

# COMPARISON OF THE USAGE OF SELECTED INDIGENOUS AND IMPORTED BUILDING MATERIALS IN ROOF CONSTRUCTION FOR HOUSEHOLD UNITS IN NIGERIA

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## Abstract

*Nigeria has for many years over dependent on conventional and imported building materials which are rather costly and beyond the affordability of common man. In this work an ex post facto research design was used and secondary data were collected. Data were sourced from the National Population Commission. Abuja, priority table 2006. Analysis of the data was carried out using T-Test, Bar Charts, regression analysis and analysis of variance (ANOVA) were employed to test the thirty six states of Nigeria including Abuja. The background information revealed the different types and classification of both indigenous and imported building materials viz: corrugated metal sheet, slates, asbestos sheet cement concrete, roofing tiles are imported materials while thatch, raffia palm, wood, bamboo, earth/mud are indigenous materials. It is assumed that all buildings under consideration are homogeneous, that is, all buildings are considered to be the same, irrespective of shape, size, height and design, with five persons per house hold. The weak  $R^2$  value for roof and are: 55%. The results obtained show that roofs are constructed mainly using imported materials. The proportion of local content in roofs is only about 34%. This show that 2/3 of household in Nigeria are roofed with imported materials. It is recommended that government agencies and organized private sectors should encourage the use of indigenous materials by using it in the construction of schools, markets, and public offices. In future research number of buildings can be considered, secondly, the household number could be increased from five persons to seven due to rising populations. Lastly, the shape, size and height of buildings can be used in future research.*

**Key words:** *Imported, Indigenous, Household, building, Materials, construction.*

## 1. Introduction

Throughout the world, developing countries are facing severe problems with regard to the supply of building materials, the core of the construction sector. As population grows and interactions

improve and as aspirations to higher living standards rise, so the demand for building both qualitatively and quantitatively grows even more rapidly. The rising cost of building materials has made it impossible to provide affordable housing for the low-income residents.

Several policies and programs have been put in place to alleviate this problem ranging from direct importation to technology transfer and diffusion. What has been realized in Nigeria and developing countries in general is that there is still the need to reduce import –dependences of the sector and at the same time curtail escalating cost of building materials. As predicated in spite of the current financial challenges, there is notable increase in activity in Nigeria’s construction sub-sector. This is primarily driven by government agencies through with a heavy reliance on imported materials. The depreciation of the naira has an immediate impact on both the supply and pricing of building materials and component. The prices of steel, building ceramics, slate and tiles, sanitary ware and electrical component and roof covering rise every year by 10%. In addition to this is the often arbitrary change in import policies. This is further compounded by the cumbersome clearing process, causing delays and congestion in the ports. The end user bears the burnt of the inconsistency in policy and poor process of implementation by paying significant premium on all imported materials three or four times the off- the shelf prices in other economy.

The building materials industry faces peculiar challenges such as. general lack of standardization of component parts. Manufactures are not able to establish factory lines for their products, the total reliance on imported sub-components, accessories and lack of research and development initiatives which should be the primary source of manufacturing opportunities are most of the challenges by building material industries. Fundamental to any industry revolution is the availability of basic infrastructure. Current measure on the part of the government in this regard must be intensified. Government is support to the real sector of the economy should be demonstrable in the policies it creates. Unfortunately, a number of existing policies do not encourage manufacturing at any scale, e.g, tax break, special financing sources and government agency guarantees on the investor in the field are some of the incentives in the building materials sector.

Research activities in building materials started in Nigeria during the colonial era under the platform of the West African Building Research Institute (WABRI) which was an institution for

collaborative research in the then British West African Colonies of Gambia, Sierra-leone, Ghana and Nigeria. This arrangement came to an end in 1962. Nigeria remained without an organized institute until 1975 when the Federal Government approved the establishment of a national Construction, Building and Road Research Institutes (NCBRRI) under the control of the Federal Ministry of Works and Housing in 1976. The National Science and Technology Development Agency (NSTDA) was established as a central body to administer and control all Federal Government Research Institutes. (NCBRRI) was established in 1978, with the creation of a separate ministry of Science and technology to replace (NSTDA). (NBRRI) came under the Federal Ministry of Science and Technology in 1979. Cardinal to the establishment of NCBRRI is conduct of integrated applied researchers on construction materials,

