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Agricultural Sub-Sectors and Economic Development in Nigeria

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ABSTRACT

This study examined the relationship between Agricultural sub-sectors and economic development in Nigeria from 1980 to 2025. The key indicators in this study are human development index, crop production, livestock production, fishery and aquatic production and forestry production. The data was sourced from the Central Bank of Nigeria (CBN) Statistical bulletin and the analysis employed the Augmented Dickey Fuller (ADF) Unit root test to Co-integration and the Error correction mechanism model to guarantee data stationarity and robust examination of short-run and long run relationship. The ECM result of –0. 304544 or 30 % indicate the speed of adjustment from the long run to its short dynamics. Results also discovered that R^2 is 0.603452 (60 %) meaning that the various independent variables explain 60 % of the variations in the dependent variable (HDI) in the short run. The study concludes that Government should vehemently support agriculture as it stands to cushion hunger in a populated country like Nigeria. Banks should equally give out loans to encourage agricultural activities using mechanized equipment.

Keywords: *human development index, crop production, livestock production, fishery and aquatic production and forestry production*

1. INTRODUCTION

Background to the study

Nigeria's agricultural sector, comprising crop production, livestock, fishing, and forestry, is a cornerstone of the economy, contributing about 24% to gross domestic product and employing over 65% of the workforce. Crop production dominates over 87 % - 90% of output, while livestock (8.1%), fishing (3.2%), and forestry (1.1%) contribute less, yet all are critical for poverty reduction, food security, and economic development (Emeh, 2017). Nigeria, the largest economy in Africa, has faced persistent challenges in harnessing its vast agricultural potential to drive viable economic development. Though agriculture accounts for over 22% of the country's GDP and employs more than 65% of the workforce, its contribution to Nigeria's economic development is hindered by several obstacles (Ogundele, 2017). Key challenges include limited access to financing, inadequate infrastructure, and an inefficient institutional framework. According to a World Bank report (2010), agriculture employed 31% of Nigeria's total labour force, highlighting the sector's significant role in the country's economy. Similarly, agriculture is a significant source of employment in Nigeria, providing livelihoods for millions of people (Ogen, 2017; Akpan & Uford, 2024). Nigeria's agricultural sector is the foundation of the country's economy, including farming, fishing, and forestry. As the oldest and largest sector, agriculture has played a vital role in Nigeria's development (Asuquo et al, 2024). Conventionally, rural Nigeria was home to thriving communities with complex social systems, where peasant farmers cultivated various food crops for subsistence and had trade excess with neighbouring villages, thus, largely sustaining themselves (Ohiomah, Bossey and Umoru, 2025). In recent years, Nigeria's government has prioritized economic diversification, seeking to reduce dependence on oil and unlock the agricultural sector's potential for driving growth and development. Nevertheless, the link between agriculture and economic development in Nigeria remains unclear, and there is scarcity of empirical studies examining the affiliation between these two critical variables (Umaru, Sanusi, Ukwe and Salisu, 2025). The agricultural sector grew by 1.20% in the second quarter of 2022 lower than the 1.30% growth recorded in the same quarter in 2021. The sector grew by -0.90% in the first quarter of 2023 lower than the 3.16% growth recorded in the first quarters of

2022. In 2013, the sector recorded a 2.94% growth rate while in 2014 it recorded 4.27% which is highest through to 2022. In 2015 to 2021, the growth rate was 3.72%, and a fall to 2.13% respectively (Odifa, 2023). A hasty look at the Nigeria's agricultural sector's output contribution to human development indicate that its performance was not too impressive but display a steady rise between 2020 and 2024.

Thus, according to the world development index in 2022, the sector's output contribution to the Nigeria human development index was 20.98% in 2020 and witnessed a steady increase to 24.14% in 2024 (Akinniran, 2013). The challenges face by the sector affecting the growth rate and its output contribution to HDI between 2020 and 2024 include insecurity, climate change, and other factors, leading to low growth rate and contributions to HDI (Ebere, Hobken and Osimdina, 2014). The top agricultural products in 2020 include Cassava ($10.3b), Maize ($6.3b), Rice ($4.5b), Yams ($3.5b) and Cow pea ($2.5b). Crop production has been the foremost driver of agricultural growth in Nigeria, accounting for over 80% of total agricultural output. Correspondingly, livestock production contributes significantly to Nigeria's agricultural output, with cattle, sheep, and goats being the main livestock products. Credit to the private sector in agriculture as a share of Nigeria HDI between 2020 and 2024 steadily declined (Eboh, 2017; Oluwafemi, Adedokun and Ogunleye (2015). In 2020, the share of agricultural credit to the private sector was 13.55% while it declined to 12.44% in 2018 and a further fall to 11.35% in 2024 (Kamil, Sevin and Festus, 2017). The average credit to private sector as a percentage of GDP between 1991 and 2000 was on average of 12 – 15%. Between 2018 and 2023 it rose to between 20 – 25% while between 2018 and in 2023, it was 14 – 15%. In the period under review, credit to private sector to percentage of GDP reach an all-time high of 38.39% and a record low of 8.43% in 1990 (Adebiyi, 2018). The study investigates whether agricultural sector output contributions enhance economic development in Nigeria. All agricultural subs-sectors identified were empirically tested various tests (Akinniran, 2013).

