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# Potential Benefits of Indigenous Earth as Building Materials for Shelter Provision in Socio Economy Development in Nigeria: A Case Study of Origbo Communities in Osun State South West of Nigeria

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**ABSTRACT:** *Improved indigenous shelter performance play an important role in quality of living and socio-economic activities. Finding support that substandard shelter situated at the rural area encourages rural urban drift and discourages local industrial developments, this generated unemployment problem. Interaction with rural dweller reveal that the quality of life developments is affected because of appreciable rural development need, such as quality shelter system that will enhance quality of living, education system, health system and industrial development. This research focuses on how indigenous earth as building material can be adopted and improved to provide adequate and appropriate building performance for a variety of purpose that will enhance socio economy development. Data were obtained through the stratification of the study area which comprises of seven communities of Origbo in Ife North Local Government area of Osun state south Nigeria, data were analyzed using descriptive statistics and one-way analysis variance (ANOV) to determine the relationship of earth as building material and potential benefits that associated with it which include cost, affordability and availability.The research concludes, which indicates the significance of shelter to improve both local and national economy and development of capacity of socio-economic base of the nation especially in the poorly developed economic communities*

**KEY WORDS:** Indigenous shelter, performance, earthen material, provision, economy**.**

## INTRODUCTION

A world where the poorest groups are able to live in a quality of life and health with considerable economic, social and cultural significance is a possibility. Shelter fulfils several socio-economic objectives; it provides investment opportunities, offers shelter and privacy. Olugbenga and Olawoye (2007) give a more comprehensive definition and significance of housing. Shelter has much more than physical structure; it has become a subject of highly socio-economic investment and activities.

The significance of shelter in Osun State and even in the entire country is noteworthy it occupies the largest proportion of land use in towns and cities. However, many urban and rural dwellers still

do not have access to quality housing due to poor economic base. Rapid urbanization in Nigeria has created a rising need for shelter, which has led to a dramatic shift in the nature of poverty. Shelter is the very issue that shapes the very pattern of national economic growth, the settlement of vast population, and the social and political stability of the nation. Akinkunmi, (2018).

The classic view of significance of shelter as presented in economics includes economic growth as one of its essential aspect. Also, the complex inter-depended changes in the quality of life and of society as a whole which carry society forward according to prevailing adequate shelter situation Kuklinski, (1972). Economic growth has to do with increased growth in the overall economy and involves increased shelter rather than human being. This also involves the process by which per capital output of a country is increased on a sustained basis, thereby raising the level of income.The study of benefits of shelter is necessary if Nigeria is to achieve an overall socio-economic development as a precondition for achieving millennium development goal. Griffin (1981) observed that shelter plays two usual roles in the eradication of socio-economic problem.

Firstly, it contributes to the improvement of the quality of life and secondly, it facilitates production, thereby contribution to overall national economic development. Shelter in this context should be viewed to be more than a source of satisfaction but as a means to national development it should be viewed as an incentive to achieve higher standard of living and tools for socio-economic development.

**SHELTER IN THE NATIONAL ECONOMY**

Firstly, emphasis is placed on shelter because it is one of man's basic needs. A vigorous and buoyant shelter is an indication of a strong programme of national investment and indeed the foundation to future economic growth and social development. The gross shelter delivering is therefore a major factor in the nation's gross domestic product (GDP) and indeed, this reflects the mirror and the barometer of the state of health of the nation. Economic activities are well known to encompass all aspects of human endeavour that are directed towards the creation of wealth. It is also known to enhance our self-worth by improving our living standards.

Economic growth is therefore a national pursuit in any human set-up as such improvement is expected to lead to increased wealth and prosperity both for individual and the whole nation. Despite international support and domestic investment in shelter provision since the colonial era to date, Nigeria's shelter problem still remains intractable. In fact, access to decent shelter has worsened for increasing segment of the urban population in Nigeria. It was reported that out of 121,000 housing units scheduled to be built between 1994-1995, only 1014 were completed (CBN, 1990 & 1998 & Vision 2000 main report). It was estimated that about 85% of urban residents live in single rooms, and the member of occupants per room range from 8 to 12 with adverse effects on their health.

