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ANALYSIS OF EFFECTS OF PUBLIC SPENDINGS ON LIVESTOCK SUB-SECTOR OUTPUTS IN NIGERIA (1980-2017): IMPLICATIONS FOR POVERTY REDUCTION

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Abstract

This study analyzed effects of public spends on livestock sub-sector output and its implication for poverty reduction in Nigeria, using time series annual data from 1980 to 2017. The analysis was based on trend, growth, ARDL models and examined both long and short-run effects. The trend showed the results on fluctuations in variables like public spending, livestock sub-sector output and inflation. The growth model revealed that public spending (0.0024) accelerated, while livestock output (-0.0002) and inflation rate (-0.00012) decelerated. The Bounds test confirmed a long-run relationship between agricultural spending and livestock output (F-value of 5.004 at 5% significance). The ARDL model showed that public spending negatively affected livestock output (-0.018%) in the short run but positively impacted (0.083%) in the long run. Livestock output also significantly influenced poverty, with coefficients of 4.148 (short run) and 3.019 (long run) respectively. The study concluded that those public spendings significantly affected of livestock output in Nigeria. It was recommended that Maputo Agreement should be implemented, offering training and low-interest loans to livestock farmers, and encouraging entrepreneurship to maximize benefits of agricultural spends in Nigeria.

Keywords: Livestock, Output, Public, Poverty, Spending.

1.0 Introduction

Despite the significant potential of agriculture in Nigeria, its impact on poverty reduction and self-sufficiency remains limited (Ajumon & Ogwumike, 2013). Over 80 million Nigerians (64% of the population) live below the poverty line of USD 01.90, and this situation has worsened over the years (Seun, 2016). Key factors contributing to this

include poor private investment in agriculture, limited access to resources, outdated technology and unreliable power supply (Ajumon & Ogwumike, 2013). Historically, poverty reduction has closely linked to agricultural performance, particularly growth in agricultural productivity. Countries with the highest increases in productivity have seen the greatest reductions in poverty (Ajumon & Ogwumike, 2013).

Livestock production plays a key role in Nigeria's economy, contributing to food production alongside crop farming (Afifi-Affat, 1998). Among other financial funding, the livestock sub-sector has received funding through loans from the CBN via the Agricultural Credit Guarantee Scheme (ACGS), with N0.63 billion (14.4%) in 2018 and N0.72 billion (17.8%) in 2019 (CBN Annual Report, 2018 and 2019). However, its economic contribution remains modest, accounting for about 10% of agricultural activity and under 3% of GDP. Specifically, livestock contributed 1.77% to GDP in 2014, 1.86% in 2015, 1.60% in 2018, 1.46% in 2019, and 1.39% in 2020 (NBS, 2016, 2019, 2020).

While several studies had examined public agricultural spendings and agricultural output, few have focused on the relationship between public agricultural spending and sub-sector output, particularly livestock and its implications for poverty reduction in Nigeria. For instance, Kolawole and Omobitan (2014) explored government spending on agriculture and poverty reduction from 1980-2009. Omigie *et al*. (2013) studied agriculture's role in poverty reduction from 1980-2011 and Ihugba et al. (2013) analyzed government expenditures on agriculture and its impact on economic growth, using data from 1980-2011. This study, however, aims to fill the gap by assessing the effects of public agricultural spendings, specifically on the livestock subsector's output and its contribution to poverty reduction in Nigeria. The study analyzes the direction and growth rates of public agricultural spending and livestock

subsector output, as well as trends in agricultural spending, poverty, livestock, and inflation from 1980 to 2017.

2.0 Objectives of the Study

The broad objective of this study was to assess effects of public agricultural spending on livestock subsector outputs in Nigeria. The specific objectives were to:

i. examine the trends in public agricultural spendings and livestock subsector outputs in Nigeria;
ii. ascertain the direction and growth rates of public agricultural spendings and livestock subsector outputs;
iii. analyze effects of public agricultural spending on livestock subsector outputs in both the short and long run; and
iv. examine effects of livestock subsector outputs on poverty in both the short and long run.

3.0 Methodology

3.1 The Study Area

The study was conducted in Nigeria and it is located in the Gulf of Guinea on Africa's west coast. Nigeria covers an area of 923,768 sq. km (356,669 sq. miles), about twice the size of California. It is bordered by Chad to the Northeast, Cameroon to the East, the Atlantic Ocean to the South, Benin to the West, and Niger to the Northwest, with a total boundary length of 4,900 km (3,045 miles), including 853 km (530 miles) of coastline. The borders with Chad and Cameroon are disputed. Nigeria has 36 States and a capital, Abuja, at its centre. As at 14th November, 2019, Nigeria's population was 202,882,412 (Worldometers, 2019).

