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# AN EMPIRICAL ANALYSIS OF THE CONTRIBUTION OF FORESTRY TO GROSS DOMESTIC PRODUCT OF NIGERIA

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***Abstract***

*This study was done to determine the contribution of forestry to Gross Domestic Product of Nigeria. The population of this study comprised of all the thirty six (36) states in Nigeria and the data for this study was obtained from secondary sources. Linear regression and trend model were used as analytical tools for the study. The results showed that an increase in the forestry value will cause the GDP to increase by 920.533 and this is statistically significant at 5% level of probability, the F-value of 1012.92 with a P-value of 0.0000 showed that the variables included are jointly statistically significant at 1%. The R2 of 0.9844 and adjusted R2 of 0.9835 showed that, 98% of the variation of GDP of Nigeria is explained by the variables in the model. The result on the effect of government expenditure on agric-forestry productivity showed that an increase in credit to agriculture will cause the GDP to increase by 0.0001538 and this is statistically significant at 5% level of probabilityThe study concluded that, forestry contributes to gross domestic product of Nigeria and inflation has a negative effect on forestry as high inflation rate will lead to a decrease in forestry value which in turn reduces the value of Gross Domestic Product of Nigeria. The study also concludes that government expenditure can increase agri-forestry productivity as increases in budgetary allocations will cause increases in forestry productivity, since forestry has been seen to have significant contributions to gross domestic product of Nigeria. Increased government expenditure in agriculture (forestry) through increase in the annual budgetary allocation to forestry as well as setting up fiscal policies to control inflation in the country so as to provide a favourable ground for forests products to thrive in both domestic and export markets are recommended to help increase the contribution of forestry to gross domestic product of Nigeria. nt reasons behind the lack of awareness level of Pradhan Mantri Mudra Yojana among the citizens of Arunachal Pradesh.*

***Keywords****: Empirical Analysis, Forestry, Gross Domestic Product*

## INTRODUCTION

Forest is a complex ecological system dominated with trees which grow tall and usually very close to one another covering many lower plants like shrubs and spines and animal species in the same environment (Alao and Ugwona, 2011). FAO
defined forest as land with trees crown cover or equivalent stocking level of more than 10% and area of more than 0.5ha (FAO 2010). Forest is an ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species composition, structure, age class, and associated processes, and commonly including meadows, streams, fish, and wildlife. Forest is a highly complex constantly changing environment made up of a variety of living things (trees, wildlife, shrubs, wild flowers, ferns etc.) and non-living things

(water, nutrients, rocks, sunlight and air). Forest plays a major role in our daily life. From the air we breathe to the wood we use, forest plays a role.

Historically, forests have played a major role to influence patterns of economic development, supporting livelihoods, helping structure economic change, and promoting sustainable growth. For millennia before the industrial revolution, forests, woodland, and trees were the source of land for cultivation and settlement, of construction materials, of fuel and energy, and indeed of food and nutrition as well (Williams 2002). The extended use and exploitation of forest resources even before the industrial revolution had led to efforts to conserve forested areas and plant new trees in specific regions of the world. In Europe, France and Germany were leaders in developing policies in the 17th and 18th centuries to regulate the use of and to protect forests. The emergence of forestry as a science with its focus on sustainable timber production was also a hallmark of colonial forest departments founded all over the developing world by European colonizers (Barton 2001, Peluso and Vandergeest 2001, Troup 1940). The foundational justification for many forestry departments all over the world was to improve management and enhance the public benefits of forests in terms of soil conservation, watershed protection and flood control. But most forestry departments were also under substantial pressure to generate revenues and often sought to protect forests for commercial exploitation. The consequence was tensions between government forest agencies and the poor populations that depended on forests for their livelihoods (Guha 2000).