Analysis of government's response to shelter in Osun State Government at both federal and state levels have been insufficient for adequate and affordable shelter for the population of Osun State despite the goals, policies and programmes put in place by them. The third tiers of governance in

the country, the local governments, have not been actively involved in shelter provision due to long term nature of recouping cost on investment.

**Background of the study area**

Origbo communities in Ife North Local Government area of Osun State comprise of seven sisters town with the headquarters being Ipetumodu, its geographical coordinates are 7˚22'N, 4˚ 28'E, 7.367˚ N and 4.467˚ E. The seven sisters town is known as Origbo meje, they are; Ipetumodu, Eduabon, Moro, Asipa, Yakoyo, Akinlalu and Isope. The morphological characteristics of the area exhibits features of typical traditional Yoruba towns which are Oba's Palace (Afin) and traditional Oba market (Oja Oba) in the frontal part of the palace. The traditional market is to promote the cultural heritage of specific town as an instance at Ipetumodu they are known for a poetry work of various kinds, the traditional market promote the poetry work. Surrounding the Oba's palace is the high concentration of traditional residential houses which for the indigenous occupants in the residential analysis then followed by intermediate zone of contemporary face-me-i-face-you) vernacular earth dwelling, whereas the outskirt consist of sparsely distributed modern single family dwelling Intercepted with few tradition and vernacular houses. Origbo rural communities has undergone considerable growth in the recent time as influxes of people were necessitates by spontaneous development such as advent of permanent site of distance learning programme by Obafemi Awolowo University as well as corresponding increase of commercial activities. House-form pattern commonly feautured at Origbo community are typical courtyard housed and vernacular dwelling built from local material. Many of those houses are still in their normal natural form while some of them has been plastered with cement, either total plastering or lower part of the building, the roofing element is corrugated sheet, indigenous thatched system of roofing has been substituted with currugated due to technological innovation and improvement over the thatch.


**Figure 1: Geographical location of study area (Origbo communities)**
**Source: Image on 2015 Google earth.**

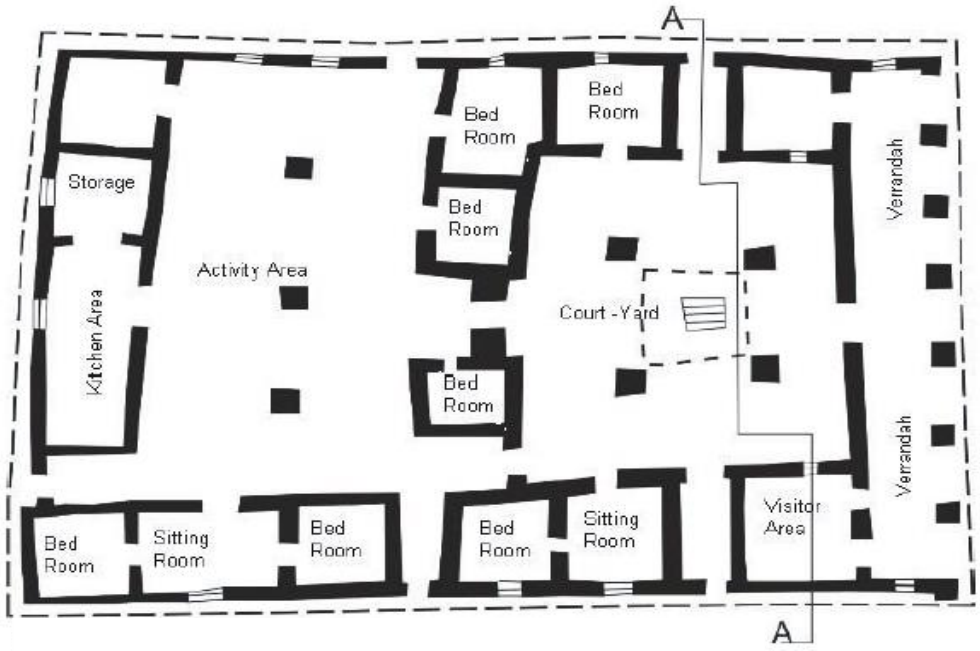



Figure 2 The plan of a typical traditional earth building
Author: Field Survey, 2015