In processing structural designs to increase effectiveness and the development of design criteria, specifications and codes of practice, respectively (Okeke,2003), the NCBRRI maintains strong link with standard organization of Nigeria (SON) in all its activities for the purpose of establishing new standards and updating old ones in line with the research findings (Okeke 2003). However due to the absence of comprehensive standard for building materials in Nigeria, the British standard (BS) and the American Society for the Testing of Materials (ASTM) standards are commonly used. The standards that exist are for modern building materials such as cement, concrete and steel products (United Nation Center for Human Settlement UNCHS and common Wealth Science Council CEC 1990a). One of the disadvantages of lack of standard is that it can lead to very high production cost making indigenous materials non- competitive with import – based materials. Where standards exist for import based material the only feature in building regulations and tender documents making them automatic choice in construction. It is reported that about 70% - 80% of finishing of a building is not locally produced. As a result the associated high cost of building makes it difficult for majority of low income earners to have access to decent shelter. The rational for this study is to investigate and compare the uses of imported building materials and indigenous building materials in roof and to provide solutions to high cost of building materials in Nigeria due over dependence on imported materials in roofing.

This research work is aimed to establish the degree of usage of the imported materials and indigenous materials in the residential building in Nigeria. The aim were achieved through the following specific objectives. Specifically the research seeks

- i. Estimate the number of household using indigenous and imported building materials respectively in geopolitical zones for roof construction.
- ii. Suggest systematic Policies that will encourage and promote the use of indigenous materials in construction of residential houses in Nigeria.
- iii. Investigate particular geo –political zone that adopted the use of indigenous and imported materials in roof construction in Nigeria.

## **2. Literature Review**

The construction industry is very vital to the socio-economic development of a nation. In many countries, the yardstick for measurement of national progress is hinged on the degree of contributions of the construction industry to the nation's economic, social and political advancement. Okegbo (1982) and Mogbo (2001) described the building and construction sector in Nigeria as being important and crucial to her economy. Abiola (2000) identified building materials as one of the principal factors affecting the effective performance of the Nigerian construction industry. The building materials sector is a major contributor to the construction industry because materials constitute the single largest input in construction often accounting for about half of the total cost of most or any construction products Mogbo 1999; Okereke 2003. In some United Nation Center for Human Settlement reports (UNCHS, 1985, UNCHS, 1992), the building materials sector was splited into three production groups. Modern or Conventional building materials which are materials based on modern conventional production methods like concrete, steel, glass, traditional are those materials that have been in local production from ancient times using small-scale rudimentary technologies, e.g. literite, gravel, thatch, straw, stabilized mud, Ferro-cement product e.t.c However, despite the general popularity of both the modern and innovative building materials in the market, there exist calls for the return to traditional materials, referred in this study as indigenous building materials (IBM). Amongst the reasons advanced for these calls are high cost of both the modern and innovative building materials and their inadequate supply in the markets (UNCHS, 1990, Lilly and Wai 2001). Furthermore, the need to revert to indigenous building materials is also traceable to prevalent dictates of some neo-global concepts vis-à-vis sustainability, and the use of biodegradable materials [Mahgoub, 1997, Adams, 2000; mourshed et al, 2000; Peakstoprairies, 2005]. This has led to the creation of global political agendas and researches on the potential for wide application of indigenous building materials. In Nigeria for example, the establishment of the center for earth construction technology (CEC Tech) by the national commission for museums and monuments, the have made efforts toward promoting the use of earth technology as a partial or complete substitute for block work, flooring e.t.c (Lamori, 1993). The Raw Materials Institute and the Directorate for food, roads and rural infrastructure (DFRRI) were also set.

### 3. Methodology

Two statistical methods, descriptive and inferential, were employed for the research. The descriptive method consists of frequency classification of data in tables using measures of location (mean, median) and descriptive (standard deviation, minima,maxima). Data were also displayed in bar charts in addition to scatter diagrams of research variables.The inferential method of analysis utilized paramatic statistical analysis, namely regression, correlation and analysis of variance (ANOVA).