3.2 Method of Data Collection and Data Analysis

This study adopted a documentary analysis form of survey, which made use of

time series data from 1980 to 2017. Data for this study were collected from National Bureau of statistics (NBS) and Nucleic Acid Phylogenetic Profiling (NAAP) Policy data.

Analysis was done using both descriptive and inferential statistics. Also, preliminary unit root tests such as the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests were conducted on all the series. Growth and Autoregressive distributed lag (ARDL) models were used. Bounds test and T-test were also used to test hypotheses.

3.3 Measurement of Variables

Table 1 below shows the measurement of variables as used in the study. Livestock sub-sector output was measured in tons and sourced from NAAP Policy data with the symbol lstk. Agricultural spending was measured in naira and sourced from CBN, while inflation, and poverty rate were measured in percentage and all were sourced from NBS.

Table 1: Measurement of Variables

Variables	Measurement	Source	Symbol
Livestock	Tons	NAAP Policy Data	Lstk
Agricultural spending	Naira	CBN	Agrspdin
Inflation rate	Percentage	CBN	Inflrt
Poverty rate	Percentage	NBS	Pov

Author's Computation (2020)

Growth model

Growth model was used to ascertain direction and growth rates of variables of interest and was specifically stated for the variables of interest as below:

$$\ln Y_t = \alpha + \beta_{liv} t + \mu_t \quad \ldots\ldots\ldots\

$$\ln Y_t = \alpha + \beta_{pov} t + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

where, α = intercept;

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

$\beta_{liv,}$ β_{pagr}, β_{pov} = coefficients of the trend variable for livestock sub-sector production, public agricultural spending, and poverty, respectively.

A semi-log growth rate model was developed for this study instead of a linear trend model because the study was interested in both absolute and relative change in the parameters of interest for this study. The parameter of utmost interest in equations (1–3) was 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 β by 100, gives the instantaneous growth rate (IGR) at a point in time.

$$IGR = \beta \text{ X } 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

where: IGR = Instantaneous growth rate and

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

Secondly, taking the antilog of β subtracting 1 from it and then multiplying the difference by 100 gives the compound growth rate (CGR) over a period of time. The compound growth rate (CGR) in percentage in each of the five cases can be recovered from the equations 1 – 3 in the following manner:

$$CGR = (e^{\beta i}\text{-}1)*100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

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

Further, the quadratic form of the model was estimated as:

$$Y_t = \beta_0 + \sum_{i=1}^{p1} \theta_1 Y_{t-i} + \sum_{i=1}^{q1} \beta_1 X_{1t-i} + \sum_{i=1}^{q3} \beta_2 X_{2t-i} + + \varepsilon_t \quad (7)$$

Finally, the short run dynamic parameters from estimating an error correction model associated with the long run estimates is specified as follows:

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{p} \varphi_1 \Delta Y_{t-i} + \sum_{i=1}^{q1} \delta_1 \Delta X_{1t-i} + + \sum_{i=1}^{q3} \delta_3 \Delta X_{3t-i} + \pi ECM_{t-1} + \varepsilon_t \quad (8)$$

Where Y_t = livestock (lstk) subsector output in tons

X_{it} = public agricultural spending (agrspdin) in Nair

X_{zt} = inflation rate (inflrt) in percentage

ECM_{t-1} =the error correction term

ε_t =the error term

π = speed of adjustment

p and q are lags.

$$Y_t = \beta_0 + \sum_{i=1}^{p} \beta_1 Y_{t-i} + \sum_{i=1}^{q1} \beta_1 X_{1t-i} + \sum_{i=1}^{q2} \beta_2 X_{2t-i} + \varepsilon_t \quad (9)$$

Finally, the short run dynamic parameters from estimating an error correction model associated with the long run estimates was specified as follows:

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{p} \varphi_1 \Delta Y_{t-i} + \sum_{i=1}^{q1} \delta_1 \Delta X_{1t-i} + \sum_{i=1}^{q2} \delta_2 \Delta X_{2t-i} + \pi ECM_{t-1} + \varepsilon_t \quad (10)$$

Where Y_t =poverty rate (in percentages)

X_{1t} =livestock subsector output (tons)

X_{2t} = public agricultural spending (Naira)

ECT_{t-1} =the error correction term

ε_t =the error term

p and q are lags

4.0 Results and Discussion

4.1 Summary Statistics of Variables Used

The summary statistics of the variables used for analysis were presented in Table 2. The results show that all the variables have positive mean values. This implies that on the average, public agricultural spending (agrspdin), livestock sub-sector output (lstk), inflation rate (inflrt), and poverty rate (pov) were increasing over the years.