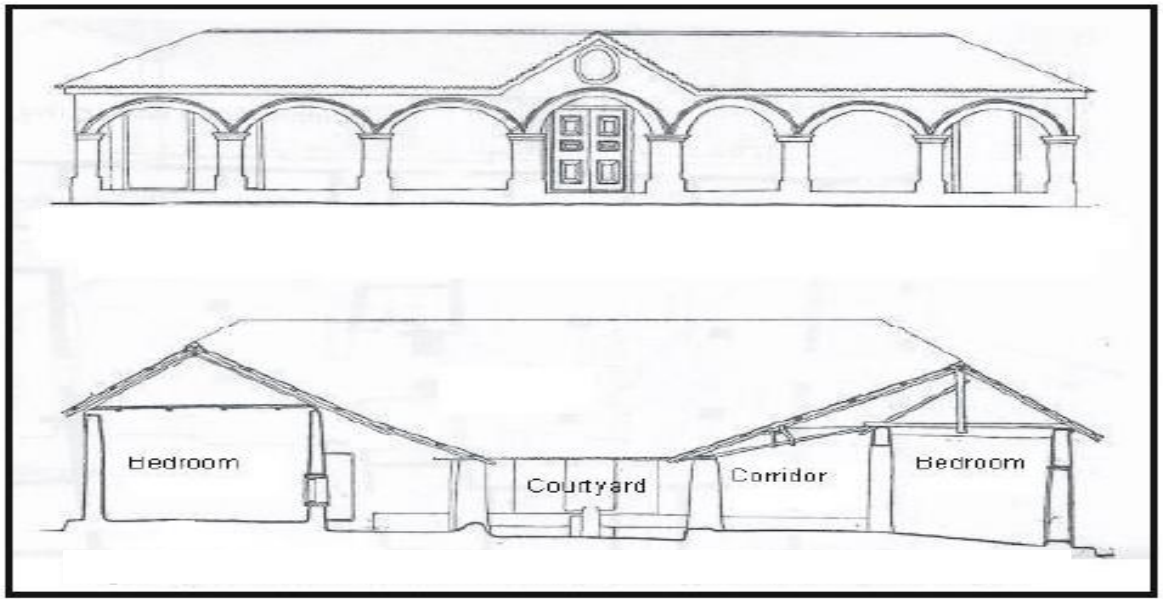


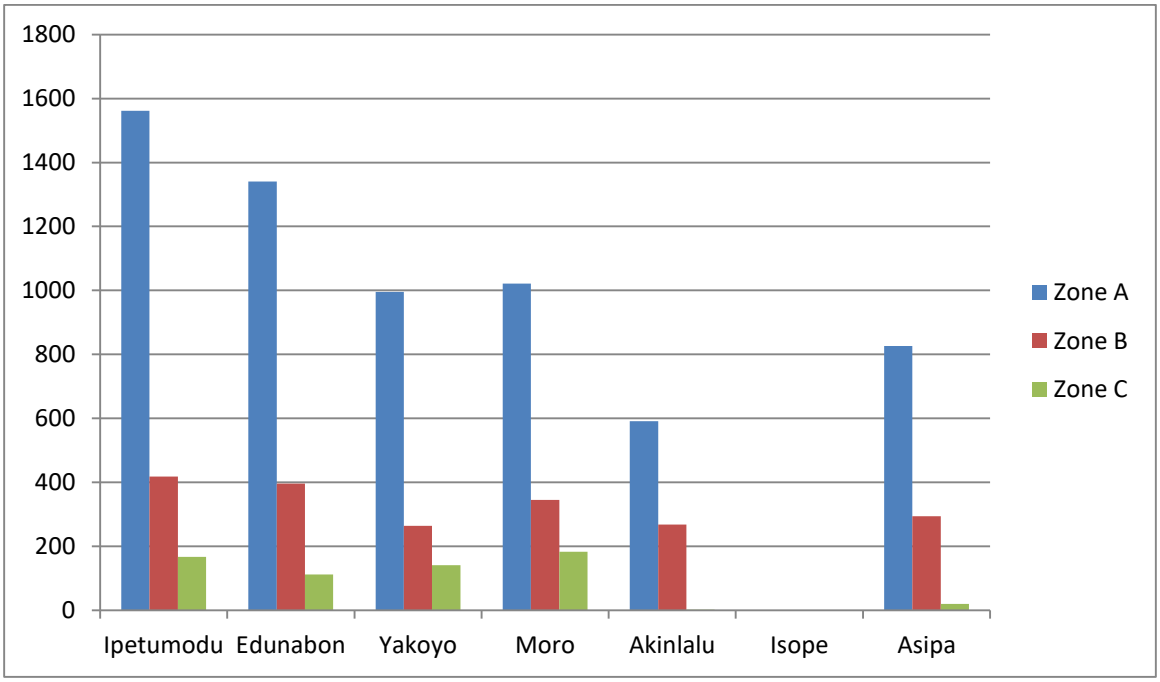

**Figure 3 The sketch of the sections and elevations of a typical traditional earth building.**
Author: Field Survey, 2015

## METHODOLOGY

Data for this study were obtained from both primary and secondary sources. Primary data were obtained through the stratification of the study area which comprises of seven communities of Origbo in Ife North Local Government area of Osun state Nigeria. The stratification were into three zone of residential house-form distribution in each of the community, Namely; Central Traditional Residential zone (Zone A), Intermediate Section of vernacular earth dwelling (Zone B) and newer modern residential at outskirt area of the town. (Zone C), Ojo (1966), Egunjobi,(1999), Ajiboye (2014). Table 1 Present the Origbo community with approximate shelter units analysis which are stratified into house-form zones.

**Table 1: Shelter Unit at the rural communities**

| S/N | Community | Zone A | Zone B | Zone C |
|---|---|---|---|---|
| 1 | Ipetumodu | 1562 | 418 | 167 |
| 2 | Edunabon | 1340 | 396 | 112 |
| 3 | Yakoyo | 995 | 264 | 141 |
| 4 | Moro | 1021 | 345 | 183 |
| 5 | Akinlalu | 591 | 268 | 02 |
| 6 | Isope | N/A | N/A | N/A |
| 7 | Asipa | 826 | 294 | 20 |
| | Total | 6335 | 1985 | 580 |




Zone A has 6335 unit of shelter distribution, zone B has 1985 units, whereas Zone C has 580 units using stratified systematic sampling methods cited by Dixon and Leach ,(1977), 10% sample were administered with questionnaires. Total number of 890 questionnaires was administered at the study area with pertinent structured question pertaining to house-form patterns, cultural value, and practices, preferred building material, suitability of indigenous approach to construction