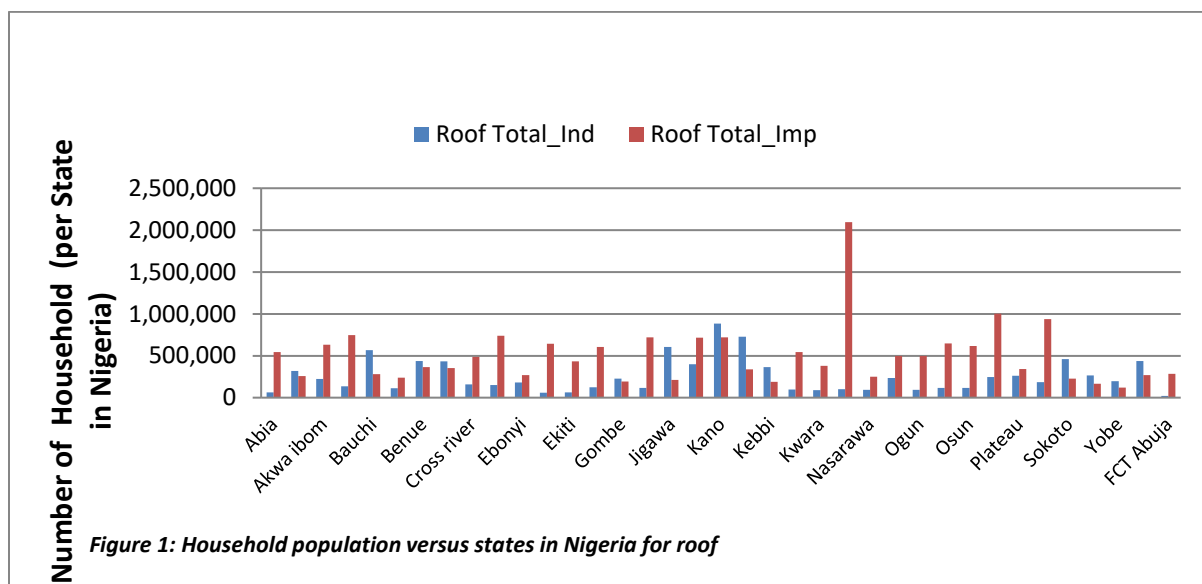


Figure 1 above shows the household population and states in Nigeria on the use of roofing materials. It was observed that most states in Nigeria preferred the use of imported materials for roofing except in few states in the North like Sokoto, Yobe, Bauchi and Benue where the use of indigenous roofing materials is prevalent.

Table 1: Tabular Analysis on Geopolitical Zones (6 geopolitical zones)-Raw Data

S/NO	GEO-POLITICAL ZONE	HsgRoof ind	HsgRoof imp
1	NC	1235928	2636872
2	NE	1994630	1337152
3	NW	3878465	2622637
4	SE	619194	2870653

5	SS	889875	3665047
6	SW	730029	5263589

Source: author's Comutation.2016.

**Table 2: Tabular Analysis on Geopolitical zone Basis (6 geopolitical zones) – percentage values**

S/NO	GEO-POLITICAL ZONE	HsgRoof ind as % of All Roof	HsgRoof imp as % of All Roof
1	NC	31.9	68.1
2	NE	59.9	40.1
3	NW	59.7	40.3
4	SE	17.7	82.3
5	SS	19.5	80.5
6	SW	12.2	87.8

Source: Author's computation, 2016

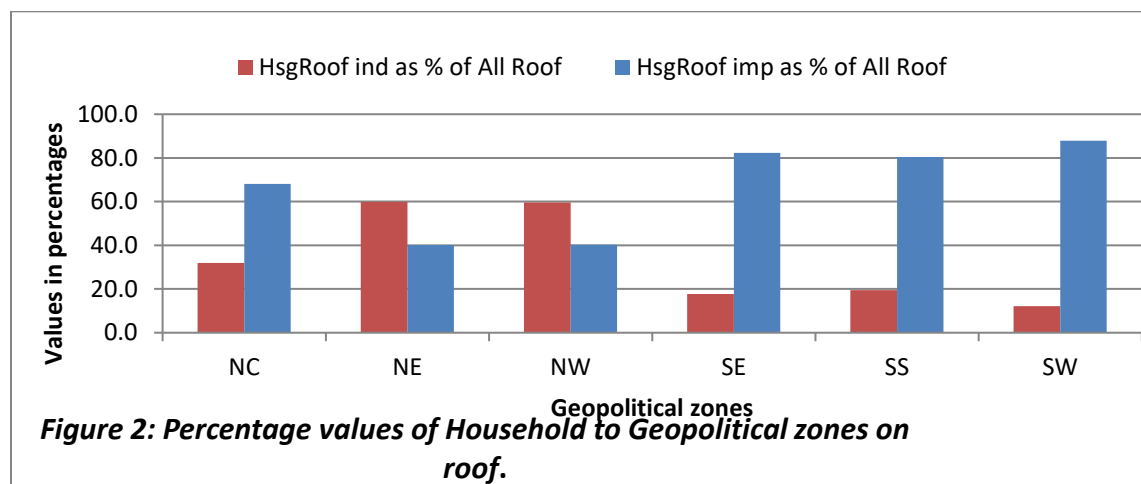


Figure 2 above shows that the percentage value of household in North-Central, South-East, South-South, and South-West show that the imported materials are 68%, 82%, 80%, 89% respectively. While in North-East and North-West, the use of indigenous materials is paramount.