Usually, people look at the contribution of forestry only in monetary terms thereby undermining the overall importance of forests. Forest is not only limited to timber production; there are numerous resources and functions that forests perform that cannot be quantified. For example, forests play a significant role in carbon sequestration thereby reducing the quantity of greenhouse gases (GHGs) released into the atmosphere which is common cause of ozone layer depletion and global warming. Thus, apart from acting as a carbon sink, forests also play an equally important role of acting as a sink for pollution among others. Forests purify the air and ameliorate the hot weather condition. Unfortunately, almost all of these services are un-priced and unaccounted for because forests are usually classified as public goods. In analyzing the contribution of the forestry subsector to the economy therefore, one is constrained to employ the only measuring rod, that is, its monetary value addition to the GDP alongside with the other subsectors in the agricultural sector namely: crop, livestock and fishery, (Idumah, ***et al***. 2016).

Inflation can be seen generally as a measure of the general increase ofprice level in an economy, as presented typically by an inclusive price index, such as the Consumer Price Index (CPI).Inflation is best described as an increase in price as general, where inflation decreases purchasing power from a currency (McConnel and Brue, 2008). There are a few causes of inflation where aggregate demand increases faster than aggregate supply, therefore increasing the cost of goods and services. The imbalance of aggregate demand and supply is linked to the government's deficit, expansion of bank's interest rates and the increase of foreign demand (Haberler, 1960). Inflation also increases the price of goods and the price of work labor thus the cost of goods and selling price increases (Sukimo, 2000). Inflation has a few indicators such as Consumer Price Index (CPI), Wholesale Price Index (WPI), and Implicit Price Index (deflator GDP) (Majalah Tempo, 2002).

The rate of inflation in the country has a significant role to play in the various sectors of the country's economy. Forestry as a sub-sector under the agricultural sector is not left out. The effect of inflation can be observed in the various forest products and industries, just as the effect of inflation on livelihood is rising geometrically, so is it with the forest product industry, in 1913, one dollar bought 18 loaves of bread or three gallons of milk or close to three dozens of eggs. Today, over one hundred years after, one dollar fails to buy a single loaf of bread, the same is the case with the Nigerian naira, its devaluation over time past has continued to affect the forestry subsector, as raw materials cannot be purchased in the same quantity at which they were bought some years back. The general increase in nominal prices and associated decrease in real buying and/or purchasing power is inflation in action.

Nigeria's gross domestic product before the discovery of oil greatly revolved around the agricultural sector with forestry as a sub-sector under agriculture contributing immensely to the gross domestic product (GDP). At present the agricultural sector accounts for less than 30 percent of the gross domestic product of Nigeria, (CBN 2014).
The broad objective of the study is to analyze the contribution of forestry to gross domestic product of Nigeria. Specifically, the study intends to examine the effect of inflation of forestry productivity in Nigeria and examine the productivity trend of forests in Nigeria.

## METHODOLOGY

### Study Area

Nigeria is a federal constitutional republic comprising of 36 states and its Federal Capital Territory Abuja. Nigeria is located in West Africa on latitudes $5^0$ to $10^0$ North and between longitudes $2^02$' and $14^030$' East and with a land area of 923 769 Sq km. Nigeria shares boundary with The Republic of Benin in the West, Chad and Cameroon in the East, Niger in the North. Its coast in the South lies in the Gulf of Guinea in the Atlantic Ocean. Nigeria is referred to as the giant of Africa, it is the most populous nation, with an estimated population of about 131,859,731 inhabitants. The average annual growth rate according to the 2006 estimate was 2.38%. Nigeria's population is divided among 478 different ethnic groups, some numbering fewer than 10000 people. Of the different ethnic groups, ten (Hausa, Yoruba, Igbo, Fulani, Kanuri, Tiv, Edo, Nupe, Ibibio and Ijaw) account for nearly 80% of the population. Twenty five percent (25%) of the population is in the former western region (12% of area), 21% in the former eastern region (9% of area) and 53% in the northern region (79% of area). The lowest population densities are in the northern regions, especially in Borno, Adamawa, Kebbi, Kwara, Taraba, Yobe and Zamfara States.