that matched with standard, cost benefit of earth as building material Vis-a-Vis foreign material.etc. Data were analyzed using descriptive statistics and one-way analysis variance (ANOV) to determine the relationship of earth as building material and potential benefits that associated with it which include cost, affordability and availability. The analysis revealed that the earth architecture adopted allowed the use of indigenous building material in its natural form without any modification of properties of material for shelter provision.

## RESULT AND DISCUSSION

**Table 2: Shelter classification**

| Classification | Number | Percentages % |
|---|---|---|
| Typical Traditional Building | 682 | 76.6 |
| Vernacular Dwelling | 157 | 17.6 |
| Modern Flat Apartment | 51 | 5.8 |

Author: Field Survey, 2015

Table 2 shows the data on existing and identifiable house-form in seven Origbo communities. The Result shows that 76.6% of the respondents live in typical Yoruba courtyard traditional residential house-form while 17.6 occupy vernacular dwelling and 5.8% indicated that their dwelling were modern flat dwelling. The result suggests that the traditional Yoruba house-form were the major dwelling of the Origbo communities. These findings was substantiate further by Denyer, S, (1978), Bascom, B. M, (1955), and Osasona .C.O, (2007), that in Yoruba town traditional compound house-form usually dominates the central core. Further expatiate that the compounds were divided into numerous forms unified by central courtyard which draw members of the extended family into prolonged daily contact, also used for socio economic activities such as cassava processing, weaving, dyeing, tailoring….etc. (fig. 2 and 3). The following factors were derived from the significance of earthen shelter.