**Table 3: Results of the Analysis of the use of Imported Materials on the Use of Indigenous Materials for Roof Construction**

An aly sis No	Variable		Type of Model	Observation					Inferences		
	X	Y		Regression Equation	R <sup>2</sup>	Fea l	Fta b	Pval ue	Strength of Relations hip	Rm k	Actio n on hyp

07	Roof Mat Imp	Roof Mat Ind.	Linear	$y = 0.892 - 0.0784x$	55%	46.901	2.042	0.000	Weak	SS	Rejected $H_0$
08	Roof Mat Imp	Roof Mat Ind.	Quadratic	$y = 0.798 - 0.997 - 0.024x$	56%	25.457	2.042	0.000	Weak	SS	Rejected $H_0$
09	Roof Mat Imp	Roof Mat Ind.	Cubic	$y = 0.531 + 9.999 - 12.503 + 3.588x$	67%	26.986	2.042	0.000	Strong	SS	Rejected $H_0$

Source: Author's Computation, 2016. Keys: SS = Statistically Significant NS = Not Significant

**Table 4: Results of Analysis on Imported And Indigenous Materials For Roof Construction In Geopolitical Zones.**

Analysis No	Variable		Type of model	Observation					Inferences		
	X	Y		Regression Equation	R <sup>2</sup>	F <sub>cal</sub>	F <sub>tab</sub>	P <sub>value</sub>	Strength of Relationship	R <sub>mk</sub>	Action on Hyp
16	Roof Imported	Roof Ind	LINEAR	$Y=0.383x_1$	37%	4.568	6.61	0.086	Very weak	SS	Ho Rejected
17	Roof Imported	Roof Ind	QUADRATIC	$Y= - 0.038 + 2.487x_2$	97%	104.934	6.94	0.000	Very strong	SS	Ho Rejected
18	Roof Imported	Roof Ind	CUBIC	$Y=0.000x_1 - 0.079x_2 + 4.005x_3$	100%	5053.926	9.28	0.000	Very strong	SS	Ho Rejected

Source: Author's Computation, 2016. Key: SS = Statistically Significant NS = Not Significant

The result of the simple Linear Regression Analysis that tested the impact of use of imported materials on use of indigenous materials for roof construction was statistically significant. In table 3, a weak R<sup>2</sup> value was observed (55%). The regression equation derived from this test shows a low increase in number of household occupying houses built with imported roof material. The result is important in several ways, first. The weak R<sup>2</sup> value observed meant that across the sample (in almost all the 36 states and Abuja) the trend in numbers of household using imported materials for roof construction is not very similar, as most homes Two third 2/3 of most home roofed with imported materials (i.e imported material in roof construction is high). The weak correlation between indigenous and imported content in roofing reduces local content only minimally.



#### 4. The use of Imported and Indigenous Materials for Roofing in Geopolitical Zones

Positive linearity, quadratic and cubic features existed in all the imported and indigenous materials examined, Coefficient of determination ( $R^2$ ) value were very high, ranging 90%, 98%, 100%.. It was inferred that increase in the use of any imported material for roofing in geopolitical zones would lead to the total use of indigenous materials for roofing. Such increase would be a significant influence on total use of indigenous materials for roofing given the high  $R^2$  value observed. The significant use of indigenous roofing materials across geopolitical zones was underlined by the fact that a very low  $P_{\text{value}}$  was obtained, thus ruling out the probability that the result were due to chance alone. In the analysis which was based on regression analysis, it is inferred that increases in the use of any imported and indigenous materials would lead to increase in total use of indigenous materials for walls. Such increase would be a significant influence on total use of indigenous materials. Given the  $R^2$  values observed, the significance of the use of indigenous wall materials across Nigeria was underlined by the fact that a very low P-value was obtained, thus ruling out the probability that the results was due to chance alone.

In roofing, (fig. 1) shows household population per state with the highest and the lowest highest, lowest indigenous materials in Kano and Abuja with population of 800,000, 5,000 respectively and with three states falling within the average of 506,315.51 households. For the indigenous materials we have Lagos and Yobe with populations of 2,150,000 and 100,000 and an average of 255,767.86 households. It is observed that a greater number of household adopted the use of imported materials in roof construction. However, roofs are constructed mainly using imported materials. The proportion of local content in roofs and floors were only about 34%.

#### 5. Conclusion

Our findings support that 34% of households in the country uses indigenous building materials for roof while 66% of the number of household employed the use of imported materials for roof construction in Nigeria. The North east and North west geopolitical zone were found to be prominent in the use of indigenous materials with 60% and 59% respectively. The high  $R^2$  value of 55% shows that two third of houses are roofed with imported materials. It is recommended that:

- Government at all levels and organized private sectors should invest on the development and application of local building materials in roof and floor construction
- Government agencies and organized private sectors should encourage the use of indigenous materials it for construction of schools, markets and public offices.
- Local manufacturing companies should be given appropriate incentives to to produce indigenous building materials.

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