Table 2: Summary Statistics

Variable	Agrspdn	Lstck	inflrt	Pov
Minimum	11.230	51.830	5.400	12
Maximum	6363782	124.670	72.800	86
Mean	1694289	87.960	19.266	49
Observatio	38	38	38	38

Source: Author's computation (2019)

4.3 Trends in Nigeria's livestock output (1980 – 2017)

Figure 1 summarized the trends in livestock output. Specifically, between 1980 and 2017, livestock production witnessed a steady rise, although with fluctuation during the period under review. This result is contrary to that of CBN (2010) that despite these enormous qualities and contributions of agriculture, the sector has slipped into a systemic decline, particularly in the past four decades; the contribution of agriculture to overall GDP went from 64 % in 1960 to 46 % in 2010. This is as a result of its sub-sectors' performing decimally, which showed that livestock share of agricultural GDP declined from 24 % in 1980 to 6 % in 2010.

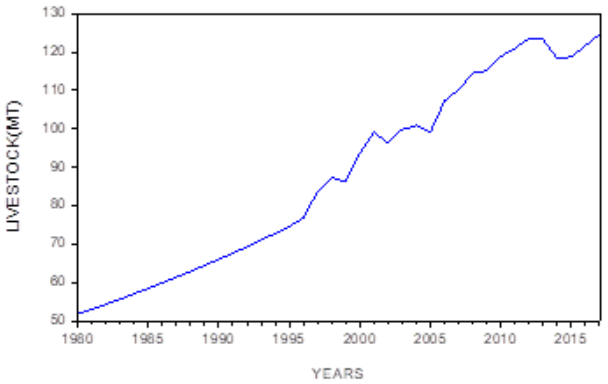


Figure 1: Trend in Nigeria's Livestock Output (1980 – 2017)

Source: Author's compilation (2020)

4.4 Trends in Nigeria's inflation rate (1980 – 2017)

Figure 2 summarized the inflation rate trends in Nigeria (1980-2017) showing significant fluctuations. From 1980 to 1985, inflation ranged from 10% to 23.2%, before dropping to 5.7% in 1986. This aligns with Ogbokor's (2004) study, which highlighted imported inflation's negative impact on growth. Between 1986 and 1988, inflation spiked from 7% to 54.5%, likely due to the naira's devaluation and the Structural Adjustment Programme (SAP). This is consistent with Dikeogu's (2018) findings on public spending and inflation which showed a negative impact. From 1989 to 1990, inflation fell from 50.5% to 7.4%, supporting Dikeogu, (2018) that inflation rate has been on double digit and has moved up and down within the period of discussion.

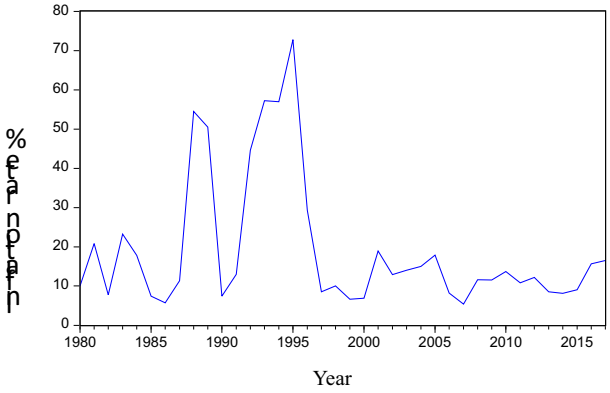
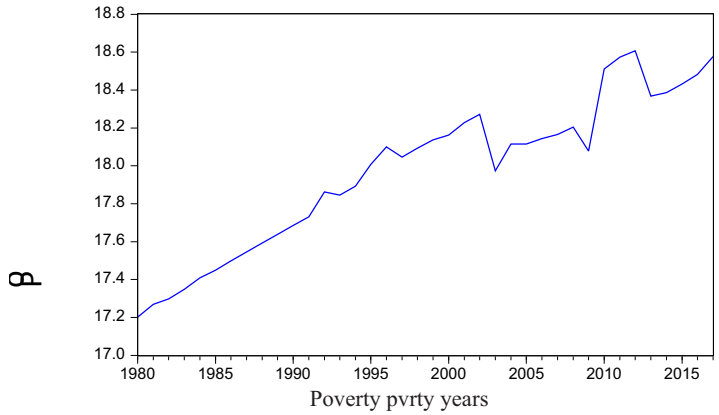