**Advantage of earthen shelter and the use of indigenous materials.**

Table 3 shows that 90% of the respondents have signified that the house-from pattern for Yoruba traditional building have reflected architectural simplicity at the design stage that enable indigenous material especially earth to be used in its natural state without any special modification. Most earthen building techniques require very local skill or indigenous technology for construction process. The roofing system is simple enough to allow woody stem of trees to be used in natural form without any processing. According to Osasona .C.O, (2007), thatch are normally used for roof covering but has been replaced with corrugated iron sheet. Table 3 indicated further that 9.0% and 1.0% of the respondent claimed that vernacular dwelling are fairly for use of indigenous material and modern flat is not conformed to the use of indigenous material. The traditional building house-form is not complex in its architectural articulation which makes it possible for indigenous knowledge and skill to be used alongside with readily available local materials. This is not readily possible with other house-form dwelling. According to Stulz, R. and Mukerji, K. (1993), earthen shelter exploited indigenous resources which include natural occurring raw material deposit, in addition low skilled techniques has been adopted for construction and maintenance.

**Table 3: Advantage of house-form to indigenous material scale**

| | Rating | Frequency | Percentage % |
|---|---|---|---|
| **Traditional Building** | Very good | 800 | 90 |
| **Vernacular Dwelling** | Fairly good | 89 | 9 |
| **Flat Apartment** | Very Low | 1 | 1 |
| | | **890** | **100** |

Author: Field Survey, 2015

**Relationship of earthen shelter and cost affordability**

The conformity of earthen shelter with the use of indigenous building material has made it affordable, comfortable and sustainable. Table 4 shows that the construction cost for earth shelter is very low compare to other modern building. This is because local material is readily available it elimination of transportation cost. Earth to be used for construction usually derived from the site of construction at no cost, no huge mine or clear-cut forest is required. A hole dug to extract clay-rich soil can be used as water tank during the raining season, creating a pool of water for construction work; furthermore, it can be stabilized to become septic tank for waste disposal. Several surviving heritages of house-from of earth structures shows that earth has potential to produce high quality building products.

**Table4: Relationship of house-form pattern and cost affordability**

| | Rating | Frequency | Percentage |
|---|---|---|---|
| **Traditional Building** | Very Low | 806 | 90.9 |
| **Vernacular Dwelling** | Low | 75 | 8.4 |
| **Flat Apartment** | Very High | 09 | 0.7 |
| | | **890** | **100** |

Author: Field Survey, 2015

**Understanding Earth as a Building Material**

The research suggested that adequate understanding of earth as a building material will enhance performance evaluation of indigenous earth dwellings as its passionate advocates but not just to build with earth because of its availability but must understand the nature and behavioural pattern of earth under different conditions. Earth is vulnerable to weakness according to rural dwellers, in the presence of damp it loses much of its comprehensive strength. Earth dwellings has tendency of re-mix with water to reduce its strength, it extremely susceptible to heavy rainfall, splash-back erosion, seasonal and non-seasonal flooding. This will either cause shrinkage or decay to earth structure (John Norton, 1997). It is important to note that adequate draining of water away from earth dwelling will eliminate the threat posed by the presence of water. Furthermore, it was established that earth is weak in tension but has appreciable compressive strength. The critical constraint in using load bearing earth is the slenderness of the structure, since the lack of resistance to bending has to be compensated for by greater width in the structure to maintain stability. Reports corroborate further that soil composition of the earth construction is paramount important; majority of rural shelter developers have no adequate knowledge about the right earth composition for the earth walling. Doat, ()1991, Gans, (2006), Gernot, (2006). They use earth in wrong context that will not guarantee strength, durability and quality control of earth dwelling. In effect, there are soil which are extremely sensitive to the effect of water, expanding greatly when wet and shrinking

when drying out. This is destructive in earth dwelling with a great deal of multiple cracking. Observations of existing rural earth dwelling provide best information about the local soils. Rain and wind had destructive effects on these local buildings with multiple cracks and absolute collapse. This is as a result of inappropriate soil composition, poor workmanship, poor roof cover, inadequate roof eaves overhang and lack of maintenance. Akinkunmi, (2018).A great variety of construction techniques have been identified from the research in response to local soils and weathering actions. In accordance to this study, inappropriate construction techniques resulted in poor quality earth structure associated with cracking and structural defect dwelling. The prevailing construction process adopted in different part of Nigeria includes:

(a) Direct moulding in western area with the form of multiple cracking and dilapidation due to inability to compact very well.
(b) Wattle and daub and direct moulding in Eastern and Southern area which reflect the problem of structural defect due to rottenness of skeletal element of wattle and daub.
(c) Unfired brick in form of adobe in Northern part of the country which attains relative compaction enhancing adequate comprehensive strength but problem of flooding causes multiple cracking. Akinkunmi, (2018).