Statement of the Problem

Despite the enormous potential of the agricultural sector in driving Nigeria's economic development, its performance over the past decades has remained below expectations. Agriculture continues to employ the largest share of the country's labor force, accounting for about 35.2 percent of total employment in 2024. Yet, its contribution to Gross Domestic Product (GDP) has stagnated at around 24–26 percent between 2021 and 2024. This trend suggests that while agriculture remains the mainstay of rural livelihoods, its productivity and contribution to overall economic transformation remains limited compared to its vast resource base and workforce capacity. A major problem lies in the low level of productivity among smallholder farmers, who constitute over 80 percent of Nigeria's farming population. Most operate on subsistence or semi-commercial levels using rudimentary tools and rain-fed techniques, leading to yields far below regional and global averages. For instance, Nigeria's average maize yield stands at 4.5 metric tons per hectare, compared to 4.8 metric tons per hectare in South Africa and 6.6 metric tons per hectare globally. Similarly, rice productivity in Nigeria averages 3.4 metric tons per hectare, significantly lower than metric tons per hectare in Asia. Furthermore, inadequate infrastructure and post-harvest losses have continued to weaken the agricultural value chain. The International Fund for Agricultural Development estimates that Nigeria loses up to 60 percent of perishable agricultural produce such as tomatoes, fruits, and vegetables annually due to poor storage, transportation, and processing facilities. This loss translates into an estimated ₦6.0 trillion in economic value every year, undermining farmers' incomes and national food availability. Similarly, limited access to finance remains a critical challenge, less than 5 percent of total commercial bank credit is allocated to the agricultural sector, constraining investment in mechanization, irrigation, and agro-processing industries. In addition, climate change and insecurity have emerged as significant threats to Nigeria's agricultural stability. Increasing incidences of droughts, flooding, and desertification have reduced arable land and disrupted planting seasons in the northern and middle-belt regions. The Nigerian Meteorological Agency reported that climate-induced flooding in 2024 alone destroyed over 700,000 hectares of farmland across 18 states.

2. THEORETICAL LITERATURE REVIEWED

Agricultural Transformation Theory

Lewi (1954) Agricultural Transformation Theory (ATT) emerged from the classical development ideas

and was further developed and popularized by John W. Mellor (1961, 1976) and later Johnston and Mellor (1961). These laid the foundation of the Dual-Sector Model, which emphasized the shift of surplus labor from the traditional agricultural sector to the modern industrial sector. The Agricultural transformation theory argues that economic development begins with the modernization of the agricultural sector, which leads to increases in productivity, income, and the release of labour and resources for industrial expansion. It suggests that as agriculture becomes more productive leading to food supply increases and keeping food prices stable. Rural incomes rise, stimulating demand for manufactured goods. Labour and capital move from agriculture to more productive industrial sectors. This process leads to structural transformation which is the hallmark of economic development. Thus, agriculture serves as both a foundation and a catalyst for industrial and economic development.

Endogenous Growth Model

Romer (1990) emphasized on technological progress to increases the growth of capital stock. This increases the level of output, which raises the proportion of output allocated to saving and investment, thus accelerating economic development even further. Technological progress is the result of economic agents' investments. The output generated per hour worked rises as capital accumulation and technological change combine. People deliberately respond to market incentives to bring about technological change, so it is expected that technological change is endogenous. Technology is also assumed to have a fixed cost because it may be used repeatedly without incurring additional costs after the initial development cost is incurred (Uford, 202). Human capital, according Romer (1990), is a foremost determinant of economic progress. Since technological change exists independently of the individual, human capital is assumed to be separate from the technological component. Individuals with higher level of education are more productive and have more skills. As a result of differences, human capital formation can be utilized to explain differences in labour productivity and per capita income.