Figure 2: Trend in Nigeria's Inflation Rate (1980 – 2017)
Source: Author's compilation (2020)



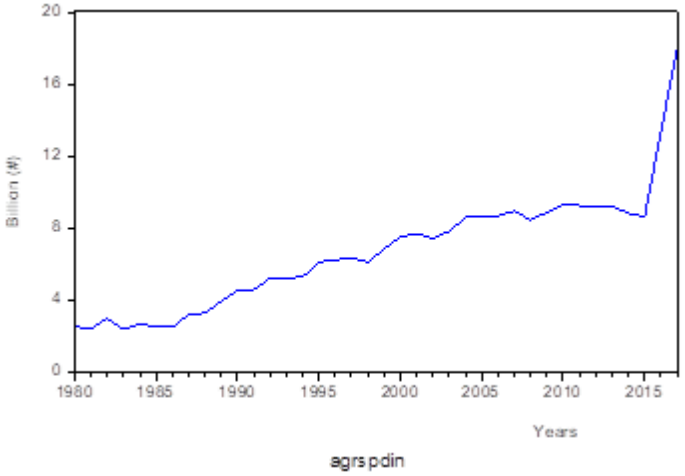
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Figure 3 : Trend in Nigeria's Poverty (1980 – 2017)

Source: Author's compilation

4.6 Trends in Agricultural Spending (1980 - 2017)

Figure 4 summarized the trends in agricultural spending. Specifically, between 1980 and 2016, agricultural spending increased from ₦13.9 million in 1980, to ₦637,378 million in 2016 and ₦63,637,822 million naira in 2017 during the period under review. This result is in line with Ogbodo *et al*, (2020) who stated that the figures for average capital expenditure for the period 2011 to 2018 were N72.06 billion as compared to N71.14 billion within 2001 to 2011.



4.7 The Direction and Growth Rate of Public Agricultural Spending and Livestock Subsector Output

The results of the growth rate and direction of growth were presented in Tables 4 and 5. The direction of growth showed that the coefficient for public spending (0.0024) was positive and significant at the 1% level. This implies that public spending increased during the period, possibly due to government, efforts to diversify the economy from oil to agriculture. Conversely, the coefficients for livestock sub-sector output (-0.0002) was negative and significant at 1% level, indicating a decline. This may be due to inadequate investment in agriculture, Nigeria's failure to implement the Maputo Agreement, and challenges like high feed costs, animal diseases, and poor infrastructure. This result aligns with McKay (2012) and Bamaiyi (2014) who stated that farmers lack the resources needed for optimal productivity. Regarding growth rates, instantaneous growth rates were positive for agricultural spending, livestock sub sector output, inflation rate, and poverty rate, with values of 1.31%, 1.02%, 1.15%, and 1.03%, respectively. The corresponding compound growth rates for agricultural spending, livestock sub sector output, inflation rate, and poverty rate were 1.36%, 1.02%, 1.16%, and 1.03%, respectively.

Table 4: Instantaneous and Compound Growth Rate

	Instantaneous % Growth Rate	Compound Growth rate %
Public agric spending (lnagrspdn)	1.31	1.36
L/stock subsector (lnlstk)	1.02	1.02
Inflation Rate (lninflrt)	1.15	1.16
Poverty (lnpov)	1.03	1.03

Source: Author's computation (2020)

Table 5: Direction of Growth of Nigeria's agricultural spending and livestock subsector output (1980 – 2017)

	Agrspdin	Lstk	Inflrt	Pov
Constant	2.225	3.903	2.671	17.203
@Trend	0.180	0.065	0.032	0.057
@Trend^2	0.002	-0.0002	-0.001	-0.001
t-value	(2.371)**	(15.413)***	(0.794)	(9.357)
R^2	0.849	0.984	0.091	0.936
F-value	98.429	1080.232	1.749	257.530
Akaike criterion	3.456	-3.612	2.172	-1.603
Durbin-watson stat	0.708	0.463	1.078	1.099
Pro(f-statistic)	0.000	0.000	0.189	0.000
Decision	Accelerated	Decelerated	Decelerated	Decelerated