Nigeria has two major seasons which include rainy season between April and October and dry season from November to March. Nigeria is found in the region where the climate is seasonally damp and very humid. Nigeria is affected by four climate types which includes; tropical monsoon climate found in the southern part of the country with temperature of 26-$28^0$C; tropical savannah climate or tropical wet and dry climate is extensive in area and covers most of the western Nigeria to central Nigeria beginning from the tropical rainforest climate boundary in southern Nigeria to the central part of Nigeria, where it exerts enormous influence on the region with a temperature of 18.45-$36.9^0$C; and Alpine climate or highland climate or mountain climate are found on highland regions of Nigeria. Agriculture employs over 70% of the country's manpower (WIKIPEDIA, 2017).

The country's main cash crops are cocoa, groundnut, shear butter, palm oil, cashew, timber, etc. Major food crops include; cassava, yam, millet, soybean, rice, sesame, etc.

**DATA ANALYSIS TECHNIQUES**

Simple Linear Regression was used to analyze the effect of forestry on gross domestic product of Nigeria and effect of inflation on forest products in Nigeria, while trend model was used to analyze the productivity trend of forests in Nigeria. F-statistics was used to test whether forestry has any significant effect on Gross Domestic Product of Nigeria.

**MODEL SPECIFICATION**

The model specification for effect of forestry on Gross Domestic Product of Nigeria was stated as follows:

**REGRESSION MODEL**

**Linear function**

$GDP_t = \beta_0 + \beta_1 FtV_t + \beta_2 CrA_t + Ɛi$

**Double Log function**

$LnGDP_t = \beta_0 + \beta_1 LnFVt + \beta_2 LnCrA_t + Ɛi$

Where,

$GDP_t$ = Gross Domestic Product at period t

$B_0$ = the intercept which is the average value of gross domestic product without forestry.

$B_1$ = coefficient of independent variable (forestry).

$B_2$ = coefficient of independent variable (Credit to Agriculture)

t = subscript for time period

Ɛi = error term which indicates omitted variables

**TREND MODEL**

$Y_t = Y_0(1 + r)t$ ---------- (1)

Where,

$Y_t$ = rate of productivity of forest products

$Y_0$ = rate of productivity of forest products at a base year

r = compound rate of growth of Y

t = time in chronological years

**RESULTS AND DISCUSSION**

**EFFECT OF FORESTRY ON GROSS DOMESTIC PRODUCT OF NIGERIA**

The result on effect of forestry on gross domestic product of Nigeria is presented in Table 1 below. The result shows that, an increase in the forestry value will cause the GDP to increase by 920.533 and this is statistically significant at 5% level of probability. This shows that there is a positive relationship between forestry value and GDP. The implication is that an increase in the forestry value will cause the GDP to also increase. The table above also shows that, an increase in the credit to agriculture will increase the GDP by 31.75031 and this is statistically significant at 5% level of probability. This shows that credit to agriculture has a significant impact on the GDP, thus increasing the credit to agriculture will lead to an increase in the GDP of Nigeria. The F-value of 1012.92 with a P-value of 0.0000 means that the variables included are jointly statistically

significant at 1%. Thus, the null hypothesis which stated that forestry has no significant effect on gross domestic product is rejected. The $R^2$ of 0.9844 and adjusted $R^2$ of 0.9835 show that, 98% of the variation of GDP of Nigeria is explained by, the variables in the model. Oji-Okoro (2011) investigate the contribution of agricultural sector on the Nigerian economic development and reveal that foreign direct investment on agriculture contribute the most (56.43), this means that for every unit of change in FDI on agriculture there is a corresponding change of 56.43 unit in GDP in Nigeria.