**Constructional detail of earth shelter.**

According to research analysis, structural failures in the earth structures are common and of great concern to this study. Raining season leaves evidence of collapse of earth structure and multiple cracks often observed. The following limitations were raised.

- Complete absence of adequate constructional knowledge from design to construction.
- Lack of building professional impute in supervision
- Incompetent builder and the use of poor materials
- Low standard of workmanship and lack of quality control in the construction process. Reeves, (2006).

**Causes of cracks and failure are briefly explained thus:**

Hydrometer test at the laboratory reveal that there is a relatively high sand fraction above the recommended limits in the soil sample collected from Western and Northern parts of Nigeria. The average sand fraction content of 78.5 percent is higher than the acceptable and recommended limits on the other hand soils sample from Eastern part of the country reflect high clay content which shows outright cracking as the structure is drying out. This must have affected bonding properties of the earth structure. Furthermore, many of the earth structure have no proper foundations design in structural detail they were constructed on bare earth after shallow excavations. Then due to settlement of the applied load, cracking resulted because of no foundation to transfer the load to the ground. This eventually leads to absolute wall collapse. John Norton, (1997).

**Fundamental requirements of earth construction process for maximum effectiveness and productivity**

**Choosing suitable site and appropriate soil composition for earth shelter.**
According to research report, earth building requires stable site which do not flooded and providing some weather protection from erosive effect of driving rain. Knowledge of earth as a building material by shelter developer is important for excellent performance of earth dwelling from selection of soil through construction and maintenance processes. Moisture must be perpetually drained away from the earth structure, its external fabrics must be protected against moisture, it must render impervious to moisture and preventing the clay from losing its binding capacity. Choose suitable soil for earth construction is vital to overall durability of the earth dwelling. Adequate knowledge that guards balancing the acceptable level of clay, sand, silt and water is essential in construction of earth structure. The crucial features of the appropriate soil composition must be understood, it must contain at least five to fifty percent clay to achieve bonding. This must enhance effective cohesion and waterproof ness that will enhance durability of earth structure. In building with earth, necessary modification can be carried out in an unsuitable soil by adding necessary composition that will affect adequate cohesion and waterproofing. Akinkunmi, (2015).

**Choosing suitable earth building technique.**
There are different earth-building techniques requirement for different soil mixes. This study showed that most of rural area sampled used direct earth mouldling, which are not frequently effective because of inability to compact well and is usually accompany with shrinkage and cracking, the known technique has been identified unsuitable. However rammed earth, poured earth, adobe, pressed brick, wattle and daub each of these techniques has different mixes that must be abided with, that produced durable earth shelter. Akinkunmi,(2015).

**Design of earth Building.**
Good design take account of the limitation of the earth to be useful as building material, it must be used as thick wall built of limited height. It must be designed in such a way that all forces must pass down within the thickness of the structure to the ground. The structure to maintain stability, also openings and joinery must not pose a threat to the stability of adjoining walls. Opening should be kept out at least 50 CM away from corners of walls. Joining should not be positioned in the thickness of the wall in such a way that when the door or window is opened it will pivot on the corner edge of the openings. An experienced earth designer can assist with design that works for structure and durability.

**Detailing Precisions**
There are rules to be strictly abided with if the earth structure is to be improved for effective performance. Indigenous earth structure requires good foundation that will discourage moisture absorption and protection from foundation. It must be effective in preventing rain splash that causes lower erosion, also must discourage any rising damp that weakens the lower part of the structure. Roof eaves overhang must be adequate to discourage upper level erosion. Structure orientation in which majority of shelter developer are ignorant of causing majority of weathering

effect on earth structure. It must be positioned to minimize exposure to prevailing rain bearing winds as this will protect external wall that are in direction of rain. (John Norton 1997). The choice of protection must be done carefully within the most effective limits the best protection to be used is earth itself, difficult with many other protections is that it will not adhere well to earth structure especially unstabilized indigenous earth walls. In particular cement does not achieve a chemical bond with earth because of seasonal changes. In this condition difference of rates of expansion of different materials lead to cracking of earth building materials Reeves, (2006).