Empirical Literature Reviewed

Ohiomah, Bossey and Umoru (2025) study delves into the agricultural sector's contribution to Nigeria's economic growth, employing the pooled least squares techniques to analyze the relationship between gross domestic products (GDP), agricultural output, credit to private sector, and inflation rate from 1990 to 2020. The results show a positive, albeit insignificant, link between agricultural output and GDP. The study suggests that agricultural friendly government policies are crucial to stem the leakages in agricultural output and foster inclusive growth. The study recommended policies that will build storage facilities like silos to ensure year-round availability of agricultural products at stable rates. Furthermore, the study emphasizes the need for additional research on leveraging agriculture to reduce unemployment in Nigeria. This is particularly important, given that the agricultural sector remains the largest employer in Nigeria, accounting for over 65% of the labour force. Umaru, Sanusi, Ukwe and Salisu (2025) study examined the role of Agriculture in driving economic growth in Nigeria. The annual time series data was collected from world development indicator, covering 9 latest years span from 1990 to 2024 were used. The study employed the econometric estimation technique Autoregressive Distribution Lag Model (ARDL) for the analysis, adopting annual data method of analysis. The result estimated indicates that all the explanatory variables were consistent with a priori expectation. This implies that a unit increase in Agriculture Merchandisem Export (AME), unemployment (UNEM) and technology (TECH) lead to be decrease by approximately 0.047, 0.22 and 0.0006 and the first – two were statistically significant at five percent level of significant, ceteris paribus. On the other hand, log of exportation of goods and services (EGS), inflation (INFL), labour force (LBF), livestock production (LVSPP), Log of manufacturing values added (MVA), which is 0.217, 0.0053, 0.137, 0.0068 and 0.507 respectively, all things being equal, promote Value Addition in Agriculture: Government should enhance agricultural mechanization and agro-processing to improve the efficiency of agricultural merchandise exports and ensure that the sector contributes more significantly to GDP. It is noted that Unemployment can be reduced through industrial expansion: Policies should focus on job creation in the manufacturing and technology sectors to absorb excess labour and reduce the adverse impact of unemployment on growth. Olayemi and Olanrewaju (2024) investigated agricultural output and economic growth in Nigeria using evidence from ARDL Bounds Testing

Approach by examining the long-run relationship between agricultural output and GDP from 1990 to 2022. Using the Autoregressive Distributed Lag (ARDL) model, they found a positive and statistically significant relationship between agricultural output and economic growth. Specifically, a 1% increase in agricultural productivity led to a 0.42% rise in real GDP. The study recommended investment in mechanization and rural infrastructure as key drivers of agricultural-led growth. Eyo and Udoh (2022) investigated agricultural productivity and economic growth in Nigeria: using evidence from Error Correction Model analyzed data from 1981–2020. The results indicated that agricultural output, gross capital formation, and labor force significantly influenced GDP growth in the long run. The study found that agriculture contributed an average of 24.8% to GDP during the study period, highlighting its role as a stabilizer during economic recessions. The authors suggested increased budgetary allocation and policy consistency to strengthen the sector. Ahmed and Abubakar (2021) study examined the link between agriculture and GDP between 1995 and 2020 through a panel across 15 West African countries using Generalized Method of Moments (GMM) estimation. Their findings revealed that agricultural value added had a significant positive effect on GDP growth at the 5% level, implying that a 1% rise in agricultural value-added increased GDP by 0.31%. They emphasized that sustained investment in rural finance and regional agricultural integration could enhance growth performance. Odetola and Etumnu (2020) investigated the contribution of agriculture to economic growth in Nigeria and used time-series data from 1981–2018 and applied an Ordinary Least Squares (OLS) regression model. The results showed that agricultural output had a significant and positive impact on GDP, with an elasticity coefficient of 0.56, indicating that a 10% increase in agricultural production boosts GDP by 5.6%. The authors concluded that agriculture remains a viable pathway for achieving sustainable growth and poverty reduction in Nigeria.

3. METHODOLOGY

Model Specification

From the theoretical and empirical literature reviewed, the study specifies a model in which human development index is the dependent variable while crop production, livestock production, fishery and aquaculture and forestry production are the independent variables.