**Table 1: Effect of Forestry of Gross Domestic Product of Nigeria.**

| Variable | Coefficient | Std. Error | t-value | P>\|t\| | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| Forestry value | 920.533 | 30.35237 | 30.33 | 0.0000 | 858.7073 | 982.3588 |
| Credit to agric | 31.75031 | 7.846507 | 4.05 | 0.0000 | 15.7675 | 47.73312 |
| Constant | -7.38e+07 | 2565927 | -28.75 | 0.0000 | -7.90e+07 | -6.85e+07 |
| Number of obs | = 35 | | | | | |
| F (2,32) | = 1012.92 | | | | | |
| Prob>F = | 0.0000 | | | | | |
| R-squared | = 0.9844 | | | | | |
| Adj R-squared | = 0.9835 | | | | | |
| Root MSE | = 3.7e+06 | | | | | |

**Source: SPSS Output**

**EFFECT OF INFLATION ON FORESTRY PRODUCTIVITY IN NIGERIA**

The result on effect of inflation on forestry productivity in Nigeria is shown in Table 2 below. The result show that an increase in inflation will cause the GDP to increase by 88.84808 and this is statistically significant at 5% level of probability. This shows that there is a positive relationship between inflation and GDP. The implication is that an increase in inflation value will cause the GDP to also increase. The result is consistent with that of Mubarik (2005). The table above also shows that, an increase in the credit to agriculture will increase the GDP by 0.1809401 and this is statistically significant at 5% level of probability. This shows that credit to agriculture has a significant impact on the GDP, thus increasing the credit to agriculture will lead to an increase in the GDP of Nigeria. The F-value of 13.78 with a P-value of 0.0000 means that the variables included are jointly statistically significant at 1%. The $R^2$ of 0.4627 shows that, 46% of the variation of GDP of Nigeria is explained by, the variables in the model. This result is similar to that of Kalu and Okojie (2009), who conducted a study on Economic Contributions of Forests in Nigeria and obtained similar $R^2$ and t-value showing that an increase in inflation will affect the productivity of forests and consequently affect Gross Domestic Product of Nigeria.

**Table 2: Effect of Inflation on Forestry Productivity in Nigeria**

| Variable | Coefficient | Std. Error | t-value | P>\|t\| | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| Inflation | 88.84808 | 140.9092 | 0.63 | 0.533 | -198.1746 | 982.3588 |
| Credit to agric | .1809401 | .0349818 | 5.17 | 0.0000 | .1096845 | 47.73312 |