*, ** and *** indicate significance at 1 %, 5 % and 10 % levels respectively
Source: Author's computation (2020)

Table 5: Direction of Growth of Nigeria's agricultural spending and livestock subsector ou (1980 – 2017)

	Agrspdin	Lstk	Inflrt	Pov
Constant	2.225	3.903	2.671	17.203
@Trend	0.180	0.065	0.032	0.057
@Trend^2	0.002	-0.0002	-0.001	-0.001
t-value	(2.371)**	(15.413)***	(0.794)	(9.357)
R^2	0.849	0.984	0.091	0.936
F-value	98.429	1080.232	1.749	257.530
Akaike criterion	3.456	-3.612	2.172	-1.603
Durbin-watson stat	0.708	0.463	1.078	1.099
Pro(f-statistic)	0.000	0.000	0.189	0.000
Decision	Accelerated	Decelerated	Decelerated	Decelerated

*, ** and *** indicate significance at 1 %, 5 % and 10 % levels respectively
Source: Author'scomputation (2020)

4.8 Effect of Public Agricultural Spending on Livestock Sub-sector Output in both Short and Long Run

Bounds co-integration test for agricultural spending and livestock output

Table 6 presents the result of Bounds co-integration test that shows the long-run relationship existence or otherwise among the variables included in the ARDL model. The F statistics value of 5.004 was higher than the critical value of the I1 bound value of

3.79 at 5% probability level, showing existence of long run relationship among the variables. Hence, we reject the null hypothesis which states that public spending in agriculture does not have long run relationship with the livestock sub-sector output in

ARDL Estimates for long and short run effect of public agricultural spending on the livestock sub-sector

Table 7 shows the results of the estimated ARDL model. The R-squared value of 0.996 indicates that 99.6% of the variation in livestock output is explained by the model's variables. The negative error correction term (-0.347) was significant at the 1% level, indicating a 34.7% speed of adjustment, meaning disequilibrium from the previous year is corrected at this rate. In the short run, the previous year's livestock output was negative (-0.278) and significant at the 10% level, meaning a 1% increase in last year's output reduces current output by 0.278%. However, output from two years ago was positive (0.3201) and significant at the 5% level, indicating a 1% increase in this lag boosts current output by 0.3201%.

Public spending had a negative short-run effect on livestock output (-0.018) and was significant at the 10% level, meaning a 1% increase in public spending reduces output by 0.018%. This result aligns with Ewubare and Eyitope (2015), who found significant effects of government spending on agricultural output, but contrasts with Cletus and Sunday (2018), who found a positive relationship between government spending and economic growth. In the long run, public spending had a positive effect (0.083) and was significant at the 5% level, meaning a 1% increase in public spending raises output by 0.083%. This result aligns with Cletus and Sunday (2018) in what?. However, inflation had a negative long-run effect (-0.058) and was significant at the 1% level, suggesting that a 1% increase in inflation decreases output by 0.058%. This could

be due to rising feed costs and production inefficiencies, consistent with Ukoha (2007), who noted inflation increases risk and uncertainty for farmers.

Table 7: ARDL Estimates of the Effects of Agricultural Spending on the Livestock Sub-sector Output

Short run estimates				
Variable	Coefficient	Std Error	t-Statistic	Prob
D(LNLSTK(-1))	-0.278***	0.145	-1.922	0.071
D(LNLSTK(-2))	0.320**	0.156	2.056	0.055
D(LNAGRSPDIN)	0.003	0.004	0.64	0.53
D(LNAGRSPDIN(-1))	-0.018***	0.01	-1.794	0.09
D(LNINFLRT)	-0.007	0.006	-1.215	0.24
CointEq(-1)	-0.347*	0.107	-3.235	0.005
Long run estimates				
Variable	Coefficient	Std Error	t-Statistic	Prob
LNAGRSPDIN	0.083**	0.016	5.126	0.000
LNINFLRT	-0.058*	0.02	-2.872	0.001
C	-2.493	4.097	-0.608	0.551
R-squared	0.996			
Adjusted R-squared	0.994			
F-statistic	504.044			
Prob(F-statistic)	0.000			

Source: Author's Computation (2020)

Effect of Livestock Sub-sector Output on Poverty in both Short and Long Run

Bounds cointegration test for livestock output and poverty

Table 8 presents the result of bounds co-integration test that shows whether long run relationship exists among the variables included in the ARDL model. The F statistics value of 9.054 was higher than the critical value of the I1 bound value of 3.34 at 5% probability level, showing the existence of long run relationship among the variables. Hence, we rejected the null hypothesis, which states that livestock sub-sector output does not have significant long run relationship with poverty in Nigeria.