**Developing Maintenance Culture**

Regular inspection of the earth dwelling is always worthwhile for improved performance of the earth dwelling. Majority of shelter developer lack maintenance culture they built without regular maintenance practice. The rural dwellers must be educated for the need for regular maintenance lack of which will result in deterioration of earth structure Ajiboye, (2010). This leads to decay, cracking and total collapse. Proper and adequate maintenance will restore the building to effective state of improved performance. On the other hand, it is important to note that better protection cannot replace regular maintenance practice once the protection is affected the wall is exposed. Regular maintenance must prevent absolute dilapidation, whereas lack of maintenance will result in total collapse of earth structure and returning to soil.

**The benefits of indigenous earth as building material Includes:**

**a) Reliance on local material**

The Availability of indigenous material such as clay and others is an advantage for shelter provision. It has been confirmed that locally produced building material can replace, expensive imported material. Also it has been reported that those locally produced materials also exhibits, functionality, aesthetic, durability and structural stability (Un-Habitat 1986, Akinkunmi 2012). Olugbenga and Olaluwoye (2007), Akinkunmi 2010), further buttressed that local alternatives provide safe, durable, comfortable, and durable shelter for communities

**b) Provision of affordable building**

According to (Akinkunmi,2012) where cost is concerned building with local material may cost less than using conventional material. Local building material are affordable and cheap as also stated by Heathcare (1995), furthermore, Arumala and Gondal (2007) explained that earth is one of the oldest building material readily available cheap among others. Normally local building materials are not bought, the cost incurred in obtaining them are for only those who will fetch the material .e.g. hiring people to dig earth and cut bamboo. This makes it cheap and affordable for obtaining local material for building purpose

**c) Reliance in local skill and Technology**

Indigenous building technologies are the skills or methods in building constructions that are local in its origin. The advantage of the building technology is that is within the reach of the masses. The cost is very cheap and affordable. The tools to carry out the construction process are equally available and very cheap. Akinkunmi, (2015).

**Quality Shelter in Socio Economic Development.**

Shelter offer opportunity of meeting national objectives of the developmental process and improve the general living condition (Wu, 1979). Also among many other reasons, the fact that shelter aid development of small-scale cottage industries within the rural setting which include local textile weaving, tailoring, cassava processing, dyeing among others. In the light of this, shelter enhances economic productivity also in the recent work of Arayela, (1999) frustration of economic activities are traceable to shelter problem.

Shelter should not therefore be seen as a service function but an instrument that contribute to economic development. It gives an appropriate shape to the physical environmental development thereby motivating people towards greater productivity. Shelter have direct effect on the social stability, employment, physical, rural health and education. It also affects the efficiency and ultimate development. Therefore, performance evaluation of indigenous dwelling must recognize the role and significant of shelter since no development can be achieved without standard shelter plan.

**Recommendation**

The following recommendations will scale down the cost of building if appropriately adopted and thus increase the rate of shelter provisions. This includes;

a) Adopting the use of earth as building material

b) The country should set goals to make the nation a self-sufficient in area of housing material not depend on high expensive, imported materials.

c) Indigenous material should be advocated and recommended for use as a way of cutting cost of shelter provision.

d) More research is needed in low-cost, local materials and component to improve commonly used local building materials.

## CONCLUSION

Improved indigenous shelter performance play an important role in quality of living and socio-economic activities. Finding support that substandard housing situated at the study area encourages rural urban drift and discourages local industrial developments, this generated unemployment problem. Interaction with rural dweller reveal that the quality of life developments is affected because of appreciable rural development need, such as quality shelter system that will enhance quality of living, education system, health system and industrial development. This research focuses on how indigenous earth shelter can be adopted and improved to provide adequate and appropriate building performance for a variety of purpose at affordable cost that will enhance rural development. Furthermore, to achieve improved shelter performances a practical implementation of the above listed recommendations is required for the opportunity of spreading socio economic development. This becomes tools to enhance socio-economic characteristic which contribute to overall national economy.

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