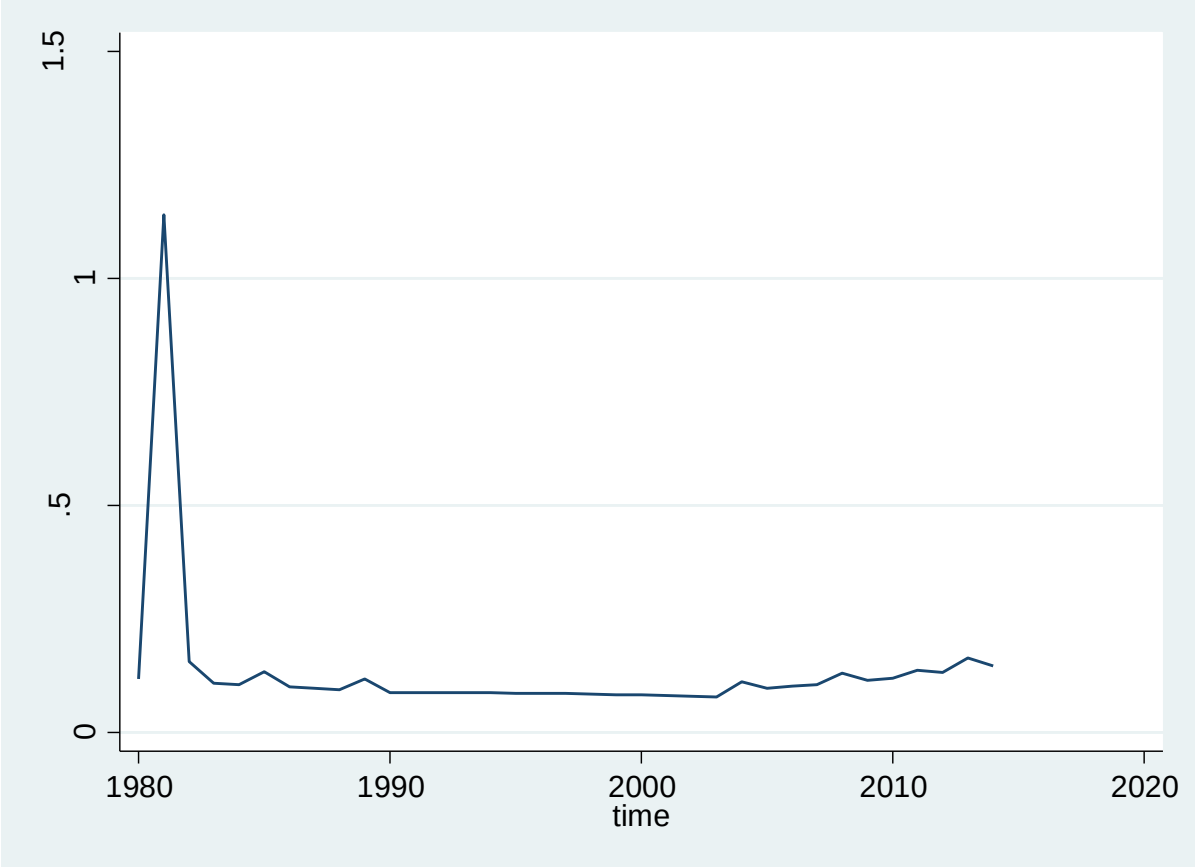
| | | | | | | |
|---|---|---|---|---|---|---|
| Constant | 76623.44 | 6725.904 | 11.39 | 0.0000 | 62923.22 | 90323.65 |
| Number of obs | = 35 | | | | | |
| F (2,32) | = 13.78 | | | | | |
| Prob>F = | 0.0000 | | | | | |
| R-squared | = 0.4627 | | | | | |
| Adj R-squared | = 0.4292 | | | | | |
| Root MSE | = 21285 | | | | | |

**Source: SPSS Output**

**PRODUCTIVITY TREND OF FORESTS IN NIGERIA**

The result on productivity trend of forests in Nigeria is shown in Figure 1 below. From the graph below, it can be observed that forest productivity started rising 1980 to about 1983, this was due to increase in agricultural policy formulation and implementation as well as increased budgetary allocations to the agricultural sector (forestry sector inclusive), before the sudden decline in productivity from the year 1984 and since then there has been fluctuations in productivity of forests at a fairly constant rate to the year 2007. From 2008 beyond to 2016, little increases have been observed in the productivity of forests in Nigeria and this can continue to increase even higher if more attention is placed on forestry as a veritable sector to contribute to agricultural growth, consequently increasing the gross domestic product of Nigeria.

**Figure 1: Productivity Trend of Forests**



## CONCLUSION AND RECOMMENDATIONS

The study concludes that, forestry contributes to gross domestic product of Nigeria and inflation has a negative effect on forestry as high inflation rate will lead to a decrease in forestry value which in turn reduces the value of Gross Domestic Product of Nigeria. The study also concludes that government expenditure can increase agri-forestry productivity as increases in budgetary allocations will cause increases in forestry productivity, since forestry has been seen to have significant contributions to gross domestic product of Nigeria. Increased government expenditure in agriculture (forestry) through increase in the annual budgetary allocation to forestry as well as setting up fiscal policies to control inflation in the country so as to provide a favourable ground for forests products to thrive in both domestic and export markets are recommended to help increase the contribution of forestry to gross domestic product of Nigeria.

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