Table 8: Bounds Test for cointegration between Livestock Output and Pove

Test Statistic	Value	K
F-Statistics	9.054	5
Critical Value Bound		
Significance	I0 Bound	I1 Bound
10%	1.81	2.93
5%	2.14	3.34
2.5%	2.44	3.71
1%	2.82	4.21

Source: Author's Computation (2020)

ARDL Estimates for long and short run effects of livestock subsector output on poverty.

The effects of livestock sub-sector output (lnlstk) in the short run were shown in the upper panel of Table 9. The R-squared value of 0.995 indicates that 99.5% of the variation in livestock sub-sector output was explained by the model's variables. The negative cointegration coefficient (-1.337) was significant at the 1% level, suggesting a self-adjustment mechanism with a 133.7% speed of adjustment, meaning disequilibrium from the previous year was corrected at this rate.

In the short run, the poverty rate in the second year was negative and significant at the 1% level, indicating that a 1% increase in poverty reduces the previous year's poverty by 0.573%. This may reflect government efforts to diversify the economy, boosting livestock production. However, livestock sub-sector output in the current year and in the previous two years showed positive relationships with poverty, with a 1% increase in output raising poverty by 4.148%, 1.795%, and 1.932%, respectively. This contrasts with Irz et al. (2001) findings, that a 1% increase in agricultural productivity reduces poverty by 0.6% to 1.3%. Agricultural spending was positive and significant at

the 1% level, meaning a 1% increase in public agricultural spending reduces poverty by 0.2%. This supports Inoni *et al*. (2007), who found that livestock subsidies can reduce rural poverty. In the long run, both livestock sub-sector output and agricultural spending significantly affect poverty at 1% significance level.

Table 9: ARDL Estimates of the Effect of Livestock Subsector Output on Poverty

Short run estimates				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNPOV(-2))	-0.573*	0.165	-3.483	0.008
D(LNPOV(-3))	-0.59	0.145	-4.058	0.004
D(LNLSTK)	4.148*	0.737	5.626	0.001
D(LNLSTK(-1))	1.795**	0.703	2.552	0.034
D(LNLSTK(-2))	1.932**	0.582	3.321	0.011
D(LNAGRSPDIN)	-0.200*	0.042	-4.768	0.001
D(LNAGRSPDIN(1))	0.093	0.025	3.776	0.005
D(LNAGRSPDIN(2))	0.039	0.025	1.544	0.161
D(LNINFLRT)	0.028	0.02	1.401	0.199
D(LNINFLRT(1))	-0.033	0.026	-1.267	0.241
D(LNINFLRT(2))	-0.038	0.024	-1.57	0.155
CointEq(-1)	-1.337	0.226	-5.92	0.000
Long run estimates				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNLSTK	3.019*	0.279	10.824	0.000
LNAGRSPDIN	-0.327*	0.035	-9.236	0.000
LNINFLRT	0.149	0.025	5.834	0.000
R-squared	0.995			
Adjusted R-squared	0.981			
F-statistic	81.054			
Prob(F-statistic)	0.000			

Source: Author's Computation (2020)

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5.0 Conclusion and Recommendations

5.1 Conclusion

This study was carried out on analysis of public spending on livestock sub-sector output and its implication for poverty reduction in Nigeria, using time series data from 1980 to 2017. It is concluded that the trends of public spending, livestock subsector output, inflation, and poverty rate were fluctuating during the period under review. The results showed that public spending accelerated while livestock sub-sector output and inflation decelerated during the period under review. The results also showed that public spending had a significant effect on livestock sub-sector output both in the long and short run. The results further revealed that livestock sub-sector output had a

significant effect on poverty in both long and short run.

5.2 Recommendations.

Based on the findings of this study, the following recommendations were made:

1. Since public spending significantly impacts livestock subsector output, the government and stakeholders should implement the Maputo Agreement, allocating 10% of the budget to agriculture, which will boost output and aid poverty reduction in Nigeria.
2. The government, through the Federal Ministry of Agriculture and Rural Development (FMARD), should increase funding for capacity building and training of livestock entrepreneurs, and provide low-interest loans to encourage greater participation in agriculture.

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