The mathematical model is specified as

$$HDI = f(CRP, FAP, FRP, LSP)$$

HDI = human development index
CRP = crop production
FAP = fishery and aquaculture production
FRP = forestry production
LSP = livestock product
And the econometric form is;

$$HDI = \beta_0 + \beta_1 CRP_t + \beta_2 FAP_t + \beta_3 FRP_t + \beta_4 LSP_t)$$

HDI = human development index at time "t"
CRP = crop production at time "t"
FAP = fishery and aquaculture production at time "t"
FRP = forestry production at time "t" Where
LSP = livestock production at time "t"
μ_t = Error term
β_0 = Intercept
$\beta_1, -\beta_4$ are parameter estimates

4. PRESENTATION AND DISCUSSIONS OF RESULTS

Table 1. Summary of Descriptive Statistic Test.

Variable	Obs	Mean	Std Dev.	Min	Max
HDI	46	73.30130	33.59285	10.47000	99.70000
Crop production	46	17.41478	4.680179	7.500000	29.80000
Forestry production	46	19.36304	21.15521	16.90000	99.70000

Fishery production	46	85.21522	15.81577	5.380000	72.84000
Livestock production	46	85.21522	19.53088	16.90000	99.70000

The descriptive statistics presented in Table 1 summarize the average values, variability, and range of contributions from Nigeria's agricultural subsectors livestock, fishing, crop production, and forestry as well as the overall Gross Domestic Product (GDP) at 2020 constant market prices, all expressed in billions of US dollars (USD) for the period spanning 1980 to 2025. The livestock sector recorded an average annual contribution of $16.90000 billion, with a standard deviation of $19.53088billion, indicating moderate variability over the study period. The lowest value recorded was $341.41 billion, while the highest reached $99.70000 billion. This trend suggests a consistent growth in livestock production, reflecting improvements in animal husbandry, government support for agribusiness, and increasing demand for animal protein.

Crop production was the dominant agricultural activity in terms of economic contribution, with an average annual value of $17.41478 billion. The standard deviation of $4.680179 billion indicates a very high level of variation across the years. The minimum value stood at $7.500000billion, while the highest value reached $29.80000 billion. This large spread reflects the dynamic nature of crop production in Nigeria, compelled by changes in technology, population growth, land use patterns, and agricultural investment.

The forestry sector recorded the lowest average contribution among the subsectors, at $16.90000billion, with a standard deviation of $21.15521billion. The range of values spanned from $16.90000billion to $99.70000 billion. The modest level and low variability of forestry contributions suggest limited growth over the years. Forestry in Nigeria has been constrained by factors such as deforestation, land degradation, and limited investment in afforestation or reforestation efforts.

Fisheries contributed an average of $85.21522 billion annually, with a standard deviation of $15.81577 billion. The contribution ranged from a minimum of $5.380000 billion to a maximum of $72.84000 billion. Although fisheries contribute less to the HDI compared to other subsectors, the high standard deviation relative to the mean suggests a pattern of uneven growth. These fluctuations may be attributed to factors such as illegal fishing practices, declining fish stock, environmental degradation, and inconsistent policy implementation affecting the fisheries subsector.

Livestock contributed an average of $ 85.21522 billion annually, with a standard deviation of $ 19.53088billion. The contribution ranged from a minimum of $16.90000 billion to a maximum of $99.70000 billion. Although Livestock contribute less to the HDI compared to other subsectors, the high standard deviation relative to the mean suggests a pattern of uneven growth. These fluctuations may be attributed to factors such as fowl diseases or bed flu which can wipe the entire livestock farming. The cost of this occurrence may be huge and detrimental to the economy. Again, declining fish stock, environmental degradation, and inconsistent policy implementation affecting the fisheries subsector.

In terms of overall economic performance, Nigeria's HDI (measured at 2020 constant market prices) averaged $73.30130 billion annually over the 44-year period. The HDI ranged from a low of $10.47000 billion to a high of $99.70000 billion, with a standard deviation of $33.59285 billion, indicating significant growth but also substantial year-to-year fluctuations. These variations reflect Nigeria's broader macroeconomic environment, influenced by oil price shocks, inflation, fiscal and monetary policy shifts, exchange rate volatility, and political instability.

Unit Root Test

Table 2. The Augmented Dickey Fuller (ADF) unit root test is use to establish the stationarity of the time series data used in the study.

