag one forms of the independent variables (GCF and HCF) were positively signed. While the current and lag one forms of the independent variable (NNS) are negatively signed. All these conform to apriority expectation. But for the one period, the independent variables were not statistically significant at 5 percent level. With these results, we accept the null hypotheses of the analysis which state that there is no significant relationship between capital accumulation and livestock production output. In model two, the current and lags forms (i.e lag one and two) of the independent variables (GCF and HCF) were positively signed. While the current and lags forms of the independent variable (NNS) are negatively signed except lag one form that is positively signed. But for the one period, the independent variables were not statistically significant at 5 percent level. Table ECM appeared with the right sign but statistically not significant at the 5% level. Meanwhile, the lag one and three forms of the independent variables (HCF) are positively signed. But only the lag three form is statistically significant. Also, the lag one and three forms of the independent variable (GCF) are positively signed but not statistically significant. But for the independent variable (NNS), only the lag one period are statistically not significant while the lag three period is negative and statistically not significant. With these results, we accept the null hypothesis of the model which state that there is no significant relationship between capital accumulation and livestock production output in Nigeria. Meaning that capital accumulation (proxied by net national savings, gross capital formation and human capital formation) alone does not spur livestock output in Nigeria during the period under review. From this, it is obvious that the government has not done much to make capital accumulation impact significantly on livestock production output.

Government policies on capital Investment in the livestock sector should be increased and monitored to ensure that the target groups use the funds for the development of the livestock sector.

Policies on National savings should be reviewed and strengthened. This is because net national savings is abysmally low in Nigeria hence it is not impacting significantly on growths especially growth in the livestock sector.

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