Variables	Levels		First Difference		Order of Integration	P-value
	ADF Statistics	5% Critical Value	ADF Statistics	5% Critical Value		
HDI	-2.354231	-1.342657	2.669115	-1.946072	1(0)	0.0072
CRP	-5.432652	-2.546522	-3.159311	-2.898420	1(0)	0.0256
LSP	-3.436537	2.544365	-3.179343	-2.808420	1(0)	0.0340
FAP	-4.657432	-2.765481	-3.762576	-2.815522	1(0)	0.0044
FRP	-5.645328	-4.705655	-3.672554	-2.818420	1(0)	0.0039

Source: Author Computation from EViews 2025* Level of significance at 5%

This study employs the Augmented Dickey-Fuller (ADF) unit root test to form the order of integration

of the variables and the results are presented above in a table. The results of Augmented Dickey-Fuller (ADF) indicated that the variables are integrated of order zero series. The ADF result revealed that all variables are stationary at levels 1(0). This condition makes the Error Correction Mechanism (ECM) test approach to co-integration too appropriate for investigating the long-run relationship among these variables.

Table 3; Co-integration test

Trace Statistic

Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None *	0.707218	77.58242	47.85613	0.0000
At most 1	0.324309	27.22097	29.79707	0.0963
At most 2	0.209359	11.14817	15.49471	0.2026
At most 3	0.036320	1.516816	3.841465	0.2181

And

Max-Eigen

Hypothesized		Max-Eigen	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None *	0.707218	50.36145	27.58434	0.0000
At most 1	0.324309	16.07279	21.13162	0.2206
At most 2	0.209359	9.631358	14.26460	0.2373
At most 3	0.036320	1.516816	3.841465	0.2181

Co-integration analysis can help disclose long-run relationships given the fact that there is interplay between agricultural sub-sectors and economic development in Nigeria in Nigeria and such interplay is multifaceted and predisposed by numerous factors. Arising from the Co-integration test using Trace Statistic and Max-Eigen tests, there is an indication of a long run links amongst the variables used. The rule states that even if there is the existence of one co-integrating variable, there a long run equilibrium in the model. This, therefore, enables the error correction test (ECM) for the justification of a short run equilibrium dynamics within the periods under review, 1980-2025 to be conducted.

Table 4. ECM Short-run Result (HDI)

Variable	Coefficient	Std. Error	t-Statistics	Prob
C	-0.327505	0.095939	-3.413683	0.0015
D(HDI)	0.456373	0019862	3.151124	0.0006
D(HDI(-1)	-0.006107	0.024465	-0.249625	0.8042
D(CRP(-2)	-0.034944	0.020209	-1.729130	0.0915
D(CRP)	-0.117079	0.041731	-2.805586	0.0052
D(LAP(-1)	-0.000260	0.050393	-0.005151	0.9959
D(DLAP)	-0.024159	0.040919	-0.590400	0.5582
D(DFAP)	-0.222959	0.102217	-2.181227	0.0351
D(FAP(-1)	-0.383830	0.125570	3.056702	0.0001
D(FRP(-2)	-0.090421	0.099960	-0.904570	0.3711
D(FRP)	-0.132177	0.170749	-0.774100	0.4434
Ecm (-1)*	-0.304544	0.006325	-3.312732	0.0020
Adj R^2 = 0.603452	F-statistics = 2.139910	DW1.= 1. 653421		

Source: Author Computation from E-Views 2025. Level of significance at 5%

The coefficient estimates for the Error Correction term, ECM (-1) has a negative value and is significant at the 0.05 level suggesting that the model will reach long-run equilibrium at a rate of -0.03% every year. This means that yearly adjustments speed of -0.03% may fix the mistake from the previous year. The independent variables HDI, explain 30% of the total variation in all the dependent variables according to the corrected R-Square (R^2) value of 0.603452 or 60 percent. In nutshell, the model is noteworthy since the F-statistic is significant at the 5% level of significance. Without serial correlation, the model would not work, according to the Durbin-Watson statistics of 1. 653421, which is close to 2.

Discussion of Findings

Crop production and human development index in Nigeria

Inference drawn from the ECM result revealed that, crop productions (CRP) have a negative relationship with human development index (HDI) in the first and second year period of the short-run in Nigeria. The negative relationship between crop production and human development index does not conform to economic theory. It is expected that increase crop production will increase human development index. The p-value of the result also indicates that crop production is statistically significant to impact on human development index. The study therefore rejects the null hypotheses that there is no significant relationship between crop production and human development index. This implies that there is a statistically significant relationship between crop production and human development index in the first year period.

Livestock product and human development in Nigeria

Suggestion drawn from the long-run using the ECM result revealed that, livestock product has a negative relationship with human development index in Nigeria. The negative relationship between livestock product and human development index does not conform to economic theory. It is expected that increases in livestock production will boost human development index in the country. The p-value of the result also indicates that livestock production is statistically insignificant to impact on human development index. The studies consequently do not reject the null hypotheses that there is no significant relationship between livestock production and human development index. This implies that there is statistically insignificant association between livestock product and human development index.

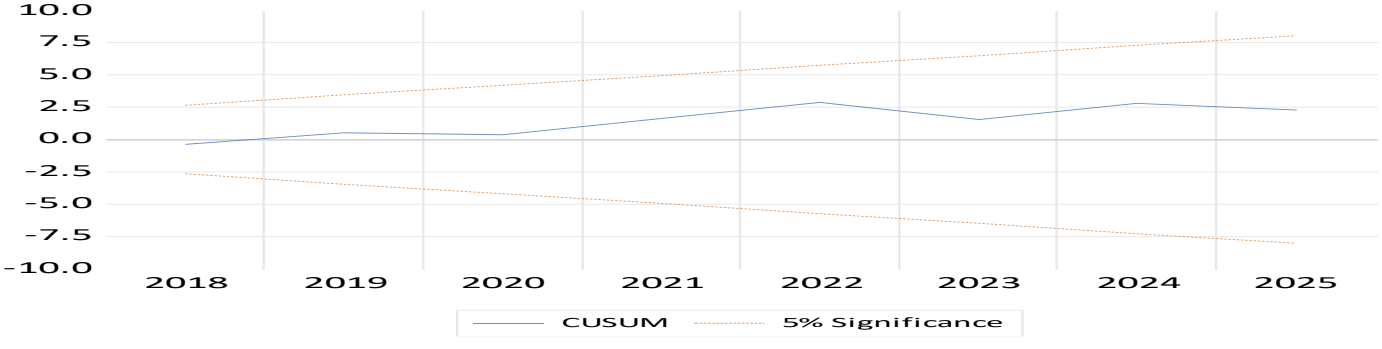
Fishery and aquaculture production and human development index

Suggestion drawn from the long-run and short-run using the Error correction mechanism result revealed that, Fishery and aquaculture production has a negative relationship with human development index. The negative relationship between Fishery and aquaculture production and human development index do not conform to economic theory. It is expected that increase in Fishery and aquaculture production will promote HDI. The p-value of the result also indicates that it is statistically insignificant to influence human development index. The study thus do not reject the null hypotheses that there is significant relationship between Fishery and aquaculture production and human development index. This implies that there is statistically insignificant relationship between fishery and aquaculture production and human development index.

Forestry production and human development index in Nigeria.

Submission drawn from the long-run and short-run using the Error correction mechanism result revealed that, forestry production has a negative relationship with human development index. The negative relationship between forestry production and human development index conform to economic theory. It is expected that increase in forestry production will improve human development index. The p-value of the result also indicates that forestry production is statistically significant to impact on human development index. The study therefore does not reject the null hypotheses that there is no significant relationship between forestry production and human development index. This implies that there is a statistically insignificant relationship between forestry production and human development index. This result agrees with previous studies by (Akpansumg & Babalola (2009).

Stability test



The outcome of the CUSUM test indicates the variables displayed a levelled stability amongst the variables from 1980- 2025.

5. CONCLUSIONS / RECOMMENDATIONS FROM THE FINDINGS

This study fixated on the relationship between agricultural sub-sectors and human development index in Nigeria. The study covered a period from 1980-2025. The study's proxy for economic development is human development index as dependent variable while the independent variables are crop production, livestock production, fishery and aquaculture and forestry production. The study made use of time series data sourced mainly from World Development Indicators (WDI). The model was estimated using Error correction mechanism (ECM) technique. Specifically, the data analysis carried out in the study includes but not limited to Unit root test using Augmented Dickey-Fuller (ADF), Co-integration test as well as long run and short dynamics of ECM model. The findings obtained are summarized as follows:

i. Crop production in the current and lagged (1) value period had a negative but significant relationship with human development index of the short-run analysis.
ii. Similarly, livestock production is shown to have a negative and significant relationship with deficit financing with HDI in the short-run.
iii. Additionally, fishery and aquaculture revealed a negative relationship with HDI in the short-run but statistically significant.
iv. Equally, forestry production is reported to have a negative but significant relationship with HDI in the current lagged (1) period.

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